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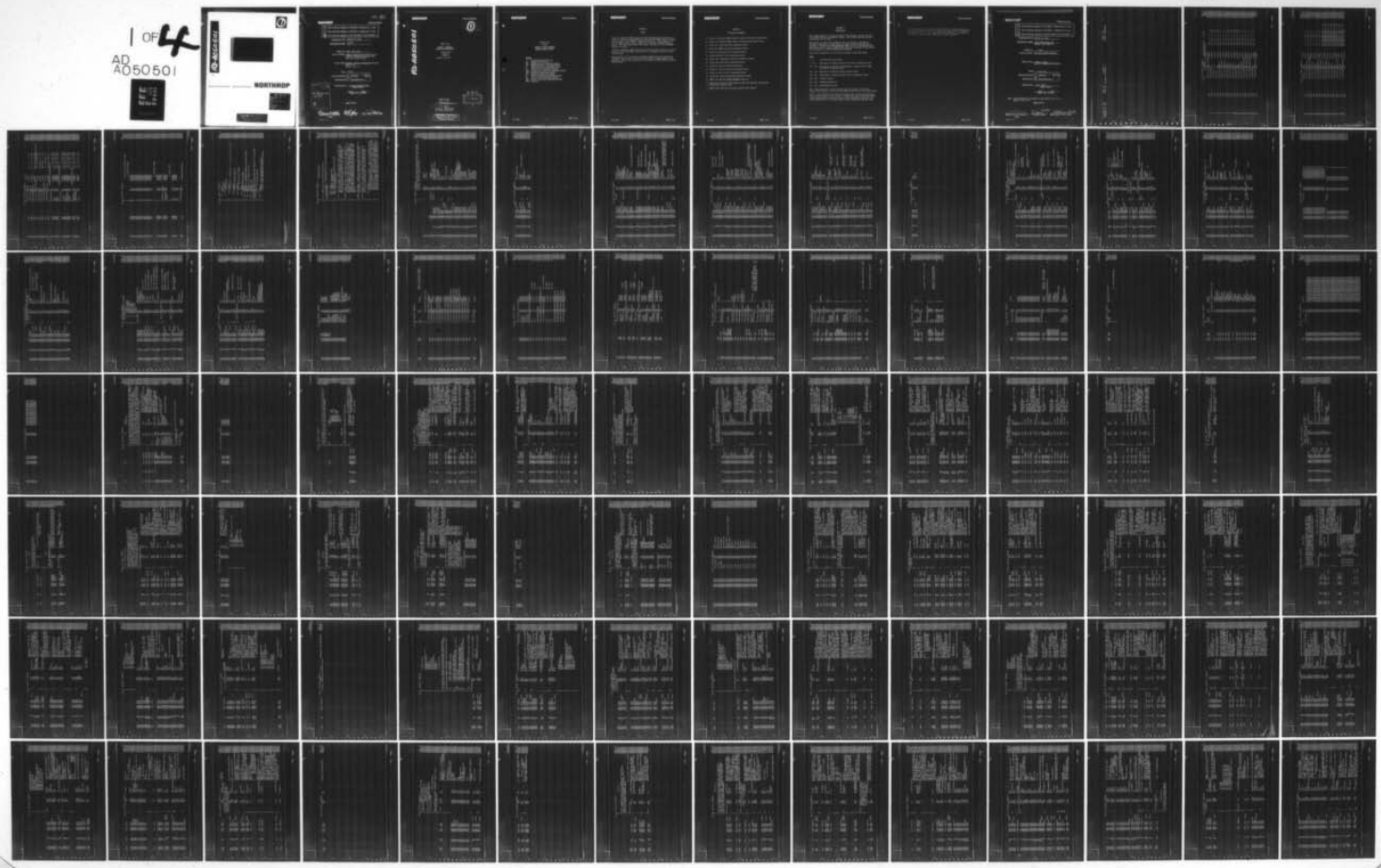

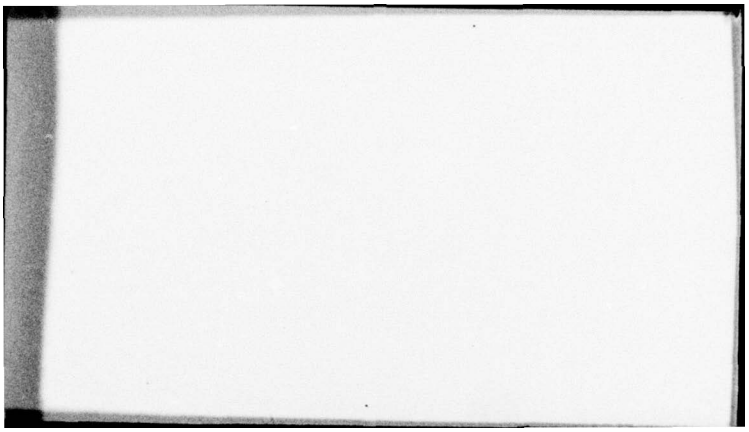

VOL XIII

NORTHROP

Electronics Division

- ☐ This submittal applies to AN/BRN-7 (Submarine Ω) only.
- ☐ This submittal applies to AN/SRN-( ) (Hydrofoil Ω) only.
- ☒ This submittal applies to both AN/BRN-7 and AN/SRN-( ).

CONTRACT NO: N00039-73-C-0209

PROGRAM NAME: AN/BRN-7

CDRL No: A01D, A01E, A01F

Title of CDRL: Computer Program Design Specification
Computer Subprogram Design Document
Data Base Design Document

Title of Doc: AN/BRN-7 Computer Program Specification
NORT 73-48
Volume 2 thru 13

Date: 1/16/74

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Prepared by: System Integration Unit
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FORM 6512 (2-72)

NORTHROP

Electronics Division

AD-A050501

NORT 73-48

AN/BRN-7 COMPUTER PROGRAM SPECIFICATION

Volume XIII

APPENDIX

October 12, 1973

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Approved by

G. W. Hauser
Director, Engineering
Navigation Department

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Volume XIII

of the

AN/BRN-7 OMEGA COMPUTER
PROGRAM SPECIFICATION

Volume	
I	Performance Specification
II	Design Specification
III	Synchronization Subprogram Design
IV	OMEGA Processing Subprogram Design
V	Tracking Filter Subprogram Design
VI	Kalman Filter Subprogram Design
VII	Propagation Prediction Subprogram Design
VIII	Navigation Subprogram Design
IX	Executive Subprogram Design
X	Control-Indicator Subprogram Design
XI	Built-in Test Subprogram Design
XII	Common Subroutines Subprogram Design
XIII	Appendix

SECTION 1

SCOPE

Volume I, Submarine OMEGA Computer Program Performance Specification, defines the functional requirements for the Submarine OMEGA Computer Program which is used by the AN/BRN-7 OMEGA Navigation Set. The navigation set and the OMEGA program together comprise the Submarine OMEGA Navigation System. The tape which defines the computer program is entitled AN/BRN-7 Navigation Program.

Volume II, Submarine OMEGA Computer Program Design Specification, allocates the functional requirements of Volume I to the computer routine and subprogram level.

This volume is the listing of the Submarine OMEGA Computer Program tape, designated above, whose contents are described by the subprogram design documents, Volumes III through XII of the Submarine OMEGA Computer Program Specification.

SECTION 2

APPLICABLE DOCUMENTS

a) Volume I, Submarine OMEGA Computer Program Performance Specification

b) Volume II, Submarine OMEGA Computer Program Design Specification

c) Volume III, Synchronization Subprogram Design

d) Volume IV, OMEGA Processing Subprogram Design

e) Volume V, Tracking Filter Subprogram Design

f) Volume VI, Kalman Filter Subprogram Design

g) Volume VII, Propagation Prediction Subprogram Design

h) Volume VIII, Navigation Subprogram Design

i) Volume IX, Executive Subprogram Design

j) Volume X, Control Indicator Subprogram Design

k) Volume XI, Built-in-Test Subprogram Design

l) Volume XII, Common Subroutines Subprogram Design

m) NORT 71-41 NDC-1070 MACRO ASSEMBLER, MAY 1971

n) NORT 68-115A, Detailed Description of NDC-1070 Computer Instructions, Revision A, February 1970

o) NORT 69-87A, NDC-1070 Flow Chart Program User's Manual

SECTION 3

DESCRIPTION

This volume contains a listing and label cross-reference list for the Submarine OMEGA Operational Computer Program. This listing defines the exact configuration of the SCDP.

The listing and label cross-reference list is an output of the NAP-70 Assembler program that is produced at the same time that punched tape is generated. The NDC-1070 MACRO ASSEMBLER (NORT 71-41) and the NDC-1070 Flow Chart Program User's Manual (NORT 69-87A) describe the format of the listing and the meaning of special characters and symbols.

The overall organization of the listing is given in the table below.

Pages	
1 - 4	I/O Equivalance Dictionary
5 - 250	Description of memory location 0 to 1737 in sequential order
251 - 258	Description of variable storage memory location 1B39 to 1FFF in inverse sequential order
259 - 264	Description of memory locations 181D to 1990.
265 - 317	Description of memory locations 1991 in sequential order
318 - 319	Literal listing
320 - 322	Assembler Statistics
323 - 344	Cross-Reference List

Note: Equivalences not in the I/O Dictionary are placed in convenient places in the listing, usually near the instructions that use the equivalences.

Users of the listing and the flow charts should rely on the cross-reference list to locate labels in the listing. In particular, main labels that appear on the flow charts can be quickly located in the listing by looking in the cross-reference list to find the memory location associated with the label

and then turning to that location in the listing. Another important use of the cross-reference list is to identify all the users of an operand. The memory location of every instruction that addresses the operand is given in the cross-reference list entry for that operand.

NORTHROP Electronics Division

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☐	This submittal applies to AN/SRN-( ) (Hydrofoil Ω) only.
☒	This submittal applies to both AN/BRN-7 and AN/SRN-( ).

CONTRACT NO: N00039-73-C-0209

PROGRAM NAME: OMEGA NAVIGATIONAL SET
AN/BRN-7 AND AN/SRN-17

CDRL No: A01F

Title of CDRL: DATA BASE DESIGN DOCUMENT

Title of Doc: PROGRAM LISTING
MOD 36 & CORRECTION ON PAGE 83

Date: 19 MAY 1976

Initial Submittal: ☐ Release MZ, 21 May 76

Resubmittal: ☒ Authentication

Prepared by: PROJ. ENGR.
Orgn. Name

4150 545
Orgn. No. and Ext.

NOTE: THIS SUBMISSION IN RESPONSE TO NAVY LETTER 52013B:DC pw DATED 16 JULY 1975.

Approved by:

[signature]	C Jones by WWW	WWWeimer 5/20/76
Supervisor of Preparing Orgn.	Program Mgr.	Proj. Engr./Proj. Mgr.

FORM 6512 (2-72)

```
PROGRAM_ID  VIS        "MOD 35              AN/BRN-7 "                    10750  NEW          0
PROGRAM_ID  VIS        "MOD 36  02/06/75 AN/BRN-7 "                       10750  REPLACED
```

```
                    **/          LIBRARY        OMEGA_IO_DICTIONARY    04/04/69                 000010
                    *        IOC,SET, AND SNS LABEL DEFINITIONS                                 000020
                    *            IOC            CODES                                          IC000030
                    INHIBIT_BOTH_CSE_INTERRUPTS;                                               IC000040
        8000                    EQU          X(8000)        1000 .... .... ....                IC000050
                    LOAD_PRINTER;                                                              IC000060
        DF01                    EQU          X(DF01)        1101 1111 .... 0001                IC000070
                    LOAD_PUNCH;                                                                IC000080
        DF02                    EQU          X(DF02)        1101 1111 .... 0010                IC000090
                    READ_TAPE;                                                                 IC000100
        CF01                    EQU          X(CF01)        1100 1111 .... 0001                IC000110
                    RESET_CMP_INTERRUPT;                                                       IC000120
        9F00                    EQU          X(9F00)        1001 1111 .... ....                IC000130
                    INHIBIT_CMP_INTERRUPT;                                                     IC000140
        AF00                    EQU          X(AF00)        1010 1111 .... ....                IC000150
                    ENABLE_CMP_INTERRUPT;                                                      IC000160
        BF00                    EQU          X(BF00)        1011 1111 .... ....                IC000170
                    READ_START_ADDRESS;                                                        IC000180
        CF02                    EQU          X(CF02)        1100 1111 .... 0010                IC000190
                    READ_STOP_ADDRESS;                                                         IC000200
        CF03                    EQU          X(CF03)        1100 1111 .... 0011                IC000210
                    LOAD_PMU_REGISTER;                                                         IC000220
        DE00                    EQU          X(DE00)        1101 1110 .... 0000                IC000230
                    LOAD_PMU_TIMER;                                                            IC000240
        DE0A                    EQU          X(DE0A)        1101 1110 .... 1010                IC000250
                    READ_PMU_KEYBOARD;                                                         IC000260
        CE0B                    EQU          X(CE0B)        1100 1110 .... 1011                IC000270
                    RESET_PMU_INTERRUPT;                                                       IC000280
        9E00                    EQU          X(9E00)        1001 1110 .... ....                IC000290
                    RESET_RECORDER_INTERRUPT;                                                  IC000300
        9B00                    EQU          X(9B00)        1001 1011 .... ....                IC000310
                    INHIBIT_RECORDER_INTERRUPT;                                                IC000320
        AB00                    EQU          X(AB00)        1010 1011 .... ....                IC000330
                    ENABLE_RECORDER_INTERRUPT;                                                 IC000340
        BB00                    EQU          X(BB00)        1011 1011 .... ....                IC000350
                    LOAD_RECORDER;                                                             IC000360
        CB00                    EQU          X(CB00)        1100 1011 .... ....                IC000370
                    PROGRAMMER_CONTROLLER_GO_LIGHT;                                              000380
        8CC3                    EQU          X(8CC3)                                              000390
```

```
                    **          SNS          CODES                                  SS000400
                    DOPPLER_IN_MEMORY;                                              SS000410
        0000                    EQU          X(0000)     0... .... 0000 ....       SS000420
                    INERTIAL_SYSTEM_NO_GO;                                          SS000430
        0010                    EQU          X(0010)     0... .... 0001 ....       SS000440
                    NAV_INERTIAL_DOPPLER_MODE;                                      SS000450
        0020                    EQU          X(0020)     0... .... 0010 ....       SS000460
                    HEADING_EXITATION_A;                                              000470
        0030                    EQU          X(0030)     0... .... 0011 ....       SS000480
                    SPEED_EXITATION_B;                                                000490
        0040                    EQU          X(0040)     0... .... 0100 ....       SS000500
                    PFG_COUNTDOWN_NO_GOOD;                                          SS000510
        0050                    EQU          X(0050)     0... .... 0101 ....       SS000520
                    OMNI_ANTENNA_AVAILABLE;                                         SS000530
        0060                    EQU          X(0060)     0... .... 0110 ....       SS000540
                    PUNCH_OR_PRINTER_BUSY;                LOW INDICATOR RESET IF TRUE SS000550
        8F10                    EQU          X(8F10)     1... 1111 0001 ....       SS000560
                    TAPE_READER_DATA_READY;               LOW INDICATOR RESET IF TRUE SS000570
        8F20                    EQU          X(8F20)     1... 1111 0010 ....       SS000580
                    PMU_KEYBOARD_REQUEST;                 LOW INDICATOR RESET IF TRUE SS000590
        8E10                    EQU          X(8E10)     1... 1110 0001 ....       SS000600
                    PMU_TIMER_OVERFLOW;                   LOW INDICATOR RESET IF TRUE SS000610
        8E20                    EQU          X(8E20)     1... 1110 0010 ....       SS000620
                    PMU_DISPLAY_BUSY;                     LOW INDICATOR RESET IF TRUE SS000630
        8E30                    EQU          X(8E30)     1... 1110 0011 ....       SS000640
                    HIGH_SPEED_PRINTER_BUSY;              LOW INDICATOR RESET IF TRUE SS000650
        8D00                    EQU          X(8D00)     1... 1101 .... ....       SS000660
                    TAPE_RECORDER_BUSY;                   LOW INDICATOR RESET IF TRUE SS000670
        8B01                    EQU          X(8B01)     1000 1011 .... ..01       SS000680
                    TAPE_RECORDER_INTERRUPT;              LOW INDICATOR RESET IF TRUE SS000690
        8B02                    EQU          X(8B02)     1000 1011 .... ..10       SS000700
```

```
                    **          SET          CODES                                    ST000710
                    RESET_PFG_COUNTDOWN;                                              ST000720
        000A                    EQU         X(000A)       0... .... .... 101.         ST000730
                    PROGRAM_SEQUENCING;                                               ST000740
        000C                    EQU         X(000C)       0... .... .... 110.         ST000750
                    MEMORY_AUGMENTER_GO;                                              ST000760
        0008                    EQU         X(0008)       0... .... .... 100.         ST000770
                    HIGH_SPEED_PRINTER_OUTPUT;            BITS 1-8 DEFINE CHARACTER CODE ST000780
        8D00                    EQU         X(8D00)       1... 1101 XXXX XXXX         ST000790
                    INTER_RECORD_GAP;                                                 ST000800
        8B01                    EQU         X(8B01)       1000 1011 .... ..01         ST000810
                    WRITE_FILE_GAP;                                                   ST000820
        8B02                    EQU         X(8B02)       1000 1011 .... ..10         ST000830
                    DISABLE_MEMORY_PROTECT;                                           ST000840
        8E20                    EQU         X(8E20)       1... 1110 0010 ...0         ST000850
                    ENABLE_MEMORY_PROTECT;                                            ST000860
        8E21                    EQU         X(8E21)       1... 1110 0010 ...1         ST000870
                    *                  ADDENDA FOR PMU INDICATORS                     ST000880
                    PMU_INDICATORS;                                                   ST000890
        8E10                    EQU         X(8E10)       1... 1110 0001 0000         ST000900
        0008        ALPHA       EQU         X(0008)       .... .... .... 1...         ST000910
        0004        BETA        EQU         X(0004)       .... .... .... .1..         ST000920
        0002        GAMMA       EQU         X(0002)       .... .... .... ..1.         ST000930
        0001        ERROR       EQU         X(0001)       .... .... .... ...1         ST000940
                    *                  ADDENDA FOR TAPE CONTROL                       ST000950
                    TAPE_CONTROL;                                                     ST000960
        8F10                    EQU         X(8F10)       1... 1111 0001 0000         ST000970
        0001        FORWARD     EQU         X(0001)       .... .... .... ...1         ST000980
        0002        RUN         EQU         X(0002)       .... .... .... ..1.         ST000990
        0004        VERIFY_ON   EQU         X(0004)       .... .... .... .1..         ST001000
        0008        SELFTEST_ON EQU         X(0008)       .... .... .... 1...         ST001010
        0000        REVERSE     EQU         X(0000)       .... .... .... ...0         ST001020
        0000        STOP        EQU         X(0000)       .... .... .... ..0.         ST001030
                    *                  ADDENDA FOR TAPE FILL                          ST001040
        8F20        TAPE_FILL   EQU         X(8F20)       1... 1111 0010 0000         ST001050
        0000        ENABLE_READ EQU         X(0000)       .... .... .... ...0         ST001060
                    INHIBIT_READ;                                                     ST001070
        0001                    EQU         X(0001)       .... .... .... ...1         ST001080
        0002        FORCE       EQU         X(0002)       .... .... .... ..1.         ST001090
```

```
                                 **
                                 *                    FLAG AND LGC EQUIVALENCE TABLE
                                 *
                                 *                        1. CONDITION CODES
                                 *
58          0000                 UC          EQU         X(0000)
59          0010                 NE          EQU         X(0010)
60          0020                 GE          EQU         X(0020)
61          0030                 G           EQU         X(0030)
62          0040                 LE          EQU         X(0040)
63          0050                 L           EQU         X(0050)
64          0060                 E           EQU         X(0060)
65          0070                 NO          EQU         X(0070)
66          0080                 AT          EQU         X(0080)
67          0090                 AF          EQU         X(0090)
68          00A0                 BT          EQU         X(00A0)
69          00B0                 BF          EQU         X(00B0)
70          00C0                 CT          EQU         X(00C0)
71          00D0                 CF          EQU         X(00D0)
72          00E0                 DT          EQU         X(00E0)
73          00F0                 DF          EQU         X(00F0)
                                 *
                                 *                        2. FLIP-FLOP CODES
                                 *
74          0000                 A           EQU         X(0000)
75          0001                 B           EQU         X(0001)
76          0002                 C           EQU         X(0002)
77          0003                 D           EQU         X(0003)
78                               INTERRUPT_INHIBIT;
78          0000                             EQU         X(0000)
79          0001                 DMA_INHIBIT EQU         X(0001)
80          0002                 PIN_MODE    EQU         X(0002)
                                 *
                                 *                        3. LOGIC CODES
                                 *
81          0000                 UCD         EQU         X(000)
82          0004                 OR          EQU         X(0004)
83          0008                 AND         EQU         X(0008)
84          000C                 EOR         EQU         X(000C)
                                 *//         ENDL
                                 *
85                               FLOATER_ANTENNA;
85          0010                             EQU         INERTIAL_SYSTEM_NO_GO
```

```
**                                                                    001530
*    001 = BLOCK 1                                                    001540
*          MAIN PROGRAM                                               001550
*       002 = BLOCK 2                                                 001560
*          DEBUG ROUTINE                                              001570
*                                                                     001580
*       004 = BLOCK 3                                                 001590
*          TEST ROUTINES - EITHER BLOCK 2 OR 4 MUST BE LOADED AT FILL 001600
*                                                                     001610
*       008 = BLOCK 4                                                 001620
*          MAGNETIC TAPE DATA ROUTINE                                 001630
*                                                                     001640
*       010 = BLOCK 5                                                 001650
*          PLOT - MODIFIES MAIN PROGRAM                               001660
*                                                                     001670
*      020 = BLOCK  6                                                 001680
*          DECIMAL PRINT ROUTINES                                     001690
*   040 = BLOCK 8                                                     001700
*          SIMULATOR, PROGRAMMER CONTROLLER FAILURE DISPLAY           001710
*   080 = BLOCK 9                                                     001720
*          PRODUCTION INSP UNUSED I/O TEST                            001730
*   100 = BLOCK 10                                                    001740
*          NAV PERF TEST                                              001750
*   200 = BLOCK 11                                                    001760
* PCI, DYNAMIC RANGE-RANDOM NOISE TEST DISPLAYS 91 ON CI PANEL        001770
*   400 = BLOCK 12                                                    001780
*        SRN-17   OPERATIONAL OVERLAY                                 001790
*                                                                     001800
*   800 = BLOCK 13                                                    001810
*          LITERALS - DOES NOT MODIFY MAIN PROGRAM                    001820
*          MUST BE LOADED WHENEVER MAIN PROGRAM IS LOADED             001830
```

```
**                          OMEGA_FILL_PUNCH                          001840
*                                                                     001850
*                                                                     001860
* FILL, COMPARE AND PUNCH PROGRAM DISCRIPTION                         001870
*                                                                     001880
*     THIS PROGRAM IS CONTROLLED FROM THE START ADDRESS SWITCHES ON THE 001890
* MAINTENANCE PANEL                                                   001900
*                                                                     001910
*      6XXX = FILL                                                    001920
*      7XXX = COMPARE, PUNCH AND PRINT                                001930
*      8XXX = COMPARE AND PRINT                                       001940
*      YXXX = HALT AND RESTART IF COMPUTE IS PRESSED                  001950
*       XXX = BLOCK SELECTOR BITS                                     001960
*                                                                     001970
* FILL - LOAD THE SELECTED BLOCKS INTO CORE.  IF BLK1 IS SELECTED     001980
*        CLEAR CORE FIRST.  FOR BLK2 AND UP MODIFY CHECKSUM.  CLEAR   001990
*        MOST OF CORE USED BY FILL PROGRAM AFTER COMPLETING FILL.     002000
*        PUT BLK SELECTOR BITS INTO BITS 5-16 OF TAPE ID WORD.        002010
*                                                                     002020
* COMPARE, PUNCH AND PRINT - UPDATE CORR NO BY 1 AND COMPARE THE      002030
*        SELECTED BLOCKS WITH CORE. PUNCH AND PRINT DIFFERENCES.  PUT 002040
*        BLK SELECTOR BITS IN FIRST 3 CHARACTERS OF CORR NUMBER ON    002050
*        VISUALS.  DECREMENT CORR NO AFTER COMPLETION.  IF BLK1 IS    002060
*        SELECTED ALSO PUNCH AND PRINT ALL NON ZERO WORDS WHERE GAPS  002070
*        OCCUR ON THE TAPE BETWEEN START_CKSUM AND END_CKSUM.  ALSO   002080
*        PUNCH OR PRINT ALL NON ZERO WORDS BETWEEN LAST_WORD+1 AND    002090
*        ROLL-1.                                                      002100
*                                                                     002110
* COMPARE AND PRINT - IDENTICAL TO COMPARE, PUNCH AND PRINT EXCEPT NO 002120
*        MODIFICATION OF CORR NO AND NO PUNCHING OF A CORR TAPE.      002130
*                                                                     002140
* BLOCK SELECTOR BITS - THESE BITS TELL THE PROGRAM WHAT BLKS TO      002150
*        PROCESS.  THE SUM OF THE DESIRED BLOCK NUMBERS SHOULD BE     002160
*        SET IN THE MAINTENANCE PANEL START ADDRESS SWITCHES.         002170
*                                                                     002180
*       001 = BLOCK 1                                                 002190
*           MAIN PROGRAM LESS LITERALS - NOTE - ANY CORR TAPES PUNCHED 002200
*           WITH BLK 1 SELECTED WILL ALSO CONTAIN ANY BLKS IN CORE THAT 002210
*           MODIFY MAIN PROGRAM IN ADDITION TO ALL CORRS TO MAIN PROGRAM 002220
*           AND THOSE BLKS      SHOULD NOT BE FILLED WHEN USING THE   002230
*           CORR TAPE.  IF BLKS THAT DO NOT MODIFY MAIN PROGRAM ARE IN 002240
*           CORE WHEN PUNCHING A TAPE BUT THE BLKS HAVE THEMSELVES BEEN 002250
*           MODIFIED THEN THOSE BLKS SHOULD BE SELECTED FOR THE CORR  002260
```

```
                                    *          TAPE AND MUST ALSO BE FILLED EVERY TIME THAT CORR TAPE
                                    *          IS USED.  ANY BLK MAY BE LOADED AFTER THE CORR TAPE AND THE
                                    *          APPROPIATE BLKS ARE LOADED INITIALLY.
                                    *
                                    *
                                               TAPE        4,X(F2)
                                               TAPE        3,12
                                               TAPE        4,X(F1)
                                               TAPE      1
                0000                           SCS
                2000                _CORE_SIZE EQU         X(2000)
                1D00                           ORG         _CORE_SIZE-X(300)
        4R      1D00  FCE91FFA      _VERIFY    CLAM      14,,_ROLL_END
       12       1D02  F00F8E20                 SET       DISABLE_MEMORY_PROTECT
       16       1D04  FCF91FE6                 CLAM      15,,_ROLL_14
       20       1D06  FC291F5B                 CLAM      2,,_END_CKSUM
       24       1D08  FC191D00                 CLAM      1,,_VERIFY
       26       1D0A  B000                     SUB       0,0
        6R      1D0B  B601          $4         ADD       I0,1
       14       1D0C  C412   (1D0B)            BXU       1,,$4
        4R      1D0D  D063   (1D11)            BRE       $5
        8R      1D0E  F00F8F10                 SET       TAPE_CONTROL+STOP
       12       1D10  0000                     HLT
        2R      1D11  9C2F          $5         CLAM      2,,15
        6       1D12  B800                     SUBD      0,0
       10R      1D13  F1171F5C      $1         STA       X1,,_PPTEMP
       18       1D15  C413   (1D13)            BXU       1,,$1
        8R      1D16  F4088000                 FETM      0,,X(8000)
       18       1D18  F4071F60                 PTR       0,,_BLOCK_NO+1
       26       1D1A  F80FBF00                 IOC       ENABLE_CMP_INTERRUPT
       34       1D1C  F00F8F21                 SET       TAPE_FILL+INHIBIT_READ
       42       1D1E  F80FCF02                 IOC       READ_START_ADDRESS
       52       1D20  F40D1F5C                 PIP       0,,_PPTEMP
       60       1D22  F40A1F5C                 CLA       0,,_PPTEMP
       68       1D24  E4101F5A                 EXT       1,0,_XOFFF
       78       1D26  F0171F5D                 STA       1,,_BLOCKS
       80       1D28  B001                     SUB       0,1
       90       1D29  F0071F62                 STA       0,,_FILL_COMP
       94       1D2B  F8098000                 COMM      0,,X(8000)
       98       1D2D  D163   (1D41)            BRE       _COMPARE
        4R      1D2E  F8097000                 COMM      0,,X(7000)
        8       1D30  D169   (1D4A)            BRE       _PUNCH_TAPE
        4R      1D31  F8096000                 COMM      0,,X(6000)
```

```
124     8     1D33  D064   (1D38)          BRE     $3                                  PV002700
125     8R    1D34  F00F8F10               SET     TAPE_CONTROL+STOP                   PV002710
126    12     1D36  0000                   HLT                                         PV002720
127    16     1D37  DB08   (1D00)          BUC     _VERIFY                             PV002730
128     4R    1D38  F4148000       $3      LSA     1,,15          CLEAR IF BLOCK 1     PV002740
129     8     1D3A  D320   (1D6B)          BGE     _START                              PV002750
130     4R    1D3B  FC291CFF               CLAM    2,,_VERIFY-1                        PV002760
131     8     1D3D  8800                   SUBD    0,0                                 PV002770
132     8R    1D3E  7110           $2      STA     X1,,0                               PV002780
133    16     1D3F  C412   (1D3E)          BXU     1,,$2                               PV002790
134     4R    1D40  D20A   (1D6B)          BUC     _START                              PV002800
```

```
                                **
135      14R        1D41  F80C0151      _COMPARE    FETD    0,,X(151)                                          PV002810
136      22         1D43  F00F8F10                  SET     TAPE_CONTROL+STOP                                  PV002820
137      30         1D45  F48A014C                  CLA     8,,CORR_CKSUM                                      PV002830
138      38         1D47  F49A0152                  CLA     9,,X(152)                                          PV002840
139      42         1D49  D101    (1D5B)            BUC     _START_READ                                        002850
140       8R        1D4A  F46A014C      _PUNCH_TAPE CLA     6,,CORR_CKSUM                                      PV002860
141      16         1D4C  F00F8F10                  SET     TAPE_CONTROL+STOP                                  PV002870
142      22         1D4E  FD69FFFF                  CLAM    X6,,1(-1)                                          PV002880
143      32         1D50  F007014C                  STA     0,,CORR_CKSUM                                      PV002890
144      34         1D52  9C20                      CLAM    2,,0                                               PV002900
145      42   *     1D53  F80D1EA0                  BSV     _PPLEADER                                          PV002910
146      56         1D55  F80C0151                  FETD    0,,X(151)       TAPE AND CORRECTION NUMBER         PH002920
147      58         1D57  A491                      CLA     9,1                                                PH002930
148      60         1D58  9411                      ADDM    1,,1                                               PH002940
149      70         1D59  F0170152                  STA     1,,X(152)                                          PH002950
150       8R   *     1D5B  F80D1E78      _START_READ BSV     _PUNCHBCD                                          PH002960
151      22         1D5D  F80C014F                  FETD    0,,X(14F)       DATE AND MOD                       002970
152      30   *     1D5F  F80D1E78                  BSV     _PUNCHBCD                                          PH002980
153      38         1D61  F4080072                  FETM    0,,X(72)        STOP-CODE CHARACTER                PH002990
154      46   *     1D63  F80D1E29                  BSV     _PUNCH                                             PH003000
155      54   *     1D65  F80D1EA0                  BSV     _PPLEADER                                          PH003010
156      62         1D67  F4080071                  FETM    0,,X(71)        START-FORCE-FILL CHARACTER         PH003020
157      70   *     1D69  F80D1E29                  BSV     _PUNCH                                             PH003030
158       8R        1D6B  F00F8F20      _START      SET     TAPE_FILL+ENABLE_READ                              PH003040
159      18         1D6D  FC8A0144                  CLAD    8,,X(0144)      SAVE OLD CONTENTS                  PV003050
160      22         1D6F  FC191EFD                  CLAM    1,,_TAPE_INPUT                                     PV003060
161      26         1D71  FC09F80D                  CLAM    0,,X(F80D)      BSV                                PV003070
162      38         1D73  F8070144                  STAD    0,,X(0144)      INTERRUPT LOCATION                 PV003080
163      40         1D75  DF60                      LGC     INTERRUPT_INHIBIT+E                                PV003090
164      48         1D76  F00F8F13                  SET     TAPE_CONTROL+FORWARD+RUN                           PV003100
165      52         1D78  FC0900D4                  CLAM    0,,START_CKSUM-1                                   003110
166      54         1D7A  8C31                      CLSM    3,,1                                               PH003120
167       8R   *     1D7B  F80D1ED7      $1          BSV     _READ_DATA                                         PH003130
168      18         1D7D  F00C1F5F                  FET     0,,_BLOCK_NO    IF BLOCK ONE PUNCH GAPS BETWEEN    PH003140
169      20         1D7F  9801                      COMM    0,,1             START AND END CHECKSUM PLUS       PV003150
170      28         1D80  D700                      PRN     0                AREA AFTER LAST WORD TO ROLL-1    PV003160
171      32         1D81  D01C    (1D8E)            BNE     $3                                                 PV003170
172       4R        1D82  F8091946                  COMM    0,,END_CKSUM                                       PV003180
173       8         1D84  D012    (1D87)            BNE     $10                                                PV003190
174       4R        1D85  FC091AE6                  CLAM    0,,LAST_WORD                                       PV003200
175       2R        1D87  9CA0          $10         CLAM    10,,0           ZERO DATA FOR GAP                  PV003210
176       2R        1D88  9401          $2          ADDM    0,,1                                               PV003220
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177      4        1D89  8005                    COM     0,5            TEST FOR GAP                PH003240
178      8        1D8A  D023   (1D8E)           BGE     $3                                         PH003250
179      8R *     1D8B  F80D1DE2                BSV     $5             COMPARE DATA                PH003260
180     12        1D8D  D806   (1D88)           BUC     $2                                         PH003270
181      4R       1D8E  F8591B3C        $3      COMM    5,,ROLL                                    PH003280
182      8        1D90  D025   (1D96)           BGE     $4             SKIP IF END OF TAPE         PH003290
183      2R       1D91  A405                    CLA     0,5                                        PH003300
184      4        1D92  A4A4                    CLA     10,4           DATA FROM TAPE              PH003310
185     12  *     1D93  F80D1DE2                BSV     $5                                         PV003320
186     16        1D95  D90B   (1D7B)           BUC     $1                                         PV003330
187     10R       1D96  F00C1F62        $4      FET     0,,_FILL_COMP                              PV003340
188     14        1D98  F8096000                COMM    0,,X(6000)                                 PV003350
189     18        1D9A  D01B   (1DA6)           BNE     $12                                        PV003360
190      8R       1D9B  F40A1F5F                CLA     0,,_BLOCK_NO                               PV003370
191     16        1D9D  E4001F5D                EXT     0,0,_BLOCKS                                PV003380
192     20        1D9F  D066   (1DA6)           BRE     $12                                        PV003390
193      8R       1DA0  F47A1F61                CLA     7,,_CHECK_SUM                              PV003400
194     16        1DA2  F47B1946                ADD     7,,END_CKSUM                               PV003410
195     26        1DA4  F0771946                STA     7,,END_CKSUM                               PV003420
196      2R       1DA6  9C00            $12     CLAM    0,,0                                       PV003430
197     12        1DA7  F4071F61                PTR     0,,_CHECK_SUM                              PV003440
198     22        1DA9  F00C1F5E                FET     0,,_END_TAPE                               PV003450
199     26        1DAB  D01A   (1DB6)           BNE     $20                                        PV003460
200      8R       1DAC  F40A1F5F                CLA     0,,_BLOCK_NO                               PV003470
201     12        1DAE  4402                    LSA     0,,1                                       PV003480
202     20        1DAF  F0081F5D                COM     0,,_BLOCKS     NO MORE BLOCKS TO PROCESS IF PV003490
203     24        1DB1  D034   (1DB6)           BRG     $20            MORE THAN NEXT BLOCK NUMBER PV003500
204      8R       1DB2  F00F8F13                SET     TAPE_CONTROL+FORWARD+RUN                   PV003510
205     16        1DB4  D700                    PRN     0                                          PV003520
206     20        1DB5  D80B   (1D7B)           BUC     $1                                         PV003530
207     12R       1DB6  F8970144        $20     STAD    9,,X(144)      RESTORE INTERRUPT LOCATION  PV003540
208     20        1DB8  F80FAF00                IOC     INHIBIT_CMP_INTERRUPT                      PV003550
209     28        1DBA  F00F8F21                SET     TAPE_FILL+INHIBIT_READ                     PV003560
210     36        1DBC  F00F8F12                SET     TAPE_CONTROL+RUN+REVERSE                   PV003570
211     44        1DBE  F40A1F62                CLA     0,,_FILL_COMP                              PV003580
212     48        1DC0  F8096000                COMM    0,,X(6000)                                 PV003590
213     52        1DC2  D161   (1DD4)           BRE     $23                                        PH003600
214      8R       1DC3  D700                    PRN     0                                          PH003610
215     18        1DC4  F0770152                STA     7,,X(152)                                  PV003620
216     28        1DC6  F067014C                STA     6,,CORR_CKSUM                              PV003630
217     36        1DC8  F4080073                FETM    0,,X(73)       INHIBIT FORCE-FILL          PH003640
218     44  *     1DCA  F80D1E29                BSV     _PUNCH                                     PH003650
219     52        1DCC  F4080074                FETM    0,,X(74)       TAPE-REVERSE CHARACTER      PH003660
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220     60  *   1DCE  F80D1E29                 BSV     _PUNCH                                  PH003670
221     70      1DD0  F41801F3                 FETM    1,,499                                  PH003680
222     78  *   1DD2  F80D1EA2                 BSV     _PPLEADER$1                             PH003690
223     12R     1DD4  F428021F        $23      FETM    2,,_CORE_SIZE-$21                       PH003700
224     10R     1DD6  F1171DE1        $22      STA     X1,,$21                                 PH003710
225     18      1DD8  C413    (1DD6)           BXU     1,,$22                                  PH003720
226      8R     1DD9  F4083FFF                 FETM    0,,X(3FFF)                              PH003730
227     18      1DDB  F0071F6B                 STA     0,,R12                                  PH003740
228     28      1DDD  F0071F6F                 STA     0,,R21                                  PH003750
229     38      1DDF  F0071F79                 STA     0,,R33                                  PH003760
230      4R     1DE1  0000            $21      HLT                                             PH003770
                                     * COMPARE DATA OR FILL DATA                                PV003780
231     10R     1DE2  F00C1F5F        $5       FET     0,,_BLOCK_NO                            PV003790
232     18      1DE4  E4001F5D                 EXT     0,0,_BLOCKS     0 UNLESS THIS BLOCK TO BE PV003800
233     22      1DE6  D011    (1DE8)           BNE     $30                PROCESSED            PV003810
234     12R     1DE7  D500                     BBK     0                                       PV003820
235      8R     1DE8  F40A1F62        $30      CLA     0,,_FILL_COMP                           PV003830
236     12      1DEA  F8096000                 COMM    0,,X(6000)                              PV003840
237     16      1DEC  D113    (1E00)           BNE     $31              COMPARE ONLY           PV003850
238     10R     1DED  F00C1F61                 FET     0,,_CHECK_SUM                           PV003860
239      4R     1DEF  F8290144        $34      COMM    2,,X(0144)                              PV003870
240      8      1DF1  D013    (1DF5)           BNE     $32                                     PV003880
241      2R     1DF2  B40A                     ADD     0,10             MODIFY CKSM BY OLD CONTENTS PV003890
242      4      1DF3  A4AC                     CLA     10,12           FILL NEW WORD           PV003900
243      8      1DF4  D008    (1DFD)           BUC     $35                                     PV003910
244      4R     1DF5  F8290145        $32      COMM    2,,X(0145)                              PV003920
245      8      1DF7  D013    (1DF8)           BNE     $33                                     PV003930
246      2R     1DF8  B40B                     ADD     0,11             MODIFY CKSUM           PV003940
247      4      1DF9  A4BC                     CLA     11,12           FILL NEW WORD           PV003950
248      8      1DFA  D002    (1DFD)           BUC     $35                                     PV003960
249      6R     1DFB  B602            $33      ADD     I0,2            SUM OLD                 PV003970
250     14      1DFC  72C2                     STA     I12,2           FILL NEW WORD           PV003980
251     10R     1DFD  F0071F61        $35      STA     0,,_CHECK_SUM                           PV003990
252     24      1DFF  D510                     BBK     1                                       PV004000
253      8R     1E00  D700            $31      PRN     0                                       PV004010
254     12      1E01  F8090144                 COMM    0,,X(0144)      CHECK FOR LOCATIONS     PV004020
255     16      1E03  D012    (1E06)           BNE     $6              CHANGED BY THIS PROGRAM PV004030
256      2R     1E04  A418                     CLA     1,8                                     PH004040
257      6      1E05  D006    (1E0C)           BUC     $8                                      PH004050
258      4R     1E06  F8090145        $6       COMM    0,,X(145)                               PH004060
259      8      1E08  D012    (1E0B)           BNE     $7                                      PH004070
260      2R     1E09  A419                     CLA     1,9                                     PH004080
261      6      1E0A  D001    (1E0C)           BUC     $8                                      PH004090
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262     6R     1E0B  A610          $7        CLA     I1,0                PH004100
263     2R     1E0C  801A          $8        COM     1,10                PH004110
264     6      1E0D  D011   (1E0F)           BNE     _PPDATA             PH004120
265     8R     1E0E  D5F0                    BBK     15                  PH004130
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                                        **  PRINT AND PUNCH DATA WORD POINTED TO BY R0                          PH004140
                                        *       REGISTERS ON ENTRY:                                             PH004150
                                        *         0       ADDRESS OF WORD TO BE PUNCHED                         PH004160
                                        *         1       DATA TO BE PUNCHED                                    PH004170
                                        *         2       PRINTER CHARACTER POSITION                            PH004180
                                        *         3       ADDRESS OF LAST WORD PUNCHED                          PH004190
266      2R      1E0F  8003            _PPDATA   COM     0,3          DO WE NEED TO PUNCH ADDRESS?             PH004200
267      6       1E10  D013   (1E14)             BNE     $3                                                    PH004210
268      4R      1E11  F829002C                  COMM    2,,44        8 WORDS PER LINE                         PH004220
269      8       1E13  D054   (1E18)             BRL     $1                                                    PH004230
270      6R      1E14  C000            $3        FET     0,0          GET ADDRESS                              PH004240
271     12       1E15  8405                      FETM    0,,5         ADDRESS CODE                             PH004250
272     20  *    1E16  F80D1E1C                  BSV     $2                                                    PH004260
273      6R      1E18  C001            $1        FET     0,1                                                   PH004270
274      8       1E19  A441                      CLA     4,1          REMEMBER FOLLOWING ADDRESS               PH004280
275     14       1E1A  8404                      FETM    0,,4         DATA CODE                                PH004290
276     16       1E1B  9451                      ADDM    5,,1                                                  004300
277      8R  *   1E1C  F80D1E4A        $2        BSV     _PRINT_WORD                                           PH004310
278     14       1E1E  FC040010                  LSAD    0,,4                                                  PH004320
279     22  *    1E20  F80D1E29                  BSV     _PUNCH                                                PH004330
280     28       1E22  8400                      FETM    0,,0                                                  PH004340
281     34       1E23  FC040040                  LSAD    0,,6                                                  PH004350
282     42  *    1E25  F80D1E29                  BSV     _PUNCH                                                PH004360
283     48       1E27  F4050040                  LSE     0,,6                                                  PH004370
                                        *   PUNCH CHARACTER IN R0, AFTER ADDING PARITY BIT                      PH004380
284      6R      1E29  C000            _PUNCH    FET     0,0          COPY CHARACTER                           PH004390
285     14       1E2A  F4080080                  FETM    0,,X(80)     INITIALIZE PARITY                        PH004400
286     24       1E2C  F00C1F5C                  FET     0,,_PPTEMP                                            PH004410
287     28       1E2E  D15A   (1E49)             BRL     $62                                                   PH004420
288      4R      1E2F  FC09007F                  CLAM    0,,X(7F)     FIRST PARITY MASK                        PH004430
289     10R      1E31  F0071F5C        $4        STA     0,,_PPTEMP                                            PH004440
290     18       1E33  E4221F5C                  EXT     2,2,_PPTEMP                                           PH004450
291     22       1E35  D065   (1E3B)            1BRE     $5                                                    PH004460
292      4R      1E36  F4190080                  ADDM    1,,X(80)     COUNT BITS IN CHARACTER                  PH004470
293     10       1E38  FD29FFFF                  CLAM    X2,,I(-1)                                             PH004480
294     14       1E3A  D80A   (1E31)             BUC     $4                                                    PH004490
295     10R      1E3B  F0371F5C        $5        STA     3,,_PPTEMP   ORIGINAL CHARACTER                       PH004500
296     22       1E3D  E0111F5C                  MRG     1,1,_PPTEMP  INSERT PARITY                            PH004510
297      8R      1E3F  F40F8F10        $6        SNS     PUNCH_OR_PRINTER_BUSY                                 PH004520
298     12       1E41  D823   (1E3F)             BGE     $6           WAIT FOR I/O                             PH004530
299      8R      1E42  F80FDF02                  IOC     LOAD_PUNCH                                            PH004540
300     18       1E44  FC0D1F5C                  POP     0,,_PPTEMP                                            PH004550
301     22       1E46  FC1909C4                  CLAM    1,,I((20000)/8) GUARANTEE 20 MSEC DELAY               PH004560
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302      8R      1E48  C411    (1E48)  $61          BXU      1,,$61          (R2 IS ZERO)                PH004570
303     18R      1E49  D530            $62          BBK      3                                           PH004580
                                       *   PRINT WORD IN R1, TYPE (ADDRESS OR DATA) IN R0                 PH004590
304      8R      1E4A  F4080081        _PRINT_WORD FETM     0,,X(81)        SPACE                       PH004600
305     10       1E4C  9814                         COMM     1,,4            TEST FOR DATA WORD          PH004610
306     14       1E4D  D067    (1E55)               BRE      $9              BRANCH IF SO                PH004620
307      4R      1E4E  FC090081                     CLAM     0,,X(81)        SPACE                       PH004630
308      2R      1E50  8C51            $8           CLSM     5,,1            RESET CHARACTER POSITION    PH004640
309     10       1E51  F4080084                     FETM     0,,X(84)        NEW LINE                    PH004650
310     18  *    1E53  F80D1E66                     BSV      _PRINT                                      PH004660
311      4R      1E55  F8590038        $9           COMM     5,,59           END OF LINE 12 WORDS        PH004670
312      8       1E57  D828    (1E50)               BGE      $8                                          PH004680
313      8R  *   1E58  F80D1E65                     BSV      $12                                         PH004690
314     16  *    1E5A  F80D1E5C                     BSV      $10                                         PH004700
                                       *       PRINT TWO DIGITS                                           PH004710
315      8R  *   1E5C  F80D1E5E        $10          BSV      $11                                         PH004720
                                       *       PRINT ONE DIGIT                                            PH004730
316      6R      1E5E  F4150010        $11          LSE      1,,4                                        PH004740
317     12       1E60  8400                         FETM     0,,0                                        PH004750
318     20       1E61  E4021F56                     EXT      0,2,_X000F                                  PH004760
319     28       1E63  F50A1EC7                     CLA      X0,,_PPTABLE                                PH004770
                                       *       PRINT ONE CHARACTER                                        PH004780
320      2R      1E65  9451            $12          ADDM     5,,1            ADVANCE CHARACTER POSITION  PH004790
321     10R      1E66  F0071F5C        _PRINT       STA      0,,_PPTEMP                                  PH004800
322      8R      1E68  F40F8F10        $14          SNS      PUNCH_OR_PRINTER_BUSY                       PH004810
323     12       1E6A  D823    (1E68)               BGE      $14                                         PH004820
324      8R      1E6B  F80FDF01                     IOC      LOAD_PRINTER                                PH004830
325     18       1E6D  FC0D1F5C                     POP      0,,_PPTEMP                                  PH004840
326     22       1E6F  F8090084                     COMM     0,,X(84)        CR                          PH004850
327     26       1E71  D015    (1E77)               BNE      $15                                         PH004860
328      4R      1E72  FC097FFF                     CLAM     0,,X(7FFF)                                  PH004870
329      4R      1E74  FC090001        $20         2SUBM     0,,1                                        PH004880
330      8       1E76  D833    (1E74)               BRG      $20                                         PH004890
331     12R      1E77  D500            $15          BBK      0                                           PH004900
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                                    **  PUNCH VISUAL FROM R0,1 IN FOUR GROUPS OF TWO                PH004910
332    12R      1E78  8433          _PUNCHBCD   FETM     3,,3                                      PH004920
333    20       1E79  F4080084                  FETM     0,,X(84)        CR                        PH004930
334    28  *    1E7B  F80D1E66                  BSV      _PRINT                                    PH004940
335    36       1E7D  C015                      FET      1,5             PRINT FIRST HALF          PU004950
336    42       1E7E  8400                      FETM     0,,0                                      PH004960
337    50  *    1E7F  F80D1E4A                  BSV      _PRINT_WORD                               PH004970
338    52       1E81  A418                      CLA      1,8                                        004980
339    54       1E82  9C00                      CLAM     0,,0                                       004990
340    62  *    1E83  F80D1E4A                  BSV      _PRINT_WORD                               PH005000
341    74       1E85  D720                      PRN      2                                         PU005010
342     8R *    1E86  F80D1E8F      $1          BSV      _PUNCHVIS                                 PH005020
343    16  *    1E88  F80D1E8F                  BSV      _PUNCHVIS                                 PH005030
344    20       1E8A  B800                      SUBD     0,0             BLANK                     PH005040
345    28  *    1E8B  F80D1E96                  BSV      _PUNCHVIS$1                               PH005050
346    36       1E8D  C428   (1E86)             BXU      2,,$1                                     PH005060
347    22R      1E8E  D550                      BBK      5                                         PH005070
                                    *                                                              PH005080
348     8R      1E8F  E4051F56      _PUNCHVIS   EXT      0,5,_X000F                                PH005090
349    18       1E91  F8450800                  RSLD     4,,4                                      PH005100
350    20       1E93  B400                      ADD      0,0                                       PH005110
351    30       1E94  FD0A1EA7                  CLAD     X0,,_VISTABLE                             PH005120
352     8R      1E96  8415          $1          FETM     1,,5            SIX FRAMES                PH005130
353     6R      1E97  C003          $2          FET      0,3                                       PH005140
354    14       1E98  E4001F57                  EXT      0,0,_X003F                                PH005150
355    22  *    1E9A  F80D1E29                  BSV      _PUNCH                                    PH005160
356    32       1E9C  F8250200                  RSLD     2,,6                                      PH005170
357    40       1E9E  C408   (1E97)             BXU      0,,$2                                     PH005180
358    14R      1E9F  D510                      BBK      1                                         PH005190
                                    *   PUNCH BLANK LEADER                                         PH005200
359    10R      1EA0  F41800C7      _PPLEADER   FETM     1,,199                                    PH005210
360     6R      1EA2  8400          $1          FETM     0,,0            (BLANK)                   PH005220
361    14  *    1EA3  F80D1E29                  BSV      _PUNCH                                    PH005230
362    22       1EA5  C404   (1EA2)             BXU      0,,$1                                     PH005240
363    14R      1EA6  D510                      BBK      1                                         PH005250
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                                  **                                                    PH005260
1EA7  1E86185E          _VISTABLE   COND        X(3D0C308C)/2 0                         PH005270
1EA9  008BF800                      COND        X(0117F000)/2 1                         PH005280
1EAB  32A69A66                      COND        X(654D34CC)/2 2                         PH005290
1EAD  2196595A                      COND        X(432CB2B4)/2 3                         PH005300
1EAF  0830AFC8                      COND        X(10615F90)/2 4                         PH005310
1EB1  27965959                      COND        X(4F2CB282)/2 5                         PH005320
1EB3  1EA69A50                      COND        X(3D4D34A0)/2 6                         PH005330
1EB5  31449143                      COND        X(62892286)/2 7                         PH005340
1EB7  1A96595A                      COND        X(352CB2B4)/2 8                         PH005350
1EB9  1296595E                      COND        X(252CB2BC)/2 9                         PH005360
1EBB  3E14517E                      COND        X(7C28A2FC)/2 A                         PH005370
1EBD  21FE595A                      COND        X(43FCB2B4)/2 B                         PH005380
1EBF  1E861852                      COND        X(3D0C30A4)/2 C                         PH005390
1EC1  21FE185E                      COND        X(43FC308C)/2 D                         PH005400
1EC3  3F965961                      COND        X(7F2CB2C2)/2 E                         PH005410
1EC5  3F145141                      COND        X(7E28A282)/2 F                         PH005420
                                  *                                                     PH005430
1EC7  0038              _PPTABLE    CON         X(38)          0                        PH005440
1EC8  007F                          CON         X(7F)          1                        PH005450
1EC9  0076                          CON         X(76)          2                        PH005460
1ECA  003E                          CON         X(3E)          3                        PH005470
1ECB  0075                          CON         X(75)          4                        PH005480
1ECC  0030                          CON         X(3D)          5                        PH005490
1ECD  0034                          CON         X(34)          6                        PH005500
1ECE  007C                          CON         X(7C)          7                        PH005510
1ECF  0079                          CON         X(79)          8                        PH005520
1ED0  0031                          CON         X(31)          9                        PH005530
1ED1  004F                          CON         X(4F)          A                        PH005540
1ED2  0046                          CON         X(46)          B                        PH005550
1ED3  000E                          CON         X(0E)          C                        PH005560
1ED4  0045                          CON         X(45)          D                        PH005570
1ED5  000D                          CON         X(0D)          E                        PH005580
1ED6  0004                          CON         X(04)          F                        PH005590
```

```
                                    ** READ ADDRESS/DATA PAIR FROM TAPE READER                                PH005600
                                    *   RETURN ADDR IN  R5, DATA IN R4                                        PV005610
396     14R     1ED7  F4381F63      _READ_DATA  FETM    3,,_TAPE_DATA                                      PV005620
397     18      1ED9  FC991B3C                  CLAM    9,,ROLL        END-OF-TAPE DEFAULT ADDRESS         PV005630
398      6R     1EDB  A535          $1          CLA     X3,,5                                                005640
399     10      1EDC  D015   (1EE2)             BNE     $2             SKIP IF DATA READY                  PV005650
400      6R     1EDD  A536                      CLA     X3,,6                                                005660
401     10      1EDE  D824   (1EDB)             BGE     $1             TEST FOR END OF BLOCK               PV005670
402      2R     1EDF  9C00                      CLAM    0,,0           RESET END OF BLOCK MKR              PV005680
403     10      1EE0  7136                      STA     X3,6                                                PV005690
404     14      1EE1  D10A   (1EFC)             BUC     $5                                                  PV005700
405      8R     1EE2  F80FAF00      $2          IOC     INHIBIT_CMP_INTERRUPT                               PV005710
406     14      1EE4  A535                      CLA     X3,,5                                                005720
407     18      1EE5  F809005C                  COMM    0,,_BUFFER_LIM                                      PV005730
408     22      1EE7  D025   (1EED)             BGE     $3                                                   005740
409      8R     1EE8  C136                      FET     X3,,6                                                005750
410     16      1EE9  D700                      PRN     0                                                    005760
411     20      1EEA  D052   (1EED)             BRL     $3                                                   005770
412      8R     1EEB  F00F8F13                  SET     TAPE_CONTROL+RUN+FORWARD                            PH005780
413      2R     1EED  9002          $3          SUBM    0,,2                                                PV005790
414     10      1EEE  7135                      STA     X3,,5                                                005800
415     18      1EEF  F80FBF00                  IOC     ENABLE_CMP_INTERRUPT                                PV005810
416     24      1EF1  A538                      CLA     X3,,8                                                005820
417     38      1EF2  F90C1F6C                  FETD    X0,,_BUFFER                                         PV005830
418     42      1EF4  ACA0                      CLAD    10,0                                                PV005840
419     52      1EF5  D710                      PRN     1                                                   PV005850
420     54      1EF6  9402                      ADDM    0,,2                                                PV005860
421     58      1EF7  F809005C                  COMM    0,,_BUFFER_LIM                                      PV005870
422     62      1EF9  D051   (1EFB)             BRL     $4                                                  PV005880
423      2R     1EFA  9C00                      CLAM    0,,0                                                PV005890
424      8R     1EFB  7138          $4          STA     X3,,8                                                005900
425     18R     1EFC  D530          $5          BBK     3                                                   PV005910
```

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                                        **  TAPE READER INTERRUPT ROUTINE                                    PV005920
                                        *   REGISTERS USED:                                                  PV005930
                                        *       0   TRIPLET ASSEMBLY                                         PV005940
                                        *       1   CURRENT ADDRESS                                          PV005950
                                        *       2   TRIPLET COUNTER                                          PV005960
                                        *       3   CONTROL TYPE                                             PV005970
                                        *       4   BUFFER INDEX                                             PV005980
                                        *       5   BUFFER COUNT                                             PV005990
                                        *       6   ADDRESS VALID                                            PV006000
                                        *       7   SCRATCH                                                  PV006010
426      8R     1EFD  F80F9F00          _TAPE_INPUT IOC        RESET_CMP_INTERRUPT                           PV006020
427      16     1EFF  F80FCF01                      IOC        READ_TAPE                                     PV006030
428      26     1F01  F40D1F6A                      PIP        0,,_TAPE_DATA+7                               PV006040
429      64     1F03  F07C1F63                      FET        7,,_TAPE_DATA                                 PV006050
430      72     1F05  E4771F59                      EXT        7,7,_X007F      REMOVE PARITY                 PV006060
431      76     1F07  F879007F                      COMM       7,,X(7F)                                      PV006070
432      80     1F09  D06B    (1F15)                BRE        $1              SKIP IF DELETE CODE           PV006080
433      4R     1F0A  F879003F                      COMM       7,,X(3F)                                      PV006090
434      8      1F0C  D04B    (1F18)                BLE        $2              SKIP UNLESS CONTROL CODE      PV006100
435      4R     1F0D  F8790070                      COMM       7,,X(70)                                      PV006110
436      8      1F0F  D228    (1F38)                BGE        $7              SKIP IF SUB-CONTROL           PV006120
437      8R     1F10  E4371F58                      EXT        3,7,_X0070                                    PV006130
438      10     1F12  B073                          SUB        7,3             FIRST FOUR INFORMATION BITS   PV006140
439      12     1F13  A407                          CLA        0,7                                           PV006150
440      14     1F14  9C22                          CLAM       2,,2            COUNT FOR TWO MORE CHARACTERS PV006160
441      34R    1F15  F4671F63          $1          PTR        6,,_TAPE_DATA                                 PV006170
442      46     1F17  D500                          BBK        0                                             PV006180
                                        *   PROCESS INFORMATION ONLY                                         PV006190
443      2R     1F18  9830              $2          COMM       3,,0            IGNORE IF NO PRIOR CONTROL    PV006200
444      6      1F19  D865    (1F15)                BRE        $1                                            PV006210
445      4R     1F1A  F4040040                      LSA        0,,6            ASSEMBLE INFORMATION          PV006220
446      6      1F1C  B407                          ADD        0,7                                           PV006230
447      8      1F1D  9021                          SUBM       2,,1            TEST FOR END OF TRIPLET       PV006240
448      12     1F1E  D83A    (1F15)                BRG        $1                                            PV006250
                                        *   PROCESS COMPLETE TRIPLET                                         PV006260
449      4R     1F1F  F8390050                      COMM       3,,X(50)                                      PV006270
450      8      1F21  D232    (1F44)                BRG        $8              SKIP IF END FORCE FILL        PV006280
451      4R     1F22  D161    (1F34)                BRE        $5              SKIP IF ADDRESS                 006290
452      2R     1F23  9860                          COMM       6,,0                                          PV006300
453      6      1F24  D960    (1F15)                BRE        $1                                            PV006310
454      12R    1F25  F9471F6C                      STAD       X4,,_BUFFER                                   PV006320
455      14     1F27  9442                          ADDM       4,,2                                          PV006330
456      18     1F28  F849005C                      COMM       4,,_BUFFER_LIM                                PV006340
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457     22     1F2A  D051   (1F2C)                BRL     $3                                  PV006350
458      2R    1F2B  9C40                         CLAM    4,,0                                PV006360
459      2R    1F2C  9452            $3           ADDM    5,,2                                PV006370
460      6     1F2D  F859005C                     COMM    5,,_BUFFER_LIM                      PV006380
461     10     1F2F  D052   (1F32)                BRL     $4                                  PV006390
462      8R    1F30  F00F8F11                     SET     TAPE_CONTROL+STOP+FORWARD           PV006400
463      2R    1F32  9411            $4           ADDM    1,,1          ADVANCE ADDRESS        006410
464      6     1F33  D002   (1F36)                BUC     $6                                   006420
465      2R    1F34  9C61            $5           CLAM    6,,1                                PV006430
466      4     1F35  A410                         CLA     1,0           REMEMBER NEW ADDRESS   006440
467      2R    1F36  9C30            $6           CLAM    3,,0                                PV006450
468      6     1F37  DA03   (1F15)                BUC     $1                                  PV006460
                                    *   PROCESS  SUB-CONTROL                                  PV006470
469      4R    1F38  F8790071        $7           COMM    7,,X(71)      START FORCE FILL      PV006480
470      8     1F3A  D016   (1F41)                BNE     $9                                  PV006490
471     14R    1F3B  F80C1F5F                     FETD    0,,_BLOCK_NO  START NEXT BLOCK      PV006500
472     20     1F3D  4C02                         LSAD    0,,1                                PV006510
473     34     1F3E  FC071F5F                     PTRD    0,,_BLOCK_NO                        PV006520
474     38     1F40  D808   (1F36)                BUC     $6                                  PV006530
475      4R    1F41  F8790073        $9           COMM    7,,X(73)                            PV006540
476      8     1F43  D014   (1F48)                BNE     $10                                 PV006550
477      8R    1F44  F00F8F11        $8           SET     TAPE_CONTROL+STOP+FORWARD           PV006560
478     10     1F46  8C61                         CLSM    6,,1                                PV006570
479     14     1F47  DB03   (1F15)                BUC     $1                                  PV006580
480      4R    1F48  F8790074        $10          COMM    7,,X(74)                            PV006590
481      8     1F4A  DB16   (1F15)                BNE     $1                                  PV006600
482      6R    1F4B  8401                         FETM    0,,1                                PV006610
483     16     1F4C  F4071F5E                     PTR     0,,_END_TAPE                        PV006620
484     24     1F4E  F80FAF00                     IOC     INHIBIT_CMP_INTERRUPT               PV006630
485     32     1F50  F00F8F21                     SET     TAPE_FILL+INHIBIT_READ                006640
486     40     1F52  F00F8F12                     SET     TAPE_CONTROL+RUN+REVERSE            PV006650
487     46     1F54  04001F15                     BUC     $1                                  PV006660
```

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                                 **                                                    PH006670
1F56  000F                       _X000F      CON      X(000F)                          PV006680
1F57  003F                       _X003F      CON      X(003F)                          PV006690
1F58  0070                       _X0070      CON      X(0070)                          PV006700
1F59  007F                       _X007F      CON      X(007F)                          PV006710
1F5A  0FFF                       _X0FFF      CON      X(0FFF)                          PV006720
1F5B  4CF6                       _END_CKSUM  ECS                                       PV006730
1F5C  0000                       _PPTEMP     CON      0                                PV006740
1F5D                             _BLOCKS     EQU      _PPTEMP+1                        PV006750
1F5E                             _END_TAPE   EQU      _BLOCKS+1                        PV006760
1F5F                             _BLOCK_NO   EQU      _END_TAPE+1                      PV006770
1F61                             _CHECK_SUM  EQU      _BLOCK_NO+2                      PV006780
1F62                             _FILL_COMP  EQU      _CHECK_SUM+1                     PV006790
1F63                             _TAPE_DATA  EQU      _FILL_COMP+1                     PV006800
1F6C                             _BUFFER     EQU      _TAPE_DATA+9                     PV006810
005C                             _BUFFER_LIM EQU      92                                 006820
1FC8                             _ROLL       EQU      _BUFFER+_BUFFER_LIM              PV006830
1FE6                             _ROLL_14    EQU      _ROLL+30                         PV006840
1FFA                             _ROLL_END   EQU      _ROLL_14+20                      PV006850
                                             TAPE       2,_VERIFY                      PV006860
                                             TAPE       3,12                           PV006870
                                             TAPE       4,X(F1)                        PV006880
                                 *                                                      006890
```

```
                                **
                                *
509     0008                    OS          EQU         8               NUMBER OF STATIONS TRACKED
510     01FE                    OSHEX       EQU         X(01FE)         STATION IMAGE FOR DISPLAY
                                *
                                *
                                *
                                *           DIRECT MEMORY ACCESS (DMA)
                                *
511                             C_I_INPUT_MISCELLANEOUS_SWITCHES;
511     0001                                EQU         X(0001)
512                             C_I_INPUT_KEYBOARD_SWITCHES;
512     0002                                EQU         X(0002)
513                             C_I_LEFT_DISPLAY;
513     0003                                EQU         X(0003)
514                             C_I_LEFT_DISPLAY_DIGITS_6_TO_3;
514     0003                                EQU         X(0003)
515                             C_I_LEFT_DISPLAY_DIGITS_2_TO_1;
515     0004                                EQU         X(0004)
516                             C_I_RIGHT_DISPLAY;
516     0005                                EQU         X(0005)
517                             C_I_RIGHT_DISPLAY_DIGITS_6_TO_3;
517     0005                                EQU         X(0005)
518                             C_I_RIGHT_DISPLAY_DIGITS_2_TO_1;
518     0006                                EQU         X(0006)
519                             C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION;
519     0007                                EQU         X(0007)
520                             C_I_RIGHT_DISPLAY_LEGEND_AND_PUNCTUATION;
520     0008                                EQU         X(0008)
521                             C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES;
521     0009                                EQU         X(0009)
522                             C_I_OUTPUT_MALFUNCTION_STATUS_INDICATORS;
522     0009                                EQU         X(0009)
523                             C_I_UPPER_LEFT_KEYBOARD_LAMPS;
523     000B                                EQU         X(000B)
524                             C_I_UPPER_RIGHT_KEYBOARD_LAMPS;
524     000C                                EQU         X(000C)
525                             C_I_LOWER_KEYBOARD_LAMPS;
525     000D                                EQU         X(000D)
                                *
                                *
526                             SUM_T_ZERO_DOT;
526     000E                                EQU         X(000E)
```

```
                                *
                                *
                                PHASE_COUNTER_TEST_LOCATION;
          0010                          EQU         X(0010)
          0011                  COS_10_2    EQU         X(0011)
          0012                  SIN_10_2    EQU         X(0012)
          0013                  COS_13_6    EQU         X(0013)
          0014                  SIN_13_6    EQU         X(0014)
          0015                  COS_11_33   EQU         X(0015)
          0016                  SIN_11_33   EQU         X(0016)
                                DIRECT_MEMORY_ACCESS_TEST_LOCATION;
          0017                          EQU         X(0017)
                                CH0;                                NOT USED
          0018                          EQU         X(0018)
                                CH1;                                NOT USED
          0019                          EQU         X(0019)
                                TRUE_HEADING_INPUT;                 CH2
          001A                          EQU         X(001A)
                                TRUE_AIR_SPEED_INPUT,SHIP_SPEED_INPUT; CH3
          001B                          EQU         X(001B)
                                A_TO_D_CONVERTER_TEST_LOCATION;     CH4  4E84 NOMINAL
          001C                          EQU         X(001C)
                                CH5;                                NOT USED
          001D                          EQU         X(001D)
                                CH6;                                NOT USED
          001E                          EQU         X(001E)
                                CH7;                                NOT USED
          001F                          EQU         X(001F)
                                ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2;
          0020                          EQU         X(0020)
                                ANTENNA_SWITCHING_MATRIX_OUTPUT_13_6;
          0021                          EQU         X(0021)
                                ANTENNA_SWITCHING_MATRIX_OUTPUT_11_33;
          0022                          EQU         X(0022)
                                OUTPUT_TEST_AND_MISCELLANEOUS_SIGNALS;
          0023                          EQU         X(0023)
```

```
                    **                                                                  007690
547                 SIGMA_SQUARED_PHI_SUB_M;                                            007700
547     0024                    EQU         X(0024)                                     007710
548     002A        ACCEPT_OLD  EQU         X(002A)                                     007720
549     0028        AD_DATA     EQU         X(0028)         3 WORDS                     HH007730
550                 TEST_FAIL_TEMP;                                                     HH007740
550     002E                    EQU         X(002E)         2 WORDS                     HH007750
                    * LOCATION 30 RESERVED FOR HARDWARE GARBAGE DUMP                    HH007760
551                 DB_SAVEPATCHSTART;                                                  HH007770
551     0031                    EQU         X(0031)                                     HH007780
552     0032        Q_SUB_T     EQU         X(0032)         3 WORDS                     HH007790
553                 ANTENNA_SELECT_SAVE;                                                HH007800
553     0035                    EQU         X(0035)         3 WORDS                     HH007810
554     0038        Q_M         EQU         X(0038)         6 WORDS  (3 DOUBLE)         HH007820
555                 PANEL_COUNT;                                                        HH007830
555     003E                    EQU         X(003E)                                     HH007840
                    * LOCATION 3F RESERVED FOR HARDWARE GARBAGE DUMP                    HH007850
556                 MAG_TAPE_DATA;                                                      HH007860
556     0040                    EQU         X(0040)         10 WORDS                    HH007870
557     004A        M_MATRIX    EQU         X(004A)                                     007880
558     004A        R_MATRIX    EQU         M_MATRIX                                    007890
559     005C        PHI_MATRIX  EQU         X(005C)                                     007900
560                 DIVERGENCE_CONTROL;                                                 007910
560     005C                    EQU         PHI_MATRIX                                  007920
561     006F        DF_MKR      EQU         PHI_MATRIX+19                               007930
562     0070        CONNIE      EQU         PHI_MATRIX+20                               007940
                    *MEASUREMENT VARIANCE AND MEASUREMENT MUST BE IN ORDER              007950
563                 MEASUREMENT_VARIANCE;                                               007960
563     0072                    EQU         PHI_MATRIX+22                               007970
564     0074        MEASUREMENT EQU         PHI_MATRIX+24                               007980
565                 MEASUREMENT_RESIDUAL;                                               007990
565     0076                    EQU         PHI_MATRIX+26                               008000
566     0078        DB_MODE     EQU         X(0078)                                     008010
```

```
                                 **
                                 * START EXTENDED ADDRESSING - VARIABLE STORAGE
                                 *
0080                                     ORG        X(0080)
                                 *
0080  0000                       RESET_TF  CON        0
                                 POSITION_NOISE;
0081  00000000                           COND       0
0083  0000                               CON        0
0084  0000                       N       CON        0
0085  00000000                   TF_TEMP   COND       0
0087  00000000                           COND       0
0089  00000000                           COND       0
0085                             SYNC_1OVERN EQU      TF_TEMP
                                 SYNC_DATA_ADDRESS_AND_FREQUENCY;
0087                                     EQU        TF_TEMP+2
                                 SYNC_DATA_ADDRESS;
0087                                     EQU        TF_TEMP+2
                                 SYNC_FREQUENCY;
0088                                     EQU        TF_TEMP+3
                                 TEN_SECOND_SYNC_PERIOD_COMPLETE_MARKER;
0089                                     EQU        TF_TEMP+4
                                 START_SYNC_TIME;
008B  00000000                           COND       0
                                 INTEGRATION_COUNTER;
008D  00000000                           COND       0
008F  0000                       PSI_A_SAVE CON       0
008F                             SYNC_N    EQU        PSI_A_SAVE     SYNC N +1 = 0 IN SYNC
                                 KAL_STA_FLG;                      END OF SYNC MARKER FOR KALMAN    11
0090  0000                               CON        0             TO LET PROP FINISH OS STATIONS   11
                                 *                                 BEFORE MAKING MEAS UPDATE        11
                                 NON_OMEGA_TASK_INDEX;
0091  00000000                           COND       0
                                 NON_OMEGA_TIME;
0093  00000000                           COND       0
                                 OLD_NON_OMEGA_TASK_TIME;
0095  00000000                           COND       0
0097  00000000                   OMEGA_TIME COND      0
0099  0000                       OMEGA_TASK CON       0
                                 CALIBRATE_COMPUTED_MARKER;
009A  0000                               CON        0
                                 NOISE_COMPUTED_MARKER;
009B  0000                               CON        0
```

```
592                                  START_OMEGA_NOW;                                  008450
592   009C  0000                            CON       0                                008460
593                                  PAST_NAV_MODE;                                    008470
593   009D  0000                            CON       0                                008480
594   009E  00000000     IMAGE9      COND      0                                      008490
595                                  C_I_STATUS_IMAGE;                                 008500
595   009F                           EQU       IMAGE9+1                               008510
596   00A0  0000         DB_SAVE     CON       0                                      008520
597                                  PMU_INDICATOR_WORD;                               008530
597   00A1  0000                     CON       0                                      008540
598   00A2  00000000     V2          COND      0                                      008550
599   00A3               V3          EQU       V2+1                                   008560
600   00A4  0000         SLOW_RATE   CON       0                                      008570
601   00A5  0000         WINDOWAD    CON       0                                      008580
602   00A6  0000         PC_INSERT   CON       0                                      008590
603                                  STATION_INDEX;                                    CF008600
603   00A7  0000                     CON       0                                      CF008610
604   00A8  00000000     TIME_INC    COND      0                                      008620
605   00AA  00000000     DB_BUFFER   COND      0                                      008630
606   00AC  00000000                 COND      0                                      008640
607   00AE  00000000                 COND      0                                      008650
608   00B0  00000000                 COND      0                                      008660
609   00B2  0000         START_CNT   CON       0                                      008670
610   00B3  0000         START_MKR   CON       0                                      008680
611   00B4  0000         PP_STATION  CON       0                                      008690
612                                  STATION_COUNTER;                                  008700
612   00B5  0000                     CON       0                                      008710
613                                  STATION_NUMBER;                                   008720
613   00B6  0000                     CON       0                                      008730
614                                  COLD_START_MKR;                                   008740
614   00B7  0000                     CON       0                                      008750
615                                  AUGMENTER_KEY;                                    008760
615   00B8  0000                     CON       0                                      008770
616   00B9  0000         DELTA_V2    CON       0                                      008780
617   00BA  0000         DELTA_V3    CON       0                                      008790
                                     *                                               008800
                                     *     START WORDS PICKED UP BY C I PROG         008810
                                     *                                               008820
618   00BB  0000         V_TAS       CON       0                                      008830
619   00BC  00000000     TIME        COND      0                                      008840
                                     *                                               008850
                                     *     END WORDS CLEARED AT TURN ON              008860
                                     *                                               008870
```

```
                                *                                                    008880
620     00BE  00000000          VC2          COND        0                           008890
621     00BF                    VC3          EQU         VC2+1                       008900
622     00C0  00000000          THETA_P      COND        0                           008910
623     00C2  0000              PSI_A        CON         0                           008920
624                             CONNIE_LIMIT;                                        008930
624     00C3  0000                           CON         0                           008940
                                *                                                    008950
                                *                                 END WORDS PICKED UP BY C I PROG   008960
                                *                                                    008970
625                             DAY_SINCE_JAN1_1972;                                 008980
625     00C4  00000000                       COND        0                           008990
626     00C6  00000000          GMT          COND        0                           009000
627     00C8  00000000          DAY          COND        0                           009010
628     00CA  0000              MODE         CON         0                 REQD =0 FOR PHASE DIFFERENCE   009020
                                *                                 OTHERWISE IT FORCES RHO RHO   009030
629     00CB  00000000          BASE         COND        0                           009040
630     00CD  0000              NEED_BASE    CON         0                          SB009050
631     00CE  0000              OFF_COUNT    CON         0                           009060
632     00CF  0000              PFG_COUNT    CON         0                           009070
633     00D0  0000              PMU_INPUT    CON         0                           009080
634     00D1  00000000          TEST_FAIL    COND        0                          HH009090
```

```
                                **                                                                                  009100
                                *                                                                                   009110
635             00D5                            ORG         X(00D5)                                                 009120
636             00D5            START_CKSUM SCS                                                                     009130
637                                             TAPE        1                                                       009140
                                *                                                                                   009150
638                             POWERS_OF_TWO,;                                                                     009160
638             00D5  0001      HX0001          CON         X(0001)                                                 009170
639             00D6  0002      HX0002          CON         X(0002)                                                 009180
640             00D7  0004      HX0004          CON         X(0004)                                                 009190
641             00D8  0008      HX0008          CON         X(0008)                                                 009200
642             00D9  0010      HX0010          CON         X(0010)                                                 009210
643             00DA  0020      HX0020          CON         X(0020)                                                 009220
644             00DB  0040      HX0040          CON         X(0040)                                                 009230
645             00DC  0080      HX0080          CON         X(0080)                                                 009240
646             00DD  0100      HX0100          CON         X(0100)                                                 009250
647             00DE  0200      HX0200          CON         X(0200)                                                 009260
648             00DF  0400      HX0400          CON         X(0400)                                                 009270
649             00E0  0800      HX0800          CON         X(0800)                                                 009280
650             00E1  1000      HX1000          CON         X(1000)                                                 009290
651             00E2  2000      HX2000          CON         X(2000)                                                 009300
652             00E3  4000      HX4000          CON         X(4000)                                                 009310
653             00E4  8000      HX8000          CON         X(8000)                                                 009320
                                *                                                                                   009330
654                             STATIONS_IN_USE;                                                                    009340
654             00E5  04FF                      CON         X(04FF)     STATIONS - SHIPS LOG/HDG                    009350
655             00E6  FB01                      CON         X(FB01)     COMPLEMENT FOR CHECKSUM                     009360
                                *                                                                                   009370
656             00E7  C7C46925                  LITD        F((5D-3831)/(24*3600*1811))                      11 009380
657             00E9  0AAAAAAB                  LITD        F((1)/12)                                           009390
658             00EB  00000001                  LITD        X(00000001)                                         009400
659             00ED  00000014                  LITD        20                                                  009410
660             00EF  1999999A                  LITD        F(.1E+1)                                            009420
661             00F1  00008000                  LITD        X(00008000)                                         009430
662             00F3  7FFFFFFF                  LITD        X(7FFFFFFF)                                         009440
663             00F5  20000000                  LITD        X(20000000)                                         009450
664             00F7  008C8CCC                  LITD        F((.25)*.25D-128+36)                                009460
                                *                                                                                   009470
665             00F9  00C8      HD200           CON         200                                                     009480
666             00FA  0800      HX0800          CON         X(0800)                                                 009490
667             00FB  1F9A      CAL_R_ADD       CON         CALIBRATE_RESULTS                                HH 009500
668             00FC  0079      DB_M1_ADD       CON         DB_MODE+1                                               009510
669             00FD  1F69      RIJ_ADD         CON         RIJ                                                     009520
```

```
670          00FE  179B          SV_ADD      CON        STATION_VECTOR_TABLE
671          00FF  1C1E          XXX_ADD     CON        XXX
                                 *
                                 *
                                 *                                END  EXTENDED ADDRESSING
                                 *
                                 *
```

```
                                **                                                    009600
                                *                                                     009610
0100  00ED                      HX00ED      CON        X(00ED)                        009620
0101  1800                      HX1800      CON        X(1800)                        009630
                                *                                                     009640
                                *           PIN ROUTINES - LOCATIONS 102 TO 10F       009650
                                *                                                     009660
0102                                        ORG        X(0102)                        009670
                                            PIN          OMEGA,2,58                   009680
0102  172E                                  CON        OMEGA_TASK_PIN                 009690
                                            PIN          GEN,3,564                    DP009700
0103  14FA                                  CON        GEN_PIN                        DP009710
                                            PIN          SQRT,4,434                   009720
0104  1629                                  CON        SQUARE_ROOT                    009730
                                            PIN          SINCOS,5,422                 009740
0105  164F                                  CON        SC_ENTRY                       009750
                                            PIN          ATAN,6,526                   009760
0106  1688                                  CON        ATAN_ENTRY                     009770
                                            PIN          INPUT,7,58                   CI009780
                                            PIN          ACCEPT,7,68                  CI009790
0107  1214                                  CON        PANEL_PIN                      CI009800
                                            PIN          PLINE,8                      OM009810
                                            PIN          PSPACE,8                     OM009820
0108  1897                                  CON        HSP_OUT                        OM009830
                                            PIN          PDLINE,9                     OM009840
0109  18AE                                  CON        HSP_LINE_D                     OM009850
                                            PIN          PDEC,10                      OM009860
010A  18B3                                  CON        HSP_D                          OM009870
                                            PIN          FAIL,11                      009880
010B  0258                                  CON        FAIL_PIN                       009890
                                            PIN          SIGNAL,12,34                 009900
010C  19AA                                  CON        SIGNAL_PIN                     TS009910
                                            PIN          MARK,13                      009920
010D  025B                                  CON        MARK_PIN                       009930
                                            PIND         FAILD,11                     009940
010E  FF00                      HXFF00      CON        X(FF00)                        009950
010F  00FF                      HX00FF      CON        X(00FF)                        009960
```

```
                    **                                                                  009970
704      0110                        ORG       X(0110)                                  009980
                    *                                                                   009990
705      0110 0000  DCAY1_TABLE CON   0                                                PP010000
706      0111 68FD                  CON       F(((60.9)*.9974)*217.021860-6)  13.6PP010010
707      0112 3532                  CON       F(((30.0)*.9974)*217.021860-6)  11.3PP010020
708      0113 06BD                  CON       F(((03.8)*.9974)*217.021860-6)  PP010030
709      0114 6187                  CON       F(((55.0)*.9974)*217.021860-6)  PP010040
710      0115 3201                  CON       F(((28.2)*.9974)*217.021860-6)  PP010050
711      0116 0E88                  CON       F(((08.3)*.9974)*217.021860-6)  PP010060
712      0117 4445                  CON       F(((38.5)*.9974)*217.021860-6)  PP010070
713      0118 2598                  CON       F(((21.2)*.9974)*217.021860-6)  PP010080
714      0119 09C1                  CON       F(((05.5)*.9974)*217.021860-6)  PP010090
715      011A 1547                  CON       F(((12.0)*.9974)*217.021860-6)  PP010100
716      011B 09C1                  CON       F(((05.5)*.9974)*217.021860-6)  PP010110
717      011C 2788                  CON       F(((22.3)*.9974)*217.021860-6)  PP010120
718      011D 1AF4                  CON       F(((15.2)*.9974)*217.021860-6)  PP010130
719      011E 2266                  CON       F(((19.4)*.9974)*217.021860-6)  PP010140
720      011F 2EA3                  CON       F(((26.3)*.9974)*217.021860-6)  PP010150
721      0120 220C                  CON       F(((19.2)*.9974)*217.021860-6)  PP010160
722      0121 2951                  CON       F(((23.3)*.9974)*217.021860-6)  PP010170
723      0122 358D                  CON       F(((30.2)*.9974)*217.021860-6)  PP010180
724      0123 2951                  CON       F(((23.3)*.9974)*217.021860-6)  PP010190
725      0124 2FE0                  CON       F(((27.0)*.9974)*217.021860-6)  PP010200
726      0125 3A29                  CON       F(((32.8)*.9974)*217.021860-6)  PP010210
727      0126 2CAF                  CON       F(((25.2)*.9974)*217.021860-6)  PP010220
728      0127 344F                  CON       F(((29.5)*.9974)*217.021860-6)  PP010230
729      0128 3BEF                  CON       F(((33.8)*.9974)*217.021860-6)  PP010240
730      0129 2CAF                  CON       F(((25.2)*.9974)*217.021860-6)  PP010250
731      012A 3532                  CON       F(((30.0)*.9974)*217.021860-6)  PP010260
732      012B 3CA5                  CON       F(((34.2)*.9974)*217.021860-6)  PP010270
733      012C 2CAF                  CON       F(((25.2)*.9974)*217.021860-6)  PP010280
734      012D 358D                  CON       F(((30.2)*.9974)*217.021860-6)  PP010290
735      012E 3B94                  CON       F(((33.6)*.9974)*217.021860-6)  PP010300
736      012F 2CAF                  CON       F(((25.2)*.9974)*217.021860-6)  PP010310
737      0130 3532                  CON       F(((30.0)*.9974)*217.021860-6)  PP010320
738      0131 3ADF                  CON       F(((33.2)*.9974)*217.021860-6)  PP010330
739      0132 2B44                  CON       F(((24.4)*.9974)*217.021860-6)  PP010340
740      0133 3422                  CON       F(((29.4)*.9974)*217.021860-6)  PP010350
741      0134 3A57                  CON       F(((32.9)*.9974)*217.021860-6)  PP010360
742      0135 2A06                  CON       F(((23.7)*.9974)*217.021860-6)  PP010370
743      0136 333F                  CON       F(((28.9)*.9974)*217.021860-6)  PP010380
744      0137 39CF                  CON       F(((32.6)*.9974)*217.021860-6)  PP010390
```

```
745  0138  2A06  CON  F(((23.7)*.9974)*217.021860-6)  PP010400
746  0139  3312  CON  F(((28.8)*.9974)*217.021860-6)  PP010410
747  013A  38EC  CON  F(((32.1)*.9974)*217.021860-6)  PP010420
748  013B  2A06  CON  F(((23.7)*.9974)*217.021860-6)  PP010430
749  013C  3289  CON  F(((28.5)*.9974)*217.021860-6)  PP010440
750  013D  3863  CON  F(((31.8)*.9974)*217.021860-6)  PP010450
751  013E  2A06  CON  F(((23.7)*.9974)*217.021860-6)  PP010460
752  013F  30F1  CON  F(((27.6)*.9974)*217.021860-6)  PP010470
```

```
                                    **                                                                                  010480
753                 0140                        ORG         X(140)                                                      EX010490
                                    *                         INTERRUPTS                                                *H010500
                                    *                                                                                   *H010510
                                    * THE FOLLOWING INSTRUCTIONS ARE LOCATED IN THE WORDS THAT ARE HARDWIRED           *H010520
                                    * IN THE COMPUTER FOR INTERRUPTS AND START SIGNALS.  THE START SIGNALS             *H010530
                                    * CAN BE GIVEN BY POWER ON OR THE PROGRAMMER CONTROLLER. FIRDT                      *H010540
                                    * INSTRUCTION AFTER A START SIGNAL MUST LOAD THE NEXT INSTRUCTION                  *H010550
                                    * REGISTER.  WHEN INTERRUPTS OCCUR THE NEXT INSTRUCTION REGISTER WILL              *H010560
                                    * CONTAIN THE LOCATION OF THE INSTRUCTION THAT WOULD HAVE BEEN EXECUTED            *H010570
                                    * NEXT IF THE INTERRUPT HAD NOT OCCURRED.  THE FIRST INSTRUCTION AFTER             *H010580
                                    * THE INTERRUPT MAY PRESERVE THIS LOCATION IF REQUIRED.                           *H010590
                                    *                                                                                   *H010600
                                    *                                                 "POWER ON START SIGNAL"           *S010610
754         6R      0140  04000166                2BUC        BEGIN                   "BEGIN NORMAL PROGRAM OPERATION   EX010620
                                    *                                                 "POWER OFF INTERRUPT"             *S010630
755         6R      0142  04000161                2BUC        OFF                     "RECOVERY NOT REQUIRED            EX010640
                                    *                                                 "SUPPORT EQUIPMENT INTERRUPT      *I010650
756         8R *    0144  F80D18AE                BSV         MAG_TAPE                "NOT USED BY NAVIGATION PROGRAM   *I010660
                                    *                                                 "OMEGA 5 MILLISEC INTERRUPT       *I010670
757         8R *    0146  F80D0285  PLOT15        2BSV        EXEC                    "CONTROLS ALL PROGRAM TIMING      EX010680
                                    *                                                 "C/I INTERRUPT"                   *I010690
758        16 *     0148  F80D1060                BSV         PANEL_INPUT             "BUTTON HAS BEEN DEPRESSED        EX010700
759                 014A  00000000  PLOT20        COND        0                       SPARE, OVRLYD BY TEST PGM.        EX010710
760                 014C  0000      CORR_CKSUM    CON         0                       CKSUM OF CORR NUMBER              EX010720
761                 014D  1AE7      DB_PCHAD      CON         LAST_WORD+1                                               DB010730
762                 014E  1F69                    CON         RIJ                     PUNCH TAPE LINKAGE                EX010740
763                 014F  05187636  PROGRAM_ID    VIS         "MOD 36  05/18/76  AN/BRN-7 "                              10750
764                 0151  11120000  TAPE_ID       COND        X(11120000)                                               EX010760
765                 0153  00D5      CKSUM_LINK    CON         START_CKSUM                                               EX010770
766                 0154  1B38      ROLLADDRESS   CON         ROLL_15-1               END CHECKSUM ADDRESS              EX010780
767                 0155  0080      TITLE_LINK    CON         TITLE                                                     EX010790
768                 0156  0000      PROG_ID_DB    CON         0                                                          010800
769                 0157  0000      PROG_ID_OVL   CON         0                                                          010810
770                 0158  0000      DB_CKSUM      CON         0                                                          010820
                                    *                                                                                  EX010830
                                    *                                                                                  EX010840
                                    * THE FOLLOWING 8 LOCATIONS ARE USED BY GP_TEST_ENTRY                              EX010850
                                    * FOR A MEMORY TEST.                                                              EX010860
                                    *                                                                                  EX010870
771                                 AUG_MEM_TEST;                                                                      EX010880
771                 0159  FC1A                    CON         X(FC1A)                                                   EX010890
772                 015A  0153                    CON         X(0153)                                                   EX010900
```

```
773   015B  B000   CON   X(B000)   EX010910
774   015C  B601   CON   X(B601)   EX010920
775   015D  C412   CON   X(C412)   EX010930
776   015E  D013   CON   X(D013)   EX010940
777   015F  0308   CON   X(0308)   EX010950
778   0160  0400   CON   X(0400)   EX010960
```

```
                                        **                                                                    EX010970
                                        *                                                                     EX010980
                                        * TITLE CHARACTERS  0-F = 0-F G=10 H=11 I=12 J=13 K=14 L=15 M=16 N=17  EX010990
                                        * O=18 P=19 Q=1A R=1B S=1C T=1D U=1E V=1F W=20 X=21 Y=22 Z=23 -=24     EX011000
                                        * .=25 /=26 ==27 (=28 )=29 +=2A ,=28 *=2C &=2D BLANK=2E                EX011010
                                        *                                                                     EX011020
                                        *                                                                     EX011030
779                 0080                TITLE       EQU         X(0080)                                        011040
                                        *                         'X0A17260B   AN/B                            011050
                                        *                           18172407   RN-7                            011060
                                        *                           2E2E170A     NA                            011070
                                        *                           1F2E1C1E  V SU                             011080
                                        *                           08160A1B  BMAR                             011090
                                        *                           12170E2E  INE                              011100
                                        *                           2E2E2E2E                                   011110
                                        *                           2E2E                                       011120
                                        *           POWER OFF                                                 *H011130
                                        *                                                                     *H011140
                                        * POWER OFF INTERRUTS FORCE ENTRY TO THIS ROUTINE                     *H011150
                                        *                                                                     *H011160
                                        *                                       "STOP INTERRUPTS SO THAT THIS *I011170
780       2R        0161  DF00            OFF         LGC         INTERRUPT_INHIBIT   "ROUTINE IS NOT INTERRUPTED EX011180
781        8        0162  9E4E    (00CE)              CLA         0,,OFF_COUNT   "INCREMENT COUNT OF NUMBER OF  EX011190
782       10        0163  9401                        ADDM        0,,1           "POWER OFF INTERRUPTS          EX011200
783       18        0164  704E    (00CE)              STA         0,,OFF_COUNT                                  EX011210
784       22        0165  0000                        HLT                        "STOP COMPUTER"                %S011220
```

```
                                                  **                                                                    EX011230
                                                  *          MAIN PROGRAM                                               *H011240
                                                  * THIS ROUTINE IS THE LOWEST LEVEL ROUTINE                           *H011250
                                                  * IN THE SYSTEM.  IT IS ENTERED BY THE POWER                         *H011260
                                                  * ON INTERRUPT OR WHENEVER A DECISION IS                             *H011270
                                                  * MADE TO RESTART.  THIS ROUTINE PERFORMS                            *H011280
                                                  * INITIALIZATION, ENABLES DMA AND INTERRUPTS,                        *H011290
                                                  * ENTERS THE SYNC COMPUTATIONAL ROUTINE AND                          *H011300
                                                  * DOES CHECKSUM.  IT ONLY OPERATES WHEN THERE                        *H011310
                                                  * ARE NO OMEGA OR NON OMEGA TASKS REMAINING.                         *H011320
785        4R        0166  FCF91BEB          BEGIN      CLAM       15,,ROLL_14     "INITIALIZE R14 AND R15 TO POINT EX011330
                                                  *                                  "TO THE TOP OF THE R14 AND R15   EX011340
786        8         0168  FCE91C03                     CLAM       14,,ROLL_END    "PUSHDOWN STACKS                EX011350
                                                  *                                  "TURN ON PROTECT IN CASE PROGRAM *I011360
787        16        016A  F00F8E21                     SET        0,,ENABLE_MEMORY_PROTECT "MONITOR IS AVAILABLE  EX011370
788        30        016C  F01C014D                     FET        1,,DB_PCHAD     "SET UP TO ENTER DEBUG IN SUCH A EX011380
                                                  *                                  "WAY THAT IT WILL READ THE INPUT EX011390
                                                  *                                  "WORD ON THE FIRST ENTRY WITHOUT EX011400
                                                  *                                  "WAITING FOR A BUTTON TO BE      EX011410
                                                  *                                  "DEPRESSED.  THIS WILL ALLOW THE EX011420
                                                  *                                  "OPERATOR TO 'HOLD' THE PROGRAM  EX011430
789        68        016E  FC7C0078                     FET        7,,DB_MODE      "FROM THE PMU AT TURN ON.        EX011440
                                                  *                                  "DEBUG - AUTOMATIC RETURN IF NO  *I011450
790        76  *     0170  F80D1948                     BSV        OMEGA_DEBUG$2   "PROGRAM MONITOR UNIT AVAILABLE EX011460
791        84        0172  9EBC    (008C)               CLAD       0,,TIME         "ADD VALUE OF COMPUTER TIME      EX011470
792        102       0173  42E7    (00E7)               MPYD       0,,=DF(5D-3B31/24/3600/1B11)                 11  011480
                                                  *                                                  "TURN OFF TO GMT      011490
793        110       0174  96C4    (00C4)               ADDD       0,,DAY_SINCE_JAN1_1972 "OF PREVIOUS TURN ON TO    011500
794        120       0175  7844    (00C4)               STAD       0,,DAY_SINCE_JAN1_1972 "GET TIME OF THIS TURN ON  011510
                                                  *                                  "(WHICH THE OPERATOR CAN REJECT) EX011520
                                                  *                                                                    EX011530
795        124       0176  B811                         SUBD       1,1             "CLEAR LOWER MEMORY FROM ZERO UP EX011540
796        128       0177  FC3900BD                     CLAM       3,,TIME+1       "TO AND INCLUDING TIME LOCATION  EX011550
797        8R        0179  7212              $1         STA        I1,2                                             % 011560
798        16        017A  C422    (0179)               BXU        2,,$1                                            % 011570
                                                  *                                  "                                EX011580
799        4R        017B  FC291B41                     CLAM       2,,ROLL+5       "CLEAR UPPER MEMORY FROM THE     EX011590
800        8         017D  FC391F66                     CLAM       3,,PANEL_DATA-1 "BOTTOM OF THE R15 PUSHDOWN STACEX011600
                                                  *                                  "UPTO PANEL DATA LOCATION        EX011610
801        8R        017F  7212              $2         STA        I1,2                                             % 011620
802        16        0180  C422    (017F)               BXU        2,,$2                                            % 011630
                                                  *                                                                    EX011640
803        4R        0181  FC194A00                     CLAM       1,,X(4A00)      "TURN ON THE INSERT, DISPLAY,    %S011650
```

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                                        *                                   "NORMAL, ENTER T AND CLEAR LAMPS EX011660
804      6     0183  9C23                      CLAM     2,,X(0003)        "ON THE C/I PANEL                EX011670
805     10     0184  FC39E000                  CLAM     3,,X(E000)                                         EX011680
806     20     0186  F0170009                  STA      1,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES         EX011690
807     32     0188  F8271F48                  STAD     2,,PANELMODE+1 "SET PANEL SWITCH MASK SO THAT      EX011700
                                        *                                   "DEPRESSING THE ILLUMINATED      EX011710
                                        *                                   "BUTTONS IS VALID                EX011720
                                        *                                                                    EX011730
                                        *   DISPLAY PROGRAM ID ON PANEL                                        011740
808     46     018A  F80C0156                  FETD     0,,PROG_ID_DB                                      011750
809     68     018C  F03C014F                  FET      3,,PROGRAM_ID                                   01 011760
810     70     018E  B445                      ADD      4,5                                                011770
811     72     018F  A424                      CLA      2,4                                                011780
812     2R     0190  983A             $11      COMM     3,,10                                              011790
813      6     0191  D054    (0196)            BRL      $21                                                011800
814     2R     0192  903A                      SUBM     3,,10                                              011810
815      6     0193  F4290010                  ADDM     2,,16                                              011820
816     10     0195  D806    (0190)            BUC      $11                                                011830
817     2R     0196  B423             $21      ADD      2,3                                                011840
818      4     0197  A431                      CLA      3,1                                                011850
819      8     0198  F4340100                  LSA      3,,8                                               011860
820     18     019A  FC4A00DC                  CLAD     4,,HX0080                                          011870
821     48     019C  F4570003                  PTR      5,,C_I_LEFT_DISPLAY                                011880
822     56     019E  8410                      FETM     1,,0              SET TIME ARGUMENT = 0 FOR OMEGA EX011890
823     60     019F  FC094135                  CLAM     0,,X(4135)          DELAY TO ALLOW                 011900
824     2R     01A1  9001             $3       SUBM     0,1                 OSCILLATOR TO                  011910
825      6     01A2  D812    (01A1)            BNE      $3                  ADJUST.                        011920
                                        *                                   "SET 1ST OMEGA TASK = PREFLIGHT  *I011930
826     70R    01A3  0808                      OMEGA    TEST1-OMEGA_TASK_TABLE/2   "TO OCURR IN 50 MSEC EX011940
                                        *                                                                    EX011950
                                        *                                   "INITIALIZE PRECISION FREQUENCY  *I011960
827     78     01A4  030A                      SET      RESET_PFG_COUNTDOWN   "GENERATOR IN RECEIVER       EX011970
828     82     01A5  FC090300                  CLAM     0,,X(0300)                                         % 011980
                                        *                                   "ALLOW DIRECT MEMORY ACCESS I/O  *I011990
829     84     01A7  DF61                      LGC      DMA_INHIBIT+E   "TO OCCUR (INHIBIT NOT TRUE)       EX012000
                                        *                                   "ALLOW INTERRUPTS TO OCCUR IN THE*I012010
830     86     01A8  DF60                      LGC      INTERRUPT_INHIBIT+E   "1070 (INHIBIT NOT TRUE)     EX012020
831     96     01A9  F0070023                  STA      0,,OUTPUT_TEST_AND_MISCELLANEOUS_SIGNALS           EX012030
                                        *                                   "SET COMPUTER AND SYSTEM OK BITS EX012040
                                        *                                   "IN TEST SIGNAL OUTPUT WORD      EX012050
                                        *                                     "100 MILLISECOND MONITOR SIGNAL*I012060
832    104     01AB  030C                      SET      PROGRAM_SEQUENCING   "FOR MALF INDICATOR           EX012070
833    112     01AC  F80F8CC3                  IOC      0,,PROGRAMMER_CONTROLLER_GO_LIGHT                  012080
```

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834      122        01AE  FC0D0150                  POP        0,,PROGRAM_ID+1   'GO' & MOD # ON P/C          012090
                                          * THE 5 MSEC OMEGA INTERRUPT WILL BE                                  *H012100
                                          * ENABLED AFTER ONE PASS THROUGH                                      *H012110
                                          * CHECKSUM.  THIS ROUTINE WILL CYCLE                                  *H012120
                                          * THROUGH CHECKSUM REPEATEDLY (EXCEPT                                 *H012130
                                          * WHEN DOING SYNC CALCULATIONS) WHEN                                  *H012140
                                          * THERE ARE NO OTHER PROCESSING REQUIREMENTS                          *H012150
                                          *                                                                     EX012160
                                          *                                  "CHECKSUM PROGRAM AREA OF MEMORY *I012170
835       8R *      0180  F80D0243          TEST_SYNC  BSV        MP_CKSUM   "INDICATE MALF IF NOT CORRECT    EX012180
836      14         0182  9E09   (0089)                CLA        0,,TEN_SECOND_SYNC_PERIOD_COMPLETE_MARKER      % 012190
                                          *                                  "HAS A SYNC 10                   *2012200
837      18         0183  D864   (0180)                BRE        TEST_SYNC  "SEC DATA COLLECTION PERIOD JUST %R012210
                                          *                                  "ENDED?                          EX012220
                                          * PERFORM SYNC COMPUTATIONS                                           *H012230
                                          * RETURN TO TEST SYNC IF NOT COMPLETE                                 *H012240
                                          * CONTINUE ON IF SYNC IS COMPLETE                                     *H012250
```

```
                                        **                                                                  SY012260
                                        *                        SYNC CALCULATIONS                          *H012270
                                        *                                                                   *H012280
                                        *  THIS PROGRAM IS ENTERED AFTER THE SYNC DATA COLLECTION ROUTINE   *H012290
                                        *  HAS COLLECTED DATA FOR TEN SECONDS.  IT WILL PROCESS THE DATA AND *H012300
                                        *  DECIDE IF SYNC IS COMPLETE.                                      *H012310
                                        *                                                                   *H012320
838      2R      01B4  9C00             SYNC_CALC  CLAM    0,0            "RESET SYNC TEN SECOND MARKER"   SY012330
839      10      01B5  7009   (0089)               STA     0,,TEN_SECOND_SYNC_PERIOD_COMPLETE_MARKER       SY012340
840      14      01B6  FC7900C8                    CLAM    7,,200         "INITIALIZATION"                 %S012350
841      16      01B8  A487                        CLA     8,7            "SET C(100) = -.5                SY012360
842      18      01B9  A497                        CLA     9,7            "SET POINTERS TO THE 4 LARGEST   SY012370
843      20      01BA  A4A7                        CLA     10,7           "C(I) = C(100)                   SY012380
844      30      01BB  FC0A1A7A                    CLAD    0,,=DF(-1B-1)      LOCATION                     SY012390
845      34      01BD  FCB91DAE                    CLAM    11,,SYNC_C                                      SY012400
846      44      01BF  7B78                        STAD    IX7,11                                          SY012410
847      48      01C0  FC4900C6                    CLAM    4,,198         "SET UP INDEX FOR I (0 TO 198)   SY012420
848      50      01C2  9C30                        CLAM    3,0            "BY 2'S FOR THE 100 C'S (0 TO 99)SY012430
849      52      01C3  9C50                        CLAM    5,0            "SET UP INDEX FOR K (0 TO 14)    SY012440
850      54      01C4  9C6E                        CLAM    6,14           "BY 2'S FOR THE 8 STATIONS       SY012450
851      6R      01C5  8400             $33        FETM    0,,0           "START C(I) COMPUTATION"         SY012460
852      10      01C6  B822                        SUBD    2,2            "SET SUMMATION = 0"              SY012470
853      2R      01C7  A406             $3         CLA     0,6            "COMBINE K AND FREQ (MOD 8) TO   SY012480
854      8       01C8  9208   (0088)               SUB     0,,SYNC_FREQUENCY "FIND OUT WHICH STATION IS NEXSY012490
855      14      01C9  F0044000                    RSA     0,,1           "(STATION = A FOR K = 0 AND 10.2)SY012500
856      18      01CB  D021   (01CD)               BGE     $1                                              % 012510
857      2R      01CC  9408                        ADDM    0,8                                             SY012520
858      8R      01CD  F50A00D5         $1         CLA     X0,,POWERS_OF_TWO                               % 012530
859      16      01CF  E40000E5                    EXT     0,0,STATIONS_IN_USE                             SY012540
860      20      01D1  D06C   (01DE)               BRE     $2             "IS THIS A USABLE STATION?       SY012550
                                        *                                  "READ START TIME AND BURST       SY012560
                                        *                                  "TIME FOR THIS STATION.  ALL     SY012570
                                        *                                  "TIMES ARE RELATIVE TO START OF  SY012580
                                        *                                  "STATION A 10.2 AND IN UNITS OF  SY012590
861      10R     01D2  FD6A16DE                    CLAD    X6,,SYNC_LIMIT_TABLE ".05 SEC (THEREFORE THE STASY012600
                                        *                                  "TIME IS A NUMBER BETWEEN 0 AND  SY012610
                                        *                                  "198 AND MATCHES THE INDEX I).   SY012620
                                        *                                  "BURST TIME IS THE NUMBER OF .1  SY012630
                                        *                                  "SEC INTERVALS IN A STATION BURSTSY012640
                                        *                                  "COMPUTE SUM OVER BURST FOR THIS *I012650
862      18  *   01D4  F80D0268                    BSV     SYNC_SUMMATION_SUBROUTINE   "STATION            SY012660
863      22      01D6  8C40                        ADDD    4,0            "ADD SHORT SUM TO C(I)           SY012670
864      32      01D7  D710                        PRN     1              "INCREASE NUMBER OF .1 SEC       %S012680
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865     34        01D8  9414                  ADDM     1,4          "INTERVALS BY 4 AND LOWER THE     SY012690
866     36        01D9  9004                  SUBM     0,4          "START TIME BY 2 .1 SEC INTERVALSSY012700
                                        *                            "TO INCLUDE SLOTS BEFORE AND      SY012710
                                        *                            "AFTER BURST IN NEXT SUM.         SY012720
                                        *                            "COMPUTE SUM OVER BURST + SLOTS   *I012730
867     44  *     01DA  F80D0268              BSV      SYNC_SUMMATION_SUBROUTINE   "FOR THIS STATION   SY012740
868     48        01DC  B840                  SUBD     4,0          "SUBTRACT LONG SUM FROM C(I)      SY012750
869     58        01DD  D710                  PRN      1                                              SY012760
                                        *                            "INCREMENT K BY 2                 *2012770
870      8R       01DE  CD68   (01C7)  $2     BXUD     6,,$3        "ARE THERE MORE STATIONS FOR      SY012780
                                        *                            "THIS C(I)?                       SY012790
871      2R       01DF  A412                  CLA      1,2          "AVERAGE C(I) WITH OLD C(I)"      SY012800
872      4        01E0  A423                  CLA      2,3          "AVERAGE = (C(I) - C(OLD))/N      SY012810
873     12        01E1  D700                  PRN      0            "                + C(OLD)         SY012820
874     20        01E2  BB3B                  SUBD     IX3,11       "WHERE N = NUMBER OF TEN SECOND   SY012830
875     38        01E3  4285   (0085)         MPYD     0,,SYNC_1OVERN "INTERVALS PROCESSED             SY012840
876     46        01E4  BF3B                  ADDD     IX3,11                                         SY012850
877     56        01E5  7B3B                  STAD     IX3,11       C B25                             SY012860
                                        *                                                              SY012870
                                        *                  R0 = KLK, C(I)                              SY012880
                                        *                  R1 = KUK - KLK + 1                          SY012890
                                        *                  R2 = TEMP (SUM)                             SY012900
                                        *                  R3 = I                                      SY012910
                                        *                  R4 = I END                                  SY012920
                                        *                  R5 = K                                      SY012930
                                        *                  R6 = K END                                  SY012940
                                        *                  R7 = I 4TH LARGEST                          SY012950
                                        *                  R8 = I 3RD LARGEST                          SY012960
                                        *                  R9 = I 2ND LARGEST                          SY012970
                                        *                  RA = I 1ST LARGEST                          SY012980
                                        *                  RB = SYNC C ADDRESS                         SY012990
                                        *                  RC = SPARE                                  SY013000
                                        *                  R0 = TEMP(FIRST SUM)                        SY013010
                                        *                                                              SY013020
                                        * NOW DETERMINE IF THIS C(I) IS ONE                                *H013030
                                        * OF THE FOUR LARGEST C(I)'S COMPUTED                              *H013040
                                        * SO FAR                                                          *H013050
878     64        01E6  8B7B                  COMD     IX7,11                                         % 013060
                                        *                            "IS THIS C(I)                     *1013070
879     68        01E7  D05D   (01F5)         BRL      $4           "LARGER THAN THE FOURTH LARGEST? %R013080
880      2R       01E8  A473                  CLA      7,3          "PUT I INTO 4TH LARGEST POINTER   SY013090
881     10        01E9  8B8B                  COMD     IX8,11                                         SY013100
                                        *                            "IS THIS C(I)                     *1013110
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882     14     01EA  D05A   (01F5)          BRL     $4          "LARGER THAN THE THIRD LARGEST?  %R013120
883      2R    01EB  A478                   CLA     7,8         "MOVE OLD THIRD POINTER TO 4TH   SY013130
884      4     01EC  A483                   CLA     8,3         "AND PUT I INTO 3RD LARGEST      SY013140
885     12     01ED  8B9B                   COMD    IX9,11      "POINTER                         SY013150
                                     *                           "IS THIS C(I)                    *1013160
886     16     01EE  D056   (01F5)          BRL     $4          "LARGER THAN THE SECOND LARGEST? %R013170
887      2R    01EF  A489                   CLA     8,9         "MOVE OLD SECOND POINTER TO 3RD  SY013180
888      4     01F0  A493                   CLA     9,3         "AND PUT I INTO 2ND LARGEST      SY013190
889     12     01F1  8BAB                   COMD    IX10,11     "POINTER                         SY013200
890     16     01F2  D052   (01F5)          BRL     $4          "IS THIS C(I) THE LARGEST C(I)?  %R013210
891      2R    01F3  A49A                   CLA     9,10        "MOVE OLD 1ST POINTER TO 2ND AND SY013220
892      4     01F4  A4A3                   CLA     10,3        "PUT I INTO THE LARGEST POINTER  SY013230
                                     *                           "I = I+2                         *2013240
893      8R    01F5  CF31   (01C5)  $4      BXUD    3,,$33      "ARE THERE MORE C(I)'S TO        SY013250
                                     *                           "COMPUTE?                        SY013260
                                     * NOW USE THE FOUR LARGEST C(I)'S TO                                *H013270
                                     * DETERMINE IF SYNCHRONIZATION HAS BEEN                             *H013280
                                     * OBTAINED AND, IF SO, COMPUTE SYNC TIME                            *H013290
                                     *                                                                  SY013300
                                     *                     DETERMINE IF SYNC IS COMPLETE                SY013310
                                     *                                                                  SY013320
894      8R    01F6  AFAB                   CLAD    IX10,11     "COMPUTE CONFIDENCE LEVEL"C"     SY013330
895     28     01F7  F8061A7C               MPYD    0,,=DF((.15)*2) "C =(.3*C(1ST) + .036*4*240*240)SY013340
896     38     01F9  FC0B1A7E               ADDD    0,,=DF(.036*16*240*240*2B-25/2)                HH013350
897     50     01FB  8685   (0085)          FETD    0,,SYNC_10VERN                                 SY013360
898    496     01FC  1000                   SQRT    0                                              SY013370
899    512     01FD  6820                   MPYD    2,0         CONFIDENCE LEVEL  B25            SY013380
900    524     01FE  F8071ED5               STAD    0,,Q_STORAGE+2 "SAVE 1/N**.5 FOR SYNC DISPLAY SO%S013390
                                     *                           "THAT DISPLAY IS 0 IF C(1ST) IS  SY013400
                                     *                           "LESS THAN ZERO                  SY013410
901    536     0200  F8271ED7               STAD    2,,Q_STORAGE+4 "SAVE C FOR SYNC DISPLAY         SY013420
902    544     0202  AFCD                   CLAD    IX12,13     LARGEST MUST BE +                OM013430
903    554     0203  D710                   PRN     1                                              SY013440
                                     *                           "IS C(1ST) MINUS?                *1013450
904    560     0204  040501B0               BRL     TEST_SYNC   "(COLLECT MORE DATA IF YES)      SY013460
905      8R    0206  8BAB                   SUBD    IX10,11     "FORM (C(1ST) - C(2ND)) - C      SY013470
906     12     0207  A800                   CLSD    0,0         C1ST - CD                        SY013480
907     20     0208  8B9B                   SUBD    IX9,11      COM WITH SEC                     SY013490
908     32     0209  F8071ED5               STAD    0,,Q_STORAGE+2 "AND SAVE FOR SYNC DISPLAY       SY013500
                                     *                           "IS C(1ST)-C(2ND)                *2013510
909     36     020B  D231   (022D)          BRG     $10         "GREATER THAN C?  (SYNC COMPLETE SY013520
                                     *                           "IF YES)                         SY013530
                                     * THERE IS STILL A POSSIBILITY THAT                                *H013540
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                                        * SYNC IS COMPLETE IF C(1ST) IS IN                                    *H013550
                                        * A TIME SLOT ADJACENT TO C(2ND) OR                                   *H013560
                                        * C(3RD)                                                              *H013570
910      8R     020C  BF9B                      ADDD     IX9,11                                              SY013580
911     10      020D  A42A                      CLA      2,10          "FORM ABSOLUTE I(1ST) - I(2ND)        SY013590
912     12      020E  B029                      SUB      2,9             ADJACENT                            SY013600
913     16      020F  D021   (0211)             BGE      $21                                                 % 013610
914      2R     0210  A022                      CLS      2,2                                                 SY013620
915      2R     0211  9822             $21      COMM     2,,2                                                % 013630
                                        *                              "ARE C(1ST) AND                       *2013640
916      6      0212  D066   (0219)             BRE      $12           "C(2ND) ADJACENT?   (I(1ST)           SY013650
                                        *                              "- I(2ND) = 2)                        SY013660
917      4R     0213  F82900C6                  COMM     2,,198                                              % 013670
                                        *                              "ARE C(1ST) AND                       *2013680
918     10      0215  040101B0                  BNE      TEST_SYNC     "C(2ND) THE FIRST AND LAST .1 SEC     %R013690
                                        *                              "INTERVALS?                           SY013700
919      4R     0217  F49900C8                  ADDM     9,,200        "ADD 10 SEC TO I(2ND) SO THAT         SY013710
                                        *                              "I(1ST) + I(2ND) AVERAGE WILL         SY013720
                                        *                              "BE CORRECT IF SYNC IS COMPLETE       SY013730
920      8R     0219  BB8B             $12      SUBD     IX8,11        "SAVE (C(1ST) - C(3RD)) - C           SY013740
921     20      021A  F8071ED5                  STAD     0,,Q_STORAGE+2 "FOR SYNC DISPLAY                     SY013750
                                        *                              "IS C(1ST)-C(3RD)                     *2013760
922     24      021C  D132   (022F)             BRG      $13           "GREATER THAN C?  (SYNC COMPLETE      SY013770
                                        *                              "IF YES)                              SY013780
923      8R     021D  BF8B                      ADDD     IX8,11                                              SY013790
924     10      021E  A42A                      CLA      2,10          "FORM ABSOLUTE I(1ST) - I(3RD)        SY013800
925     12      021F  B028                      SUB      2,8             ADJACENT                            SY013810
926     16      0220  D021   (0222)             BGE      $14                                                 % 013820
927      2R     0221  A022                      CLS      2,2                                                 SY013830
928      2R     0222  9822             $14      COMM     2,,2                                                % 013840
                                        *                              "ARE C(1ST) AND                       *2013850
929      6      0223  D064   (0228)             BRE      $15           "C(3RD) ADJACENT?   (I(1ST)           SY013860
                                        *                              "- I(3RD) = 2)                        SY013870
930      4R     0224  F82900C6                  COMM     2,,198                                              % 013880
                                        *                              "ARE C(1ST) AND                       *2013890
931     10      0226  040101B0                  BNE      TEST_SYNC     "C(3RD) THE FIRST AND LAST .1 SEC     %R013900
                                        *                              "INTERVALS?                           SY013910
932      8R     0228  BB7B             $15      SUBD     IX7,11        "SAVE (C(1ST) - C(4TH)) - C           SY013920
933     20      0229  F8071ED5                  STAD     0,,Q_STORAGE+2 "FOR SYNC DISPLAY                     SY013930
                                        *                              "IS C(1ST)-C(4TH)                     *2013940
934     26      022B  040401B0                  BLE      TEST_SYNC     "GREATER THAN C?  (SYNC COMPLETE      %R013950
                                        *                              "IF YES)                              SY013960
935      2R     022D  A41A             $10      CLA      1,10          "SYNC COMPLETE"                       SY013970
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                                        *                                   "I(1ST) DEFINES START OF STATION SY013980
936      6      022E  D004  (0233)              BUC     $16                 "A 10.2 BURST                    SY013990
937      2R     022F  A41A                $13   CLA     1,10                "SYNC COMPLETE"                  SY014000
938      4      0230  B419                      ADD     1,9                 "C(1ST) AND C(2ND) ARE ADJACENT  SY014010
                                        *                                   "USE (I(1ST) + I(2ND))/2 TO      SY014020
                                        *                                   "DEFINE START OF STATION A       SY014030
939      10     0231  F0144000                  RSA     1,,1                "10.2 BURST                      SY014040
940      4R     0233  441A                $16   MPIM    1,,10               "MULTIPLY I BY 10 TO GET STATION SY014050
                                        *                                   "A 10.2 BURST TIME WITH RESOLU-  SY014060
                                        *                                   "TION OF 5 MSEC. THE EFFECTIVE   SY014070
                                        *                                   "RESOLUTION IS THE .1 SEC INTER- SY014080
                                        *                                   "VAL OVER 2 (OR 50 MSEC)         SY014090
941      2R     0234  9C00                $8    CLAM    0,0                                                  % 014100
                                        *                                   "ADD START SYNC TIME TO GET TIME SY014110
                                        *                                   "OF STATION A 10.2 BURST IN      SY014120
942      10     0235  9688  (0088)              ADDD    0,,START_SYNC_TIME                                   SY014130
                                        *                                   "REAL TIME (COMPUTER TIME)  IT ISSY014140
                                        *                                   "THE BURST THAT OCURRED DURING   SY014150
943      20     0236  7808  (0088)              STAD    0,,START_SYNC_TIME                                   SY014160
                                        *                                   "THE FIRST SYNC 10 SEC PERIOD    SY014170
944      24     0237  B800                      SUBD    0,0                  SET OMEGA TIME = 0 TO STOP SYNC  SY014180
945      34     0238  7817  (0097)              STAD    0,,OMEGA_TIME        DATA COLLECTION PROGRAM          SY014190
                                        *                                    SHOULD BE LARGE NUMBER IN OMEGA SY014200
                                        *                                    TIME TO STOP OMEGA PROGRAMS     SY014210
946      4R     0239  FC290205            $11   CLAM    2,,PHI_ZERO-SYNC_DATA COMPUTE NUMBER WORDS           HH014220
                                        *                                   "CLEAR THE SYNC DATA STORAGE AREASY014230
947      14     023B  F1171C1E                  STA     X1,,SYNC_DATA       "FOR USE BY OTHER PROGRAMS       SY014240
948      22     023D  C415  (0239)              BXU     1,,$11                                               % 014250
949      2R     023E  9C01                      CLAM    0,,1                "SET THE 'START OMEGA' MARKER TO %S014260
                                        *                                   "TELL THE START OMEGA PROGRAM    SY014270
950      10     023F  701C  (009C)              STA     0,,START_OMEGA_NOW  "TO BEGIN OMEGA NAVIGATION       SY014280
                                        *                                                                    SY014290
                                        *                                                                    SY014300
                                        *                                                                    EX014310
                                        * SEQUENCE TO THE LAST PART OF MAIN PROGRAM                          #H014320
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                                                  **                                                                  EX014330
                                                  *   MAIN PROGRAM - CONTINUOUS CHECKSUM TEST                         EX014340
                                                  *       PMU DATA-ERROR LIGHT SET ON FAIL, RESET ON PASS             EX014350
                                                  *                                   "CHECKSUM PROGRAM AREA OF MEMORY *I014360
951                                               MAIN_PROGRAM;                                                       EX014370
951        8R *      0240  F80D0243                      BSV        MP_CKSUM       "INDICATE MALF IF NOT CORRECT    EX014380
952       12         0242  D803    (0240)                BUC        MAIN_PROGRAM   "LOOP ON CHECKSUM"               EX014390
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                                                  **                                                                  EX014400
                                                  * MEMORY CHECKSUM - SUM ALL WORDS OF                                 *H014410
                                                  * MEMORY EXCEPT VARIABLE STORAGE                                     *H014420
                                                  * RESULT SHOULD BE ZERO                                              *H014430
953     14R       0243  F80C0153          MP_CKSUM    FETD      0,,CKSUM_LINK                                         EX014440
954     22        0245  8411                          FETM      1,,1                                                  EX014450
955      6R       0246  B602              $1          ADD       I0,2                                                  EX014460
956     14        0247  C422    (0246)                BXU       2,,$1                                                 EX014470
957      4R       0248  D064    (024D)                BRE       $3                                                    EX014480
958      8R       0249  F0181C05                      COM       1,,DB_CKSUM_IGNORE MRKR=1 MEANS DB WRITE MADE         TS014490
959     12        024B  D014    (0250)                BNE       $4                                                    TS014500
960      2R       024C  9C00                          CLAM      0,,0            PREPARE TO ZERO MRKR                  TS014510
961     10R       024D  F0071C05          $3          STA       0,,DB_CKSUM_IGNORE  ALWAYS ZERO DB MRKR                 014520
962     14        024F  D003    (0253)                BUC       $2                                                      014530
963     18R *     0250  2EDC    (00DC)    $4          FAILD     I0,,HX0080      RESET COMP/REC GO                     TS014540
964     30  *     0251  3400                          MARK      0,,0                                                  TS014550
965     32        0252  9C01                          CLAM      0,,ERROR                                              EX014560
966     12R       0253  E00100A1          $2          MRG       0,1,PMU_INDICATOR_WORD                                EX014570
967     20        0255  8660    (00E0)                FET       0,,HX0800       ENABLE                                EX014580
968     34  *     0256  2E60    (00E0)                FAIL      I0,,HX0800        INTERRUPTS                          EX014590
969     52        0257  D530                          BBK       3                                                     EX014600
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                                        **                                                                  TS014610
                                        *                FAIL                                               *H014620
                                        *                                                                   *H014630
                                        * THIS PIN ROUTINE POSTS BITS IN THE                               *H014640
                                        * TEST SIGNAL OUTPUT WORD. THE BITS ARE                            *H014650
                                        * IN R0 AND THE MASK IS IN R1                                      *H014660
                                        *                                                                   TS014670
970     12R     0258  E0010023          FAIL_PIN    MRG         0,1,OUTPUT_TEST_AND_MISCELLANEOUS_SIGNALS   TS014680
                                        *                                   "MERGE BITS INTO TEST SIGNAL    EX014690
971     26      025A  D510                          BBK         1           "OUTPUT WORD                    EX014700
                                        *                                                                   TS014710
                                        *                                                                   *H014720
                                        *                                                                   *H014730
                                        *                MARK                                               *H014740
                                        *                                                                   *H014750
                                        * THIS PIN ROUTINE WILL SET BITS IN A TEST                         *H014760
                                        * FAIL WORD GIVEN THE BIT NUMBER IN R0                             *H014770
972      8R     025B  F50A00D5          MARK_PIN    CLA         X0,,POWERS_OF_TWO "READ BIT FROM POWERS OF TWO EX014780
973     20      025D  E00000D1                      MRG         0,0,TEST_FAIL  "TABLE AND MERGE INTO TEST FAIL EX014790
974     32      025F  E000002E                      MRG         0,0,TEST_FAIL_TEMP "AND TEST FAIL TEMP WORDS   EX014800
975     44      0261  D500                          BBK         0                                           TS014810
                                        *                                                                     014820
976                                     FAIL_EXTERNAL;                          PRN'S 1 OFF                   014830
976     18R *   0262  2EDD    (00DD)                FAILD       I0,,HX0100       TURN ON SYSTEM FAIL LIGHT    014840
977     12R     0263  E00000D2          $1          MRG         0,0,TEST_FAIL+1          ONLY                 014850
978     24      0265  E000002F                      MRG         0,0,TEST_FAIL_TEMP+1                          014860
979     36      0267  D500                          BBK         0                                             014870
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                                        **                                                                  SY014880
                                        * SYNC SUMMATION ROUTINE                                            *H014890
                                        *                                                                   *H014900
                                        * THIS ROUTINE IS USED BY THE SYNC COMPUTATIONAL                    *H014910
                                        * PROGRAM TO FORM THE SUMMATION OF THE SINE'S                       *H014920
                                        * AND COSINE'S OVER THE INTERVAL SPECIFIED BY                       *H014930
                                        * THE ARGUMENTS.  THE ARGUMENTS CONSIST OF THE                      *H014940
                                        * NUMBER OF TERMS, NUMBER OF THE FIRST TERM                         *H014950
                                        * (ASSUMING I=0) AND THE CURRENT VALUE OF I. THE                    *H014960
                                        * ARGUMENTS ARE NOT DISTURBED AND THE RESULT IS                     *H014970
                                        * LEFT IN REGISTERS ADDED BY THIS ROUTINE.                          *H014980
                                        *                                                                   *H014990
980                                     SYNC_SUMMATION_SUBROUTINE;                                          SY015000
980     20R     0268  8470                      FETM     7,,0          "CLEAR SUM COS AND SUM SIN          SY015010
981     22      0269  A459                      CLA      5,9           "MOVE NUMBER OF TERMS AND           SY015020
982     24      026A  A408                      CLA      0,8           "START POINT                        SY015030
                                        *                                "IS THE START                       *2015040
983     28      026B  D021   (026D)             BGE      $1            "POINT IN PROPER RANGE?             SY015050
                                        *                                "(0 TO 198 BY 2)                    SY015060
                                        *                                "PUT START POINT INTO RANGE         SY015070
984      6R     026C  9679   (00F9)             ADD      0,,HD200      "BY ADDING 200                      SY015080
985      2R     026D  B40C              $1      ADD      0,12          "FORM START POINT + I               SY015090
986     10      026E  F41A0087                  CLA      1,,SYNC_DATA_ADDRESS "READ BASE ADDRESS OF SYNC     SY015100
                                        *                                "DATA FOR THIS 10 SEC PERIOD AND    SY015110
987     12      0270  B401                      ADD      0,1           "ADD TO CURRENT START POINT         SY015120
988     16      0271  F41900C8                  ADDM     1,,200        "FORM BASE ADDRESS + 200 = UPPER    SY015130
                                        *                                "LIMIT OF DATA STORAGE AREA         SY015140
989      2R     0273  8001              $3      COM      0,1           "POINTER TO NEXT DATA WORD IS NOW   SY015150
                                        *                                "AVAILABLE FOR SUM'S                SY015160
                                        *                                "IS THE DATA                        *2015170
990      6      0274  D051   (0276)             BRL      $2            "POINTER LESS THAN THE DATA UPPER   SY015180
                                        *                                "LIMIT?                             SY015190
991      6R     0275  9279   (00F9)             SUB      0,,HD200      "FORM POINTER - 200 TO PUT IT IN    SY015200
                                        *                                "THE PROPER RANGE                   SY015210
992      6R     0276  B620              $2      ADD      I2,0          "USE DATA POINTER TO SUM COSINE     SY015220
993      8      0277  9401                      ADDM     0,,1          "INCREMENT POINTER FOR SIN          SY015230
994     14      0278  B660                      ADD      I6,0          "USE DATA POINTER TO SUM SINE       SY015240
995     16      0279  9401                      ADDM     0,1           "INCREMENT POINTER FOR NEXT PAIR    SY015250
                                        *                                "ARE THERE MORE                     *1015260
996     24      027A  C448   (0273)             BXU      4,,$3         "TERMS TO ADD TO THE SUM'S?         SY015270
997      2R     027B  9451                      ADDM     5,,1          "FORM FINAL RESULT"                 SY015280
998      6      027C  F4540400                  LSA      5,,10         "= ((SUM SIN)**2 + (SUM COS)**2)    SY015290
999      8      027E  A445                      CLA      4,5           "  /(NUMBER OF TERMS)              SY015300
```

```
1000    10    027F  9C50          CLAM    5,0     "THE SUM'S ARE IN COUNTS AT B15   SY015310
1001    26    0280  6822          MPYD    2,2     "NO OF TERMS IS AN INTEGER AT B5  SY015320
1002    42    0281  6866          MPYD    6,6     "RESULT IS COUNTS SQUARED AT B25  SY015330
1003    46    0282  8C62          ADDD    6,2     SUM SQ B30                        SY015340
1004   172    0283  DC64          DIVD    6,4     C(I) INCREMENT B25                SY015350
1005   194    0284  D550          BBK     5                                         SY015360
                                  *                                                 SY015370
                                  *       R0 = BASE + KLK +I                        SY015380
                                  *       R1 = LAST ADDRESS OF THIS SET OF DATA     SY015390
                                  *       R2 = SUM Y                                SY015400
                                  *       R3 = SUM X                                SY015410
                                  *       R4 = TERM COUNT                           SY015420
                                  *       R5 = NUMBER OF TERMS                      SY015430
                                  *       R6 = KLK                                  SY015440
                                  *       R7 = NUMBER OF TERMS                      SY015450
                                  *       R8 = TEMP                                 SY015460
                                  *       R9 = I                                    SY015470
```

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                                                  **                                                                    EX015480
                                                  *                                                                     EX015490
                                                  *          EXECUTIVE                                                  *H015500
                                                  *                                                                     *H015510
                                                  * FIVE MILLISEC OMEGA INTERRUPT PROGRAM                               *H015520
                                                  * ALL TASKS ARE INITIATED FROM THIS ROUTINE                           *H015530
                                                  *                                                                     EX015540
1006      12R     0285  86BC   (00BC)   EXEC      FETD      0,,TIME        "INCREMENT CURRENT COMPUTER TIME EX015550
1007      20      0286  96EB   (00EB)             ADDD      0,,=DX(1)        "BY 5 MILLISEC (LOW ORDER BIT) EX015560
1008      30      0287  783C   (00BC)             STAD      0,,TIME                                          EX015570
1009      34      0288  F8097FFF                  COMM      0,,X(7FFF)     "DO NOT LET TIME OVERFLOW          015580
1010      38      028A  D013   (028E)             BNE       $2                                                 015590
1011      10R     028B  D710                      PRN       1                                                  015600
1012      16      028C  04000306                  BUC       SYNC$9                                             015610
                                                  *                                "100 MILLISECOND MONITOR SIGNAL  *I015620
1013       8R     028E  030C           $2         SET       PROGRAM_SEQUENCING    "FOR MALF INDICATOR        EX015630
1014      20      028F  86C6   (00C6)             FETD      0,,GMT         "INCREMENT GMT FOR MAGNETIC TAPE % 015640
1015      28      0290  96EB   (00EB)             ADDD      0,,=DX(1)                                        % 015650
1016      40      0291  7C46   (00C6)             PTRD      0,,GMT                                           % 015660
1017      48      0292  9A97   (0097)             COMD      0,,OMEGA_TIME                                    % 015670
                                                  * NOTE - TIME IS IN REGISTERS 0 AND 1                                 *H015680
                                                  * WHEN BEGINNING A NEW OMEGA TASK                                     *H015690
                                                  *                                "IS IT TIME                      *I015700
1018      58      0293  06020099                  BGE       I,,OMEGA_TASK  "TO START A NEW OMEGA TASK?       EX015710
1019       8R     0295  9A93   (0093)             COMD      0,,NON_OMEGA_TIME                                % 015720
                                                  *                                "IS IT TIME TO                   *I015730
1020      12      0296  D021   (0298)             BGE       DO_NON_OMEGA_TASK   "START A NEW NON OMEGA TASK?EX015740
                                                  * NO NEW TASKS TO BE INITIATED AT THIS TIME                           *H015750
1021      14R     0297  D510           END_EXEC   BBK       1              "RETURN TO INTERRUPTED PROGRAM   EX015760
```

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                                                  **                                                                    EX015770
                                                  *          NON OMEGA TASK                                             *H015780
                                                  *                                                                     *H015790
                                                  * THIS ROUTINE SELECTS THE NEXT NON OMEGA TASK                        *H015800
                                                  * FROM A TABLE.  AFTER ALL TASKS HAVE BEEN                            *H015810
                                                  * EXECUTED IT UPDATES THE TIME OF NON OMEGA                           *H015820
                                                  * TASKS BY .1 SEC.                                                    *H015830
1022                                              DO_NON_OMEGA_TASK;                                                    EX015840
1022        8R        0298  9E91   (0091)                  CLAD       0,,NON_OMEGA_TASK_INDEX "READ LAST VALUE OF TABLEX015850
1023        10        0299  9C18                           CLAM       1,,END_TASK-NON_OMEGA_TASK_TABLE "POINTER      EX015860
                                                  *                                   "(POINTER + 1)                  *1015870
1024        20        029A  F40C02A0                       BXU        0,,$1          "HAVE ALL ENTRIES BEEN EXECUTED? %R015880
1025        12R       029C  8695   (0095)                  FETD       0,,OLD_NON_OMEGA_TASK_TIME "COMPUTE THE TIME THAEX015890
1026        20        029D  96ED   (00ED)                  ADDD       0,,=D20        "THE NON OMEGA TASK SHOULD BE    EX015900
                                                  *                                   "INITIATED AGAIN BY ADDING .1 SECEX015910
                                                  *                                   "TO THE TIME THAT THEY WERE LAST EX015920
                                                  *                                   "INITIATED.                     EX015930
1027        30        029E  7815   (0095)                  STAD       0,,OLD_NON_OMEGA_TASK_TIME                     EX015940
1028        42        029F  7C13   (0093)                  PTRD       0,,NON_OMEGA_TIME "SAVE NEXT NON OMEGA TASK TIMEEX015950
1029        10R       02A0  7811   (0091)          $1      STAD       0,,NON_OMEGA_TASK_INDEX "SAVE NEW POINTER VALUE EX015960
1030        20        02A1  070002A3                       BUC        IX0,,NON_OMEGA_TASK_TABLE "SELECT TASK FROM TABL%S015970
                                                  * THE TABLE CONSISTS OF 12 ENTRIES     OMEGA DEBUG                    *H015980
                                                  *                                      VELOCITY PROCESSING            *H015990
                                                  * THE SECOND ENTRY IS THE FIRST        OMEGA DEBUG                    *H016000
                                                  * ROUTINE EXECUTED AND THE FIRST       RIJ UPDATE                     *H016010
                                                  * ENTRY IS THE LAST ROUTINE            OMEGA DEBUG                    *H016020
                                                  * EXECUTED IN A GIVEN .1 SEC           OMEGA DEBUG                    *H016030
                                                  * PERIOD.  AFTER THE LAST ROUTINE      PANEL MAIN                     *H016040
                                                  * IS EXECUTED THERE IS A WAIT          OMEGA DEBUG                    *H016050
                                                  * (USUALLY .04 SEC) BEFORE THE         AD IO TEST                     *H016060
                                                  * FIRST ROUTINE IS EXECUTED AGAIN.     OMEGA DEBUG                    *H016070
                                                  * ONE ROUTINE IS EXECUTED EACH 5       SLOW                           *H016080
                                                  * MILLISECONDS                         START OMEGA                    *H016090
                                                  *                                                                     EX016100
1031                                              NON_OMEGA_TASK_TABLE;                                                 EX016110
1031                  02A3  1947                           CON        OMEGA_DEBUG                                    EX016120
1032                  02A4  0690                           CON        VELOCITY_PROCESSING                            EX016130
1033                  02A5  1947                           CON        OMEGA_DEBUG                                    EX016140
1034                  02A6  0701                           CON        RIJ_UPDATE                                     EX016150
1035                  02A7  1947                           CON        OMEGA_DEBUG                                    EX016160
1036                  02A8  1947                           CON        OMEGA_DEBUG                                    EX016170
1037                  02A9  0EB2                           CON        PANEL_MAIN                                     EX016180
1038                  02AA  1947                           CON        OMEGA_DEBUG                                    EX016190
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1039    02AB  1949                  CON     AD_IO_TEST                EX016200
1040    02AC  1947                  CON     OMEGA_DEBUG               EX016210
1041    02AD  02AF                  CON     SLOW                      EX016220
1042    02AE  0334        END_TASK  CON     START_OMEGA               EX016230
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                                                **                                                                  EX016240
                                                *           ONE SECOND                                              #H016250
                                                *                                                                   #H016260
                                                * THIS ROUTINE IS A NON OMEGA TASK THAT                              #H016270
                                                * WILL CYCLE THROUGH A TABLE OF TEN ENTRIES                          #H016280
                                                * EXECUTING ONE TASK EACH TIME (THEREBY                              #H016290
                                                * YIELDING ROUTINES EXECUTED ONCE A SECOND)                          #H016300
1043      6R    02AF  9E24  (00A4)  SLOW        CLA         0,,SLOW_RATE  "READ LAST VALUE OF TABLE POINTERE          EX016310
                                                *                         "INCREMENT POINTER AND RESET              EX016320
                                                *                         "TO ZERO IF IT GOES TO 10                 EX016330
1044      8     02B0  9C19                      CLAM        1,,9                                                    EX016340
1045     16     02B1  C400  (02B2)              BXU         0,,$1                                                   % 016350
1046     8R     02B2  7024  (00A4)  $1          STA         0,,SLOW_RATE                                            % 016360
                                                *                         "SAVE NEW VALUE OF POINTER                EX016370
1047     18     02B3  07000285                  BUC         IX0,,ONE_SEC  "SELECT NEXT TASK FROM TABLE              %S016380
                                                * THE TABLE CONSISTS OF 10 ENTRIES     RZ UPDATE          2ND       #H016390
                                                * WHERE THE FIRST, 4TH, AND LAST 5 ENTRIES                          #H016400
                                                * RETURN TO THE INTERRUPTED PROGRAM    RZ TIME UPDATE 3RD          #H016410
                                                * AS THERE ARE ONLY 3 1 SEC ROUTINES   GP TEST 5TH                 #H016420
                                                *                                                                   EX016430
                                                *                                                                   EX016440
1048              02B5  0297                    ONE_SEC     CON         END_EXEC      NO MAG VAR IN SUB             EX016450
1049              02B6  1579                    $101        CON         RZ_UPDATE                                   EX016460
1050              02B7  1598                                CON         RZ_TIME_UPDATE                              EX016470
1051              02B8  0297                    $100        CON         END_EXEC                                     016480
1052              02B9  1948                                CON         GP_TEST                                     EX016490
1053              02BA  194D                                CON         OSC_TEST      OSCILATOR DRIFT TEST          EX016500
1054              02BB  0297                    $102        CON         END_EXEC                                     016510
1055              02BC  0EA2                    $103        CON         OPER_P_C      BECOMES TYPE ROUTINE ENTRY    016520
1056              02BD  0297                    $104        CON         END_EXEC      DATA COLLECT WHEN LOADED      016530
1057              02BE  0297                                CON         END_EXEC                                    EX016540
                                                *                                                                   EX016550
                                                *                                                                   EX016560
1058                                            OMEGA_TASK_TABLE,;                                                  EX016570
1058              02BF  02E7                    SYNC1       CON         SYNC                                        EX016580
1059              02C0  0028                                CON         40                                          EX016590
1060              02C1  02F3                    SYNC2       CON         SYNC$2                                      EX016600
1061              02C2  001E                                CON         30                                          EX016610
1062              02C3  0300                    SYNC3       CON         SYNC$3                                      EX016620
1063              02C4  0014                                CON         20                                          EX016630
1064              02C5  0538                    START_SLOT  CON         START_OF_SLOT                               EX016640
1065              02C6  001E                                CON         30                                          EX016650
1066              02C7  0544                    END_SLOT    CON         END_OF_SLOT                                 EX016660
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02C8  0014                  CON    20                                    EX016670
02C9  0635      START_BURST CON    START_OF_BURST                        EX016680
02CA  001E                  CON    30                                    EX016690
02CB  0765      K_FILTER    CON    KALMAN_FILTER                         EX016700
02CC  0000                  CON    0                                     EX016710
02CD  0357      END_BURST   CON    END_OF_BURST                          EX016720
02CE  0001                  CON    1                                     EX016730
02CF  194F      TEST1       CON    PREFLIGHT_TEST                        EX016740
02D0  000A                  CON    10                                    EX016750
02D1  195A      TEST2       CON    PREAMP_TEST$1                         EX016760
02D2  00C8                  CON    200            200 X 5 MSEC = 1 SECOND EX016770
02D3  1965      TEST3       CON    PREAMP_TEST$2                         EX016780
02D4  00C8                  CON    200                                   EX016790
02D5  1983      TEST4       CON    RF_TEST$1                             EX016800
02D6  00C8                  CON    200                                   EX016810
02D7  19B2      TEST5       CON    AD_TEST$1                             EX016820
02D8  0008                  CON    8                                     EX016830
02D9  198A      TEST6       CON    RF_TEST$2                             EX016840
02DA  00C8                  CON    200                                   EX016850
02DB  19ED      TEST7       CON    PD_TEST$1                             EX016860
02DC  00C8                  CON    200                                   EX016870
02DD  1A0A      TEST8       CON    PC_TEST$1                             EX016880
02DE  00C8                  CON    200                                   EX016890
02DF  1A15      TEST9       CON    PC_TEST$2                             EX016900
02E0  00C8                  CON    200                                   EX016910
02E1  1A27      TEST10      CON    DMA_TEST$1                            EX016920
02E2  0001                  CON    1                                     EX016930
02E3  19E9      TEST11      CON    PD_TEST                               EX016940
02E4  0004                  CON    4                                     EX016950
02E5  197A      TEST12      CON    RF_TEST                               EX016960
02E6  000A                  CON    10                                    EX016970
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                                        **                                                                  SY016980
                                        *          SYNCHRONIZATION                                          *H016990
                                        *                                                                   *H017000
                                        * ENTERED .2 SEC AFTER PREFLIGHT TESTS                              *H017010
                                        *                                   "SET UP SECOND SYNC TASK .15 SECS*I017020
1098      70R      02E7  0801           SYNC      OMEGA     0,,SYNC2-OMEGA_TASK_TABLE/2 "AFTER THIS TASK    SY017030
1099      76       02E8  8401                     FETM      0,,X(0001)     "SET + A LOOP FOR FLOATER ANTENNASY017040
                                        *                                   "READ STATE OF THE ANTENNA SELECT*I017050
1100      84       02E9  F0081F8C                 COM       0,,FLOATER     "WORD  1=FLOAT  0=LOOP           SY017060
                                        *                                   "IS THE SYSTEM                   *2017070
1101      88       02EB  D061   (02ED)            BRE       $1             "OPERATING WITH THE FLOATER      SY017080
                                        *                                   "ANTENNA?                        SY017090
1102       2R      02EC  9C06           $81       CLAM      0,,6           "LOOP ANTENNA"                    017100
                                        *                                   "SELECT +B LOOP AND A LOOP +90   SY017110
1103       8R      02ED  C010           $1        FET       1,0            "WRITE LOOP SELECTIONS INTO      SY017120
                                        *                                   "ANTENNA SWITCHING MATRIX FOR ALLSY017130
1104      26       02EE  F4270020                 PTR       2,,ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2 "3 FREQ SY017140
1105      34       02F0  F80F8CC0                 IOC       0,,X(8CC0)     PROG CONT - SEND GO LIGHT        SY017150
1106      42       02F2  D5F0                     BBK       15                                              SY017160
                                        *                                                                   SY017170
                                        * SECOND SYNC TASK - CLEAR 10.2 REGISTERS AND START SYNC            SY017180
                                        * SECOND SYNC TASK - CLEAR SIN/COS REGISTERS                        *H017190
                                        * AND START FIRST SYNC 10 SECOND PERIOD                             *H017200
1107      10R      02F3  780B   (008B)   $2        STAD      0,,START_SYNC_TIME "SAVE SYNC START TIME"       SY017210
                                        *                                   "THE SYNC PROCESS WILL DETERMINE SY017220
                                        *                                   "WHEN STATION A STARTS ITS 10.2  SY017230
                                        *                                   "BURST WITHIN THE FIRST 10 SECONDSY017240
                                        *                                   "PERIOD.  THE SYNC START TIME IS SY017250
                                        *                                   "THE VALUE OF THE COMPUTER REAL  SY017260
                                        *                                   "TIME COUNTER AT THE START OF THESY017270
                                        *                                   "FIRST TEN SECOND BURST.         SY017280
                                        *                                   "SET UP THIRD SYNC TASK .1 SECS  *I017290
1108      80       02F4  0802                     OMEGA     0,,SYNC3-OMEGA_TASK_TABLE/2 "AFTER THIS TASK    SY017300
1109     100       02F5  8470                     FETM      7,,0           "CLEAR ALL SIN/COS INPUT REGIS-  SY017310
                                        *                                   "TERS TO START SYNC DATA         SY017320
1110     130       02F6  F4570011                 PTR       5,,COS_10_2    "COLLECTION                      SY017330
1111     136       02F8  9E62   (00E2)            CLA       0,,HX2000      "ILLUMINATE SYNC LAMP ON THE     %5017340
1112     148       02F9  E000009F                 MRG       0,0,C_I_STATUS_IMAGE "C/I PANEL                SY017350
1113     152       02FB  FC091C1E                 CLAM      0,,SYNC_DATA   "SET DATA BASE ADDRESS TO THE    %S017360
1114     162       02FD  F0071E7A                 STA       0,,SYNC_BASE   "FIRST STORAGE AREA FOR FIRST 10 SY017370
1115     176       02FF  D510                     BBK       1              "SECONDS (200 DATA WORDS)        SY017380
                                        *                                                                   SY017390
                                        * THIRD SYNC TASK - DATA COLLECTION                                 *H017400
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                                        * ENTERED EVERY .1 SEC UNTIL SYNC                                    *H017410
                                        * IS COMPLETE                                                        *H017420
                                        *                                  "SET UP TO REENTER THIS TASK      *I017430
1116    70R    0300  0802               $3      OMEGA    0,,SYNC3-OMEGA_TASK_TABLE/2 "IN .1 SECOND        SY017440
                                        *                                  "READ BITE DISCRETE"              *I017450
1117    78     0301  0250                       SNS      PFG_COUNTDOWN_NO_GOOD   "FROM RECEIVER"          SY017460
                                        *                                  "IS THE PRECISION                 *I017470
1118    82     0302  D066   (0309)              BRE      $8                "FREQUENCY GENERATOR OK?"         SY017480
1119     6R    0303  9E4F   (00CF)     $19      CLA      0,,PFG_COUNT      "FAILURE"                         SY017490
1120     8     0304  9401                       ADDM     0,,1                                                SY017500
1121    16     0305  704F   (00CF)              STA      0,,PFG_COUNT      "INCREMENT FAIL COUNT"            SY017510
                                        *                                  "DO NOT ALLOW INTERRUPTS UNTIL    *I017520
1122     2R    0306  DF00               $9      LGC      INTERRUPT_INHIBIT   "AFTER SYSTEM INITIALIZATIONSY017530
1123     8     0307  04000166                   BUC      BEGIN             "RESTART SYSTEM"                  SY017540
1124    34R    0309  F06C1E78           $8      FET      6,,SYNC_BASE-2 "READ CURRENT DATA COUNTER (0 TO SY017550
                                        *                                  "198 BY 2'S), FREQ COUNTER (0 TO SY017560
                                        *                                  "4 BY 2'S), AND BASE ADDRESS OF   SY017570
                                        *                                  "DATA FOR THIS 10 SEC PERIOD      SY017580
1125    38     030B  FC6900C6                   CLAM     6,,198            MAX DATA COUNTER                  SY017590
1126    40     030D  9C44                       CLAM     4,,4              MAX FREQ COUNTER                  SY017600
1127    50     030E  FD3A0011                   CLAD     X3,,COS_10_2      "READ SIN/COS DATA PAIR INDEXED   %S017610
                                        *                                  "BY FREQ AND SAVE IN DATA STORAGESY017620
1128    60     0310  7B52                       STAD     IX5,2             "AREA INDEXED BY DATA COUNTER     SY017630
1129    64     0311  B800                       SUBD     0,0               "CLEAR SIN/COS REGISTERS TO BEGIN%S017640
1130    76     0312  F9370011                   STAD     X3,,COS_10_2      "NEXT .1 SEC DATA COLLECTION TIMESY017650
                                        *                                  "DATA COUNTER +2                  *I017660
1131    86     0314  FC5C0331                   BXUD     5,,$4             "IS DATA COLLECTION COMPLETE?     %R017670
                                        *                                  10 SEC PERIOD COMPLETE            SY017680
1132    10R    0316  D710                       PRN      1                 "SAVE DATA BASE ADDRESS AND FREQ SY017690
1133    20     0317  7807   (0087)              STAD     0,,SYNC_DATA_ADDRESS_AND_FREQUENCY                SY017700
1134    24     0318  F8091C1E                   COMM     0,,SYNC_DATA      "NUMBER FOR SYNC COMPUTATIONS     SY017710
                                        *                                  "WAS THE DATA                     *2017720
1135    28     031A  D012   (031D)              BNE      $5                "SAVED IN THE SECOND SYNC STORAGESY017730
                                        *                                  "AREA?                            SY017740
1136     6R    031B  9679   (00F9)              ADD      0,,HD200          "SET NEW BASE ADDRESS TO THE      SY017750
1137    10     031C  D001   (031E)              BUC      $6                "SECOND STORAGE AREA              SY017760
1138     6R    031D  9279   (00F9)     $5      SUB      0,,HD200          "SET NEW BASE ADDRESS TO THE      SY017770
                                        *                                  "FIRST STORAGE AREA               SY017780
                                        *                                  "INCREMENT TO                     *2017790
1139     8R    031E  CC10   (031F)     $6      BXUD     1,,$7             "NEXT FREQ - RESET TO 10.2 IF OLDSY017800
                                        *                                  "FREQ WAS 13.6                    SY017810
1140    16R    031F  8450               $7      FETM     5,,0                                                % 017820
                                        *                                  "CLEAR SIN/COS INPUT REGISTERS TO%S017830
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1141    46    0320  F4570011                  PTR     5,,COS_10_2     "START THE FIRST .1 SEC PERIOD OFSY017840
1142    68    0322  F4371E7A                  PTR     3,,SYNC_BASE    "THE NEXT 10 SEC INTERVAL        SY017850
1143    80    0324  868F    (008F)            FETD    0,,SYNC_N       "INCREMENT N = NUMBER OF SYNC    %S017860
1144    86    0325  965E    (00DE)            ADD     0,,HX0200       "10 SEC PERIODS COMPLETED        SY017870
                                      *                                 "HAS THE SYNC                    *2017880
1145    90    0326  D072    (0329)            BNO     $11             "PROCESS BEEN GOING ON FOR       %R017890
                                      *                                 "640 SECONDS?                    SY017900
1146    4R    0327  F4098200                  ADDM    0,,X(8200)      "RESET N TO 1"                   SY017910
                                      *                                 "THIS WILL HAVE THE EFFECT OF    SY017920
                                      *                                 "THROWING AWAY ALL PREVIOUS DATA SY017930
                                      *                                 "AND RESTARTING SYNC             SY017940
1147    8R    0329  700F    (008F)    $11     STA     0,,SYNC_N       "SAVE NEW N                      SY017950
1148    22    032A  F80C1A80                  FETD    0,,=DX(01FFFFFF) "COMPUTE 1/N SCALED B6 FOR      SY017960
1149   148    032C  DC02                      DIVD    0,2             "SYNC COMPUTATIONS               SY017970
1150   158    032D  7805    (0085)            STAD    0,,SYNC_1OVERN  "SET 10 SEC PERIOD COMPLETE MKR  %S017980
1151   160    032E  9C01                      CLAM    0,,X(1)         "THIS WILL SIGNAL THE SYNC COMP- SY017990
                                      *                                 "UTATION PROGRAM THAT IT CAN     SY018000
                                      *                                 "START CALCULATIONS ON THE LAST  SY018010
                                      *                                 "10 SEC INTERVAL                 SY018020
1152   168    032F  7009    (0089)            STA     0,,TEN_SECOND_SYNC_PERIOD_COMPLETE_MARKER        SY018030
1153   188    0330  D540                      BBK     4                                                SY018040
                                      *                                                                  SY018050
1154   10R    0331  F0571E7D          $4      STA     5,,SYNC_DATA_COUNTER "SAVE UPDATED DATA COUNTER  SY018060
1155    34    0333  D560                      BBK     6                                                SY018070
                                      *                                                                  SY018080
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                                        **                                                                  SY018090
                                        *          START OMEGA NAVIGATION                                   *H018100
                                        *                                                                   *H018110
                                        * THIS ROUTINE TRANSLATES THE TIME DETERMINED                       *H018120
                                        * BY THE SYNC PROCESS INTO THE TIME THAT THE                        *H018130
                                        * OMEGA NAVIGATION TASKS SHOULD BE PERFORMED                        *H018140
                                        *                                                                   SY018150
1156      8R      0334  861C   (009C)   START_OMEGA FET        0,,START_OMEGA_NOW "READ MARKER FROM SYNC      SY018160
                                        *                                        "COMPUTATION PROGRAM       SY018170
1157      12      0335  D260   (0356)              BRE        $3                "HAS SYNC JUST BEEN COMPLETED? %R018180
1158      12R     0336  868B   (008B)              FETD       0,,START_SYNC_TIME "READ SYNC TIME"           SY018190
                                        *                                        "THIS TIME IS IN COMPUTER REAL SY018200
                                        *                                        "TIME AND REPRESENTS THE START SY018210
                                        *                                        "OF STATION A 10.2 BURST.  THIS SY018220
                                        *                                        "TIME IS LESS THAN THE CURRENT SY018230
                                        *                                        "VALUE OF TIME.             SY018240
1159      22      0337  FC3A00BC                   CLAD       3,,TIME                                     %S018250
                                        *                                        "COMPUTE DESIRED TIME OF STARTINGSY018260
                                        *                                        "THE NON OMEGA TASKS JUST PRIOR SY018270
                                        *                                        "TO THE END OF STATION A 10.2  SY018280
                                        *                                        "BURST                      SY018290
                                        *                                        "= SYNC TIME + .775 SEC      SY018300
                                        *                                        "= SYNC TIME + A BURST TIME (.9) SY018310
                                        *                                        "  - PART OF BURST NOT USED AT SY018320
1160      32      0339  FC0B1A82                   ADDD       0,,=DI(220-65)  "  END (.1) - TIME BETWEEN START SY018330
                                        *                                        "  KALMAL AND END BURST (.005) SY018340
                                        *                                        "  - NUMBER OF NON OMEGA TASKS TOSY018350
                                        *                                        "  BE EXECUTED BEFORE KALMAN TIMESY018360
                                        *                                        "  (4 = .020)               SY018370
1161      10R     033B  FC0B1A84        $1          ADDD       0,,=D2000       "NON OMEGA TASK START TIME   SY018380
                                        *                                        "+ 10 SECONDS = NEXT POSSIBLE SY018390
1162      14      033D  8803                       COMD       0,3             "START TIME                  SY018400
                                        *                                        "HAS THE NEXT                *1018410
1163      18      033E  D844   (033B)              BLE        $1               "POSSIBLE START TIME PASSED? SY018420
1164      10R     033F  FC0B1A86                   ADDD       0,,=D4          "NON OMEGA TASK START TIME +  SY018430
                                        *                                        ".020 = TIME OF NEXT OMEGA TASK SY018440
1165      20      0341  7817   (0097)              STAD       0,,OMEGA_TIME   "(KALMAN)                    SY018450
                                        * NOW DETERMINE WHEN TO START THE NEXT .1 SEC INTERVAL              SY018460
1166      30      0342  FC0B1A88                   ADDD       0,,=D16         "FORM OMEGA TASK START TIME  %S018470
                                        *                                        "+ .080 = NEXT NON OMEGA TASK SY018480
                                        *                                        "START TIME                  SY018490
1167      8R      0344  92ED   (00ED)   $2          SUBD       0,,=D20         "NEXT NON OMEGA TASK START TIME SY018500
1168      12      0345  8803                       COMD       0,3             "- .100  (.1 IS TIME         SY018510
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                                        *                                   "INTERVAL BETWEEN STARTS)          SY018520
                                        *                                   "IS THIS START                     *1018530
1169      16        0346  D833   (0344)          BRG       $2               "TIME STILL IN THE FUTURE?         SY018540
                                        *                                   "THIS TIME NOW REPRESENTS THE      SY018550
1170      10R       0347  7815   (0095)          STAD      0,,OLD_NON_OMEGA_TASK_TIME                        SY018560
                                        *                                   "MOST RECENT POSSIBLE NON OMEGA    SY018570
                                        *                                   "START TIME                        SY018580
                                        *                                   "WRITE TIME IN OLD NON OMEGA TASKSY018590
                                        *                                   "TIME - BECAUSE THE NON OMEGA      SY018600
                                        *                                   "TASKS ARE NOT COMPLETE FOR THIS   SY018610
                                        *                                   "INTERVAL THE NEXT INTERVAL WILL   SY018620
                                        *                                   "BE UPDATED FROM THE 'NEW' OLD     SY018630
                                        *                                   "TIME. THE NEXT INTERVAL MAY NOT   SY018640
                                        *                                   "BE EXACTLY .1 SEC.                SY018650
1171      14        0348  FC090765              CLAM      0,,KALMAN_FILTER "SET NEXT OMEGA TASK = KALMAN     %S018660
1172      22        034A  7019   (0099)          STA       0,,OMEGA_TASK                                     SY018670
1173      32        034B  F4182000              FETM      1,X(2000)        "TURN SYNC LAMP ON C/I PANEL OFF  %5018680
1174      44        034D  E001009F              MRG       0,1,C_I_STATUS_IMAGE                              SY018690
1175      52        034F  701C   (009C)          STA       0,,START_OMEGA_NOW "RESET MARKER FROM SYNC        %S018700
                                        *                                   "COMPUTATION PROGRAM               SY018710
                                        *                                   "100 MILLI SEC MONITOR SIGNAL      *I018720
1176      62        0350  F0170090              STA       1,,KAL_STA_FLG  SET NON ZERO                    11  018730
1177      70        0352  030C                  SET       PROGRAM_SEQUENCING   "FOR MALF INDICATOR          SY018740
1178      78  *     0353  F80D1613              BSV       CALC_TIME_CORRECTION                            11  018750
1179     102        0355  D560                  BBK       6                "EXIT"                            SY018760
                                        *                                                                    SY018770
1180      16R       0356  D520            $3    BBK       2                "EXIT"                            SY018780
                                        *                                                                    SY018790
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                                                  **                                                                    EB018800
                                                  *                          END OF BURST                               *H018810
                                                  *                                                                    *H018820
                                                  * THIS IS AN OMEGA TASK THAT IS EXECUTED AT THE CONCLUSION OF        *H018830
                                                  * THE STATION BURST DATA COLLECTION PERIOD WHICH ENDS .1 SEC         *H018840
                                                  * BEFORE THE ACTUAL STATION BURST ENDS.  THIS ROUTINE SELECTS        *H018850
                                                  * THE PROPER ANTENNA / CALIBRATE SIGNALS FOR THE SLOT MEASURE-       *H018860
                                                  * MENT AND COMPUTES THE PHASE AND PHASE VARIANCE OF THE STATION      *H018870
                                                  * BURST.  IT EXITS DIRECTLY TO THE TRACKING FILTER PROGRAM.          *H018880
                                                  *                                                                    *H018890
                                                  *                                                                    EB018900
                                                  *                                          "SET UP NEXT OMEGA TASK TO OCCUR *I018910
1181                                              END_OF_BURST;                                                        EB018920
1181        70R         0357  0803                          OMEGA       0,,START_SLOT-OMEGA_TASK_TABLE/2 ".15 SEC LATER EB018930
1182        78          0358  F4081F08                      FETM        0,,END_OF_BURST_DATA "READ SIN/COS OF THE 3 FREQEB018940
                                                  *                                          "FROM DMA AND SAVE FOR COMPUTA-  EB018950
1183        108         035A  F05C0011                      FET         5,,COS_10_2     "TIONS BEFORE ANOTHER DMA INPUT  EB018960
1184        136         035C  7656                          PTR         I5,6            "CAN OCCUR                       EB018970
                                                  *                                          "USE STATION COUNTER TO          *S018980
1185        144         035D  8635    (0085)                FET         0,,STATION_COUNTER "SELECT ANTENNA / CALIBRATE  EB018990
                                                  *                                          "SIGNALS FOR SLOT DATA AND OUTPUTEB019000
                                                  *                                          "TO THE ANTENNA SWITCHING MATRIX EB019010
                                                  *                                          "(THE STATION COUNTER IS A NUMBEREB019020
                                                  *                                           "FROM 0 TO 7 THAT IDENTIFIES THEEB019030
                                                  *                                           "STATION THAT JUST COMPLETED ITSEB019040
                                                  *                                           "10.2 BURST)                   EB019050
1186        152         035E  F50A178D                      CLA         X0,,ANTENNA_NOISE_AND_CALIBRATE_CODES          EB019060
1187        160         0360  C010                          FET         1,0             3 TIMES                        EB019070
1188        178         0361  F4270020                      PTR         2,,ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2        EB019080
                                                  * STATION  -  SIGNAL DURING NEXT SLOT                                *H019090
                                                  * A (= 0)     TEST + 90     (CALIBRATE)                              *H019100
                                                  * B (= 1)     LOOP A (NOISE / PHANTOM)                               *H019110
                                                  * C (= 2)     - TEST        (CALIBRATE)                              *H019120
                                                  * D (= 3)     LOOP A (NOISE / PHANTOM)                               *H019130
                                                  * E (= 4)     TEST          (CALIBRATE)                              *H019140
                                                  * F (= 5)     LOOP B (NOISE / PHANTOM)                               *H019150
                                                  * G (= 6)     -(TEST + 90) (CALIBRATE)                               *H019160
                                                  * H (= 7)     LOOP B (NOISE / PHANTOM)                               *H019170
1189        186         0363  8618    (0098)                FET         0,,NOISE_COMPUTED_MARKER                       % 019180
                                                  *                                          "ARE THE FIRST                 *I019190
1190        190         0364  D011    (0366)                BNE         $30             "NOISE MEASUREMENTS AVAILABLE?   EB019200
                                                  *                                          "EXIT"                         EB019210
                                                  *                                          "DO NOT TAKE ANY BURST MEASURE-  EB019220
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                                        *                                  "MENTS UNTIL NOISE DATA IS        EB019230
1191    14R    0365  D510                      BBK     1                   "AVAILABLE                        EB019240
1192     6R    0366  9E7B   (00F8)   $30       CLA     0,,CAL_R_ADD        "SET UP A 3 DOUBLE COUNTER TO     EB019250
1193    14     0367  8411                      FETM    1,,1                "CYCLE ON THE 3 FREQUENCIES       EB019260
1194    38     0368  8494                      FETM    9,,4                "SET UP A 2 SINGLE COUNTER TO     EB019270
1195    48     0369  FC6A1F17                  CLAD    6,,BURST_TIME       "CYCLE ON THE COS AND SIN TERMS   EB019280
1196    58     036B  FC3A1A8A                  CLAD    3,,=DF(1.0D2B-13) "READ ACTUAL BURST TIME AND     EB019290
1197   184     036D  DC63                      DIVD    6,3                 "RESCALE TO SEC AT B1             EB019300
                                        *                                                                    EB019310
1198     6R    036E  F0854000          $4      RSL     8,,1                SINGLE INDEX                      EB019320
1199    14     0370  F58A0035                  CLA     X8,,ANTENNA_SELECT_SAVE                               EB019330
                                        *                                  "COMPUTE POINTER TO PROPER PHAN-  EB019340
                                        *                                  "TOM CORRECTIONS FOR THIS FREQ    EB019350
                                        *                                  "BASED ON ANTENNA LOOP (A OR B)   EB019360
                                        *                                  "SELECTED FOR THIS STATION        EB019370
1200    16     0372  B400                      ADD     0,0                 8 OR 2                            EB019380
1201    20     0373  FC591FA4                  CLAM    5,,Y_P-2                                              EB019390
1202    22     0375  B450                      ADD     5,0                 YP ADDR +6 OR 0                   EB019400
1203     2R    0376  A434              $1      CLA     3,4                 SAVE YB AFTER FIRST PASS          EB019410
1204     8     0377  A64D                      CLA     I4,13               READ BURST DATA AT B15            EB019420
1205    14     0378  A5C0                      CLA     X12,0               BIAS AT B14                       HH019430
1206    20     0379  6006                      MPY     0,6                 DTB AT B1 = BIAS AT B15           HH019440
1207    22     037A  B040                      SUB     4,0                 SUBTRACT BIAS FROM BURST          HH019450
1208    28     037B  A5C6                      CLA     X12,6               SF  B14                           EB019460
1209    60     037C  D440                      DIV     4,0                 XB AT B1                          EB019470
                                        *                                  "COMPUTE YB OR XB FOR THIS FREQ   EB019480
                                        *                                  "YB = COS/AY - YP * DELTA T BURSTEB019490
                                        *                                  "          SCALED B1              EB019500
                                        *                                  "XB = SIN/AX - XP * DELTA T BURSTEB019510
                                        *                                  "YB IS COMPUTED ON THE FIRST PASSEB019520
                                        *                                  "AND XB ON THE SECOND             EB019530
1210    66     037D  A785                      CLA     IX8,5                                                 EB019540
1211    72     037E  6006                      MPY     0,6                 YN * DTB                          EB019550
1212    74     037F  B400                      ADD     0,0                         B1                        EB019560
1213     2R    0380  B040              $8      SUB     4,0                 PHANTOM CORR. NOP FOR PCI.        EB019570
1214     4     0381  9453                      ADDM    5,,3                INC ADDR                          EB019580
1215     6     0382  94D1                      ADDM    13,,1               INCREMENT DATA AND                EB019590
1216     8     0383  94C1                      ADDM    12,,1               INC CALIB ADDR                    EB019600
1217    16     0384  C4AF   (0376)             BXU     10,,$1              "ARE YB AND XB COMPUTED?          %R019610
                                        *                                                                    EB019620
                                        *                                                                    EB019630
                                        *                      R0 = TEMP D                                   EB019640
                                        *                      R3 = Y(B) S                                   EB019650
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                                                *                R4 = X(B) S                                                E8019660
                                                *                R6 = DELTA T(B) D                                          E8019670
                                                *                R8 = 3 COUNTER SINGLE OR DOUBLE                            E8019680
                                                *                R9 = END 3 COUNTER                                         E8019690
                                                *                RA = 2 COUNTER                                             E8019700
                                                *                RB = END 2 COUNTER                                         E8019710
                                                *                RC = ADDRESS OF CALIBRATE RESULTS                          E8019720
                                                *                RD = ADDRESS OF BURST DATA                                 E8019730
                                                *                                                                           E8019740
1218          10R   0385  D710                        PRN        1                                                          ES019750
1219          12    0386  A401                        CLA        0,1                                                        E8019760
1220          14    0387  9C10                        CLAM       1,,0                                                       E8019770
1221          16    0388  9C30                        CLAM       3,,0                                                       E8019780
1222          38    0389  F03C1787                    FET        3,,BURST_ADDRESSES                                         E8019790
1223          50    038B  C037                        FET        3,7              PLACE SIN INTO 2, COS INTO 0              E8019800
1224         588    038C  1800                        ATAN       0,0              "COMPUTE PHI = ATAN XB/YB                 E8019810
1225         598    038D  F1CC0035                    FET        X12,,ANTENNA_SELECT_SAVE                                   E8019820
1226         606    038F  E40000E4                    EXT        0,0,HX8000       0 OR 180                                  E8019830
1227         608    0391  B410                        ADD        1,0              "ADD 180 DEG TO PHI IF THIS               E8019840
                                                *                                  "STATION IS PICKED UP ON                  E8019850
1228         616    0392  D700                        PRN        0                "MINUS LOOP A OR B. USE BIT 16            E8019860
                                                *                                  "OF ANTENNA SELECT WORD TO DECIDE         E8019870
                                                *                                  "ADD THE 180 IF BIT 16 = 1                E8019880
                                                *                                  "                                         E8019890
1229         622    0393  B3C3                        SUB        IX12,3           "PHI M = PHI - PHI ZERO SCALED PI         E8019900
1230         638    0394  6866                        MPYD       6,6              Y**2   B2                                 E8019910
1231         654    0395  6888                        MPYD       8,8              "Q M = (YB**2 + XB**2)/DELTA TB           ES019920
1232         658    0396  BC86                        ADDD       8,6                                                        E8019930
1233         784    0397  DC8A                        DIVD       8,10             "      SCALED B1                          E8019940
1234         786    0398  A47C                        CLA        7,12                                                       E8019950
1235         788    0399  B4CC                        ADD        12,12            DOUBLE C                                  E8019960
1236         798    039A  78C5                        STAD       IX12,5           PHI_M                                     E8019970
1237         802    039B  AC08                        CLAD       0,8                                                        E8019980
1238          12R   039C  F9C70038          $66       STAD       X12,,Q_M         PROD INSP PUTS NOOP HERE                    019990
1239          14    039E  AC67                        CLS        6,7                                                        DP020000
1240          22    039F  F46B0085                    ADD        6,,STATION_COUNTER                                         DP020010
1241          26    03A1  D021   (03A3)               BGE        $67                                                        S 020020
1242           2R   03A2  9468                        ADDM       6,,8                                                       DP020030
1243           2R   03A3  A417              $67       CLA        1,7                                                        S 020040
1244           6    03A4  4418                        MPIM       1,,8             "SAVE QM FOR THIS STATION AND             E8020050
1245           8    03A5  B461                        ADD        6,1              "FREQUENCY FOR C/I DISPLAY                E8020060
1246          18    03A6  F1671ED3                    STA        X6,,Q_STORAGE    "                                         E8020070
1247          20R   03A8  F9C61F25          $68       MPYD       X12,,RAW_H       "RAW H = (RAW H)*(QM)    (FORM            E8020080
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                                        *                                   "PRODUCT OF Q'S FOR BASE STATION EB020090
1248      32      03AA  F9C71F25                STAD      X12,,RAW_H      "SELECTION)                      EB020100
                                        * START PHASE VARIANCE COMPUTATION                                  *H020110
1249      38      03AC  A772                    CLA       IX7,2                                            % 020120
1250      40      03AD  9C10                    CLAM      1,,0                                             % 020130
1251      44      03AE  AC6A                    CLAD      6,10            DTB                              % 020140
1252      48      03AF  B868                    SUBD      6,8             DTB - QM B1                      % 020150
1253      52      03B0  D031   (03B2)           BRG       $7              "IS QM GREATER THAN DELTA TB?    EB020160
1254       4R     03B1  B866                    SUBD      6,6             "PHASE VARIANCE WILL BE NEGATIVE EB020170
                                        *                                   "FORCE NUMERATOR TO ZERO         EB020180
1255       4R     03B2  B880           $7       SUBD      8,0             "FORM NUMERATOR OF VARIANCE      EB020190
1256      20      03B3  688A                    MPYD      8,10            " = QT(DTB - QM) AT B4PI**2      EB020200
1257      36      03B4  6806                    MPYD      0,6             "AND DENOMINATOR                 EB020210
                                        *                                   " = DTB(QM - QT) AT B2           EB020220
1258      56      03B5  F8061A8C                MPYD      0,,=DF(((1)/3.14159265)/3.1415926582) SCALE AT BEB020230
1259      60      03B7  8808                    COMD      0,8             SEE IF DIVIDE WILL OVERFLOW      EB020240
                                        *                                   "WILL THE DIVIDE                 *2020250
1260      64      03B8  D052   (03BB)           BRL       $6              "OVERFLOW OR THE QUOTIENT BE     %R020260
                                        *                                   "NEGATIVE?                       EB020270
1261       6R     03B9  9E64   (00E4)           CLA       0,,HX8000       "SET PHASE VARIANCE NEGATIVE AS  EB020280
                                        *                                   "MARKER TO TRACKING FILTER       EB020290
1262      10      03BA  D002   (03BD)           BUC       $5              "INDICATING NO MEASUREMENT       EB020300
1263     126R     03BB  DC08           $6       DIVD      0,8             "COMPUTE PHASE VARIANCE          EB020310
1264     128      03BC  9401                    ADDM      0,,1            "SIGMA SQ M = QT(DTB - QM)/      EB020320
                                        *                                    "    DTB(QM - QT) + (.005)**2    EB020330
                                        *                                    "  SCALED (2PI)**2 OR 1 SQ CYCLEEB020340
                                        *                                                                   EB020350
                                        *                                                                   EB020360
                                        *                       R0 = PHI(M)D, SIGMA**2PHI(M)D                EB020370
                                        *                       R2 = ADDRESS OF Q(T)                         EB020380
                                        *                       R3 = ADDRESS OF PHI(0)                       EB020390
                                        *                       R4 = ADDRESS OF SIGMA**2PHI(M)               EB020400
                                        *                       R5 = ADDRESS OF PHI(M)                       EB020410
                                        *                       R6 = Y(B) D                                  EB020420
                                        *                       R8 = X(B) D                                  EB020430
                                        *                       RA = DELTA T(B) D                            EB020440
                                        *                       RC = 3 D COUNTER                             EB020450
                                        *                       RD = END 3 COUNTER                           EB020460
                                        *                                                                   EB020470
                                        *                                                                   EB020480
1265      10R     03BD  78C4           $5       STAD      IX12,4          "SAVE PHASE VARIANCE"            EB020490
1266      24      03BE  D730                    PRN       3                                                EB020500
                                        *                                   "HAVE ALL 3                      *1020510
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1267      34      03BF  FC8C036E                  BXUD      8,,$4        "FREQUENCIES BEEN PROCESSED?   %R020520
                                    * CONTINUE WITH TRACKING FILTER PROGRAM                            *H020530
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                                **                                                                  TF020540
                                *                    TRACKING FILTER                               TF020550
                                *                                                                  TF020560
                                *                    R0=ADDR OF SIGMA**2 PHI M                     TF020570
                                *                    R1=ADDR OF PHI M                              TF020580
                                *                    R2=Y(B) D                                     TF020590
                                *                    R4=X(B) D                                     TF020600
                                *                    R6=DELTA T(B) D                               TF020610
                                *                    R8=3D COUNTER                                 TF020620
                                *                    R9=END 3D COUNTER                             TF020630
                                *                    RA=TEMP D                                     TF020640
                                *                    RC=TEMP D                                     TF020650
                                *                                                                  TF020660
                                *                    TRACKING FILTER                               *H020670
                                *                                                                  *H020680
                                * THIS PROGRAM IS EXECUTED AT THE END OF EVERY STATION BURST.       *H020690
                                * IT SMOOTHES THE COMPUTED PHASE AND PROVIDES OUTPUTS TO KALMAN.    *H020700
                                *                                                                  *H020710
                                * FOR NOTATIONAL PURPOSES THE SYMBOLS LISTED BELOW WILL BE USED     *H020720
                                *                                                                  *H020730
                                * PB        = BURST PHASE MEASUREMENT                              *H020740
                                * SB        = BURST PHASE MEASUREMENT VARIANCE                     *H020750
                                *                                                                  TF020760
                                * P         = TRACKING FILTER PHASE ESTIMATE                       *H020770
                                * PR        = TRACKING FILTER PHASE RATE ESTIMATE                  *H020780
                                * PRDR      = PHASE RATE DUE TO CRAFT MOTION TOWARDS THE STATION   *H020790
                                * DTB       = DELTA T BURST                                        *H020800
                                * DT        = TIME BETWEEN TRACKING FILTER TIME UPDATES            *H020810
                                * S         = TRACKING FILTER PHASE ESTIMATE VARIANCE              *H020820
                                * SR        = TRACKING FILTER PHASE RATE ESTIMATE VARIANCE         *H020830
                                * SC        = CROSS CORRELATION OF PHASE AND PHASE RATE VARIANCE   *H020840
                                * C         = CYCLE                                                *H020850
                                *                                                                  TF020860
                                * N         = TRACKING FILTER N COUNTERS                           *H020870
                                * DTM       = TIME BETWEEN TRACKING FILTER MEASUREMENTS (10 SECONDS) *H020880
                                *                                                                  *H020890
1268                            TRACKING_FILTER;                                                   TF020900
1268     8R     03C1  8600 (0080)          FET     0,,RESET_TF   "READ THE 'RESET TF MARKER'      TF020910
1269    16      03C2  D700                 PRN     0                                              TF020920
                                *                                "SHOULD THE                    *1020930
1270    20      03C3  D01F (03D3)          BNE     $10           "TRACKING FILTERS BE RESET?      %R020940
1271    10R     03C4  F418002E             FETM    1,,OS*6-2                                      % 020950
1272    22      03C6  86E9 (00E9)          FETD    0,,=DF((1)/12)                                 % 020960
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1273    12R    03C7  F9271E33        $11     STAD    X2,,SIGMA_SQ_PHI_PHI "OPEN S UP TO 1/12 C**2     TF020970
                                     *                                  "                 (ALL FILTERS)  TF020980
1274    20     03C9  CC23   (03C7)           BXUD    2,,$11                                           % 020990
1275    14R    03CA  F4380017                FETM    3,,OS*3-1                                        TF021000
1276    22     03CC  F41A010F                CLA     1,,HX00FF                                        TF021010
1277    12R    03CE  E1211DB8        $4      MRG     X2,1,SIGMA_SQ_N_COUNTER "SET N = 0  (ALL FILTERSTF021020
1278    20     03D0  C423   (03CE)           BXU     2,,$4                                            % 021030
1279    22R    03D1  D770                    PRN     7                "SET PAST NAV MODE = 16 TO FORCE TF021040
1280    30     03D2  701D   (009D)           STA     0,,PAST_NAV_MODE "AN APPARENT NAV MODE CHANGE    TF021050
1281     8R    03D3  7000   (0080)   $10     STA     0,,RESET_TF      "RESET THE 'RESET TF MARKER'    TF021060
1282    38     03D4  F05C16FB                FET     5,,TF_SIGMA_SQ_DATA_ADDRESSES-2                  TF021070
1283    52     03D6  F438002E                FETM    3,,OS*6-2        "LOAD REGISTERS WITH ADDRESSES OFTF021080
1284    60     03D8  F4CA1F8E                CLA     12,,NAV_MODE     "S, SR, SC AND N                TF021090
1285    68     03DA  F0C8009D                COM     12,,PAST_NAV_MODE "SET UP COUNTER TO CYCLE ALL   TF021100
                                     *                                  "TRACKING FILTERS (3 PER STATION)TF021110
                                     *                                  "HAS THE NAV MODE                *1021120
1286    72     03DC  D068   (03E5)           BRE     TF_TIME_UPDATE   "CHANGED SINCE LAST ENTRY?      %R021130
1287    10R    03DD  F0C7009D                STA     12,,PAST_NAV_MODE "RESET VARIANCES ASSOCIATED WITF021140
                                     *                                  "PHASE RATE SINCE VELOCITY CHANGETF021150
                                     *                                  "MAY MAKE PREVIOUS ESTIMATES     TF021160
                                     *                                  "INVALID                         TF021170
                                     *                                  "SAVE NEW NAV MODE               TF021180
1288     4R    03DF  8800            $1      SUBD    0,0                                              % 021190
1289    14     03E0  7872                    STAD    IX7,2            "OPEN SR UP TO (.003 C/SEC)**2   TF021200
1290    24     03E1  FC0A1A8E                CLAD    0,,=DF(.17765D-3) "SET SC = 0        (ALL FILTERTF021210
1291    34     03E3  7862                    STAD    IX6,2            SIGMA**2 PHI DOT PHI DOT         TF021220
1292    42     03E4  CC26   (03DF)           BXUD    2,,$1                                            % 021230
                                     *                                                                  TF021240
                                     *                                                                  TF021250
                                     *                  R0=R**2 D                                       TF021260
                                     *                  R2=24D COUNTER                                  TF021270
                                     *                  R3=END 24D COUNTER                              TF021280
                                     *                  R4= -                                           TF021290
                                     *                  R5= -                                           TF021300
                                     *                  R6=ADDR OF SIGMA**2 PHI DOT PHI DOT             TF021310
                                     *                  R7=ADDR OF SIGMA**2 PHI PHI DOT                 TF021320
                                     *                  R8=ADDR OF SIGMA**2 PHI PHI                     TF021330
                                     *                  R9=ADDR OF SIGMA**2 N COUNTER                   TF021340
                                     *                  RA=ADDR OF SIGMA**2 PHI M                       TF021350
                                     *                  RB=ADDR OF PHI M                                TF021360
                                     *                  RC=NAV MODE                                     TF021370
                                     *                                                                  TF021380
                                     *                                                                  TF021390
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                                        * TRACKING FILTER TIME UPDATE                                                  *H021400
                                        * UPDATE ALL TRACKING FILTERS                                                  *H021410
                                        * TO TIME OF END BURST                                                         *H021420
1293                                    TF_TIME_UPDATE;                                                                TF021430
1293      12R     03E5  8430                        FETM     3,,0                                                      TF021440
1294      20      03E6  ADF6                        CLAD     X15,6          "COMPUTE UPDATE DELTA T (DT)               TF021450
1295      28      03E7  96EF    (00EF)              ADDD     0,,=DF(.2)     "DT = DTB + .4 SEC  SCALED PI              TF021460
1296      48      03E8  F8061A90                    MPYD     0,,=DF((2)/3.14159265) DELTA TK SCALED PI                 TF021470
1297      52      03EA  AC80                        CLAD     8,0            DELTA TK                                   TF021480
1298       8R     03EB  AFA6                $1      CLAD     IX10,6         SIGMA**2 PHI DOT PHI DOT                   TF021490
                                        *                                   "TIME UPDATE S"                            TF021500
                                        *                                   "S(NEW) = S + 2SCDT + SRDT**2              TF021510
                                        *                                   "            SCALED 1 C**2                 TF021520
1299      24      03EC  6808                        MPYD     0,8            DELTA TK                                   TF021530
1300      28      03ED  AC20                        CLAD     2,0                                                       TF021540
1301      38      03EE  F8044000                    RSAD     0,,1           RESCALED PRODUCT TO(B+2)PI                 TF021550
1302      46      03F0  BFB6                        ADDD     IX11,6         SIGMA**2 PHI PHI DOT                       TF021560
1303      62      03F1  6808                        MPYD     0,8            DELTA TK                                   TF021570
1304      70      03F2  BFC6                        ADDD     IX12,6         SIGMA**2 PHI PHI                           TF021580
1305      74      03F3  D076    (03FA)              BNO      $2             "DOES S(NEW) EXCEED 1 C**2?                %R021590
1306       8R     03F4  9EF3    (00F3)              CLAD     0,,=DX(7FFFFFFF) "SET S(NEW) = 1 C**2                     TF021600
1307      18      03F5  7BC6                        STAD     IX12,6         "SET SC(NEW) = SC/2                        TF021610
1308      26      03F6  AFB6                        CLAD     IX11,6         SIGMA**2 PHI PHI DOT SCALED 2PI            TF021620
1309      36      03F7  F8044000                    RSAD     0,,1           ONE HALF OF SIGMA **2 PHI PHI DOTTF021630
1310      40      03F9  D003    (03FD)              BUC      $3                                                        TF021640
1311      10R     03FA  7BC6                $2      STAD     IX12,6         "TIME UPDATE SC"                           TF021650
1312      18      03FB  AFB6                        CLAD     IX11,6         "SC(NEW) = SC + SRDT                       TF021660
1313      22      03FC  BC02                        ADDD     0,2            "        SCALED 1/2PI  C**2/SEC            TF021670
                                        *                                                                                TF021680
1314      10R     03FD  7BB6                $3      STAD     IX11,6                                                    TF021690
1315      18      03FE  AFA6                        CLAD     IX10,6         "TIME UPDATE SR"                           TF021700
1316      28      03FF  FC0B1A92                    ADDD     0,,=DX(00000006) "SR(NEW) = SR + R**2                     TF021710
                                        *                                   "    SCALED 1/2PI**2 C**2/SEC**2           TF021720
                                        *                                   "    WHERE R = .000012 (C/SEC)**2TF021730
                                        *                                    "DOES SR(NEW)                             *1021740
1317      32      0401  D075    (0407)              BNO      CP             "EXCEED (.225 C/SEC)**2?"                  %R021750
1318       8R     0402  AFB6                        CLAD     IX11,6         "SET SR(NEW) = (.225 C/SEC)**2             TF021760
1319      18      0403  F8044000                    RSAD     0,,1           "SET SC(NEW) = SC/2                        TF021770
1320      28      0405  7BB6                        STAD     IX11,6         SIGMA**2 PHI PHI DOT                       TF021780
1321      36      0406  9EF3    (00F3)              CLAD     0,,=DX(7FFFFFFF) SIGMA SQ PHI DOT PHI DOT MAX (2TF021790
                                        *                                                                                TF021800
1322      10R     0407  7BA6                CP      STAD     IX10,6         "SAVE NEW SR"                              TF021810
1323      18      0408  CD6E    (03EB)              BXUD     6,,TF_TIME_UPDATE$1 "ARE ALL FILTERS UPDATED?             %R021820
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1324    22R     0409  D770                    PRN     7                                                 % 021830
                                *                                                                       TF021840
                                *                                                                       TF021850
                                *               R0=DELTA TK D                                           TF021860
                                *               R2=ADDR OF SIGMA**2 PHI DOT PHI DOT                     TF021870
                                *               R3=ADDR OF SIGMA**2 PHI PHI DOT                         TF021880
                                *               R4=ADDR OF SIGMA**2 PHI PHI                             TF021890
                                *               R5=ADDR OF SIGMA**2 N COUNTER                           TF021900
                                *               R6=ADDR OF SIGMA**2 PHI M                               TF021910
                                *               R7=ADDR OF PHI M                                        TF021920
                                *               R8=NAV MODE                                             TF021930
                                *               R9=TEMP                                                 TF021940
                                *               RA=X(B)D                                                TF021950
                                *               RC=DELTA T(B)D                                          TF021960
                                *                                                                       TF021970
                                * START TIME UPDATE OF PHASE ESTIMATE                                   *H021980
                                *                                                                       TF021990
1325    52      040A  F05C1701                  FET     5,,TF_PHI_DATA_ADDRESSES "LOAD REGISTERS WITH   TF022000
                                *                                               "ADDRESSES OF TEMP, STATION TF022010
                                *                                               "VECTOR, RIJ, PRDR, PR AND P TF022020
                                *                                               "SET UP COUNTER TO CYCLE EACH TF022030
1326    60      040C  841E                      FETM    1,,OS*2-2               "STATION                TF022040
1327    80      040D  8474                      FETM    7,,4                    "SET UP COUNTER FOR 3 FREQ TF022050
1328    10R     040E  C02C              $1      FET     2,12                    "START UPDATE FOR EACH STATION TF022060
                                *                                               "                       TF022070
                                *                                               "GET ADDRESSES OF TEMP, STATION TF022080
                                *                                               "VECTOR AND RIJ FOR MATRIX 3D TF022090
                                *                                               "FORM TEMP = S X RIJ TO GET *I022100
1329    18  *   040F  F80D1707                  BSV     MATRIX_3D               "SL2 = S DOT R2, SL3 = S DOT R3 TF022110
1330    20      0411  9486                      ADDM    11,6                    "INCREMENT STATION VECTOR ADDRESSTF022120
1331    28      0412  ADA4                      CLAD    X10,4                   "BY 6 FOR NEXT STATION  TF022130
1332    32      0413  AC40                      CLAD    4,0                     "                       TF022140
1333    40      0414  ADA2                      CLAD    X10,2                   "COMPUTE PRDR FOR THIS STATION TF022150
1334    44      0415  AC20                      CLAD    2,0                     "PRDR = -(V3*SL3 + V2*SL2)/ TF022160
1335    56      0416  C035                      FET     3,5                     "       (SL2**2 + SL3**2)**.5 TF022170
1336    70      0417  FA8400A3                  MPYDM   I8,,V3                  "    SCALED 1/4PI IN 13.6 C/SEC TF022180
1337    84      0419  FA6400A2                  MPYDM   I6,,V2                                          TF022190
1338    88      0418  BC86                      ADDD    8,6                                             TF022200
1339    98      041C  F884A4E0                  MPYDM   8,,F(((-2)*3.14159812)/.723D56-1) 13.6 RADIANS 8TF022210
1340    114     041E  6822                      MPYD    2,2             SL2**2                          TF022220
1341    130     041F  6800                      MPYD    0,0             SL3**2                          TF022230
1342    134     0420  BC02                      ADDD    0,2                                             TF022240
1343    580     0421  1000                      SQRT    0,0                                             TF022250
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1344    706    0422  DC80                  DIVD    8,0                                          TF022260
1345    714    0423  F0C800CB              COM     12,,BASE                                     TF022270
                                     *                                  "IS THIS PRDR                *1022280
1346    718    0425  D015   (0428)         BNE     $4                 "FOR THE BASE STATION?"      %R022290
1347     42R   0426  F08C1F0D              FET     8,,PHI_DOT_DR_BASE-1 SAVE LAST 9 PHI DOT DR FOR TF022300
                                     *                                  "ADD THIS PRDR TO THE BOTTOM OF  TF022310
                                     *                                  "A NINE ELEMENT TABLE THAT KEEPS TF022320
                                     *                                  "THE LAST NINE VALUES OF PRDR FORTF022330
                                     *                                  "THE BASE STATION.  THE PREVIOUS TF022340
                                     *                                  "ENTRIES ARE MOVED UP IN THE     TF022350
                                     *                                  "TABLE AND THE OLDEST IS DELETED TF022360
1348     48    0428  A5F3                  CLA     X15,,3             PHI DOT DR BASE                  TF022370
1349     90    0429  F4871F0E              PTR     8,,PHI_DOT_DR_BASE    BASE  B-1 RAD/SEC/10SEC   TF022380
1350     22R   042B  D770           $4     PRN     7                  "FORM STATION NUMBER - BASE      TF022390
1351     24    042C  A414                  CLA     1,4                "STATION NUMBER TO GET THE TIME TTF022400
1352     30    042D  F0154000              RSL     1,,1               "BETWEEN THE BASE STATION BURST  TF022410
                                     *                                  "AND THIS STATION'S BURST        TF022420
                                     *                                  "THIS NUMBER WILL BE USED TO FORMTF022430
                                     *                                  "PRDR OF THIS STATION NOW MINUS  TF022440
                                     *                                  "PRDR OF BASE AT TIME NOW - T    TF022450
                                     *                                  "                                TF022460
                                     *                                  "IF THE BASE IS A LOWER STATION  TF022470
                                     *                                  "NUMBER THAN THIS STATION THE    TF022480
                                     *                                  "DIFFERENCE POINTS TO THE CORRECTTF022490
                                     *                                  "TERM IN THE PRDR(BASE) TABLE AS TF022500
1353     38    042F  F01B00CC              SUB     1,,BASE+1          "THE ENTRY FOR TIME (NOW) HAS    TF022510
                                     *                                  "ALREADY BEEN MADE               TF022520
                                     *                                   "IS THE BASE                    *2022530
1354     42    0431  D033   (0435)         BRG     $5                 "STATION NUMBER LESS THAN THIS   TF022540
                                     *                                  "STATION NUMBER?                 TF022550
1355      4R   0432  D061   (0434)         BRE     $10                "IS THIS THE BASE STATION?       TF022560
1356      2R   0433  9011                  SUBM    1,,1               "THE BASE STATION PRDR FOR TIME  TF022570
                                     *                                  "(NOW) HAS NOT BEEN COMPUTED YET TF022580
                                     *                                  "THE FIRST ENTRY IN THE TABLE IS TF022590
                                     *                                  "FOR THE PREVIOUS BURST SO DECRE-TF022600
                                     *                                  "MENT STATION - BASE NUMBER BY 1 TF022610
                                     *                                  "TO CORRECT FOR THIS             TF022620
1357      2R   0434  9418           $10    ADDM    1,,8               "ADD 8 TO THE STATION - BASE     TF022630
                                     *                                  "NUMBER TO PUT IT IN THE RANGE OFTF022640
                                     *                                  "1 TO 8 WHERE 8 = 10 SEC AND     TF022650
                                     *                                  "IMPLIES THIS IS THE BASE STATIONTF022660
                                     *                                  "IS THIS PHASE                   *1022670
1358      4R   0435  D0D2   (0438)  $5     BCF     $6                 "DIFFERENCE NAVIGATION?          %R022680
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1359    8R    0436  F1181F0E                SUB     X1,,PHI_DOT_DR_BASE "SUB ALWAYS PHASE DIFFERENCETF022690
                                    *                                   "                                TF022700
                                    *                                   "FORM PRDR FOR THIS SET OF THREE TF022710
                                    *                                   "TRACKING FILTERS (3 FREQ) WHERE TF022720
                                    *                                   "PRDR = PRDR (THIS STATION)      TF022730
                                    *                                   "       MINUS PRDR (BASE)        TF022740
1360    8R    0438  7394            $6      STA     IX9,4               "SAVE PRDR FOR THIS SET OF THREE TF022750
                                    *                                   "TRACKING FILTERS (3 FREQ)       TF022760
                                    *                                   "                                TF022770
                                    *                                   "NOTE - ALL PRDR'S ARE COMPUTED  TF022780
                                    *                                   "       FOR THE 13.6 FREQ ONLY   TF022790
                                    *                                   "       AND CONVERTED TO THE     TF022800
                                    *                                   "       OTHER FREQUECIES WHEN    TF022810
                                    *                                   "       NEEDED                   TF022820
1361    26    0439  C06D                    FET     6,13                                                 TF022830
1362    10R   043A  F09A1768        $2      CLAD    X9,,TF_LAMBDA_CONSTANT_TABLE                         TF022840
1363    26    043C  6807                    MPYD    0,7                 "TIME UPDATE PHI ESTIMATE (P)    TF022850
                                    *                                   "                                TF022860
                                    *                                   "P(NEW) = P + (PR + F*PRDR)*DT   TF022870
                                    *                                   "       SCALED B10 IN CYCLES     TF022880
                                    *                                   "F = RATIO OF THIS FREQ TO 13.6  TF022890
1364    34    043D  BF39                    ADDD    IX3,9               PHI DOT ESTIMATE SCALED B-1      TF022900
1365    50    043E  6805                    MPYD    0,5                 DELTA TK SCALED PI               TF022910
1366    60    043F  4808                    RSAD    0,,12               RESCALED TO(B+11)PI              TF022920
1367    68    0440  BF49                    ADDD    IX4,9               PHI ESTIMATE(K-1)SCALED B+11PI   TF022930
1368    78    0441  7B49                    STAD    IX4,9               PHI ESTIMATE(K)SCALED B+11PI     TF022940
                                    *                                   "HAS P FOR ALL                   *1022950
1369    86    0442  CC99    (043A)          BXUD    9,,$2               "THREE FREQUENCIES BEEN UPDATED? %R022960
1370    16R   0443  D740                    PRN     4                                                    % 022970
1371    18    0444  94D6                    ADDM    13,,6                 PHI EST ADD                    % 022980
1372    20    0445  94C6                    ADDM    12,,6                 PHI DOT EST ADD                % 022990
1373    28    0446  8410                    FETM    1,,0                                                 % 023000
1374    36    0447  CF8A    (040E)          BXUD    8,,$1               "HAVE ALL STATIONS BEEN UPDATED? %R023010
1375    24R   0448  D780                    PRN     8                                                    % 023020
1376    48    0449  D780                    PRN     8                                                    % 023030
                                    *                                                                    TF023040
                                    *                                                                    TF023050
                                    *                     R0=SIGMA**2 PHI DOT PHI DOT ADDR               TF023060
                                    *                     R1=SIGMA**2 PHI PHI DOT ADDR                   TF023070
                                    *                     R2=SIGMA**2 PHI PHI ADDR                       TF023080
                                    *                     R3=SIGMA**2 N COUNTER ADDR                     TF023090
                                    *                     R4=SIGMA**2 PHI M ADDR                         TF023100
                                    *                     R5=PHI M ADDR                                  TF023110
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                                        *                    R6=NAV MODE                                  TF023120
                                        *                    R7=TEMP                                      TF023130
                                        *                    R8=X(B)D                                     TF023140
                                        *                    RA=DELTA T(B)D                               TF023150
                                        *                    RC=3D COUNTER                                TF023160
                                        *                    RD=END 3D COUNTER                            TF023170
                                        *                                                                 TF023180
                                        * START TRACKING FILTER MEASUREMENT UPDATE                        *H023190
                                        * USE BURST PHASE AND VARIANCE TO UPDATE                         *H023200
                                        * THE TRACKING FILTERS OF THE THREE STATIONS                      *H023210
                                        * THAT JUST TRANSMITTED DURING THE LAST BURST                     TF023220
                                        *                                                                 TF023230
1377    22R    044A  C08D               $3        FET       8,13                                         % 023240
1378                                    MEASUREMENT_UPDATE;                                               TF023250
1378     8R    044B  F44A00B5                     CLA       4,,STATION_COUNTER                           TF023260
1379    10     044D  A42D                         CLA       2,13          SIG SQ M ADDRESS               TF023270
1380    16     044E  A63F                         CLA       I3,15         PHI M ADDRESS                  TF023280
1381    20     044F  4442                         LSA       4,,1          "USE STATION COUNTER (= NUMBER  TF023290
                                        *                                  "OF STATION THAT JUST TRANSMITTEDTF023300
                                        *                                  "10.2) AND FREQ NUMBER TO GET THETF023310
                                        *                                  "NUMBER OF THE STATION THAT JUST TF023320
1382    22     0450  B047                         SUB       4,7           "TRANSMITTED THIS FREQUENCY    TF023330
1383    26     0451  D022   (0454)                BGE       $1                                           % 023340
1384     4R    0452  F4490010                     ADDM      4,,16                                        TF023350
1385     2R    0454  A454               $1        CLA       5,4                                          % 023360
1386     4     0455  984E                         COMM      4,,OS*2-2     OS = NO OF STATIONS            TF023370
                                        *                                  "IS THIS STATION               *2023380
1387    10     0456  04030512                     BRG       $9            "IN THE LIST OF AVAILABLE"     %R023390
                                        *                                  "STATIONS?"                    TF023400
1388     2R    0458  9874                         COMM      7,,4                                         % 023410
1389     6     0459  D113   (046D)                BNE       $13           "IS THIS FREQUENCY 11.3?"      %R023420
1390    10R    045A  FC0A1F29                     CLAD      0,,RAW_H+4    "THE RAW H = Q(10.2)*Q(13.6)*  TF023430
                                        *                                  "            Q(11.3) SCALED B3 TF023440
                                        *                                  "FOR THE STATION THAT JUST     TF023450
                                        *                                  "TRANSMITTED 11.3 IS NOW       TF023460
                                        *                                  "AVAILABLE (RAW H IS COMPUTED IN TF023470
                                        *                                  "END BURST WITH Q)             TF023480
1391    18     045C  F04800C8                     COM       4,,BASE                                      TF023490
                                        *                                  "IS THIS RAW H                 *1023500
1392    22     045E  D016   (0465)                BNE       $84           "FOR THE BASE STATION?"        %R023510
1393     6R    045F  8400                         FETM      0,,0          "SET UP TO TURN SIGNAL LOSS LAMP TF023520
1394    10     0460  F8190020                     COMM      1,,X(0020)    "ON THE C/I PANEL OFF          TF023530
1395    14     0462  D031   (0464)                BRG       $83           "IS H RAW GREATER THAN .0078?  TF023540
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1396    6R    0463  9E5C   (00DC)          CLA     0,,HX0080       "CHANGE SET UP TO TURN LAMP ON    TF023550
                                    *                               "BECAUSE THE BASE STATION IS WEAKTF023560
1397    8R    0464  741F   (009F)   $83     PTR     0,,C_I_STATUS_IMAGE "SAVE STATE OF SIGNAL LOSS  TF023570
                                    *                               "LAMP FOR C/I PROGRAM             TF023580
1398   10R    0465  F94B1F7B        $84     SUBD    X4,,H_BURST     "COMPUTE H BURST"                 TF023590
1399   20     0467  F8040CCD                MPYDM   0,,F(.1)        "                                 TF023600
1400   30     0469  FD4B1F7B                ADDD    X4,,H_BURST     "H BURST(NEW) = H BURST           TF023610
1401   42     046B  F9471F7B                STAD    X4,,H_BURST     "      + .1*(H RAW - H BURST)     TF023620
                                    *                               "            SCALED B3            TF023630
1402    8R    046D  AF73            $13     CLAD    IX7,3           "READ BURST PHASE PB FOR THIS     TF023640
1403   16     046E  C011                    FET     1,1             "STATION AND FREQUENCY            TF023650
                                    *                               "IS THIS PHASE                    *1023660
1404   20     046F  D0D2   (0472)           BCF     $10             "DIFFERENCE NAVIGATION?"          %R023670
1405   10R    0470  F99B1F1F        $15     SUBD    X9,,PHI_M_BASE  "SUB ALWAYS PHASE DIFFERENCE      TF023680
                                    *                               "                                 TF023690
                                    *                               "SUBTRACT LAST BURST PHASE FROM   TF023700
                                    *                               "BASE STATION FOR THIS FREQ FROM  TF023710
                                    *                               "PB                               TF023720
1406   12R    0472  7F95            $10     PTRD    IX9,5           "SAVE NEW PB FOR THIS FILTER      TF023730
                                    *                               "                                 TF023740
1407   24     0473  CB72                    FETD    IX7,2           "READ BURST PHASE VARIANCE SB FORTF023750
1408   32     0474  C011                    FET     1,1             "THIS STATION AND FREQUENCY       TF023760
1409   34     0475  9401                    ADDM    0,,1            "COMPUTE SB + (.005 C)**2         TF023770
                                    *                               "NOTE - SB + (.005 C)**2 WILL BE  TF023780
                                    *                               "       A NEGATIVE NUMBER IF IT   TF023790
                                    *                               "       EXCEEDS 1 C**2 WHICH IS   TF023800
                                    *                               "       USED AS A MARKER INDICA-  TF023810
                                    *                               "       TING AN INVALID MEASURE-  TF023820
                                    *                               "       MENT                      TF023830
1410   38     0476  D053   (047A)           BRL     $11             "IS THIS A VALID MEASUREMENT?     %R023840
                                    *                               "IS THIS PHASE                    *1023850
1411    4R    0477  D0D2   (047A)           BCF     $11             "DIFFERENCE NAVIGATION?"          %R023860
                                    *                               "SUB ALWAYS PHASE DIFFERENCE      TF023870
1412   10R    0478  FDBB1F19                ADDD    X11,,SS_PHI_M_BASE "                              TF023880
                                    *                               "ADD LAST BURST PHASE VARIANCE    TF023890
                                    *                               "FROM BASE STATION FOR THIS FREQ  TF023900
                                    *                               "TO SB                            TF023910
1413   12R    047A  7FB6            $11     PTRD    IX11,6          "SAVE NEW SB FOR THIS FILTER      TF023920
1414   20     047B  F06800CB                COM     6,,BASE                                           TF023930
                                    *                               "IS THIS STATION                  *1023940
1415   24     047D  D015   (0483)           BNE     $14             "THE BASE STATION?"               %R023950
1416   14R    047E  FD971F19                PTRD    X9,,SS_PHI_M_BASE                                 TF023960
1417   26     0480  F9771F1F                STAD    X7,,PHI_M_BASE  "SAVE PB AND SB OF THE BASE       TF023970
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                                                *                                                "STATION FOR USE DURING THE NEXT TF023980
1418    30      0482  D001   (0484)             *               BUC     $12                      "10 SECONDS                              TF023990
1419    10R     0483  D710                      $14             PRN     1                        "ADJUST REGISTERS                        TF024000
1420    4R      0484  4443                      $12             MPIM    4,,3                     "DEVELOP POINTER TO DATA FOR             TF024010
1421    6       0485  B447                                      ADD     4,7                      "THIS TRACKING FILTER                    TF024020
1422    2R      0486  A464                      $101            CLA     6,4                                                               % 024030
1423    8       0487  9E32   (0082)                             CLA     0,,START_CNT             "INCREMENT TIME COUNTER USED IN          %S024040
1424    10      0488  9401                                      ADDM    0,,1                     "BASE STATION SELECTION                  TF024050
1425    18      0489  7032   (0082)                             STA     0,,START_CNT                                                      TF024060
1426    24      048A  9E33   (0083)                             CLA     0,,START_MKR             "READ THE TRACKING FILTER START          %S024070
                                                *                                                "MARKER WHICH IS SET TRUE BY THE         TF024080
                                                *                                                "BASE STATION SELECTION ROUTINE          TF024090
                                                *                                                "AFTER ENOUGH TIME HAS ELAPSED TOTF024100
                                                *                                                "COLLECT BASE STATION DATA SO            TF024110
                                                *                                                "THAT THE MEASUREMENTS ARE VALID         TF024120
                                                *                                                "IS THE TRACKING                         *1024130
1427    28      048B  D012   (048E)                             BNE     $21                      "FILTER START MARKER TRUE?"              TF024140
                                                *                                                "IS THIS PHASE                           *2024150
1428    6R      048C  040C0512                                  BCT     $9                       "DIFFERENCE TRACKING?"                   TF024160
                                                *                                                "(NO MEASUREMENT)                        TF024170
                                                * SUBMARINE ALWAYS PHASE DIFFERENCE                                                       *H024180
1429    8R      048E  AFD7                      $21             CLAD    IX13,7                   "READ SB FOR THIS FILTER                 TF024190
                                                *                                                "NEGATIVE SB IS A MARKER INDICA-         TF024200
                                                *                                                "TING NO MEASUREMENT                     TF024210
1430    14      048F  04050512                                  BRL     $9                       "IS THIS A VALID MEASUREMENT?            %R024220
                                                * UPDATE PHASE RATE ESTIMATE (PR)                                                         *H024230
1431    4R      0491  AC20                                      CLAD    2,0                      SIGMA SQ PHI M                           TF024240
                                                *                                                "COMPUTE THETA, SCDTM AND SB+S           TF024250
                                                *                                                "SCALED PI, 2C**2 AND 2C**2              TF024260
                                                *                                                "RESPECTIVELY FOR PR AND SAVE            TF024270
                                                *                                                "FOR USE IN UPDATING P                   TF024280
1432    12      0492  AF86                                      CLAD    IX11,6                   SIGMA SQ PHI PHI SCALED (2PI)**2         TF024290
                                                *                                                "WHERE THETA = PB - P +                  TF024300
                                                *                                                "     (PRDR*F + PR)*(0.425)              TF024310
                                                *                                                "THETA IS THE DIFFERENCE BETWEEN         TF024320
                                                *                                                "THE MEASURED AND ESTIMATED PHASE        TF024330
                                                *                                                "F = RATIO OF THIS FREQ TO 13.6          TF024340
1433    22      0493  F8044000                                  RSAD    0,,1                     SIGMA SQ PHI PHI SCALED(B+3)PI**2        TF024350
                                                *                                                "THE 0.425 IS AN AVERAGE VALUE           TF024360
                                                *                                                "EQUIVALENT TO 1/2 THE BURST TIME        TF024370
                                                *                                                "TO CORRECT THE ESTIMATED PHASE          TF024380
                                                *                                                "FROM THE END OF BURST TO THE            TF024390
                                                *                                                "MIDPOINT OF THE BURST                   TF024400
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1434    32      0495  F8244000                  RSAD   2,,1          SIGMA SQ PHI M SCALED (B+3)PI**2 TF024410
1435    36      0497  BC20                      ADDD   2,0                                          TF024420
1436    44      0498  AFA6                      CLAD   IX10,6        SIGMA SQ PHI PHI DOT SCALED 2PI  TF024430
1437    64      0499  F8061A94                  MPYD   0,,=DF((10)/3.14159265B+2) DELTA TM SCALED 4PI  TF024440
1438    94      049B  F05C1701                  FET    5,,TF_PHI_DATA_ADDRESSES                      TF024450
1439   102      049D  AFB3                      CLAD   IX11,3        PHI DOT DR SCALED B-1            TF024460
1440   122      049E  F9D61768                  MPYD   X13,,TF_LAMBDA_CONSTANT_TABLE                  TF024470
1441   130      04A0  BFC4                      ADDD   IX12,4        PHI DOT ESTIMATE SCALED 8-1      TF024480
1442   150      04A1  F8061A96                  MPYD   0,,=DF((.425)/3.14159265B+1) K/2PI             TF024490
1443   154      04A3  ACA4                      CLAD   10,4          PHI AND PHI DOT ESTIMATE ADDR    TF024500
1444   158      04A4  AC40                      CLAD   4,0           SUM OF(PHI DOT AND PHI DOT DR)K  TF024510
1445   166      04A5  AFBC                      CLAD   IX11,12       PHI ESTIMATED SCALED(B+11)PI     TF024520
1446   174      04A6  46E0    (00E0)            MPID   0,,HX0800     RESCALED TO PI                   TF024530
1447   178      04A7  B840                      SUBD   4,0           PHI ESTIMATED                    TF024540
1448   188      04A8  FDDA1EED                  CLAD   X13,,PHI_SUB_M                                 TF024550
1449   192      04AA  BC40                      ADDD   4,0           THETA SCALED PI                  TF024560
1450   208      04AB  C059                      FET    5,9                                            TF024570
1451   238      04AC  F4570085                  PTR    5,,TF_TEMP THETA,SIGMASQ PHI PHI DOT(DELTM),SUM TF024580
1452   252      04AE  D730                      PRN    3          OF 1/2(SIGMASQ PHI M+PHI PHI)         TF024590
1453   256      04AF  B842                      SUBD   4,2           SIGMA SQ PHI PHI DOT(DELTA TM)   TF024600
                                        *                            "SET UP ARGUMENTS FOR L ALPHA    *S024610
                                        *                            "SUBROUTINE                      TF024620
                                        *                            "THETA              ARGUMENT 1   TF024630
                                        *                            "B = SCDTM          ARGUMENT 2   TF024640
                                        *                            "A = L3 = SB + S - SCDTM  ARG 3  TF024650
                                        *                            "COMPUTE ALPHA 2 SCALED PI       *I024660
1454   264  *  04B0  F80D051B                  BSV    L_ALPHA       "AND L2 SCALED 1                 TF024670
1455   284      04B2  F8261A98                  MPYD   2,,=DF((3.14159265B+1)/10) L2 SCALED PI/B-1    TF024680
1456   304      04B4  F8061A98                  MPYD   0,,=DF((3.14159265B+1)/10) ALPHA 2/DELTA TM SF BTF024690
1457   312      04B6  BF64                      ADDD   IX6,4         "UPDATE PR"                      TF024700
                                        *                            "                                TF024710
                                        *                            "PR(NEW) = PR + ALPHA 2/DTM      TF024720
1458   322      04B7  7B64                      STAD   IX6,4         "          SCALED 1/4PI CYCLE/SECTF024730
1459   326      04B8  D021    (04BA)            BGE    $103                                          HH024740
1460     4R     04B9  A800                      CLSD   0,0                                           HH024750
1461     4R     04BA  F8094000          $103    COMM   0,,X(4000)    4 CEC/SEC LIMIT                  HH024760
1462     8      04BC  D052    (04BF)            BRL    $104                                          HH024770
1463     4R     04BD  B800                      SUBD   0,0                                           HH024780
1464    14      04BE  7B64                      STAD   IX6,4                                         HH024790
                                        *                                                             TF024800
                                        *                                                             TF024810
                                        *                  R0=PHI DOT ESTIMATE                        TF024820
                                        *                  R2=L2                                      TF024830
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                                        *                    R4=PHI DOT ESTIMATE ADDR                    TF024840
                                        *                    R5=PHI ESTIMATE ADDR                        TF024850
                                        *                    R6=DATA 24D COUNTER                         TF024860
                                        *                    R7=3D COUNTER                               TF024870
                                        *                    R8=END 3D COUNTER                           TF024880
                                        *                    R9=SIGMA SQ PHI DOT PHI DOT ADDR            TF024890
                                        *                    RA=SIGMA SQ PHI PHI DOT ADDR                TF024900
                                        *                    RB=SIGMA SQ PHI PHI ADDR                    TF024910
                                        *                    RC=SIGMA SQ N COUNTER ADDR                  TF024920
                                        *                    RD=SIGMA SQ PHI M ADDR                      TF024930
                                        *                                                                TF024940
                                        *                                                                TF024950
1465      8R        04BF  ABA6          $104      CLSD      IX10,6        -SIGMA SQ PHI DOT SCALED 2PI    HH024960
1466      24        04C0  6802                    MPYD      0,2           L2                              TF024970
1467      32        04C1  BF96                    ADDD      IX9,6         SIGMA SQ PHI DOT PHI DOT SF B+1 TF024980
1468      62        04C2  F05C0085                FET       5,,TF_TEMP    "UPDATE SR"                     %S024990
1469      78        04C4  6848                    MPYD      4,8           "SR(NEW) = SR +(SB+S)(L2/DTM)**2 TF025000
1470      94        04C5  6848                    MPYD      4,8           "   -2(L2/DTM)SC SCALED 1/2PI**2 TF025010
1471      98        04C6  8C46                    ADDD      4,6           SIGMA SQ PHI DOT PHI DOT(K+1)   TF025020
                                        *                                "IS SR GREATER                  *1025030
1472     102        04C7  D072   (04CA)           BNO       $2            "THAN 1/2PI**2 (C/S)**2?"       %R025040
1473     10R        04C8  FC4A00F3                CLAD      4,,=DX(7FFFFFFF) "SR IS TOO BIG               TF025050
                                        *                                "SET SR = 1/2PI**2              TF025060
1474      4R        04CA  AC60          $2        CLAD      6,0           THETA                           TF025070
1475      18        04CB  D730                    PRN       3             RELEASE FOUR REGISTERS          TF025080
1476      28        04CC  7BB8                    STAD      IX11,8        "SAVE SR(NEW)"                  TF025090
1477      38        04CD  D710                    PRN       1             RELEASE TWO REGISTERS           TF025100
1478      54        04CE  C05D                    FET       5,13                                          TF025110
                                        *                                "SET UP ARGUMENTS FOR L ALPHA   *S025120
                                        *                                "SUBROUTINE                     TF025130
                                        *                                "THETA              ARGUMENT 1  TF025140
                                        *                                "B = S              ARGUMENT 2  TF025150
                                        *                                "A = SB             ARGUMENT 3  TF025160
1479      62        04CF  AFD5                    CLAD      IX13,5        SIGMA SQ PHI M SCALED(2PI)**2   TF025170
1480      66        04D0  AC40                    CLAD      4,0                                           TF025180
1481      74        04D1  AFC3                    CLAD      IX12,3        SIGMA SQ PHI PHI SCALED(2PI)**2 TF025190
1482      78        04D2  AC20                    CLAD      2,0                                           TF025200
1483      90        04D3  C035                    FET       3,5                                           TF025210
1484     120        04D4  F4570085                PTR       5,,TF_TEMP    SIGMA SQ PHI PHI,PHI M,PHI PHI  TF025220
1485     128        04D6  C015                    FET       1,5           THETA                           TF025230
                                        *                                "COMPUTE ALPHA 1 SCALED PI      *I025240
1486     136  *     04D7  F80D051B                BSV       L_ALPHA       "AND L1 SCALED 1                TF025250
1487     146        04D9  F8040010                RSAD      0,,11         ALPHA 1 SCALED(B+11)PI          TF025260
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1488    154    04DB  BFA9                  ADDD    IX10,9        "UPDATE P"                          TF025270
                                    *                            "                                   TF025280
                                    *                            "P(NEW) = P + ALPHA 1               TF025290
1489    164    04DC  78A9                  STAD    IX10,9        "        SCALED B10 CYCLES          TF025300
1490    168    04DD  AC42                  CLAD    4,2           L1                                  TF025310
1491    178    04DE  F8444000              RSAD    4,,1          L1 SCALED B+1                       TF025320
1492    188    04E0  F84B1A9A              SUBD    4,,=DF(.5)    (L1-1) SCALED B+1                   TF025330
1493    198    04E2  F9AA1E03              CLSD    X10,,SIGMA_SQ_PHI_PHI_DOT                         TF025340
1494    228    04E4  F05C0085              FET     5,,TF_TEMP    SIGMA SQ PHI PHI,PHI M,PHI PHI      TF025350
1495    244    04E6  6828                  MPYD    2,8           L1 SCALED B+0                       TF025360
1496    260    04E7  684C                  MPYD    4,12          L2 SCALED PI/B-1                    TF025370
1497    276    04E8  68C2                  MPYD    12,2          L1 SIGMA SQ PHI M                   TF025380
1498    292    04E9  6882                  MPYD    8,2                                               TF025390
1499    296    04EA  BC64                  ADDD    6,4           L2 SIGMA SQ PHI PHI                 TF025400
1500    312    04EB  686A                  MPYD    6,10          L1-1                                TF025410
                                    *                            "COMPUTE SC"                        *S025420
                                    *                            "                                   TF025430
                                    *                            "SC(NEW) = (1-L1)(SC-(L2/DTM)S)     TF025440
                                    *                            "          + L1L2SB/DTM             TF025450
                                    *                            "    SCALED 1/2PI IN C**2/SEC       TF025460
1501    318    04EC  4C62                  LSAD    6,,1          "                                   TF025470
                                    *                            "COMPUTE FIRST TERM OF S            TF025480
                                    *                            "  = S(1-L1)**2                     TF025490
1502    322    04ED  BCC6                  ADDD    12,6          SIGMA SQ PHI PHI DOT(K+1)           TF025500
1503    338    04EE  680A                  MPYD    0,10          (L1-1) SCALED B+1                   TF025510
1504    354    04EF  68A0                  MPYD    10,0          (L1-1) SIGMA SQ PHI PHI             TF025520
1505    360    04F0  4CA4                  LSAD    10,,2                                             TF025530
                                    *                            "IS THE FIRST                       *1025540
1506    364    04F1  D071   (04F3)         BNO     $3            "TERM OF S GREATER THAN 1 C**2?     %R025550
1507     4R    04F2  D002   (04F5)         BUC     $4            "TOO BIG"                           TF025560
1508     4R    04F3  BCA8           $3     ADDD    10,8          "COMPUTE S"                         TF025570
                                    *                            "                                   TF025580
                                    *                            "S(NEW) = S(1-L1)**2 + SBL1**2      TF025590
1509      8    04F4  D072   (04F7)         BNO     $5            "IS S GREATER THAN 1 C**2?          %R025600
1510     10R   04F5  FCAA00F3       $4     CLAD    10,,=DX(7FFFFFFF) "SET S = 1 C**2                  TF025610
1511     26R   04F7  D790           $5     PRN     9             "SAVE S(NEW)"                       TF025620
1512     36    04F8  7BB6                  STAD    IX11,6        SIGMA SQ PHI PHI SCALED (2PI)**2    TF025630
1513     40    04F9  AC02                  CLAD    0,2                                               TF025640
1514     50    04FA  78A6                  STAD    IX10,6        SIGMA SQ PHI PHI DOT SCALED 2PI     TF025650
1515     52    04FB  A446                  CLA     4,6              SAVE INDEX                      *TF025660
1516     8R    04FC  AFB6           $6     CLAD    IX11,6                                            % 025670
1517     12    04FD  AC10                  CLAD    1,0                                               TF025680
1518     18    04FE  F0644000              RSA     6,,1          DATA 24S COUNTER                    TF025690
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1519   24   0500 A7C6                    CLA     IX12,6          N COUNTER                                  TF025700
1520   34   0501 F8181A9C                COMD    1,,=DF(.0009)   (.06PI)**2                              TF025710
                 * MEASUREMENT UPDATE IS NOW COMPLETE                                                     *H025720
                 * NOW CONSIDER IF VARIANCES ARE                                                          *H025730
                 * SUFFICIENTLY SMALL TO INDICATE                                                         *H025740
                 * GOOD TRACKING TO KALMAN                                                                *H025750
1521   38   0503 D038  (050F)            BRG     $7              "IS S LESS THAN (.003 C)**2?           %R025760
1522   12R  0504 CB94                    FETD    IX9,4           SR                                     % 025770
1523   22   0505 F8081A9E                COMD    0,,=DF(.09*.09D-4*3.1415926*3.1415926*2)               % 025780
1524   32   0507 D710                    PRN     1                                                      % 025790
1525   36   0508 D036  (050F)            BRG     $7              "IS SR LESS THAN (.0009 C/S)**2?       %R025800
1526   2R   0509 9401                    ADDM    0,,1            "TRACKING IS GOOD"                     TF025810
                 *                                               "INCREMENT N COUNTER BY 1              TF025820
                 *                                               "(WHEN N=3 KALMAN CAN TAKE DATA)       TF025830
1527   10   050A E41000D8                EXT     1,0,HX0008      CUT N OFF AT 7                         TF025840
1528   14   050C D064  (0511)            BRE     $8              "IS N LESS THAN 8?"                    TF025850
1529   2R   050D 9001                    SUBM    0,,1            "DECREMENT N BY 1 SO THAT IT WILL      TF025860
                 *                                               "NEVER EXCEED 7  THIS IS FOR THE       TF025870
1530   6    050E D002  (0511)            BUC     $8              "CONVENIENCE OF THE C/I PROGRAM        TF025880
1531   8R   050F E400010E        $7      EXT     0,0,HXFF00      "TRACKING IS POOR"                     TF025890
                 *                                               "SET N COUNTER = 0                     TF025900
1532   8R   0511 73C6            $8      STA     IX12,6          "SAVE THE N COUNTER"                   TF025910
                 *                                               "NOTE - THE 8 HIGH ORDER BITS OF       TF025920
                 *                                               "       THE N COUNTER WORDS ARE        TF025930
                 *                                               "       USED BY KALMAN TO COUNT        TF025940
                 *                                               "       THE NUMBER OF DUMPS            TF025950
                 *                                               "HAVE ALL 3"                           *2025960
1533   10R  0512 FC7C044B        $9      BXUD    7,,MEASUREMENT_UPDATE "MEASUREMENTS BEEN"              %R025970
                 *                                               "PROCESSED?                            TF025980
1534   22R  0514 F03C1F25                FET     3,,RAW_H        "MOVE RAW H(13.6) TO RAW H (11.3)      TF025990
                 *                                               "MOVE RAW H(10.2) TO RAW H (13.6)      TF026000
                 *                                               "SET RAW H(10.2) = 1                   TF026010
                 *                                               "RAW H(11.3) NOW CONTAINS Q(10.2)      TF026020
                 *                                               "*Q(13.6) FOR THE STATION THAT         TF026030
                 *                                               "WILL TRANSMIT 11.3 DURING THE         TF026040
                 *                                               "NEXT BURST.  RAW H(13.6) NOW          TF026050
                 *                                               "CONTAINS Q(10.2) FOR THE STATION      TF026060
                 *                                               "THAT WILL TRANSMIT 13.6 DURING        TF026070
                 *                                               "THE NEXT BURST.  END BURST WILL       TF026080
1535   34   0516 86F3  (00F3)            FETD    0,,=DX(7FFFFFFF) "COMPUTE NEW Q'S FOR EACH FREQ        TF026090
                 *                                               "AND MULTIPLY THEM BY THE              TF026100
                 *                                               "APPROPIATE RAW H.                     TF026110
1536   64   0517 FC471F25                PTRD    4,,RAW_H                                               TF026120
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1537    100    0519  D7E0          PRN     14    RELEASE FIFTEEN REGISTERS    TF026130
1538    134    051A  D5B0          BBK     11                                 TF026140
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                                                  **          TRACKING FILTER L ALPHA SUBR                                  TF026150
                                                  * CALLING SEQUENCE BSV L_ALPHA                                            TF026160
                                                  * ENTER WITH THETA SCALED PI IN R0,1                                      TF026170
                                                  *            B SCALED N IN R2,3                                           TF026180
                                                  *            A SCALED N IN R4,5                                           TF026190
                                                  * RETURN WITH ALPHA SCALED PI IN R0,1                                      TF026200
                                                  *            L SCALED B+0 IN R2,3                                         TF026210
                                                  * TWO REGISTERS PRUNED                                                     TF026220
                                                  *                        L ALPHA SUBROUTINE                               *H026230
                                                  *                                                                         *H026240
                                                  * THIS ROUTINE WILL ACCEPT 3 ARGUMENTS (THETA, B AND A)                    *H026250
                                                  * AND RETURN ALPHA AND L                                                   *H026260
                                                  *                                                                         *H026270
                                                  *                                                                         TF026280
1539      434R      051B  1400                    L_ALPHA     SINCOS      0,0          "SIN(ALPHA) = B * SIN(THETA)         TF026290
1540      450       051C  C057                                FET         5,7          "COS(ALPHA) = A + B * COS(THETA)     TF026300
                                                  *                                    "NUMERATOR OF L = (A * COS(THETA)    %S026310
                                                  *                                    "  + B) * B                          TF026320
                                                  *                                    "                                    TF026330
                                                  *                                    "DENOMINATOR OF L =                  TF026340
                                                  *                                    "(B * COS(THETA) + A)**2             TF026350
                                                  *                                    "+ (B * SIN(THETA))**2               TF026360
1541      466       051D  68A8                                MPYD        10,8         SIN THETA                            TF026370
1542      482       051E  68C6                                MPYD        12,6         COS THETA                            TF026380
1543      492       051F  F8444000                            RSAD        4,,1         1/2A                                 TF026390
1544      508       0521  6862                                MPYD        6,2          B                                    TF026400
1545      518       0522  F8244000                            RSAD        2,,1         1/2B                                 TF026410
1546      522       0524  BC64                                ADDD        6,4          1/2A                                 TF026420
1547      526       0525  AC86                                CLAD        8,6          1/2A+B COS THETA                     TF026430
1548      530       0526  AC4A                                CLAD        4,10         B SIN THETA                          TF026440
1549      546       0527  6866                                MPYD        6,6          (B COS THETA+1/2A)**2                TF026450
1550      562       0528  6844                                MPYD        4,4          (B SIN THETA)**2                     TF026460
1551      566       0529  BC64                                ADDD        6,4                                               TF026470
1552      570       052A  BCC2                                ADDD        12,2         1/2 B                                TF026480
1553      586       052B  68C2                                MPYD        12,2                                              TF026490
                                                  *                                    "COMPUTE ABSOLUTE VALUE OF           *S026500
                                                  *                                    "NUMERATOR                           TF026510
1554      590       052C  D022    (052F)                      BGE         $1                                                % 026520
1555        4R      052D  A84C                                CLSD        4,12         ABSOLUTE VALUE                       TF026530
1556        8       052E  D001    (0530)                      BUC         $2                                                % 026540
1557        4R      052F  AC4C                    $1          CLAD        4,12                                              % 026550
1558        4R      0530  8846                    $2          COMD        4,6                                               % 026560
1559        8       0531  D042    (0534)                      BLE         $3           "WILL THE DIVIDE OVERFLOW?"          %R026570
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1560    126R    0532  DCC4                    DIVD    12,4    "L = NUMERATOR / ABSOLUTE NUMERA-TF026580
                                *                       "     TOR     (= +1 OR -1)          TF026590
                                                                                            TF026600
1561    130     0533  D001    (0535)          BUC     $4
1562    126R    0534  DCC6            $3      DIVD    12,6    "L = NUMERATOR / DENOMINATOR  TF026610
                                *               "               SCALED 1                    TF026620
1563     22R    0535  D770            $4      PRN     7       RELEASE EIGHT REGISTERS       TF026630
1564    560     0536  1800                    ATAN    0,0     "ALPHA = ATAN SIN/COS SCALED PI TF026640
1565    568     0537  D5F0                    88K     15                                    TF026650
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                                                  **                                                                  SS026660
                                                  *                          START SLOT                               *H026670
                                                  *                                                                   *H026680
                                                  * THIS IS AN OMEGA TASK THAT IS EXECUTED AT THE START OF           *H026690
                                                  * THE .1 SECOND SLOT DATA COLLECTION PERIOD.  THIS PROGRAM         *H026700
                                                  * CLEARS THE 6 SIN/COS REGISTERS AND MONITORS FOR A                *H026710
                                                  * PRECISION FREQUENCY GENERATOR FAILURE                            *H026720
                                                  *                                                                   *H026730
                                                  *                                        "SET UP NEXT OMEGA TASK TO OCCUR *I026740
1566                                              START_OF_SLOT;                                                      SS026750
1566        70R     0538  0804                            OMEGA      0,,END_SLOT-OMEGA_TASK_TABLE/2 ".1 SEC LATER   SS026760
                                                  *                                        "READ THE PRECISION FREQUENCY   *I026770
1567        78      0539  0250                            SNS        PFG_COUNTDOWN_NO_GOOD   "GENERATOR BITE SIGNAL  SS026780
1568        82      053A  D062    (053D)                  BRE        $1                "IS THE PFG GOOD?"            SS026790
                                                  *                                        "FAILURE"                     SS026800
                                                  *                                        "GO TO SYNC$19 TO COUNT FAILURES SS026810
1569         6R     053B  04000303                        BUC        SYNC$19           "AND RESTART                  SS026820
1570        18R     053D  8460                    $1      FETM       6,,0              "CLEAR SIN/COS REGISTERS TO STARTSS026830
1571        48      053E  F4570011                        PTR        5,,COS_10_2       "DATA COLLECTION              SS026840
1572        58      0540  F4070047                        PTR        0,,MAG_TAPE_DATA+7 START NEW FRAME           MT026850
                                                  *                                         START NEW MAGNETIC TAPE FRAME SS026860
                                                  *                                         AND ENTER MAG TAPE PROGRAM IF SS026870
1573         8R     0542  D5F0                    PLOT16    2BBK       15                RECORDER 1S AVAILABLE "EXIT   %S026880
1573         4R     0543  D000                            FILL
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                                                  **                                                                  ES026890
                                                  *                          END OF SLOT                              *H026900
                                                  *                                                                   *H026910
                                                  * THIS IS AN OMEGA TASK THAT IS EXECUTED AT THE CONCLUSION OF       *H026920
                                                  * THE SLOT .1 SECOND DATA COLLECTION PERIOD WHICH SHOULD BE         *H026930
                                                  * THE EXACT CENTER OF THE SLOT.  THIS ROUTINE PERFORMS ANTENNA      *H026940
                                                  * SELECT FOR THE STATION BURSTS, COMPUTES SCALE FACTORS AND         *H026950
                                                  * MAKES NOISE AND PHANTOM MEASUREMENTS.                             *H026960
                                                  *                                                                   *H026970
1574      12R      0544  86A8   (00A8)   END_OF_SLOT FETD      0,,TIME_INC    "CORRECT TIME FOR OSCILLATOR   ES026980
1575      16       0545  BC02                      ADDD      0,2            "DRIFT AS CALIBRATED BY KALMAN ES026990
1576      28       0546  7C3C   (00BC)             PTRD      0,,TIME        "TIME = TIME + TIME INCREMENT  ES027000
1577      36       0547  8410                      FETM      1,,0           "TIME INCREMENT = 0            ES027010
                                                  *                                "TIME INCREMENT WILL CONTAIN   ES027020
                                                  *                                "+ OR - 5 MILLISEC WHENEVER THE ES027030
                                                  *                                "INTEGRAL OF T ZERO DOT SUMS TO 5ES027040
1578      48       0548  7C28   (00A8)             PTRD      0,,TIME_INC    "MILLISEC (PERFORMED IN KALMAN) ES027050
                                                  *                                "SET UP NEXT OMEGA TASK TO OCCUR *I027060
1579     118       0549  0805                      OMEGA     0,,START_BURST-OMEGA_TASK_TABLE/2 ".15 SEC LATERES027070
                                                  * NOTE - THE NEXT TASK WILL OCCUR .145                              *H027080
                                                  *        OR .155 SEC LATER WHENEVER                                 *H027090
                                                  *        THERE IS A TIME CORRECTION                                 *H027100
1580     152       054A  F06C0011                  FET       6,,COS_10_2    READ OMEGA DATA AND GET 1 REGSTERES027110
                                                  *                                "READ SLOT SIN/COS DATA BEFORE ES027120
                                                  *                                "NEXT DMA UPDATE               ES027130
1581     160       054C  8412                      FETM      1,,2           "SET UP 3 COUNTER TO CYCLE     ES027140
                                                  *                                "ANTENNA SELECT FOR 3 FREQ     ES027150
1582     178       054D  F02C00B3                  FET       2,,STATION_COUNTER-2 READ K AND GET 2 REGISTERS ES027160
1583      2R       054F  A402            $3        CLA       0,2            STATION NUMBER                 ES027170
1584       4       0550  9401                      ADDM      0,,1           INCREMET STATION COUNTER TO    ES027180
1585       6       0551  9808                      COMM      0,,8           NEXT STATION                   ES027190
                                                  *                                "USE STATION COUNTER AND FREQ TO ES027200
                                                  *                                "DETERMINE NEXT STATION TO     ES027210
                                                  *                                "TRANSMIT THIS FREQ            ES027220
1586      10       0552  D011   (0554)             BNE       $11                                            % 027230
1587      2R       0553  9C00                      CLAM      0,,0                                           ES027240
1588      2R       0554  8003            $11       SUB       0,3             GET K-J MOD 8                 % 027250
1589       6       0555  D021   (0557)             BGE       $1                                             % 027260
1590      2R       0556  9408                      ADDM      0,,8               PER STATION IN TABLE        ES027270
1591      4R       0557  4406            $1        MPIM      0,,6                                           % 027280
1592      10       0558  967E   (00FE)             ADD       0,,SV_ADD                                      ES027290
1593      18       0559  F4081F6F                  FETM      0,,R21                                         ES027300
                                                  *                                "COMPUTE RELATIVE BEARING FROM *I027310
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1594    26 *    055B  F80D1605                BSV     BEARING        "R3 AXIS TO STATION (CW)          ES027320
                                        *                            "BEARING FROM +A LOOP TO STATION ES027330
1595    32      055D  9240   (00C0)           SUB     0,,THETA_P     "= REL BEARING - THETA P - PSI A ES027340
1596    38      055E  9242   (00C2)           SUB     0,,PSI_A       "  - 180 DEG                     ES027350
                                        *                            "ADD 45 SO THAT 45 WILL BE MID-  ES027360
                                        *                            "POINT OF QUADRANT IN WHICH THE  ES027370
                                        *                            "+A LOOP IS SELECTED             ES027380
1597    42      055F  F409A000                ADDM    0,,X(A000)     45 + 18D                         ES027390
                                        *                            "READ STATE OF THE ANTENNA"      *I027400
1598    52      0561  F00C1F8C                FET     0,,FLOATER     "MARKER"                         ES027410
1599    60      0563  D700                    PRN     0                                               ES027420
1600    64      0564  D014   (0569)           BNE     $52            "IS THE LOOP ANTENNA IN USE NOW? %R027430
                                        *                            "LOOP"                           ES027440
1601     6R     0565  5002                    RSL     0,,14          "USE THE 180 AND 90 DEG BITS OF  ES027450
                                        *                            "THE BEARING TO DEFINE THE QUAD- ES027460
                                        *                            "RANT FOR ANTENNA SELECT         ES027470
                                        *                            "  0 -  90 = + A                 ES027480
                                        *                            " 90 - 180 = + B                 ES027490
                                        *                            "180 - 270 = - A                 ES027500
                                        *                            "270 - 360 = - B                 ES027510
1602    14      0566  F50A1762                CLA     X0,,ANTENNA_SELECT_TABLE                        ES027520
1603    18      0568  D004   (056D)           BUC     $2                                              ES027530
1604     6R     0569  9662   (00E2)   $52     ADD     0,,HX2000      "FLOATER"                        ES027540
1605    12      056A  5001                    RSL     0,,15          "ADD 45 TO THE BEARING SO THAT   ES027550
                                        *                            "90 WILL BE THE MIDPOINT OF THE  ES027560
                                        *                            "SEMICIRCLE IN WHICH +A IS USED  ES027570
                                        *                            "USE THE 180 DEG BIT TO DEFINE   ES027580
                                        *                            "THE SEMICIRCLE FOR ANTENNA USE  ES027590
                                        *                            "  0 - 180 = +A                  ES027600
                                        *                            "180 - 360 = -A                  ES027610
1606    20      056B  F50A1766                CLA     X0,,FLOATER_SELECT_TABLE                        ES027620
1607    10R     056D  F1470020        $2      STA     X4,,ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2        ES027630
                                        *                            "OUTPUT ANTENNA CHOICE FOR THIS  ES027640
                                        *                            "FREQ TO ANTENNA SWITCHING MATRIXES027650
                                        * NOTE - WHENEVER -A OR -B IS SELECTED                         *H027660
                                        *       THE MATRIX IS SET TO +A OR +B                         *H027670
                                        *       AND A MARKER IS SET FOR THE                           *H027680
                                        *       END BURST ROUTINE TO ADD 180                          *H027690
                                        *       DEG TO THE MEASURED PHASE                             *H027700
1608    20      056F  F5470035                PTR     X4,,ANTENNA_SELECT_SAVE "SAVE MARKER FOR END BURES027710
                                        *                            "INDICATING + OR - LOOP CHOICE   ES027720
1609    28      0571  C633   (054F)           BXU     3,,$3          "HAVE ALL 3 FREQ BEEN PROCESSED? %R027730
1610    16R     0572  D740                    PRN     4                                               % 027740
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                                        *                                                                  ES027750
                                        *                                                                  ES027760
1611      8R      0573  F46A00B5        $4      CLA      6,,STATION_COUNTER                               ES027770
                                        *                                  "USE LSB OF STATION COUNTER TO   ES027780
                                        *                                  "DETERMINE IF THIS IS A CALIBRATEES027790
                                        *                                  "OR NOISE MEASUREMENT SLOT       ES027800
1612      16      0575  E46600D5                 EXT      6,6,HX0001      "DO CALIBRATE FOLLOWING A,C,E,G  ES027810
1613      22      0577  040105EF                 BNE      NOT_CALIB       "IS THIS A NOISE SLOT?"          ES027820
1614      8R      0579  F46A00B5                 CLA      6,,STATION_COUNTER "SAVE THE SLOT SIN/COS DATA   ES027830
                                        *                                  "USE STATION COUNTER (=0,2,4,6)  ES027840
                                        *                                  "TIMES 3 AS A POINTER TO SAVE THEES027850
                                        *                                  "6 PIECES OF DATA AT EACH SLOT   ES027860
                                        *                                  "THE DATA IS A Y AND X (COS/SIN) ES027870
                                        *                                  "FOR EACH FREQ                   ES027880
                                        *                                  "1ST SET = C3 (TEST +90)         ES027890
                                        *                                  "2ND SET = C2 (-TEST)            ES027900
                                        *                                  "3RD SET = C1 (TEST)             ES027910
1615      12      057B  4463                     MPIM     6,,3            "4TH SET = C4 (-(TEST + 90)      ES027920
                                        *                                   ALSO SAVE ALL 4 SETS IN THE C4  ES027930
                                        *                                   AREA FOR MAGNETIC TAPE          ES027940
1616      16      057C  F4691EF6                 ADDM     6,,CALIBRATE_DATA                                ES027950
1617      46      057E  F4571F08                 PTR      5,,CALIBRATE_DATA+18                             ES027960
1618      76      0580  F05C1F08                 FET      5,,CALIBRATE_DATA+18                             ES027970
1619     104      0582  7656                     PTR      I5,6            SAVE CALIBRATE DATA              ES027980
1620     108      0583  F8091F08                 COMM     0,,CALIBRATE_DATA+18                             ES027990
                                        *                                  "IS THIS THE 4TH                 *2028000
1621     114      0585  040105E4                 BNE      NOT_FOURTH_ITERATION   "SET OF DATA IN A 10 SEC %R028010
                                        *                                  "PERIOD?"                        ES028020
1622      6R      0587  9E7B    (00FB)           CLA      0,,CAL_R_ADD                                     ES028030
1623      18      0588  86EF    (00EF)           FETD     0,,=DF(.18+1)   DELTA T CALIBRATE B-1            ES028040
1624      26      0589  8415                     FETM     1,,5            "SET UP 6 COUNTER TO PROCESS THE ES028050
                                        *                                  "6 PIECES OF DATA                ES028060
1625      64      058A  F07C177D                 FET      7,,CALIBRATE_DATA_ADDRESSES-4 AND GET 4 REGISTERES028070
1626      2R      058C  9C10            $7       CLAM     1,,0            "COMPUTE BIAS"                   ES028080
1627       8      058D  A786                     CLA      IX8,6           "BIAS = (C1 + C2 + C3 + C4)/.1   ES028090
1628      14      058E  B785                     ADD      IX8,5           X OR Y C2                        ES028100
1629      20      058F  B784                     ADD      IX8,4           X OR Y C3                        ES028110
1630      26      0590  B787                     ADD      IX8,7           X OR Y C4                        ES028120
1631     152      0591  DC0A                     DIVD     0,10            B AT B14                         ES028130
1632     158      0592  B1C0                     SUB      X12,0           NEW-OLD                          HH028140
1633     164      0593  F0040666                 MPYM     0,,F(.05)       200 SECOND TIME CONSTANT FILT    HH028150
1634     170      0595  B5C0                     ADD      X12,0           OLD+(NEW-OLD)*.05                HH028160
1635     178      0596  71C0                     STA      X12,0                                            HH028170
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1636   182        0597 D021  (0599)          BGE    $12                                    % 028180
1637    2R        0598 A000                  CLS    0,0        "GET ABSOLUTE VALUE OF BIAS ES028190
1638    4R        0599 F80901F4      $12     COMM   0,,F(2508-14) SLOW CORRELATOR         HH028200
1639    8         059B D053  (059F)          BRL    $10        "IS BIAS LESS THAN 250 COUNTS/SECES028210
1640    2R        059C 9C01                  CLAM   0,,1                                   % 028220
                                    *                          "INDICATE RECEIVER MALF FOR THIS *I028230
1641   10  *      059D F80D05E5              BSV    REC_ERROR  "FREQ AND TURN ON MALF LAMP ES028240
                                    * NOTE - BIAS NOT USED IN SYSTEM EQUATIONS             *H028250
1642    2R        059F 9C10          $10     CLAM   1,,0       "COMPUTE SCALE FACTOR       ES028260
1643    8         05A0 A786                  CLA    IX8,6      "SF = .5(C1 - C2)**2        ES028270
1644   14         05A1 B385                  SUB    IX8,5      "     + (C3 - C4)**2)**.5/.1ES028280
1645   30         05A2 6800                  MPYD   0,0        "SAVE SF FOR NOISE, BURST AND ES028290
1646   34         05A3 AC20                  CLAD   2,0        "PHANTOM                    ES028300
1647   36         05A4 9C10                  CLAM   1,,0       CLEAR                       ES028310
1648   42         05A5 A784                  CLA    IX8,4      X OR Y C3                   ES028320
1649   48         05A6 B387                  SUB    IX8,7      X OR Y C4                   ES028330
1650   64         05A7 6800                  MPYD   0,0        SQUARE                      ES028340
1651   68         05A8 BC02                  ADDD   0,2        SUM                         ES028350
1652  514         05A9 1000                  SQRT   0,0        A*DT AT B14                 ES028360
1653  640         05AA DC0A                  DIVD   0,10                                   ES028370
1654  644         05AB BC00                  ADDD   0,0        SF AT B14                   ES028380
1655  652         05AC 71C6                  STA    X12,6                                  ES028390
1656  656         05AD F0090C80              SUBM   0,,F(1600B-14) "FORM ABSOLUTE(SF-NOMINAL SF) HH028400
1657  660         05AF D021  (05B1)          BGE    $20                                    % 028410
1658   2R         05B0 A000                  CLS    0,0        " NOMINAL SF = 1600 COUNTS/SEC ES028420
1659   4R         05B1 F80903E8      $20     COMM   0,,F(500B-14)                          HH028430
                                    *                          "IS THE SF"                 *2028440
1660   8          05B3 D057  (05B8)          BRL    $80        "DEVIATION LESS THAN        HH028450
1661   8R         05B4 F58A1C18              CLA    X8,,CALIBRATE_FAIL_COUNT               HH028460
1662  10          05B6 9805                  COMM   0,,5                                   HH028470
1663  14          05B7 D055  (05BD)          BRL    $81                                    HH028480
                                    *                          "500 COUNTS/SEC?            ES028490
1664   6R         05B8 9E5D  (000D)          CLA    0,,HX0100                              % 028500
                                    *                          "INDICATE RECEIVER MALF FOR THIS *I028510
1665  14  *      05B9 F80D05E5              BSV    REC_ERROR  "FREQ AND TURN ON MALF LAMP ES028520
1666   2R         05B8 8000          $80     SUB    0,0                                    HH028530
1667   6          05BC D001  (05BE)          BUC    $82                                    HH028540
1668   2R         05BD 9401          $81     ADDM   0,,1                                   HH028550
1669  10R         05BE F1871C18      $82     STA    X8,,CALIBRATE_FAIL_COUNT               HH028560
1670   2R         05C0 94C1          $21     ADDM   12,,1      "INCREMENT POINTER"         ES028570
                                    *                          "HAVE ALL 6 SETS            *I028580
1671  10          05C1 C786  (05BC)          BXU    8,,$7      "OF DATA BEEN PROCESSED?"   %R028590
1672   2R         05C2 9C92                  CLAM   9,,2       "SET UP 3 COUNTER TO COMPUTE ES028600
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1673      4    05C3  9CA0                  CLAM    10,,0          "PHI ZERO FOR EACH FREQ          ES028610
1674      6    05C4  9C10                  CLAM    1,,0                                            ES028620
1675     6R    05C5  A7A7          $8      CLA     IX10,7         "COMPUTE PHI ZERO                ES028630
1676     12    05C6  B3A4                  SUB     IX10,4         "= ATAN (YC4-YC3+XC1-XC2) /      ES028640
1677     14    05C7  94A1                  ADDM    10,,1          "       (XC3-XC4+YC1-YC2)        ES028650
1678     20    05C8  B7A6                  ADD     IX10,6         "+ PHI ZERO 0 (= SUBMARINE       ES028660
                                   *                              "              COUPLER SHIFT)    ES028670
1679     26    05C9  B3A5                  SUB     IX10,5         "  + PHI ZERO LOOP OR FLOATER    ES028680
1680     30    05CA  AC20                  CLAD    2,0            "                                ES028690
1681     36    05CB  A7A4                  CLA     IX10,4         "NOTE - PHI ZERO NOT REQUIRED FORES028700
1682     42    05CC  B3A7                  SUB     IX10,7         "       PHASE DIFFERENCE TRACKINGES028710
1683     44    05CD  90A1                  SUBM    10,,1          DECREMENT INDEX                  ES028720
1684     50    05CE  B7A6                  ADD     IX10,6         YC1                              ES028730
1685     56    05CF  B3A5                  SUB     IX10,5         YC2                              ES028740
1686     58    05D0  94A2                  ADDM    10,,2          INCREMENT ADDRESS                ES028750
1687    596    05D1  1800                  ATAN    0,0                                             ES028760
1688    604    05D2  F56B17C8              ADD     X6,,PHI_ZERO_0                                  ES028770
                                   *                              "READ STATE OF THE ANTENNA       *I028780
1689    614    05D4  F00C1F8C              FET     0,,FLOATER     "MARKER"                         ES028790
1690    622    05D6  D700                  PRN     0                                               ES028800
1691    626    05D7  D063   (05DB)         BRE     $37            "IS THE LOOP ANTENNA IN USE?     ES028810
1692     8R    05D8  F56B17CE              ADD     X6,,PHI_ZERO_FLOATER "USE PHI ZERO FLOATER      ES028820
1693     12    05DA  D002   (05DD)         BUC     $38                                             ES028830
1694     8R    05DB  F56B17D1      $37     ADD     X6,,PHI_ZERO_LOOP "USE PHI ZERO LOOP (AND ACU144ES028840
                                   *                              "                COUPLER SHIFT)ES028850
1695     10R   05DD  F1671EF3      $38     STA     X6,,PHI_ZERO   "SAVE PHI ZERO (IN CASE USING    ES028860
                                   *                              "              RHO-RHO NAV)      ES028870
1696     18    05DF  8410                  FETM    1,,0           RESTORE PRN 2 IN ARC TAN         ES028880
1697     26    05E0  C58C   (05C5)         BXU     8,,$8          "HAVE ALL 3 FREQ BEEN PROCESSED? %R028890
1698     2R    05E1  9C01                  CLAM    0,,1           "SET CALIBRATE COMPUTED MARKER SOES028900
                                   *                              "THAT NOISE MEASUREMENTS CAN     ES028910
1699     10    05E2  701A   (009A)         STA     0,,CALIBRATE_COMPUTED_MARKER "START             ES028920
1700     46    05E3  D5C0                  BBK     12                                              ES028930
                                   *                                                               ES028940
                                   *                                                               ES028950
1701                               NOT_FOURTH_ITERATION;                                           ES028960
1701     12R   05E4  D500                  BBK     0              "EXIT - NO PROCESSING NOW        ES028970
                                   *                                                               TS028980
                                   *                                                               TS028990
                                   *        RECEIVER ERROR                                         *H029000
                                   *                                                               *H029010
                                   * THIS ROUTINE IS ENTERED WHENEVER                              *H029020
                                   * THE BIAS OR SCALE FACTOR ARE OUT                              *H029030
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                                        * OF LIMITS.                                                                    *H029040
1702      2R        05E5  A418           REC_ERROR   CLA      1,8            CONVERT 6 COUNTER TO A 3 COUNTER      TS029050
1703      8         05E6  F0144000                   RSA      1,,1           "COUNT NUMBER OF FAILURES             ES029060
1704      16        05E8  F5181F8F                   ADD      X1,,CHANNEL_FAIL                                     TS029070
1705      26        05EA  F1171F8F                   STA      X1,,CHANNEL_FAIL                                     TS029080
                                        *                                    "POST ERROR TYPE IN FAILURE WORD      *I029090
1706      44  *     05EC  351C                      MARK     X1,,12         "10.2 = BIT 13, 13.6=14, 11.3=15      ES029100
1707      62  *     05ED  2EDD    (00DD)            FAILD    I0,,HX0100     "TURN ON MALFUNCTION LAMP             ES029110
1708      70        05EE  D5F0                      BBK      15             "EXIT                                 ES029120
                                        *                                                                           ES029130
                                        *                                                                           ES029140
                                        *                      R0 = TEMP                                            ES029150
                                        *                      R2 = TEMP                                            ES029160
                                        *                      R4 = ADDRESS OF CALIB DATA YC3                       ES029170
                                        *                      R5 = ADDRESS OF CALIB DATA YC2                       ES029180
                                        *                      R6 = ADDRESS OF CALIB DATA YC1                       ES029190
                                        *                      R7 = ADDRESS OF CALIB DATA YC4                       ES029200
                                        *                      R8 = 6 COUNTER, 3 (D) COUNTER                        ES029210
                                        *                      RA = DELTA T CALIBRATE (D)                           ES029220
                                        *                      RC = ADDRESS OF CALIB RESULTS (BY10-2)               ES029230
                                        *                                                                           ES029240
                                        *                                                                           ES029250
                                        *                                                                           ES029260
                                        *                                                                           ES029270
1709      8R        05EF  F46A009A       NOT_CALIB   CLA      6,,CALIBRATE_COMPUTED_MARKER                         ES029280
                                        *                                    "THE NOISE COMPUTATIONS REQUIRE       ES029290
                                        *                                    "THAT THE SCALE FACTOR HAS BEEN       ES029300
                                        *                                    "COMPUTED                             ES029310
                                        *                                    "HAS CALIBRATION                      *I029320
1710      12        05F1  D011    (05F3)            BNE      $9             "BEEN PERFORMED YET?"                 ES029330
                                        *                                                                           ES029340
1711      24R       05F2  D560                      BBK      6              "EXIT - NO PROCESSING NOW             ES029350
                                        *                                                                           ES029360
                                        *                                                                           ES029370
1712      4R        05F3  FC691F08       $9          CLAM     6,,NOISE_DATA  "SAVE SLOT DATA FOR NOISE/PHANTOME   ES029380
1713      32        05F5  7656                      PTR      I5,6                                                 ES029390
1714      46        05F6  F80C1AA0                   FETO     0,,=DF(.1B-1)  DELTA T  NOISE   8+1                 ES029400
1715      54        05F8  8678    (00F8)            FET      0,,CAL_R_ADD   "SET UP 3 COUNTER FOR 3 FREQ         ES029410
1716      62        05F9  8412                      FETM     1,,2           "SET UP 2 COUNTER FOR Y AND X         ES029420
1717      82        05FA  8471                      FETM     7,,1           2 COUNTER + 6 REGISTERS               ES029430
1718      2R        05FB  A442           $10         CLA      4,2            SAVE Y**2 ON 2ND PASS                 ES029440
1719      8         05FC  A62D                      CLA      I2,13          "COMPUTE Y/SF = YN AT B1              ES029450
1720      14        05FD  A5A0                      CLA      X10,0          BIAS AT B14                           HH029460
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1721    20    05FE  F0040666                MPYM   0,,F(.05)      COUNTS PER .1 SECONDS              HH029470
1722    22    0600  B020                    SUB    2,0            SUB BIAS FROM PHANTOM              HH029480
1723    28    0601  A5A6                    CLA    X10,6          "COMPUTE POINTER TO PHANTOM DATA ES029490
1724    60    0602  D420                    DIV    2,0            "= 0 IF Y AND 3 IF X + FREQ 0,1,2ES029500
1725    62    0603  A406                    CLA    0,6            CONVERT 2 COUNTER TO 0 IF          ES029510
1726    66    0604  4403                    MPIM   0,,3           "  ADD 6 IF STATION COUNTER = 5    ES029520
1727    72    0605  F5891FA6                ADDM   X8,,Y_P        "  OR 7 INDICATING B LOOP DATA     ES029530
1728    80    0607  8635   (00B5)           FET    0,,STATION_COUNTER "THE DATA IS STORED            ES029540
1729    86    0608  F0052000                RSL    0,,2           "YPA10, YPA13, YPA11, XPA10,       ES029550
1730    90    060A  4406                    MPIM   0,,6           "XPA13, XPA11, YPB10, YPB13,       ES029560
1731    92    060B  B410                    ADD    1,0            "YPB11, XPB10, XPB13, XPB11        ES029570
1732    94    060C  A403                    CLA    0,3            "                                  ES029580
1733    98    060D  440A                    MPIM   0,,10              "YP(NEW) =  YP(OLD) +           ES029590
1734   104    060E  B110                    SUB    X1,0           "       .001(YN/.1 - YP(OLD))      ES029600
1735   110    060F  F0040021                MPYM   0,,F(.001)     "                                  ES029610
1736   116    0611  B510                    ADD    X1,0           "FORM YN**2                        ES029620
1737   124    0612  7510                    PTR    X1,0           "                                  ES029630
1738   130    0613  6022                    MPY    2,2            "THE ABOVE EQUATIONS REPEAT FOR XES029640
1739   132    0614  94D1                    ADDM   13,,1          INCREMENT ADDRESS OF NOISE DATA    ES029650
1740   134    0615  94A1                    ADDM   10,,1          INC CALIB ADDR                     ES029660
1741   142    0616  C56C   (05FB)           BXU    6,,$10         "HAVE BOTH X AND Y BEEN PROCESSED%R029670
                                    *                                                                ES029680
                                    *                                                                ES029690
1742    2R    0617  B442                    ADD    4,2            "Q(T)' = (XN**2 + YN**2)/.1 AT B1ES029700
1743    34    0618  D44B                    DIV    4,11           Q T PRIME B1                       ES029710
1744    42    0619  F41A009B                CLA    1,,NOISE_COMPUTED_MARKER                          ES029720
1745    46    061B  D06D   (0629)           BRE    $48            "IS THIS THE 1ST TIME THROUGH?     ES029730
1746    8R    061C  F58A0032        $47     CLA    X8,,Q_SUB_T                                       % 029740
1747    12    061E  F8490333                COMM   4,,F(.05B-1)                                      % 029750
                                    *                             "IS QT' GREATER                    *2029760
1748    16    0620  D045   (0626)           BLE    $50            "THAN .05? (WAS THERE A LOT OF     %R029770
                                    *                             "NOISE THIS TIME)                  ES029780
1749    4R    0621  4449                    MPIM   4,,9           "MAGNIFY QT' BY FORMING            ES029790
1750    8     0622  F049199A                SUBM   4,,F(.4B-1)    "QT = 9QT' - .4                    ES029800
                                    *                             "TO MINIMIZE WEIGHT OF STATION     ES029810
1751    10    0624  A404                    CLA    0,4                                               ES029820
1752    14    0625  D009   (062F)           BUC    $46            "BURSTS NOW                        ES029830
1753    4R    0626  F8090333        $50     COMM   0,,F(.05B-1)   "LOOK FOR PREVIOUS QT LARGE        ES029840
                                    *                             "INDICATING THAT THERE WAS A LOT ES029850
                                    *                             "OF NOISE BEFORE                   ES029860
1754    8     0628  D042   (062B)           BLE    $49            "IS QT GREATER THAN .05?           %R029870
1755    4R    0629  FC09019A        $48     CLAM   0,,F(.025B-1)  "SET OLD QT = .025 SO THAT NEW QT%R029880
                                    *                             "CAN DROP SHARPLY SINCE QT' IS     %R029890
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AD-A050 501 NORTHROP CORP HAWTHORNE CALIF ELECTRONICS DIV F/G 17/7
AN/BRN-7 COMPUTER PROGRAM SPECIFICATION. VOLUME XIII. APPENDIX.(U)
OCT 73 N00039-73-C-0209
UNCLASSIFIED NORT-73-48 NL

2 OF 4
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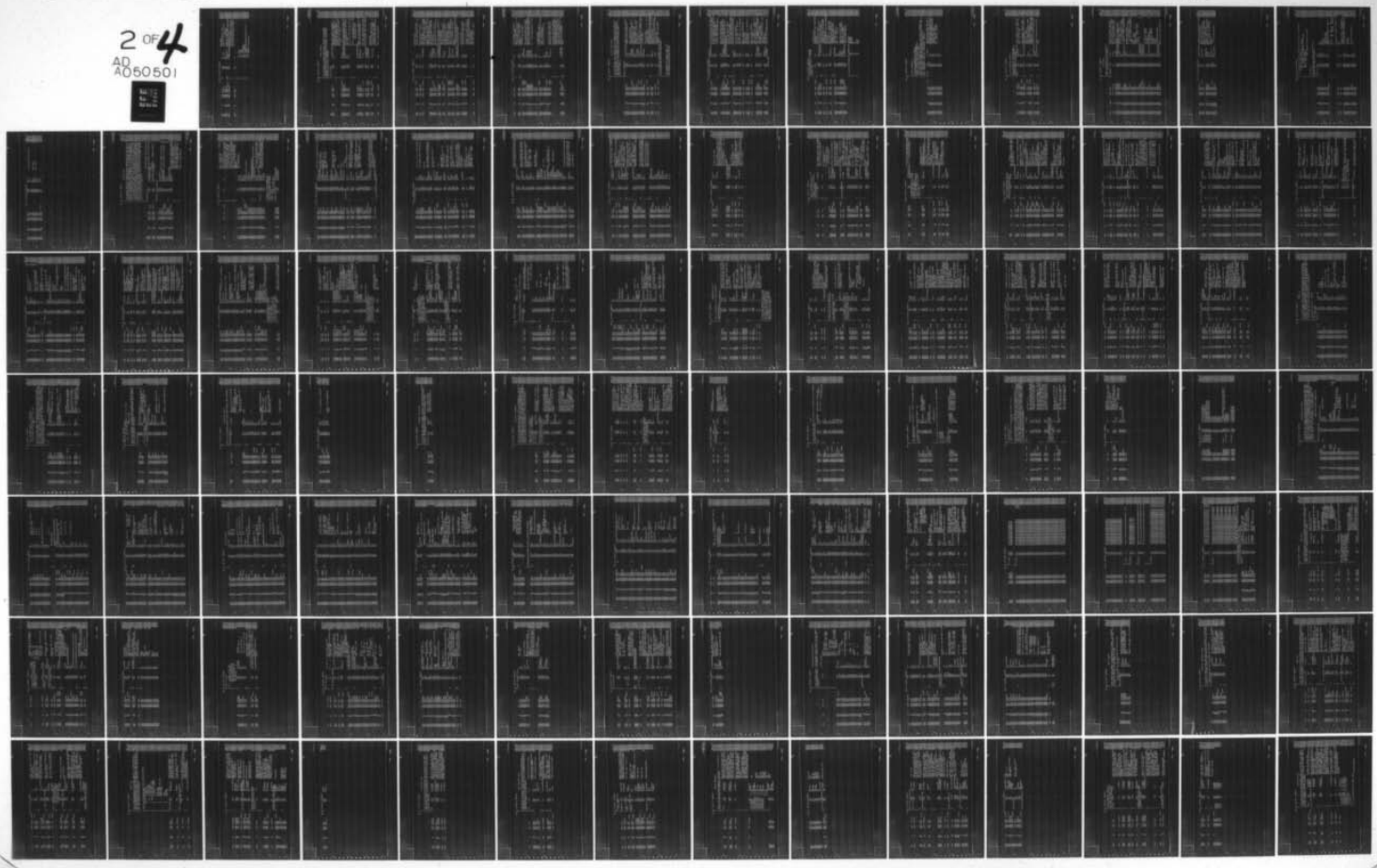

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                                        *                                   "NOW SMALL                          %R029900
1756      2R      062B  B040            $49      SUB      4,0              "FORM SMOOTHED QT WHERE             %R029910
1757      8       062C  F0440666                 MPYM     4,,F(.05)        "QT(NEW) = QT(OLD) + .05(QT'        %R029920
1758     10       062E  B404                     ADD      0,4              "            - QT(OLD))             %R029930
1759     10R      062F  F1870032        $46      STA      X8,,Q_SUB_T      "SAVE NEW QT FOR BURST              %R029940
1760      8R      0631  C787   (05FB)   $30      BXU      8,,$10           "HAVE ALL 3 FREQ BEEN PROCESSED?    %R029950
1761     10R      0632  F0970098                 STA      9,,NOISE_COMPUTED_MARKER NON ZERO                   ES029960
                                        *                                   "SET MARKER INDICATING THAT THE     ES029970
                                        *                                   "NOISE COMPUTATIONS ARE COMPLETE    ES029980
                                        *                                   "AND BURST PROCESSING CAN START     ES029990
1762     48       0634  D5D0                     BBK      13                                                   ES030000
                                        *                                                                       ES030010
                                        *                                                                       ES030020
                                        *                    R0 = TEMP                                          ES030030
                                        *                    R2 = TEMP                                          ES030040
                                        *                    R4 = TEMP                                          ES030050
                                        *                    R6 = 2 COUNTER                                     ES030060
                                        *                    R8 = 3 D COUNTER                                   ES030070
                                        *                    RA = ADDRESS OF CALIBRATE RESULTS (BY)             ES030080
                                        *                    RB = DELTA T  D                                    ES030090
                                        *                    RD = ADDRESS OF NOISE DATA                         ES030100
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                                        **                                                                  SB030110
                                        *                        START OF BURST                             *H030120
                                        *                                                                   *H030130
                                        * THIS ROUTINE IS AN OMEGA TASK THAT IS EXECUTED AT THE START      *H030140
                                        * OF EACH STATION BURST DATA COLLECTION PERIOD.  THE PROGRAM       *H030150
                                        * INCREMENTS THE STATION COUNTER, SETS THE TIME OF BURST AND       *H030160
                                        * PERFORMS BASE STATION SELECTION                                  *H030170
                                        *                                                                   *H030180
1763                                    START_OF_BURST;                                                     SB030190
1763     22R     0635  F03C00B3                 FET     3,,STATION_COUNTER-2 AND CREATE 2 REGISTERS        SB030200
1764     24      0637  9C37                     CLAM    3,,7            "INCREMENT STATION COUNTER BY 1    SB030210
                                        *                                "RESET TO ZERO IF IT GOES TO 8     SB030220
                                        *                                "THE STATION COUNTER ALWAYS        SB030230
                                        *                                "DEFINES THE STATION THAT IS JUSTSB030240
                                        *                                "STARTING IT'S 10.2 FREQ BURST     SB030250
                                        *                                "0 = STA A  7 = STA H              SB030260
1765     32      0638  C420   (0639)            BXU     2,,$1                                              % 030270
1766      8R     0639  F52A175A         $1      CLA     X2,,STATION_BURST_TIMES "READ STATION BURST TIMESB030280
1767     18      063B  F0071F17                 STA     0,,BURST_TIME   "FROM A TABLE AND ADD TO TIME      SB030290
1768     20      063D  A410                     CLA     1,0             "FOR DETERMINATION OF NEXT OMEGA   SB030300
1769     22      063E  9C00                     CLAM    0,,0            "TASK TIME                         SB030310
1770     26      063F  BC40                     ADDD    4,0             "A = .7  B = .8  C = .9  D = 1.0   SB030320
                                        *                                "E = .9  F = .7  G = 1.0  H = .8   SB030330
                                        *                                                                   SB030340
                                        *                                "NOTE - DATA COLLECTION IS .2 SECSB030350
                                        *                                "       LESS THAN THE TOTAL        SB030360
                                        *                                "       STATION BURST TIME         SB030370
1771     36      0640  F0270085                 STA     2,,STATION_COUNTER                                 SB030380
1772     52      0642  8450                     FETM    5,,0            "CLEAR THE 6 SIN/COS REGISTERS TO%SB030390
1773     82      0643  F4570011                 PTR     5,,COS_10_2     "START THE DATA COLLECTION         SB030400
1774     96      0645  D730                     PRN     3                                                  SB030410
1775    104      0646  92EB   (00EB)            SUBD    0,,=D1          NEXT TASK .005S BEFORE END BURST   SB030420
                                        *                                "SET NEXT OMEGA TASK 5 MSEC PRIOR*I030430
1776    174      0647  0806                     OMEGA   0,,K_FILTER-OMEGA_TASK_TABLE/2 "TO END OF BURST   SB030440
1777    182      0648  8632   (0082)            FET     0,,START_CNT                                       % 030450
1778    190      0649  864D   (00CD)            FET     0,,NEED_BASE                                       % 030460
                                        *                                "HAS A BASE                        *1030470
1779    194      064A  D015   (0650)            BNE     $2              "STATION BEEN SELECTED YET?        SB030480
1780      4R     064B  F8190048                 COMM    1,,I((12)*6)    "ALLOW THE SYSTEM TO OPERATE FOR   SB030490
                                        *                                "1 MINUTE AFTER SYNC BEFORE        SB030500
                                        *                                "ATTEMPTING BASE STATION SELECT    SB030510
                                        *                                "                                  *2030520
1781     10      064D  0405068F                 BRL     $10             "HAS 1 MINUTE ELAPSED?"            %R030530
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                                        *                                       "(EXIT IF NO)                                   SB030540
1782    4R      064F  D004  (0654)                BUC     $3                    "DO BASE STATION SELECTION                      SB030550
1783    2R      0650  981C                $2      COMM    1,,12                 "REVIEW BASE STATION EVERY 10 SEC               SB030560
                                        *                                       "                                               *2030570
1784    8       0651  0405068F                    BRL     $10                   "HAVE 10 SECONDS ELAPSED?                       %R030580
                                        *                                       "(EXIT IF NO)                                   SB030590
1785    8R      0653  7033  (0083)                STA     0,,START_MKR          "SET START MARKER TRUE TO ALLOW                 SB030600
                                        *                                       "THE TRACKING FILTERS TO OPERATE                SB030610
                                        *                                       "(THE MARKER WAS ALREADY TRUE                   SB030620
                                        *                                       "UNLESS THERE WAS A BASE STATION                SB030630
                                        *                                       "CHANGE 10 SECONDS AGO)                         SB030640
1786    2R      0654  8C01                $3      CLSM    0,,1                  "SET LARGEST H BURST NEGATIVE                   SB030650
1787    14      0655  8437                        FETM    3,,OS-1               "SET UP A COUNTER TO CYCLE THE                  SB030660
1788    22      0656  7032  (0082)                STA     0,,START_CNT          "OS STATIONS                                    SB030670
1789    26      0657  FC191F7B                    CLAM    1,,H_BURST            "SET A AS BASE IN CASE ALL                      SB030680
1790    28      0659  9C50                        CLAM    5,,0                  "STATIONS ARE OFF OR TOO CLOSE                  SB030690
                                        *                                       "                                               SB030700
1791    8R      065A  F52A00D5          $4      CLA     X2,,POWERS_OF_TWO     "READ STATIONS SELECTED BY                      SB030710
1792    16      065C  E40000E5                    EXT     0,0,STATIONS_IN_USE   "THE OPERATOR                                   SB030720
                                        *                                       "HAS THE OPERATOR                               *1030730
1793    20      065E  D015  (0664)                BNE     $40                   "TURNED THIS STATION OFF?"                      %R030740
1794    8R      065F  F02800CC          $42     COM     2,,BASE+1             "AT THIS POINT THE STATION IS                   SB030750
                                        *                                       "EITHER OFF OR TOO CLOSE                        SB030760
                                        *                                       "IS THIS STATION                                *1030770
1795    12      0661  D110  (0672)                BNE     $5                    "THE PRESENT BASE STATION?                      %R030780
1796    8R      0662  704D  (00CD)                STA     0,,NEED_BASE          "SET THE NEED BASE MARKER TO                    SB030790
1797    12      0663  D00E  (0672)                BUC     $5                    "FORCE A NEW BASE SELECTION NOW                 SB030800
1798    8R      0664  867D  (00FD)    $40         FET     0,,RIJ_ADD            "SET UP ARGUMENTS FOR THETA 1                   SB030810
1799    14      0665  C003                        FET     STA NO                0,3                                             SB030820
                                        *                                       "COMPUTE THE DISTANCE BETWEEN THE               *1030830
1800    22  *   0666  F80D0862                    BSV     COMPUTE_THETA1        "STATION AND THE CRAFT                          SB030840
1801    26      0668  F8090488                    COMM    0,,F((((400)*6076)/2.0950)/3.14159)                                   % 030850
1802    36      066A  D710                        PRN     1                                                                     % 030860
                                        *                                       "IS THE STATION                                 *1030870
1803    40      066B  D032  (066E)                BRG     $41                   "MORE THAN 400 N MILES AWAY?                    SB030880
1804    2R      066C  8000                        SUB     0,0                   "THIS STATION IS TOO CLOSE                      SB030890
1805    6       066D  D80F  (065F)                BUC     $42                                                                   SB030900
1806    6R      066E  8241          $41         COM     I4,1                  "COMPARE THE H BURST FOR THIS                   SB030910
                                        *                                       "STATION AGAINST THE LARGEST OF                 SB030920
                                        *                                       "THE H BURSTS FROM THE STATIONS                 SB030930
                                        *                                       "ALREADY EXAMINED                               SB030940
                                        *                                       "IS H BURST MORE                                *1030950
1807    10      066F  D032  (0672)                BRG     $5                    "THAN THE LARGEST H BURST?                      %R030960
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1808    2R    0670  A452                  CLA     5,2          "THIS STATION IS STRONGER"      SB030970
                                   *                          "SAVE STATION NUMBER            SB030980
                                   *                          "REPLACE LARGEST H BURST WITH THESB030990
1809    8     0671  A641                  CLA     I4,1         "H BURST FROM THIS STATION      SB031000
1810    2R    0672  9412            $5    ADDM    1,,2         "INCREMENT H BURST POINTER      SB031010
                                   *                          "HAVE ALL                       *1031020
1811    10    0673  C52A   (065A)         BXU     2,,$4        "STATIONS BEEN EXAMINED?        %R031030
1812    6R    0674  9E4D   (00CD)         CLA     0,,NEED_BASE                                 % 031040
1813    10    0675  D06F   (0685)         BRE     $6           "IS A BASE STATION NEEDED NOW?  SB031050
1814    4R    0676  F0190010              SUBM    1,,OS*2      "NOW DETERMINE IF THE STRONGEST   031060
1815    16    0678  F71A00CB              CLA     IX1,,BASE    "STATION IS SUFFICIENTLY STRONGERSB031070
1816    22    067A  F0040CCD              MPYM    0,,F(.1)     "THAN THE PRESENT BASE STATION  SB031080
1817    34    067C  F71B00CB              ADD     IX1,,BASE    "                               SB031090
1818    38    067E  F4090000             2ADDM    0,,0         "H  = 1.1*(H BURST(BASE)) + H(0) SB031100
1819    40    0680  B415                  ADD     1,5                                          SB031110
1820    42    0681  B415                  ADD     1,5                                          SB031120
1821    48    0682  8201                  COM     I0,1                                         SB031130
                                   *                          "IS THE LARGEST                 *1031140
1822    52    0683  D041   (0685)         BLE     $6           "H BURST GREATER THAN H?        SB031150
1823    22R   0684  D550                  BBK     5            "EXIT - NO CHANGE IN BASE STATIONSB031160
1824    14R   0685  D730            $6    PRN     3            "BASE STATION CHANGE"           SB031170
1825    2R    0686  A401            $77   CLA     0,1          "SAVE NEW BASE STATION NO.      SB031180
1826    4     0687  B400                  ADD     0,0                                          SB031190
1827    16    0688  7C4B   (00CB)         PTRD    0,,BASE                                      SB031200
1828    24    0689  8411                  FETM    1,,1                                         SB031210
1829    28    068A  D0D2   (068D)         BCF     $7           "PHASE DIFFERENCE TRACKING?     %R031220
1830    8R    068B  7000   (0080)         STA     0,,RESET_TF  "SUBMARINE ALWAYS PHASE DIFF    SB031230
                                   *                          "                               SB031240
                                   *                          "SET MARKER TO RESET TRACKING   SB031250
                                   *                          "FILTERS BECAUSE OF BASE CHANGE SB031260
                                   *                          "RESET TRACKING FILTER START    SB031270
                                   *                          "MARKER BECAUSE NEW BASE STATION SB031280
                                   *                          "PHASE'S ARE NOT AVAILABLE YET  SB031290
1831    16    068C  7033   (0083)         STA     0,,START_MKR "THEY WILL BE AVAILABLE IN 10 SECSB031300
1832    10R   068D  F01700CD        $7    STA     1,,NEED_BASE "RESET NEED BASE MARKER         SB031310
1833    14R   068F  D510            $10   BBK     1            "EXIT                           SB031320
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                                                                                                                    VP031330
                                                                                                                    *H031340
                                                                                                                    *H031350
                                                                                                                    *H031360
                                                                                                                    *H031370
                                                                                                                    *H031380
                                                                                                                    *H031390
                                                                                                                    *H031400
                                                                                                                    *H031410
                                                                                                                    *I031420
1834                                                                                                                VP031430
1834      8R        0690  F408001A                  FETM    0,,TRUE_HEADING_INPUT "SET UP INDEX TO READ 3          VP031440
1835      24        0692  8451                      FETM    5,,1          "SYNCHRO INPUTS FROM DMA                 HH031450
1836      26        0693  90F7                      SUBM    15,,7                                                  HH031460
1837      6R        0694  A746                $1    CLA     IX4,6         "READ SYNCHRO INPUT"                     VP031470
1838      12        0695  9661   (00E1)             ADD     0,,HX1000     "INCREMENT OCTANT AND EXTRACT            HH031480
1839      20        0696  E420177E                  EXT     2,0,HX6000    "QUAD FROM BITS 14 AND 15                VP031490
1840      24        0698  4422                      LSA     2,,1          "SCALE QUADRANT AT PI                    HH031500
1841      26        0699  A430                      CLA     3,0           "EXTRACT TAN/COT FROM 1 TO 12            VP031510
1842      34        069A  E403177F                  EXT     0,3,HX0FFF    "RESCALE TO 80  USE AS SINE              HH031520
1843      40        069C  4658   (0008)             MPI     0,,HX0008     "SET COSINE = 1                          HH031530
1844      42        069D  9C10                      CLAM    1,,0          "USE ARCTAN TO GET ANGLE AT PI           VP031540
1845      54        069E  86F3   (00F3)             FETD    0,,=DX(7FFFFFFF) "BASE ANGLE NOW BETWEEN 0 AND 4         VP031550
1846      592       069F  1800                      ATAN    0,0           GET BASE ANGLE                           VP031560
1847      600       06A0  E43300E1                  EXT     3,3,HX1000                                             HH031570
                                                    *                     "IS IT A COTAN?                          *I031580
1848      604       06A2  D011   (06A4)             BNE     $2            "(ORIGINAL OCTANT = 1, 3, 5 OR 7)        %R031590
1849      4R        06A3  A800                      CLSD    0,0           "COMPLIMENT ANGLE"                       VP031600
                                                    *                     "NEW BASE BETWEEN 315 AND 360 DEG        VP031610
1850      2R        06A4  8402                $2    ADD     0,2           "ADD QUADRANT TO GET FINAL RESULT        VP031620
1851      10        06A5  734F                      STA     IX4,15        "SAVE IN R15 STACK                       VP031630
                                                    *                     "SMOOTH INPUT WITH OLD DATA TO           *I031640
1852      18  *     06A6  F80D06EE                  BSV     SMOOTH        "ELIMINATE BIG JUMPS DUE TO NOISE        VP031650
                                                    *                     "HAVE ALL THREE                          *I031660
1853      26        06A8  C545   (0694)             BXU     4,,$1         "SYNCHRO'S BEEN PROCESSED?"              %R031670
                                                    * THE R15 STACK NOW CONTAINS IN R15 AND R15+1,                  HH031680
                                                    * TRUE HEADING AND SHIPS SPEED RESPECTIVELY.                    HH031690
                                                    *                                                              VP031700
                                                    *                                                              VP031710
                                                    *                                                              *H031720
                                                    * THE OPERATOR HAS SELECTED A NAV - HDG                         *H031730
                                                    * MODE THROUGH A C-I PANEL PROCEDURE.                           *H031740
                                                    * THE PROCEDURE DICTATES THAT ONE AND                           *H031750
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                        * ONLY ONE MODE WILL BE SELECTED.                                                *H031760
1854      6R    06A9 9E65   (00E5)          CLA      0,,STATIONS_IN_USE "EXAMINE VEL/HDG MODE SELECTEVP031770
1855      10    06AA F4040020               LSA      0,,5               "BY THE OPERATOR AND SET PROGRAM   031780
1856      12    06AC DE50                   FLG      L+A                "FLAGS ACCORDINGLY FOR LATER USE.VP031790
1857      16    06AD 4402                   LSA      0,,1               "A TRUE = SHIPS LOG/TRUE HDG       031800
1858      18    06AE DE52                   FLG      L+C                "C TRUE = MANUAL VEL/HDG           031810
                        *                                               "A,C ALL FALSE = NO RATE AIDING    031820
                        *                                                                                *S031830
1859      24    06AF A5F1                   CLA      X15,1              "READ SHIP LOG,SUBT 120 DEG        VP031840
1860      28    0680 F0090000               2SUBM    0,,0               "(ELECT 0=0 DEG) WAS 120/180       031850
1861      36    0682 5263   (00E3)          MPLM     10,,HX4000         "RESCALE TO FEET/SECOND AT B11     VP031860
1862       6R   0683 F0040438        $81    MPYM     0,,F(6076*40/3600811) "40 KNOTS PER 360 DEG         031870
1863      10    0685 F8090381               COMM     0,,F(((35)*6076)/3600811)                          VP031880
1864      14    0687 D051   (0689)          BRL      $20                "IS LOG LESS THAN 35 KNOTS?        VP031890
1865       2R   0688 8000          $3        SUB      0,0                BECOMES NOOP FOR PI TEST           031900
                        *                                               "SO THAT A SMALL AMOUNT OF NOISE VP031910
                        *                                               "WILL NOT MAKE 0 KTS READ 40 KTS VP031920
1866       8R   0689 7038   (00B8)  $20     STA      0,,V_TAS           "SAVE LOG IN VTAS AND R15 STACK  VP031930
1867      16    068A 71F1                   STA      X15,1                                               HH031940
1868      22    068B A64F                   CLA      I4,15              "PSI A = TRUE HEADING"           *S031950
1869      24    068C 9C52                   CLAM     5,,2               "SET HDG MODE = 2 = TRUE HDG     VP031960
1870      28    068D 8800                   SUBD     0,0                "SET VEL = 0                     VP031970
1871      30    068E 9C60                   CLAM     6,,0               "SET NAV MODE = 0 = NO RATE AID  VP031980
                        *                                               "                                *2031990
1872      34    068F D093   (06C3)          BAF      $30                "MODE = SHIPS LOG/TRUE HDG?      *R032000
                        *                                               "(FLAG A TRUE)                   VP032010
1873       6R   06C0 A5F1                   CLA      X15,1              "VEL=SHIPS LOG                     HH032020
1874       8    06C1 9C62                   CLAM     6,,2               "SET NAV MODE = 2 = SHIPS LOG/   VP032030
1875      12    06C2 D007   (06CA)          BUC      $33                "TRUE HEADING                    VP032040
                        *                                               "                                *2032050
1876       4R   06C3 D0D6   (06CA)  $30     BCF      $33                "MODE = NO RATE AIDING?"           032060
                        *                                               "(FLAG C FALSE)                  VP032070
                        *                                               "MODE = MANUAL VEL / MANUAL HDG  VP032080
1877       2R   06C4 9C51                   CLAM     5,,1               "SET HDG MODE = 1 = MANUAL       VP032090
1878      10    06C5 F44A1F8B               CLA      4,,PSI_INSERT      "PSI A = INSERTED HDG (PSI WIND) VP032100
1879       8R   06C7 F40A1FF4        $31    CLA      0,,V_INSERT        "VEL = INSERTED VEL (V INSERT)   VP032110
1880      10    06C9 9C64                   CLAM     6,,4               "NAV MODE = 4 = MANUAL           VP032120
1881       8R   06CA C015          $33     FET      1,5                "GET HDG ARGUMENT (PSI A)        VP032130
                        *                                               "COMPUTE V2 AND V3 FROM VEL, HDG *I032140
1882      16 *  06CB F80D06E3               BSV      RESOLVE            "AND THETA P                     VP032150
1883      22    06CD 9E50   (00D0)          CLA      0,,PMU_INPUT       "LAB USE ONLY"                   % 032160
1884      28    06CE 465C   (00DC)          MPI      0,,HX0080          TEST BIT 9 OF MONITOR SWITCHES   % 032170
                        *       LAB USE ONLY                                                             *H032180
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                                        * ALLOW LAB OPERATOR TO OVERRIDE                                    *H032190
                                        * VEL/HDG INPUTS FROM THE PROGRAM                                   *H032200
                                        * MONITOR UNIT                                                      *H032210
                                        *                                   "IS MONITOR UNIT                *2032220
1885      32      06CF  D023   (06D3)           BGE      $12                "OVERRIDE BUTTON TRUE INDICATING %R032230
                                        *                                   "LAB USE?                       VP032240
1886       4R     06D0  B822                    SUBD     2,2                "SET V2=V3=0 IN LAB"            VP032250
1887       8      06D1  FC492000                CLAM     4,,F((45)/180)     "SET PSI A = 45 DEG IN LAB"     VP032260
1888      10R     06D3  FC0A1F8D        $12     CLAD     0,,HEADING_MODE    "READ PREVIOUS NAV MODE"        VP032270
                                        *                                    HEADING MODE NOT USED IN SUB    VP032280
1889      12      06D5  8016                    COM      1,6                 COMPARE OLD AND NEW NAV MODES   VP032290
                                        *                                   "IS THE NEW NAV                 *2032300
1890      16      06D6  D062   (06D9)           BRE      $14                "MODE DIFFERENT THAN THE PREVIOUS%R032310
                                        *                                   "NAV MODE?                      VP032320
1891       4R     06D7  B800                    SUBD     0,0                "SET KALMAN VEL CORRECTIONS     VP032330
1892      14      06D8  7839   (00B9)           STAD     0,,DELTA_V2        "DELTA V2,3 = 0 BECAUSE THE     VP032340
                                        *                                   "PREVIOUS CORRECTIONS ARE       VP032350
                                        *                                   "PROBABLY NO LONGER VALID       VP032360
1893       8R     06D9  9EB9   (00B9)   $14     CLAD     0,,DELTA_V2         READ DELTA V2,3                VP032370
1894      10      06DA  B402                    ADD      0,2                "VC2 = V2 + DELTA V2            VP032380
1895      12      06DB  B413                    ADD      1,3                "VC3 = V3 + DELTA V3            VP032390
1896      14      06DC  94F7                    ADDM     15,,7                                              VP032400
1897      26      06DD  7C3E   (00BE)           PTRD     0,,VC2             "SAVE VC2,3 AT B12 FT/SEC       VP032410
1898      38      06DE  7C22   (00A2)           PTRD     0,,V2              "SAVE V2,3  AT B12 FT/SEC       VP032420
1899      46      06DF  7442   (00C2)           PTR      0,,PSI_A           "SAVE PSI A = HEADING           VP032430
1900      60      06E0  FC071F8D                PTRD     0,,HEADING_MODE    "SAVE HDG/NAV MODES             VP032440
1901      74      06E2  D510                    BBK      1                   PRUNE 2 EXEC REGISTERS         VP032450
                                        *                                                                   VP032460
                                        * IN GENERAL THE REGISTERS CONTAIN THE FOLLOWING                    VP032470
                                        *                        R6          NAV MODE                       VP032480
                                        *                        R5          HDG MODE                       VP032490
                                        *                        R4          PSI A                          VP032500
                                        *                        R3          V3                             VP032510
                                        *                        R2          V2                             VP032520
                                        *                        R1          SPARE                          VP032530
                                        *                        R0          SPARE                          VP032540
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                                                  **                                                                    VP032550
                                                  *                                                                     *H032560
                                                  *                                                                     *H032570
                                                  * RESOLVE SUBROUTINE                                                  *H032580
                                                  *                                                                     *H032590
                                                  * THE RESOLVE SUBROUTINE IS USED BY                                   *H032600
                                                  * VELOCITY PROCESSING OR SEA CURRENT TO                               *H032610
                                                  * COMPUTE V2 AND V3 FROM SHIPS SPEED WITH                             *H032620
                                                  * CROSS TRACK VELOCITY EQUAL TO ZERO.                                 *H032630
                                                  * THIS ROUTINE WILL RESOLVE THE VELOCITIES IN R2 AND R3 THROUGH THE   VP032640
                                                  * ANGLE IN R0 (AFTER ADDING THETA P) AND LEAVE THE RESULTS IN R4 AND R5 VP032650
                                                  * VR4 = VR2*SIN(R0 + THETA P) + VR3*COS(R0 + THETA P)                 VP032660
                                                  * VR5 = VR2*COS(R0 + THETA P) - VR3*SIN(R0 + THETA P)                 VP032670
                                                  *                                                                     VP032680
1902        6R        06E3  9640   (00C0)   RESOLVE     ADD       0,,THETA_P     "RESOLVE ALONG TRACK VEL (REG 2) VP032690
1903       440        06E4  1400                        SINCOS    0              "AND CROSS TRACK VEL (REG 3)     VP032700
1904       444        06E5  AC64                        CLAD      6,4            "THROUGH ANGLE IN REG 0,1+THETA PVP032710
1905       450        06E6  6062                        MPY       6,2            "TO FORM V2,V3 (RESCALED BY B1)  VP032720
1906       456        06E7  6040                        MPY       4,0            "LEAVE RESULT IN REG 2,3 AFTER   VP032730
1907       462        06E8  6072                        MPY       7,2            "PRUNING 2 REGISTERS             VP032740
1908       468        06E9  6050                        MPY       5,0            "V2 = VAT*SIN + VCT*COS          VP032750
1909       470        06EA  B465                        ADD       6,5            "V3 = VAT*COS - VCT*SIN          VP032760
1910       472        06EB  B047                        SUB       4,7                                             VP032770
1911       474        06EC  A474                        CLA       7,4                                             VP032780
1912       492        06ED  D530                        BBK       3                                               VP032790
                                                  *                                                                     VP032800
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                                        **                                                                  VP032810
                                        *                                                                   VP032820
                                        * SYNCHRC SMOOTHING ROUTINE                                         *H032830
                                        *                                                                   *H032840
                                        * THIS PROGRAM WILL SMOOTH THE NEW                                  *H032850
                                        * SYNCHRO INPUT IF IT IS SUBSTANTIALLY                              *H032860
                                        * DIFFERENT THEN THE OLD VALUE                                      *H032870
1913      8R     06EE  F1481F67         SMOOTH    SUB       X4,,SMOOTH_DATA "FORM .02(NEW - OLD) WHICH WILL VP032880
1914      14     06F0  F004028F                   MPYM      0,,F(.02)       "BE THE INCREMENT OF CHANGE IF  VP032890
1915      16     06F2  A410                       CLA       1,0             "NEW - OLD IS LARGE             VP032900
1916      20     06F3  D031    (06F5)             BRG       $1                                              % 032910
1917      2R     06F4  A000                       CLS       0,0             "FORM ABSOLUTE .02(NEW - OLD)   %S032920
1918      4R     06F5  F8090010         $1        COMM      0,,F(((4.4)/180)*.02) "COMPARE DIFF AGAINST 4.4 % 032930
                                        *                                   "DOES NEW - OLD                 *1032940
1919      8      06F7  D032    (06FA)             BRG       $2              "EXCEED 4.4 DEGREES?            VP032950
1920      6R     06F8  A7F4                       CLA       IX15,4          "SMALL CHANGE SO USE NEW VALUE  VP032960
1921      10     06F9  D004    (06FE)             BUC       $3              "WITHOUT ANY SMOOTHING          VP032970
1922      2R     06FA  A401             $2        CLA       0,1             "LARGE CHANGE - SMOOTH NEW VALUE VP032980
                                        *                                   "SMOOTHED V = .02(NEW-OLD) + OLD VP032990
1923      10     06FB  F5481F67                   ADD       X4,,SMOOTH_DATA "SAVE IN R15 STACK FOR USE NOW  VP033000
1924      18     06FD  73F4                       STA       IX15,4                                          VP033010
1925      10R    06FE  F1471F67         $3        STA       X4,,SMOOTH_DATA "SAVE IN SMOOTH DATA FOR NEXT   VP033020
1926      18     0700  D5F0                       BBK       15              "TIME                           VP033030
                                        *                                                                   VP033040
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                                        **                                                                  VP033050
                                        *          RIJ UPDATE                                               *H033060
                                        *                                                                   *H033070
                                        * THIS IS A NON OMEGA TASK THAT UPDATES                             *H033080
                                        * CRAFT POSITION 10 TIMES A SECOND                                  *H033090
                                        *                                                                   RU033100
1927     28R     0701  8480             RIJ_UPDATE  FETM     11,,0          "INTEGRATE COMPUTED VELOCITY    RU033110
                                        *                                   "VC2,3 * DELTA T / RHO = ANG2,3 RU033120
1928     36      0702  F48A00BF                     CLA      8,,VC3         "RHO = EARTH EQUATORIAL RADIUS  RU033130
                                        *                                   "TO GET ANGULAR CHANGE ALONG    RU033140
1929     44      0704  F4AA00BE                     CLA      10,,VC2        "R2, R3                         RU033150
1930     64      0706  F8861AA2                     MPYD     8,,=DF((.1)/2.0926D+7B-14) DT/R0 AT B-14       RU033160
1931     84      0708  F8A61AA2                     MPYD     10,,=DF((.1)/2.0926D+7B-14) DT/R0 AT B-14      RU033170
1932     94      070A  FC6A1F69                     CLAD     6,,R11         "COMPUTE DELTA THETA 2          %S033180
1933    110      070C  6866                         MPYD     6,6            "= -(1 + E(1-2R11**2 + R31**2   RU033190
1934    114      070D  BC66                         ADDD     6,6            "  - R21**2))*(ANG 3) - 2ER21R31 RU033200
1935    124      070E  F86B00F5                     SUBD     6,,=DF(1.0B-2) " *(ANG 2) + KALMAN CORRECTION 2 RU033210
1936    134      0710  FC4A1F6F                     CLAD     4,,R21         "                               RU033220
1937    138      0712  AC24                         CLAD     2,4            "COMPUTE DELTA THETA 3          RU033230
1938    154      0713  6822                         MPYD     2,2            "= (1 + E(1-2R11**2 - R31**2    RU033240
1939    164      0714  FC0A1F75                     CLAD     0,,R31         "  + R21**2))*(ANG 2) + 2ER21R31 RU033250
1940    180      0716  6840                         MPYD     4,0            "  (ANG 3) + KALMAN CORRECTION 3 RU033260
1941    196      0717  6800                         MPYD     0,0            R31**2                          RU033270
1942    200      0718  B802                         SUBD     0,2            R31SQ - R21SQ                   RU033280
1943    204      0719  A820                         CLSD     2,0            R21SQ - R31SQ                   RU033290
1944    208      071A  B826                         SUBD     2,6            1-2R11SQ - R31SQ + R21SQ        RU033300
1945    212      071B  B806                         SUBD     0,6            1-2R11SQ - R21SQ + R31SQ        RU033310
1946    232      071C  F8061AA4                     MPYD     0,,=DF(1/298.25)  E @ B0                    11  033320
1947    252      071E  F8261AA4                     MPYD     2,,=DF(1/298.25)                            11  033330
1948    260      0720  96F5    (00F5)               ADDD     0,,=DF(1.0B-2)                                RU033340
1949    270      0721  FC2B00F5                     ADDD     2,,=DF(1.0B-2)                                RU033350
1950    286      0723  6808                         MPYD     0,8            VC3 TERM OF DTHETA2             RU033360
1951    302      0724  682A                         MPYD     2,10           VC2 TERM OF DTHETA3             RU033370
1952    306      0725  BC44                         ADDD     4,4            2*R31*R21                       RU033380
1953    326      0726  F8461AA4                     MPYD     4,,=DF(1/298.25)  E*2*R31*R21               11  033390
1954    342      0728  68A4                         MPYD     10,4           VC2 TERM OF DTHETA2             RU033400
1955    358      0729  6884                         MPYD     8,4            VC3 TERM OF DTHETA3             RU033410
1956    362      072A  8CA0                         ADDD     10,0           -DTHETA 2                       RU033420
1957    366      072B  A8AA                         CLSD     10,10          DTHETA2                         RU033430
1958    370      072C  BC82                         ADDD     8,2            DTHETA 3                        RU033440
1959    380      072D  FC8B1F2D                     ADDD     8,,DELTA_THETA_3 KALMAN CORRECTIONS            RU033450
1960    390      072F  FCAB1F2B                     ADDD     10,,DELTA_THETA_2                             RU033460
1961    402      0731  8430                         FETM     3,,0           "CLEAR KALMAN CORRECTIONS 2,3   %S033470
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1962    424        0732  F4371F28                  PTR     3,,DELTA_THETA_2 "(THEY WILL BE NON ZERO AT MOSTRU033480
1963    442        0734  D750                      PRN     5                "ONCE PER 10 SECONDS)          RU033490
1964    448        0735  9E7D    (00FD)            CLA     0,,RIJ_ADD      UPDATE THIS SET OF RIJ'S        RU033500
1965    450        0736  A410                      CLA     1,0             STORE THEM IN THE SAME PLACE    RU033510
                                        *                                   "UPDATE RIJ MATRIX WITH DELTA   *I033520
1966    458  *     0737  F80D0743                  BSV     ROTATE_RIJS     "THETA 2, DELTA THETA 3         RU033530
1967    472        0739  F80C1F6F                  FETD    0,,R21          "COMPUTE THETA P = ATAN R21/R31 RU033540
1968    486        073B  F80C1F75                  FETD    0,,R31          "SAVE THETA P, SIN (THETA P)    RU033550
1969   1024        073D  1800                      ATAN    0,0             "AND COS (THETA P) FOR OTHER    RU033560
1970   1034        073E  7840    (00C0)            STAD    0,,THETA_P      "PROGRAMS                       RU033570
1971   1468        073F  1400                      SINCOS  0,0               AND                           RU033580
1972   1490        0740  F4371F92                  PTR     3,,COS_THETA_P      FOR OTHER ROUTINES          RU033590
1973   1504        0742  D510                      BBK     1                                               RU033600
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                                                                                                                    RU033610
                        **                                                                                          RU033620
                        * THIS PROGRAM WILL ROTATE A SPECIFIED SET OF RIJS.  THE CALLING                            RU033630
                        *       SEQUENCE IS AS FOLLOWS.                                                             RU033640
                        *             R0 = ADDRESS OF ROTATED RIJ MATRIX                                            RU033650
                        *             R1 = ADDRESS OF RIJ MATRIX TO BE ROTATED                                      RU033660
                        *             R2,3 = DELTA THETA 3                                                          RU033670
                        *             R4,5 = DELTA THETA 2                                                          RU033680
                        *                    (ALL REGISTERS PRUNED ON RETURN)                                       RU033690
                        *                                                                                          #H033700
                        * RIJ ROTATE                                                                               #H033710
                        *                                                                                          #H033720
                        * THIS PROGRAM WILL ROTATE A 3X3 MATRIX (R)                                                #H033730
                        * THROUGH THE 2 ANGLES SPECIFIED                                                          RU033740
                        *                                                                                          RU033750
1974      8R  0743 8412 ROTATE_RIJS FETM    1,,2                                                                    % 033760
1975     12R  0744 C930 $1          FETD    X3,0        "                                                           RU033770
1976     24   0745 C956              FETD    X5,6        R2I                                                         RU033780
1977     36   0746 C97C              FETD    X7,12       R3I                                                         RU033790
1978     52   0747 680C              MPYD    0,12        R3I(D2)                                                     RU033800
1979     68   0748 682A              MPYD    2,10        R2I(D3)                                                     RU033810
1980     72   0749 B820              SUBD    2,0         R2I(D3)-R3I(D2)                                             RU033820
1981     76   074A AC02              CLAD    0,2         R2I(D3)-R3I(D2)                                             RU033830
1982     86   0748 F8244000          RSAD    2,,1        "GIVEN THE 2 ANGLES T2 AND T3                               RU033840
                        *                                  "THEN                                                   RU033850
                        *                                  "          SQ    T3        -T2                          RU033860
                        *                                  "THETA = -T3   -T3*T2/2    T2*T3/2                      RU033870
                        *                                  "          T2    T2*T3/2   -T2*T2/2                     RU033880
                        *                                  "                                                       RU033890
                        *                                  " WHERE SQ = (T2*T2 + T3*T3) / 2                        033900
1983     90  074D BC42              ADDD    4,2         "                                                           033910
                        *                                  "AND                                                    033920
1984     94  074E A824              CLSD    2,4         "                                                           033930
                        *                                  "R(NEW) = R(OLD) + R(OLD)*THETA                         RU033940
1985    110  074F 682A              MPYD    2,10        -D3(R1I+R2I(D3)/2 -R3I(D2)/2) =X                            RU033950
1986    126  0750 684C              MPYD    4,12        +D2(R1I+R2I(D3)/2 -R3I(D2)/2) =Y                            RU033960
1987    138  0751 C82D              FETD    2,13                                                                    RU033970
1988    154  0752 680C              MPYD    0,0         (D3)(D3)                                                    RU033980
1989    170  0753 6822              MPYD    2,2         (D2)(D2)                                                    RU033990
1990    174  0754 BC20              ADDD    2,0                                                                     RU034000
1991    184  0755 F8244000          RSAD    2,,1        ((D3)(D3)+(D2)(D2))/2 = Z                                   RU034010
1992    192  0757 ADD0              CLAD    X13,0       R1I                                                         RU034020
1993    208  0758 6820              MPYD    2,0                                                                     RU034030
1994    212  0759 B802              SUBD    0,2
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1995    216    075A  BC04                ADDD    0,4                                  RU034040
1996    228    075B  7DC0                PTRD    X12,0     R1I=R1I-R1I(Z)+R2ID3-R3ID2   RU034050
1997    242    075C  D730                PRN     3                                    RU034060
1998    250    075D  BD76                ADDD    X7,6                                 RU034070
1999    262    075E  7D66                PTRD    X6,6      R2I= R2I+X                 RU034080
2000    270    075F  BD5C                ADDD    X5,12                                RU034090
2001    282    0760  7D4C                PTRD    X4,12     R3I= R3I+Y                 RU034100
2002    284    0761  9422                ADDM    2,,2                                 RU034110
2003    286    0762  9432                ADDM    3,,2                                 RU034120
2004    294    0763  C600   (0744)       BXU     0,,$1     "                          % 034130
2005     26R   0764  D570                BBK     7                                    RU034140
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                                        **                                                                    CF034150
                                        *                        KALMAN FILTER                                *H034160
                                        *                                                                     *H034170
                                        * THIS PROGRAM PROCESSES TRACKING FILTER MEASUREMENTS AND POSITION FIXES*H034180
                                        * TO GENERATE ESTIMATES OF SYSTEM ERRORS.  IT IS AN OMEGA TASK THAT IS  *H034190
                                        * ENTERED 5 MILLISECONDS BEFORE END BURST.  THIS PROGRAM ONLY CYCLES    *H034200
                                        * WHEN THE STATION COUNTER IS 0 (STATION A).  IT HAS BEEN SYNCHRONIZED  *H034210
                                        * WITH THE NON OMEGA TASK ROUTINES IN SUCH A WAY THAT RIJ UPDATE OCCURS *H034220
                                        * 5 MILLISECONDS BEFORE KALMAN.  FIVE MILLISECONDS AFTER KALMAN IS INI- *H034230
                                        * TIATED THE END BURST/TRACKING FILTER ROUTINES WILL INTERRUPT KALMAN SO*H034240
                                        * THAT ALL TRACKING FILTERS WILL BE TIME UPDATED TO THE END BURST TIME. *H034250
                                        * THIS RESULTS IN THE RIJ, KALMAN AND TRACKING FILTER UPDATES OCCURING  *H034260
                                        * WITHIN A 10 MILLISECOND PERIOD.  FOR THIS TIMING TO BE CORRECT KALMAN *H034270
                                        * MUST NOT READ ANY TRACKING FILTER DATA IN THE 5 MILLISECONDS AVAILABLE*H034280
                                        * BEFORE THE END BURST INTERRUPT.                                      *H034290
                                        *                                                                     *H034300
                                        *                                                                     *H034310
                                        *                                        "SET NEXT OMEGA TASK TO OCCUR IN *I034320
2006                                    KALMAN_FILTER;                                                        CF034330
2006      70R      0765  0807                    OMEGA      0,,END_BURST-OMEGA_TASK_TABLE/2 "5 MILLISECONDS"CF034340
2007      78       0766  8635   (0085)           FET        0,,STATION_COUNTER                              % 034350
                                        *                                        "IS IT"                        *I034360
2008      82       0767  D061   (0769)           BRE        COVARIANCE_INITIALIZATION   "STATION A TIME?"   CF034370
2009      12R      0768  D500                    BBK        0                "EXIT"                         CF034380
                                        *                                                                     CF034390
2010                                    COVARIANCE_INITIALIZATION;                                            CF034400
2010       8R      0769  D700                    PRN        0                                               HH034410
2011      42       076A  F4D81D17                FETM       13,,P_MATRIX                                    CF034420
2012      44       076C  8C02                    CLSM       0,,2          START PANEL UPDATE AT EVEN SEC   11  034430
2013      54       076D  F007003E                STA        0,,PANEL_COUNT                                11  034440
2014      60       076F  9E10   (0090)           CLA        0,,KAL_STA_FLG  HAS PP FINISHED OS STATIONS   11  034450
2015      64       0770  D062   (0773)           BRE        $21                                           11  034460
2016       6R      0771  04000A15                BUC        K_EXIT                                        11  034470
2017       8R      0773  F4AA0084        $21     CLA        10,,N                                         11  034480
2018      16       0775  F42A00B7                CLA        2,,COLD_START_MKR                               CF034490
2019      20       0777  D11E   (0796)           BNE        SAVE_RIJ        "IS IT TIME TO INITIALIZE KALMAN?%R034500
2020      22R      0778  8480                    FETM       8,,0            "SET NUMBER OF STATE VECTORS (N) CF034510
                                        *                                        "TO 0 (FOR 1 STATE VECTOR)      CF034520
                                        *                                        "RESET NO KICK AND STATION CHECK CF034530
                                        *                                        "ZERO THE FIRST STATE VECTOR    CF034540
                                        *                                        "ZERO THE COVARIANCE MATRIX (P) CF034550
                                        *                                        "                               CF034560
                                        *                                        "P44 = .25 MICROSEC/SEC         CF034570
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                                        *                                   "P33 = (441.176)**2 / 3 MICROSEC CF034580
                                        *                                   "P22 = INITIAL P22               CF034590
                                        *                                   "P11 = INITIAL P11               CF034600
2021      30      0779  7004   (0084)          STA      0,,N               "THE INITIAL P11 AND P22 ARE THE CF034610
                                        *                                   "VALUES FROM KALMAN AT TURN OFF  CF034620
                                        *                                   "IF POSITION AND TIME HAVE NOT   CF034630
                                        *                                   "YET BEEN INSERTED.  THEY ARE    CF034640
                                        *                                   "0.5 N MILE IF TIME HAS BEEN     CF034650
                                        *                                   "INSERTED (NOT OLD TIME ACCEPTED)CF034660
                                        *                                   "AND THERE IS NO POSITION INSERT CF034670
                                        *                                   "YET.  THEY ARE THE INSERTED     CF034680
                                        *                                   "QUALITY IF POSITION HAS BEEN    CF034690
                                        *                                   "INSERTED                        CF034700
2022      52      077A  F4371C27                PTR      3,,X               ZERO X1,X2,X3,X4                 CF034710
2023      78      077C  F4471CE8                PTR      4,,XXXX            ZERO X5,X6,X7,X8,X9              CF034720
2024      82      077E  FCC900A0                CLAM     12,,160                                             CF034730
2025      86      0780  B800                    SUBD     0,0                                                 CF034740
2026      10R     0781  7BBD           $3       STAD     IX11,13                                             % 034750
2027      18      0782  CCB2   (0781)           BXUD     11,,$3                                              % 034760
2028      8R      0783  9EF7   (00F7)           CLAD     0,,=DF((.25)*.25D-12B+36)                           CF034770
2029      20      0784  F8071D53                STAD     0,,P44                                              CF034780
2030      30      0786  FC0A0C3B                CLAD     0,,NOISE+2                                          CF034790
2031      42      0788  F8071D3F                STAD     0,,P33                                              CF034800
2032      22R     078A  F82C1F96       $10      FETD     2,,SAVE_POSITION_VARIANCES                          % 034810
2033      36      078C  F80C1AA6                FETD       0,,=DF(5*6076*5*6076/2.095D7/2.095D7B-8)          CF034820
2034      14R     078E  FC071D00       $11      PTRD     0,,SIGMA_SQ_KICK                                    CF034830
2035      28      0790  FC071D17                PTRD     0,,P11             "SET KALMAN STARTED MARKER WHICH CF034840
2036      42      0792  FC071D2B                PTRD     0,,P22             "   RESETS THE INITIALIZE MARKER CF034850
2037      52      0794  F0D700B7                STA      13,,COLD_START_MKR        NOT ZERO                  CF034860
2038      54R     0796  F8AC1F69       SAVE_RIJ FETD     10,,RIJ            "SAVE THE RIJ POSITION MATRIX NOWCF034870
2039     108      0798  FCA71CD5                PTRD     10,,BI             "TO ESTABLISH THE CURRENT OMEGA  CF034880
2040     138      079A  F84C1F75                FETD     4,,RIJ+12          "POSITION FOR KALMAN COMPUTATIONSCF034890
2041     168      079C  FC471CE1                PTRD     4,,BI+12                                            CF034900
                                        *                                                                        034910
                                        * COMPUTE THE OFF DIAGONAL AND                                          *H034920
                                        * NON-UNITY DIAGONAL ELEMENTS                                           *H034930
                                        * OF THE PHI MATRIX AND COMPUTE                                         *H034940
                                        * THE R MATRIX                                                          *H034950
                                        * NOTE - THERE IS SPACE FOR 14                                          *H034960
                                        *        ITEMS IN PHI MATRIX                                            *H034970
2042      4R      079E  FCD90060       COMPUTE_PHI CLAM     13,,PHI_MATRIX+4                                    CF034980
2043      8       07A0  FCB90052                CLAM     11,,R_MATRIX+8                                      CF034990
2044      16      07A2  F4AA1F8E                CLA      10,,NAV_MODE                                        CF035000
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2045    48        07A4  84D0                  FETM    13,,0          "SET FIRST 7 ITEMS IN PHI TO ZEROCF035010
2046   110        07A5  FCC7005C              PTRD    12,,PHI_MATRIX                                CF035020
2047   120        07A7  FC0A1AA8              CLAD    0,,=DF((((10B-18)*.408D+6)*2)/360)            CF035030
2048   130        07A9  79DC                  STAD    X13,,12        "9TH ITEM = PHI 3,4            CF035040
2049   140        07AA  FC0A1AAA              CLAD    0,,=DF((10)/2.095D+7B-16)                     CF035050
2050   150        07AC  79D0                  STAD    X13,,0         "3RD ITEM = PHI 1,8            CF035060
2051   160        07AD  79DA                  STAD    X13,,10        "8TH ITEM = PHI 2,9            CF035070
2052   170        07AE  FC0A1AAC              CLAD    0,,=DF(10B-7)  DELTA T                        CF035080
2053   174        07B0  AC60                  CLAD    6,0                                           CF035090
2054   176        07B1  94DE                  ADDM    13,,14                                        CF035100
2055   196        07B2  F9A60C24              MPYD    X10,,BETA_NRA                                 CF035110
2056   206        07B4  79D6                  STAD    X13,,6         "13TH ITEM = PHI 8,8           CF035120
2057   216        07B5  79D8                  STAD    X13,,8         "14TH ITEM = PHI 9,9           CF035130
2058   226        07B6  F9AA0C2A              CLSD    X10,,SIGMA_NRA         SIGMA V                CF035140
2059   236        07B8  F8047FFF              MPYDM   0,,X(7FFF)                                    CF035150
2060   254        07BA  69D6                  MPYD    X13,,6         BETA                           CF035160
2061   266        07BB  C031                  FET     3,1                                           HH035170
2062   288        07BC  FC270058              PTRD    2,,R_MATRIX+14  R8,R9                         HH035180
2063   320        07BE  84D0                  FETM    13,0                                          HH035190
2064   382        07BF  F4D7004A              PTR     13,,R_MATRIX   0 R1-R7                        HH035200
2065                                TIME_UPDATE_P;                          55700                    CF035210
2065    8R        07C1  F4080012              FETM    0,,18          "SET UP POINTERS FOR P MATRIX  CF035220
2066    14        07C3  8402                  FETM    0,,2                                          CF035230
                                    *                                  "START P UPDATE"               *I035240
2067    22  *     07C4  F80D0BA6              BSV     PHI_P_PHIT     "COMPUTE (K) = (P)*(PHI)TRANSPOSECF035250
2068    28        07C6  8402                  FETM    0,,2           "SET UP POINTERS FOR K TRANSPOSE CF035260
2069    36        07C7  F4080012              FETM    0,,18                                         CF035270
                                    *                                  "FINISH P UPDATE"              *I035280
2070    44  *     07C9  F80D0BA6              BSV     PHI_P_PHIT     "P = (K)TRANSPOSE *(PHI)TRANSPOSECF035290
2071    52  *     07CB  F80D0BD6              BSV     P_SYM          "MAKE P SYMETRIC               CF035300
2072    66        07CD  F4380010              FETM    3,,16          "UPDATE P WITH NOISE MATRIX R  CF035310
2073    70        07CF  FC491D17              CLAM    4,,P_MATRIX    "P(I,I) = P(I,I) + R(I), I = 1, 9CF035320
2074    10R       07D1  FD2A004A      $1      CLAD    X2,,R_MATRIX                                  % 035330
2075    18        07D3  8E04                  ADDD    I0,4                                          CF035340
2076    28        07D4  7A04                  STAD    I0,4                                          CF035350
2077    32        07D5  F4490014              ADDM    4,,20                                         CF035360
2078    40        07D7  CC27   (07D1)         BXUD    2,,$1                                         % 035370
2079    10R       07D8  FC0A1D17              CLAD    0,,P_MATRIX    "SAVE UPDATED P11, P22 FOR USE BY%S035380
2080    20        07DA  FC2A1D2B              CLAD    2,,P_MATRIX+20 "SYSTEM FOR KALMAN INITIALIZATIONCF035390
                                    *                                  "IF THERE IS A POWER DROPOUT NOW CF035400
                                    *                                  "AND FOR DISPLAY               CF035410
2081    42        07DC  FC271F96              PTRD    2,,SAVE_POSITION_VARIANCES                    CF035420
                                    * TIME UPDATE STATE VECTORS (X)                                   *H035430
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                                        TIME_UPDATE_X;                                                  CF035440
      20R        07DE  8471                          FETM     7,,1                                       CF035450
      28         07DF  F45A0084                      CLA      5,,N          "SET UP TO CYCLE N STATE VECTORS CF035460
      50         07E1  8480                          FETM     8,,0                                       CF035470
      92         07E2  F4871C1E                      PTR      8,,XXX        "SET AVERAGE VECTOR (XXX) TO 0   CF035480
      96         07E4  FC891CED                      CLAM     8,,XX                                      CF035490
     100         07E6  FC391C27                      CLAM     3,,X                                       CF035500
       6R        07E8  8409                $6        FETM     0,,9          NOT USED                     CF035510
      12         07E9  8401                          FETM     0,,1                                       CF035520
      18         07EA  C005                          FET      0,5           "SET ARGUMENTS FOR ASSEMBLE XX   CF035530
      26   *     07EB  F80D0BA0                      BSV      ASSEMBLE_XX   "PUT NEXT STATE VECTOR TOGETHER  CF035540
      34         07ED  F4081CED                      FETM     0,,XX                                      % 035550
      62         07EF  8480                          FETM     11,,0                                      % 035560
                                           *                                "UPDATE STATE VECTOR X"        *I035570
      70   *     07F0  F80D0BA9                      BSV      PHI_P_PHIT$6  "X = PHI * X                   CF035580
      78         07F2  8541                          FETM     X4,,1                                      CF035590
      86         07F3  867F    (00FF)                FET      0,,XXX_ADD                                 CF035600
      92         07F4  C00A                          FET      0,10            XX                         CF035610
     112         07F5  C230                          FET      I3,0                                       CF035620
     132         07F6  763A                          PTR      I3,10         "SAVE UPDATED X                CF035630
                                           *                                "UPDATE AVERAGE VECTOR XXX     *I035640
     140   *     07F7  F80D0B30                      BSV      AVERAGE_X     "AND SCATTER X2XX              CF035650
     142         07F9  9434                          ADDM     3,,4                                       % 035660
                                           *                                "ARE THERE MORE                *I035670
     150         07FA  C543    (07E8)                BXU      4,,$6         "STATE VECTORS TO UPDATE?"     CF035680
       4R        07FB  AC80                $3        CLAD     8,0                                        % 035690
      12         07FC  F56A1C1E                      CLA      X6,,XXX       "RESCALE XXX(1) AND XXX(2)     CF035700
      14         07FE  9C10                          CLAM     1,,0          "TO RAD BO FOR DELTA THETA 2, 3  CF035710
      24         07FF  F8040800                      RSAD     0,,4           2**0 RAD                      CF035720
       8R        0801  C467    (07FB)      $5        BXU      6,,$3         "                              % 035730
      14R        0802  F80C1CF6                      FETD     0,,X2XX       "SUM 1ST 2 TERMS OF SCATTER    CF035740
      16         0804  B401                          ADD      0,1           "VECTOR X2XX TO GET ESTIMATE OF  CF035750
                                           *                                "POSITION VARIATIONS BETWEEN   CF035760
                                           *                                "STATE VECTORS                 CF035770
      22         0805  9A59    (00D9)                COM      0,,HX0010     (4.76 MI)**2                   CF035780
      32         0806  D710                          PRN      1                                          CF035790
                                           *                                "DOES THE"                     *2035800
      36         0807  D137    (081F)                BRG      $9            "POSITION SCATTER EXCEED"      CF035810
                                           *                                "4.76 N MILES?                 CF035820
       4R        0808  A828                          CLSD     2,8           "CORRECT POSITION"             CF035830
      16         0809  C823                          FETD     2,3           "DELTA THETA 3 = - XXX(1)      CF035840
      20         080A  AC60                          CLAD     6,0           "DELTA THETA 2 =   XXX(2)      CF035850
      24         080B  AC42                          CLAD     4,2           "                              CF035860
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                                        *                                  "STORE DELTA THETA'S FOR RIJ UP- CF035870
                                        *                                  "DATE TO CORRECT PRESENT POSITIONCF035880
2117    46        080C  FC271F28                PTRD    2,,DELTA_THETA_2                                CF035890
2118    56        080E  F4181CD5                FETM    1,,BI                                           CF035900
2119    58        0810  A401                    CLA     0,1                                             CF035910
                                        *                                  "APPLY CORRECTIONS TO POSITION  *I035920
2120    66  *     0811  F80D0743                BSV     ROTATE_RIJS     "KALMAN SAVED AT START OF CYCLE CF035930
2121    80        0813  F4381C27                FETM    3,,X                                            % 035940
2122     6R       0815  A603            $7      CLA     I0,3            "DELETE CORRECTION JUST APPLIED CF035950
2123    14        0816  F00B1C1E                SUB     0,,XXX          "TO POSITION FROM ALL STATE     CF035960
2124    22        0818  7203                    STA     I0,3            "VECTORS                        CF035970
2125    28        0819  A531                    CLA     X3,1            "X(N)1 = X(N)1 - XXX1           CF035980
2126    36        081A  F00B1C1F                SUB     0,,XXX+1        "X(N)2 = X(N)2 - XXX2           CF035990
2127    44        081C  7131                    STA     X3,1                                            CF036000
2128    46        081D  9434                    ADDM    3,,4                                            CF036010
                                        *                                  "ARE THERE MORE                 *1036020
2129    54        081E  C44A    (0815)          BXU     4,,$7           "VECTORS TO CORRECT?"           CF036030
2130     8R       081F  F44A1F8E        $9      CLA     4,,NAV_MODE                                     CF036040
2131    16        0821  F45A00C2                CLA     5,,PSI_A                                        CF036050
2132    24        0823  F47A008F                CLA     7,,PSI_A_SAVE                                   CF036060
2133    34        0825  F057008F                STA     5,,PSI_A_SAVE                                   CF036070
2134    36        0827  B075                    SUB     7,5             OLD - NEW                       CF036080
2135    42        0828  9E39    (00B9)          CLA     0,,DELTA_V2                                     CF036090
2136    46        0829  B811                    SUBD    1,1                                             CF036100
2137    66        082A  F8060074                MPYD    0,,PHI_MATRIX+24      DECAY DELTA V2            CF036110
2138    76        082C  FC0B1D04                ADDD    0,,RES2         "DECAY DELTA V2, DELTA V3       CF036120
2139    86        082E  F0171D05                STA     1,,RES2+1                                       CF036130
2140    94        0830  F41A00BA                CLA     1,,DELTA_V3                                     CF036140
2141   114        0832  F8160074                MPYD    1,,PHI_MATRIX+24      DECAY DELTA V3            CF036150
2142   124        0834  FC1B1D02                ADDD    1,,RES3                                         CF036160
2143   134        0836  F0271D03                STA     2,,RES3+1                                       CF036170
2144   140        0838  9639    (00B9)          ADD     0,,DELTA_V2                                     CF036180
2145   148        0839  F41B00BA                ADD     1,,DELTA_V3                                     CF036190
2146   156        083B  F00B1C25                SUB     0,,XXX+7                                        CF036200
2147   164        083D  F01B1C26                SUB     1,,XXX+8                                        CF036210
2148   166        083F  9840                    COMM    4,,0                                            CF036220
2149   170        0840  D016    (0847)          BNE     $10             "IS THE NAV MODE NO RATE AIDING? %R036230
2150     8R       0841  C808                    FETD    0,8                                             % 036240
                                        *                                  "ROTATE DELTA V2,3 THROUGH HEAD- *I036250
2151    16  *     0842  F80D06E4                BSV     RESOLVE+1       "ING CHANGE IN LAST 10 SECONDS  CF036260
2152    20        0844  9F33                    CLAM    IX3,3           V2 AT 2**12 FPS                 % 036270
2153    22        0845  A412                    CLA     1,2                                             % 036280
2154    24        0846  B412                    ADD     1,2             V3 AT 2**12 FPS                 % 036290
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                                        *                                   "DO NOT PERMIT VEL PROC TO CHANGE*I036300
2155      2R     0847  DF00             $10      LGC      INTERRUPT_INHIBIT   "MODE BEFORE DELTA V UPDATE CF036310
2156     10      0848  F0481F8E                  COM      4,,NAV_MODE                                  % 036320
                                        *                                   "HAS THE NAV MODE              *2036330
2157     14      084A  D011    (084C)            BNE      $11              "CHANGED SINCE THE DECAY OF DELTACF036340
                                        *                                   "V STARTED?                    CF036350
2158     10R     084B  7839    (0089)            STAD     0,,DELTA_V2      "SAVE NEW DELTA V'S            CF036360
2159      4R     084C  B800             $11      SUBD     0,0              "SET DELTA V ELEMENTS (8,9) = 0  CF036370
2160      6      084D  DF10                      LGC      INTERRUPT_INHIBIT+NE   "ALLOW INTERRUPTS"      CF036380
2161     24      084E  F02C1C22                  FET      2,,XXX+4         "SAVE ELEMENTS 5, 6 AND 7 FROM  CF036390
2162     50      0850  F4471CE8                  PTR      4,,XXXX          "THE AVERAGE STATE VECTOR      CF036400
2163      8R     0852  F40A1D06         $52      CLA      0,,P44_INC_RATE                              CF036410
2164     12      0854  F409199A                  ADDM     0,,F(.2)         "INCREMENT P44 NOISE TERM WITH  CF036420
                                        *                                   "P44 NOISE RATE WHICH IS TOO   CF036430
                                        *                                   "SMALL TO CAUSE A CHANGE TO P44 CF036440
                                        *                                   "EVERY 10 SECONDS              CF036450
2165     22      0856  F0071D06                  STA      0,,P44_INC_RATE     NOISE FOR T ZERO DOT VAR   CF036460
2166     26      0858  D075    (085E)            BNO      $53              "DID NOISE TERM OVERFLOW?"     %R036470
2167      8R     0859  8411                      FETM     1,1              "INCREMENT P44 BY 1*2**-31 (1BIT)CF036480
2168     18      085A  FC0B1D53                  ADDD     0,,P44                                       CF036490
2169     32      085C  FC071D53                  PTRD     0,,P44                                       CF036500
2170      4R     085E  FC591D17         $53      CLAM     5,,P11           "THE POSITION AND T ZERO VARIAN- CF036510
2171      6      0860  A445                      CLA      4,5              "CES COULD OVERFLOW DUE TO VERY CF036520
2172      8      0861  9C34                      CLAM     3,4              "LONG PERIODS WITH NO MEASUREMENTCF036530
2173     10      0862  9C20                      CLAM     2,0              "                              CF036540
                                        *                                   "DECAY APPROPIATE ROWS AND COL- CF036550
                                        *                                   "UMNS IF P11, P22 OR P33 ARE   CF036560
                                        *                                   "OVER THEIR RESPECTIVE LIMITS  CF036570
2174      8R     0863  AF25             $56      CLAD     IX2,5                                        % 036580
2175     18      0864  F9280C3D                  COMD     X2,,DATA_TABLE                               CF036590
2176     22      0866  D04F    (0876)            BLE      $54                                          % 036600
2177      8R     0867  8724                      FETM     IX2,4                                        CF036610
2178     22      0868  F4380010                  FETM     3,,16                                        CF036620
2179      8R     086A  AF2A             $55      CLAD     IX2,10                                       % 036630
2180     18      086B  F8047B00                  MPYDM    0,,X(7B00)                                   CF036640
2181     28      086D  7B2A                      STAD     IX2,10                                       CF036650
2182     36      086E  AE04                      CLAD     I0,4                                         CF036660
2183     46      086F  F8047B00                  MPYDM    0,,X(7B00)                                   CF036670
2184     56      0871  7A04                      STAD     I0,4                                         CF036680
2185     60      0872  F4490012                  ADDM     4,,18                                        CF036690
2186     68      0874  CC2B    (086A)            BXUD     2,,$55                                       % 036700
2187     16R     0875  D740                      PRN      4                                            CF036710
2188      4R     0876  F4590012         $54      ADDM     5,,18                                        % 036720
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2189    12    0878  CD26   (0863)                BXUD    2,,$56                                  % 036730
2190    32R   0879  D7C0                         PRN     12          "CORRECT SYNC TIME"         %S036740
2191    44    087A  8431                         FETM    3,,1        "                           CF036750
2192    52    087B  F40A1C21                     CLA     0,,XXX+3    "FORM INTEGRAL OF T ZERO DOT WITHCF036760
                                        *                            "RESPECT TO TIME SCALED AT 2.5  CF036770
                                        *                            "MILLISECONDS SO THAT AN OVERFLOWCF036780
                                        *                            "WILL OCCUR AT 2.5 MSEC AND EVERYCF036790
                                        *                            "5 MSEC THEREAFTER.             CF036800
                                        *                            "SET CLOCK CHANGE TO + 5 MSEC FORCF036810
                                        *                            "A SLOW CLOCK                   CF036820
2193    72    087D  F8061AAE                     MPYD    0,,=DF((10)/2.5B+18D-3)                     CF036830
2194    82    087F  FC08000E                     ADDD    0,,SUM_T_ZERO_DOT                           CF036840
2195    96    0881  FC07000E                     PTRD    0,,SUM_T_ZERO_DOT                           CF036850
                                        *                            "IS IT TIME TO                  *2036860
2196   100    0883  D073   (0887)                BNO     $20         "MAKE A CORRECTION TO THE"      %R036870
                                        *                            "COMPUTER CLOCK?                CF036880
2197    4R    0884  D051   (0886)                BRL     $21         "IS THE COMPUTER CLOCK TO SLOW? CF036890
2198    4R    0885  A800                         CLSD    0,0         "CHANGE CORRECTION TO MINUS     CF036900
                                        *                            "5 MILLISECONDS"                CF036910
2199    10R   0886  7828   (00A8)      $21       STAD    0,,TIME_INC "SAVE CLOCK CHANGE FOR APPLICA- CF036920
                                        *                            "TION TO TIME IN END SLOT ROUTINECF036930
2200    22R   0887  D770               $20       PRN     7           "ADJUST R15 STACK"              CF036940
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                                        **                                                                  CF036950
                                        * SELECT MEASUREMENT TYPE - TAKE                                    *H036960
                                        * POSITION FIX IF AVAILABLE                                         *H036970
                                        * OTHERWISE TRY FOR A TRACKING                                      *H036980
                                        * FILTER MEASUREMENT                                                *H036990
2201                                    SELECT_MEASUREMENT;                                                 CF037000
2201      2R      0888  DEAD                    FLG       BT+B+EOR        "SET PROGRAM FLAG B FALSE TO NOTECF037010
                                        *                                 "THAT SYSTEM HAS NOT JUST KICKED CF037020
                                        *                                 "OPEN ON A POSITION FIXPOINT     CF037030
2202     32R      0889  84D0            $1        FETM      13,,0                                         % 037040
                                        *                                 "SET M3,4,5,6,7,8,9 = 0          CF037050
                                        *                                 "   (M MATRIX)                   CF037060
                                        *                                 "SET E3,4,5,6,7,8,9 = 0          CF037070
                                        *                                 "   (DIVERGENCE CONTROL)         CF037080
2203     94       088A  FCC7004E                PTRD      12,,M_MATRIX+4   ZERO M3,4,5,6,7,8,9            CF037090
2204    126       088C  84D0                    FETM      13,,0                                         CF037100
2205    188       088D  FCC70060                PTRD      12,,DIVERGENCE_CONTROL+4 ZERO E3,4,5,6,7,8,9    CF037110
2206    194       088F  9E26    (00A6)          CLA       0,,PC_INSERT                                  CF037120
2207    196       0890  DE10                    FLG       NE+A+UCD        "SET PROGRAM FLAG A TRUE FOR A   %S037130
                                        *                                 "POSITION FIX AND FALSE FOR A    CF037140
                                        *                                 "TRACKING FILTER MEASUREMENT     CF037150
                                        *                                 "IS THIS A                       *1037160
2208    200       0891  D263    (08B5)          BRE       TRACKING_FILTER_MEASUREMENT   "POSITION FIX?"   %R037170
2209                                    POSITION_MEASUREMENT;                       36600                   CF037180
2209      2R      0892  DECE                    FLG       CT+C+EOR        "RESET PROGRAM FLAG C WHICH IS   CF037190
                                        *                                 "USED TO COUNT THE 2 MEASUREMENTSCF037200
                                        *                                 "(NORTH AND EAST ERRORS)         CF037210
2210     32       0893  F84C1CD1                FETD      4,,ERROR_NORTH "SET UP SETS OF ARGUMENTS FOR TWOCF037220
2211     54       0895  F82C1F92                FETD      2,,COS_THETA_P "MEASUREMENTS                    CF037230
2212     62       0897  C807                    FETD      0,7            "FIRST = ERROR EAST, COS THETA P,CF037240
2213     66       0898  AC84                    CLAD      8,4            "        -SIN THETA P            CF037250
2214     70       0899  ACA2                    CLAD      10,2           "SECOND = ERROR NORTH, SIN THETA CF037260
2215     74       089A  A844                    CLSD      4,4            "         P, COS THETA P         CF037270
2216     14R      089B  FC070074        $1        PTRD      0,,MEASUREMENT "SET MEASUREMENT = ERROR         CF037280
2217     36       089D  FC27004A                PTRD      2,,M_MATRIX    "SET M1 = 2ND ARGUMENT           CF037290
                                        *                                 "    M2 = 3RD ARGUMENT           CF037300
2218     48       089F  8681    (0081)          FETD      0,,POSITION_NOISE       2**-6                   CF037310
2219     56       08A0  C801                    FETD      0,1            "SET MEASUREMENT VARIANCE        CF037320
                                        *                                 "    = INSERTED POSITION QUALITY CF037330
                                        *                                 "SET E1 = E2 =  POSITION QUALITY CF037340
2220     68       08A1  F8070072                STAD      0,,MEASUREMENT_VARIANCE                         CF037350
2221     90       08A3  FC27005C                PTRD      2,,DIVERGENCE_CONTROL     E 1,2   2**-8         CF037360
2222     92       08A5  DED2                    FLG       CF+C+UCD        "CHANGE STATE OF FLAG C - GOES   CF037370
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                                                  *                                   "TRUE IF 1ST MEAS OTHERWISE FALSECF037380
2223      100  *      08A6  F80D0A1E                    BSV        COMPUTE_BI_AND_C   "START MEASUREMENT PROCESSINGCF037390
2224      108  *      08A8  F80D0A64                    BSV        MEASUREMENT_UPDATE_X   "COMPLETE MEASUREMENT    CF037400
                                                  * MEASUREMENT UPDATE X ROUTINE                                    *H037410
                                                  * RETURNS HERE ONLY IF A STATE                                    *H037420
                                                  * VECTOR WAS UPDATED.                                             *H037430
                                                  * IF THE MEASUREMENT RESULTED                                     *H037440
                                                  * IN NO STATE VECTORS THEN THE                                    *H037450
                                                  * RETURN SKIPS ONE BOX IN THE                                     *H037460
                                                  * PROGRAM FLOW.                                                   *H037470
                                                  *                                   "MEASUREMENT PROCESSED"          CF037480
2225      114          08AA  040008B0                    2BUC       $2                 "SUCCESSFULLY"                   CF037490
2226        2R         08AC  DE01                        FLG        UC+B+UCD           "MEASUREMENT UNSUCCESSFUL"       CF037500
                                                  *                                   "THE POSITION VARIANCES HAVE BEENCF037510
                                                  *                                   "KICKED OPEN.                    CF037520
                                                  *                                   "SET FLAG B TRUE TO BYPASS THE 36CF037530
                                                  *                                   "MILE LIMIT ON STATE VECTOR POSI-CF037540
                                                  *                                   "TION ERRORS.                    CF037550
                                                  *                                   "IS THIS THE                     *1037560
2227        6          08AD  D9DC    (0892)              BCF        POSITION_MEASUREMENT   "SECOND MEASUREMENT?"    CF037570
2228       18R         08AE  D750                        PRN        5                  "DELETE THE ARGUMENTS FOR THE    CF037580
                                                  *                                   "2ND MEASUREMENT AND TRY THE     CF037590
                                                  *                                   "1ST MEASUREMENT AGAIN           CF037600
2229       22          08AF  D90E    (0892)              BUC        POSITION_MEASUREMENT                            CF037610
                                                  *                                   "IS THERE ONE                    *1037620
2230        4R         08B0  D9C6    (089B)      $2      BCT        $1                 "MORE MEASUREMENT TO PROCESS?    CF037630
2231       30R         08B1  84C0                        FETM       12,,0              "RESET THE POSITION FIX MARKER   CF037640
                                                  *                                   "                                CF037650
2232       38          08B2  7026    (00A6)              STA        0,,PC_INSERT                                      037660
2233       44          08B3  04000A15                    BUC        K_EXIT                                           CF037670
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                                        **                                                                  037680
                                        * LOOK FOR MEASUREMENT FROM 1 OR                                   *H037690
                                        * MORE FILTERS FOR ANY STATION                                     *H037700
2234                                    TRACKING_FILTER_MEASUREMENT;                  23300                CF037710
2234      8R     08B5  8417                        FETM     1,,OS-1        "SET UP COUNTER TO CONTROL SEARCHCF037720
                                        *                                  "FOR MEASUREMENTS STARTING WITH  CF037730
                                        *                                  "STATION USED LAST               CF037740
2235      6R     08B6  9E36   (00B6)   $100        CLA      0,,STATION_NUMBER                              % 037750
2236     24      08B7  8462                        FETM     6,,2                                           CF037760
2237     34      08B8  F067006F                    STA      6,,DF_MKR      "SET DIFFERENCY FREQUENCY MARKER CF037770
                                        *                                  "                               *2037780
2238      8R     08BA  C470   (08BB)   $13         BXU      7,,$5          "INCREMENT STATION COUNTER       %R037790
                                        *                                  "RESET TO A IF E                 CF037800
2239     10R     08BB  FC0A1D3F        $5          CLAD     0,,P33         "COMPUTE X = (T ZERO)*(N MILE/CY)CF037810
                                        *                                  "          * (CY/MSEC)           CF037820
2240     30      08BD  F8061AB0                    MPYD       0,,=DF(72*72*6076*6076/2.095/2.095D14B-8)     CF037830
2241     34      08BF  D0D1   (08C1)               BCF      $85            "PHASE DIFFERENCE?"              %R037840
2242      4R     08C0  B800                        SUBD     0,0            "SET X = 0                       CF037850
2243     10R     08C1  FC0B1D17        $85         ADDD     0,,P11         "COMPUTE Y = P11 + X             CF037860
2244     14      08C3  D071   (08C5)               BNO      $63            "DID Y OVERFLOW?"                %R037870
2245      4R     08C4  D00A   (08CF)               BUC      $1             "DIFFERENCE FREQ REQUIRED        CF037880
2246     10R     08C5  FC0B1D2B        $63         ADDD     0,,P22         "COMPUTE Z = P22 + Y             CF037890
2247     14      08C7  D071   (08C9)               BNO      $12            "DID Z OVERFLOW?"                %R037900
2248      4R     08C8  D006   (08CF)               BUC      $1             "DIFFERENCE FREQ REQUIRED        CF037910
2249     10R     08C9  F8081AB2        $12         COMD       0,,=DF(4*6076*4*6076/2.095D+7/2.095D+7B-8)    CF037920
                                        *                                  "CHECK SIZE OF Z                 CF037930
2250     14      08CB  D023   (08CF)               BGE      $1             "IS Z GREATER THAN 4 N MILE?     CF037940
2251     10R     08CC  F057006F                    STA      5,,DF_MKR      "ERROR'S ARE SMALL"              CF037950
2252     12      08CE  9041                        SUBM     4,,1           "RESET DIFF FREQ MARKER"         CF037960
2253      2R     08CF  9442            $1          ADDM     4,,2           "NUMBER OF FREQ NEEDED FOR MEAS  CF037970
2254      4      08D0  9C33                        CLAM     3,,3           "= 2 IF DIFF FREQ OTHERWISE = 1  CF037980
2255      8      08D1  6437                        MPI      3,7                                             CF037990
2256     10      08D2  A423                        CLA      2,3                                             CF038000
2257     14      08D3  F4391DBB                    ADDM     3,,SIGMA_SQ_N_COUNTER                           CF038010
2258      6R     08D5  9E65   (00E5)   $3          CLA      0,,STATIONS_IN_USE                              CF038020
                                        *                                  "EXAMINE STATIONS ENABLED BY     CF038030
                                        *                                  "THE OPERATOR                    CF038040
2259     14      08D6  E57000D5                    EXT      X7,0,POWERS_OF_TWO 1=A 2=B 4=C 8=D              CF038050
2260     18      08D8  D066   (08DF)               BRE      $2             "IS THIS STATION DISABLED?       CF038060
2261      6R     08D9  A753                        CLA      IX5,3          "EXAMINE TRACKING FILTER N       CF038070
2262     14      08DA  E400010F                    EXT      0,0,HX00FF     "COUNTER FOR THIS STATION / FREQ CF038080
2263     16      08DC  98C3                        COMM     0,,3                                            CF038090
                                        *                                  "IS THERE A                      *2038100
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2264    20    08DD  D051   (08DF)          BRL     $2              "MEASUREMENT AVAILABLE FROM THIS %R038110
                                   *                                "FILTER? (N = 3)                CF038120
2265     2R   08DE  9041                   SUBM    4,,1            "DECREMENT NO. OF FREQ STILL    CF038130
                                   *                                "NEEDED FOR A MEAS BY 1         CF038140
2266     8R   08DF  C458   (08D5)  $2      BXU     5,,$3           "ARE THERE MORE FREQUENCIES?    CF038150
2267     2R   08E0  9840                   COMM    4,,0                                            % 038160
                                   *                                "ARE THERE ENOUGH               *2038170
2268     6    08E1  D033   (08E5)          BRG     $28             "FREQ'S AVAILABLE FROM THIS     %R038180
                                   *                                "STATION?                       CF038190
2269     8R   08E2  861F   (009F)          FET     0,,C_I_STATUS_IMAGE                             038200
2270    16    08E3  D700                   PRN     0               "SIGNAL LOSS OFF                *1038210
2271    20    08E4  D067   (08EC)          BRE     $4              "ACCEPT MEASUREMENT IF YES        038220
2272     2R   08E5  9C40           $28     CLAM    4,,0            "NO MEASUREMENT FROM THIS STATIONCF038230
2273    10    08E6  FC7800B6               COM     7,,STATION_NUMBER                               CF038240
2274    14    08E8  DA1F   (08BA)          BNE     $13             "HAVE ALL STATIONS BEEN EXAMINED?%R038250
2275    12R   08E9  8430           $66     FETM    3,,0                                            % 038260
2276    18    08EA  04000A15               BUC     K_EXIT          "NO MEASUREMENTS THIS TIME      CF038270
                                   * THERE IS A MEASUREMENT AVAILABLE                                *H038280
2277    12R   08EC  C828           $4      FETD    2,8             MAKE REG AVAIL REP. STAT NO     CF038290
2278    22    08ED  FC2700B6               STA     2,,STATION_NUMBER                               CF038300
                                   *                                "SAVE NUMBER OF THIS STATION    CF038310
2279    32    08EF  FF89006F               CLAM    IX8,,DF_MKR     ADDRESS-DR MKR + NO OF FREQ     CF038320
2280    34    08F1  9801                   COMM    0,,1                                            CF038330
                                   *                                "ARE THERE 3 FREQ               *2038340
2281    38    08F2  D01F   (0902)          BNE     $71             "AVAILABLE AND IS DIFF FREQ     %R038350
                                   *                                "MARKER TRUE?                   CF038360
                                   *                                "THERE IS AN EXTRA FREQ AVAILABLECF038370
                                   *                                "READ COUNTER FOR THIS STATION  CF038380
                                   *                                "THAT DEFINES OPTIMUM FREQ PAIR CF038390
                                   *                                "THE COUNTER CYCLES BETWEEN 11-10CF038400
                                   *                                "11-13 AND 13-10.  IT IS RESET TOCF038410
2282     8R   08F3  F52A1D07               CLA     X2,,DF_COUNTER  "11-10 WHEN NOT IN DIFF FREQ    CF038420
                                   *                                "                               CF038430
                                   *                                "SET THE N COUNTER OF THE FREQ  CF038440
                                   *                                "THAT IS NOT TO BE USED TO ZERO CF038450
2283    10    08F5  9001                   SUBM    0,,1            DF CNT = 0 GOES TO -1  ZERO 13  CF038460
2284    14    08F6  F809FFFD               COMM    0,,I(-3)        DF CNT =-1 GOES TO -2  ZERO 10  CF038470
2285    18    08F8  D011   (08FA)          BNE     $70             DF CNT =-2 GOES TO  0  ZERO 11  % 038480
2286     2R   08F9  9C00                   CLAM    0,,0                                            CF038490
2287    10R   08FA  F1271D07       $70     STA     X2,,DF_COUNTER                                  % 038500
2288    12    08FC  9402                   ADDM    0,,2            RO = 1, 0, 2 FOR 13, 10, 11     CF038510
2289    14    08FD  B407                   ADD     0,7                                             CF038520
2290    20    08FE  A610                   CLA     I1,0                                            CF038530
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2291    28    08FF  E411010E                EXT     1,1,HXFF00                                  CF038540
2292    36    0901  7210                    STA     I1,0                                        CF038550
2293     2R   0902  B466          $71        ADD     6,6          "CREATE POINTER TO TRACKING    CF038560
                                  *                               "FILTER DATA FOR THIS STA/FREQ CF038570
                                  *                               "CREATE SCRATCH STORAGE IN R15 CF038580
2294     6    0903  F0F90022                SUBM    15,,34       "STACK FOR TF DATA FOR 3 FREQ ANDCF038590
                                  *                               "SPARE                         CF038600
2295     8    0905  9C80                    CLAM    8,,0         RESET INDEX                    CF038610
2296    10R   0906  FD6A1EA3      $7         CLAD    X6,,PHI_ESTIMATE "READ AND SAVE DATA FOR THIS FRCF038620
2297    20    0908  7B8F                    STAD    IX8,15       "PHI ESTIMATE  CYCLES B10      CF038630
2298     2R   0909  9482          $20        ADDM    8,,2                                        % 038640
2299    12    090A  FD6A1E33                CLAD    X6,,SIGMA_SQ_PHI_PHI                        CF038650
2300    22    090C  F8040020                RSAD    0,,10        "SIGMA SQ PHI PHI  CYCLES**2 B10 CF038660
2301    32    090E  7B8F                    STAD    IX8,15       "N COUNT                       CF038670
2302    34    090F  9482                    ADDM    8,,2         INC INDEX                      CF038680
2303    40    0910  A607                    CLA     I0,7         N COUNT                        CF038690
2304    48    0911  E400010F                EXT     0,0,HX00FF   "TF POINTER                    CF038700
2305    50    0913  A416                    CLA     1,6          T.F. OFFSET                    CF038710
2306    60    0914  7B8F                    STAD    IX8,15       "GOOD MEASUREMENT MKR FALSE    CF038720
2307    70    0915  FD6A10D3                CLAD    X6,,SIGMA_SQ_PHI_DOT_PHI_DOT                CF038730
2308    80    0917  F8081AB4                COMD      0,,=DF(.031*.031D-4*2*3.1415926*3.1415926) CF038740
                                  *                               "IS THE PHASE                  *2038750
2309    84    0919  D033   (091D)           BRG     $41          "RATE VARIANCE LESS THAN .031  %R038760
                                  *                               "CEC/SEC?                      CF038770
2310     6R   091A  A78F                    CLA     IX8,15                                      CF038780
2311    12    091B  9664   (00E4)           ADD     0,,HX8000    "SET GOOD MEASUREMENT MKR TRUE CF038790
2312    20    091C  738F                    STA     IX8,15                                      CF038800
2313     2R   091D  9482          $41        ADDM    8,,2         INC INDEX                      CF038810
2314     4    091E  9471                    ADDM    7,,1         INC N COUNTER ADDRESS          CF038820
2315     6    091F  9462                    ADDM    6,,2         "INCREMENT POINTER             CF038830
2316    14    0920  C59B   (0906)           BXU     9,,$7        "ARE THERE MORE FREQ'S TO READ? CF038840
2317     2R   0921  A47F                    CLA     7,15                                        CF038850
2318     6    0922  8C99                    ADDD    9,9                                         CF038860
2319     8    0923  B48F                    ADD     8,15         "SET UP POINTER FOR STATION DATA CF038870
2320    10    0924  8CD1                    CLSM    13,,1        MARKER                         CF038880
2321    12    0925  A44B                    CLA     4,11         "READ STATION NUMBER           CF038890
2322    16    0926  D003   (092A)           BUC     $42                                         CF038900
2323     2R   0927  9488          $43        ADDM    8,,8         "SET UP POINTER FOR BASE DATA  CF038910
2324    10    0928  F44A00CC                CLA     4,,BASE+1    "READ BASE STATION NUMBER      CF038920
2325     4R   092A  FC591CD5      $42        CLAM    5,,BI        "GET POINTER TO SAVED POSITION CF038930
2326    12    092C  C015                    FET     1,5          "MATRIX                        CF038940
2327    16    092D  4406                    MPIM    0,,6         STA POINTER                    CF038950
2328    22    092E  967E   (00FE)           ADD     0,,SV_ADD                                   CF038960
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2329  28        092F  C00A                    FET       0,10                                        CF038970
                                        *                                   "COMPUTE AND SAVE R . S1, R . S2 *I038980
2330  36  *     0930  F80D1707                BSV       MATRIX_3D         "AND R . S3 FOR M MATRIX  CF038990
2331  44        0932  C015                    FET       1,5                                         % 039000
                                        *                                   "COMPUTE"                 *I039010
2332  52  *     0933  F80D0B62                BSV       COMPUTE_THETA1      "PREDICTED CENTRAL ANGLE" CF039020
2333  62        0935  79A0                    STAD      X10,,0                                      % 039030
2334  70  *     0936  F80D1656                BSV       SIN               "SIN THETA 1"             CF039040
2335  82        0938  7DA6                    PTRD      X10,,6                                      % 039050
2336  84        0939  94D1                    ADDM      13,,1                                       % 039060
                                        *                                   "HAS THE BASE             *1039070
2337  88        093A  D964   (0927)           BRE       $43               "DATA BEEN COMPUTED YET?" %R039080
2338   2R       093B  9088                    SUBM      8,,8                                        % 039090
2339  10        093C  AD80                    CLAD      X8,,0             GET ANGLE BACK              039100
2340  14        093D  F8090444                COMM      0,,F(6/180)        NEAR LIMIT               039110
                                        *                                   "                         *2039120
2341  18        093F  D029   (0949)           BGE       $9                "IS THE STATION TOO CLOSE? %R039130
                                        *                                   "(360 N MILE)             CF039140
                                        * UPPER LIMIT OF RANGE TEST IS NEW IN BRN-7                  HH039150
2342   4R       0940  F4F90022          $99   ADDM      15,,34            STATION TOO CLOSE OR TOO FAR CF039160
2343   8        0942  4483                    MPIM      11,,3                                       CF039170
2344  14        0943  FD891D88                CLAM      X11,,SIGMA_SQ_N_COUNTER                     CF039180
2345  24        0945  8420                    FETM      2,,0              "SET N COUNTER AND NUMBER OF CF039190
2346  40        0946  7623                    PTR       I2,3              "KALMAN DUMPS = 0 FOR ALL 3 FREQ CF039200
2347  46        0947  C4000A15                BUC       K_EXIT                                      CF039210
2348   4R       0949  F8095555          $9    COMM      0,,F(120/180)     MAX RANGE = 120 DEGRESS     039220
2349   8        0948  D82C   (0940)           BGE       $99                                         039230
2350   2R       094C  A458                    CLA       5,11              STA NUMBER BASE IN R1     CF039240
                                        *                                   "COMPUTE POINTERS FOR STATION ANDCF039250
2351   8        094D  4C43                    MPIDM     4,,3              "BASE PROPAGATION DATA    CF039260
                                        *                                                           CF039270
                                        *                                                           CF039280
                                        *         REG D = 0001                                      CF039290
                                        *         REG 9 = FREQ  COUNTER (D)                         CF039300
                                        *         REG 8 = POINTER TO R15 STACK  THETA1, R.S2, R.S3, SIN THETA1CF039310
                                        *         REG 7 = POINTER TO R15 STACK  PHI EST, SS, N CNT, TF POINTERCF039320
                                        *         REG 5 = STA  * 3 + FREQ(S) FOR PROP               CF039330
                                        *         REG 4 = BASE * 3 + FREQ(S) FOR PROP               CF039340
                                        *                                                           CF039350
                                        *                                                           CF039360
                                        * START MEASUREMENT LOOP                                    *H039370
2352   4R       094E  FC69004A          $11   CLAM      6,,M_MATRIX       "SET PROGRAM FLAG D TRUE IF THIS CF039380
                                        *                                   "FREQ QUALIFIES AS A GOOD MEAS CF039390
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2353    12    0950  F40A006F                  CLA     0,,DF_MKR                                  11  039400
2354    16    0952  D024    (0957)            BGE     $102          IF NOT 2ND FREQ IN DF        11  039410
2355     4R   0953  D0E3    (0957)            BDT     $102          IF 1ST FREQ OK               11  039420
2356     2R   0954  DEEF                      FLG     DT+EOR+D      RESET FLG D                  11  039430
2357     8    0955  A574                      CLA     X7,,4                                      11  039440
2358    12    0956  D002    (0959)            BUC     $103                                       11  039450
2359     6R   0957  A574            $102      CLA     X7,,4         READ N COUNTER (THIS FREQ)   11  039460
2360     8    0958  DE53                      FLG     L+D           TRUE IF GOOD MEASUREMENT       CF039470
2361     2R   0959  B400            $103      ADD     0,0           DESTROY SIGN                 11  039480
2362     4    095A  9806                      COMM    0,,6                                         CF039490
                                   *                                "IS THERE A                    *2039500
2363    10    095B  040509FB                  BRL     $10           "MEASUREMENT FROM THIS FREQ?   %R039510
                                   *                                "(N = 3)                       CF039520
                                   * COMPUTE M MATRIX                                              *H039530
2364     2R   095D  9488                      ADDM    8,,8          "SET POINTER FOR BASE DATA     CF039540
2365    12R   095E  8430            $46       FETM    3,,0          "SET M1 = M2 = 0               CF039550
2366    32    095F  763A                      PTR     I3,10         ZERO M1, M2                    CF039560
2367    10R   0960  FD9A16B2        $45       CLAD    X9,,LAMBDA_TABLE "COMPUTE M1, M2"            CF039570
2368    14    0962  ACB0                      CLAD    11,0          "                              CF039580
2369    22    0963  AD86                      CLAD    X8,,6         SIN THETA 1                    CF039590
2370    30    0964  C01C                      FET     1,12          LAMBDA                         CF039600
2371    48    0965  69A2                      MPYD    X10,,2        S DOT R2                       CF039610
2372   174    0966  DC02                      DIVD    0,2           "M1 = (S.R2)*LAMBDA/SIN(THETA 1) CF039620
2373   182    0967  B980                      SUBD    X8,,0         "              - M1            CF039630
2374   194    0968  7D80                      PTRD    X8,,0         M 1                            CF039640
2375   202    0969  C01C                      FET     1,12          LAMBDA                         CF039650
2376   220    096A  69A4                      MPYD    X10,,4        S DOT R3                       CF039660
2377   346    096B  DC02                      DIVD    0,2           "                              CF039670
2378   354    096C  B982                      SUBD    X8,,2         "M2 = (S.R3)*LAMBDA/SIN(THETA 1) CF039680
2379   366    096D  7D82                      PTRD    X8,,2         "              - M2            CF039690
2380   368    096E  9088                      SUBM    8,,8          "SET POINTER FOR STATION DATA  %S039700
2381   370    096F  90D1                      SUBM    13,,1                                        CF039710
2382   374    0970  D012    (0973)            BNE     $44           "ARE THE M'S COMPLETE?         CF039720
                                   *                                "                              *2039730
2383     4R   0971  D9C2    (0960)            BCT     $45           "PHASE DIFFERENCE?"            CF039740
                                   *                                "M(STA)- M(BASE)               CF039750
2384     4R   0972  D905    (095E)            BUC     $46           "RHO-RHO  DON'T NEED BASE M'S  CF039760
2385     2R   0973  9488            $44       ADDM    8,,8                                         CF039770
2386    12    0974  FD9A1722                  CLAD    X9,,V_LAMBDA  "SET KICK LIMIT = V LAMBDA     CF039780
2387    20    0976  7043    (00C3)            STA     0,,CONNIE_LIMIT                              CF039790
2388    24    0977  D0C1    (0979)            BCT     $47           "PHASE DIFFERENCE?"            CF039800
2389    10R   0978  7964                      STAD    X6,,4         "RHO-RHO"                      CF039810
                                   *                                "SET M3 = V LAMBDA             CF039820
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2390    8R    0979  F55A1CA1      $47    CLA    X5,,PROP_C      "READ PROPAGATION VARIANCE      CF039830
                                   *                            "FOR STATION                    CF039840
2391    12    097B  D0D2   (097E)        BCF    $49             "PHASE DIFFERENCE?"             %R039850
2392    8R    097C  F54B1CA1             ADD    X4,,PROP_C      "ADD PROPAGATION VARIANCE FOR   CF039860
                                   *                            "BASE STATION                   CF039870
2393    10R   097E  F8040040      $49    RSAD   0,,9            "MEASUREMENT VARIANCE  = PROPAGA-CF039880
                                   *                            "  TION VARIANCE + SIGMA SQ PHI  CF039890
2394    8R    0980  BD72          $48    ADDD   X7,,2                                           % 039900
                                   *                            "          PHI                  CF039910
2395    20    0981  F8070072             STAD   0,,MEASUREMENT_VARIANCE                        CF039920
2396    24    0983  D0DC   (0990)        BCF    $50             "PHASE DIFFERENCE?"             %R039930
2397    2R    0984  8045                 COM    4,5                                             % 039940
                                   *                            "IS THIS A                      *1039950
2398    6     0985  D01A   (0990)        BNE    $50             "BASE STATION MEASUREMENT?      %R039960
2399    14R   0986  F99C0C43             FETD   X9,,M_4_TABLE   "READ M4 FROM A TABLE           CF039970
2400    26    0988  7D86                 PTRD   X8,,6           "NOTE - M1, M2 WILL BE ZERO     CF039980
                                   *                            "                               CF039990
                                   *                            "USE PHI DOT DR FROM THE TRACKINGCF040000
                                   *                            "FILTER AS THE 'PREDICTED'      CF040010
                                   *                            "MEASUREMENT REFERENCE          CF040020
2401    34    0989  F40A1F0E             CLA    0,,PHI_DOT_DR_BASE                             CF040030
2402    44    098B  F8040019             MPYDM  0,,F(((10)/4)/3.14159B10) SCALE CYC/SEC B10    CF040040
2403    64    098D  F9961768             MPYD   X9,,TF_LAMBDA_CONSTANT_TABLE CONVERT FROM      CF040050
                                   *                            13.6 TO APPROPIATE FREQ         CF040060
2404    68    098F  D00D   (099D)        BUC    $51                                            CF040070
2405    8R    0990  AD80          $50    CLAD   X8,,0           "GET STATION NO., FREQ AND      CF040080
2406    14    0991  C009                 FET    0,9             "THETA 1 ARGUMENTS FOR THETA C  CF040090
2407    22    0992  8636   (00B6)        FET    0,,STATION_NUMBER                              CF040100
                                   *                            "COMPUTE PREDICTED TOTAL PHASE  *I040110
2408    30 *  0993  F80D0B47             BSV    THETA_C          "FOR THE STATION              CF040120
2409    34    0995  D0D7   (099D)        BCF    $51             "PHASE DIFFERENCE?              %R040130
2410    12R   0996  C988                 FETD   X8,,8           "GET BASE STATION NO., FREQ AND CF040140
2411    18    0997  C00B                 FET    0,11            "THETA 1 ARGUMENTS FOR THETA C  CF040150
2412    26    0998  864C   (00CC)        FET    0,,BASE+1                                      CF040160
                                   *                            "COMPUTE PREDICTED TOTAL PHASE  *I040170
2413    34 *  0999  F80D0B47             BSV    THETA_C          "FOR THE BASE STATION         CF040180
2414    38    099B  B820                 SUBD   2,0             "FORM PREDICTED PHASE DIFFERENCE CF040190
2415    48    099C  D710                 PRN    1                                              CF040200
2416    12R   099D  C970          $51    FETD   X7,,0           "COMPUTE KALMAN MEASUREMENT     CF040210
2417    16    099E  B802                 SUBD   0,2             "= TRACKING FILTER PHI -        CF040220
2418    24    099F  46DA   (00DA)        MPID   0,,HX0020       "     PREDICTED                 CF040230
2419    38    09A0  FC070074             PTRD   0,,MEASUREMENT  B6 PI                          CF040240
2420    54    09A2  68BB                 MPYD   11,11           "COMPUTE DIVERGENCE CONTROL E1,2 CF040250
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2421      64        09A3  FC0A0072                  CLAD    0,,MEASUREMENT_VARIANCE                          CF040260
2422     190        09A5  DC0B                      DIVD    0,11            "= K * MEAS VAR / (LAMBDA)**2    CF040270
2423     210        09A6  F8061AB6                  MPYD    0,,=DF(.0625)                                    CF040280
2424     222        09A8  C821                      FETD    2,1                                              CF040290
2425     244        09A9  FC27005C                  PTRD    2,,DIVERGENCE_CONTROL E1,2  2**-8                CF040300
2426     254        09AB  F8040080                  RSAD    0,,8                                             CF040310
2427     270        09AD  C841                      FETD    4,1                                              CF040320
2428     300        09AE  FC470064                  PTRD    4,,DIVERGENCE_CONTROL+8  E 5,6,7 2**0            CF040330
2429     310        09B0  FCBA0072                  CLAD    11,,MEASUREMENT_VARIANCE                         CF040340
2430     320        09B2  FD9A1722                  CLAD    X9,,V_LAMBDA                                     CF040350
2431     336        09B4  6800                      MPYD    0,0             "                                CF040360
2432     462        09B5  DCB0                      DIVD    11,0            "E3 = K * MEASVAR/(V LAMBDA)**2  CF040370
2433     482        09B6  F8B61AB6                  MPYD    11,,=DF(.0625)                                   CF040380
2434     494        09B8  F8B70060                  STAD    11,,DIVERGENCE_CONTROL+4   E3 2**-18             CF040390
2435     502        09BA  F40A006F                  CLA     0,,DF_MKR                                        CF040400
2436     506        09BC  D163   (09D0)             BRE     $90             "IS KALMAN IN DIFFERENCE FREQ?   %R040410
2437       6R       09BD  04030A08                  BRG     $91             "IS THIS THE 1ST FREQ?"          CF040420
2438       2R       09BF  9CC6                      CLAM    12,,6           "SECOND FREQ"                    CF040430
                                          *                                 "FORM DIFFERENCES"               CF040440
2439       4        09C0  9CB0                      CLAM    11,,0                                            CF040450
2440      10R       09C1  FDBA1C06        $94       CLAD    X11,,KAL_TEMP                                    % 040460
2441      18        09C3  BBB6                      SUBD    IX11,6          " M = M(2ND) - M(1ST), M1,2,3,4  CF040470
2442      28        09C4  7BB6                      STAD    IX11,6          " KICK LIMIT = (2ND) - (1ST)     CF040480
                                          *                                 " MEAS VAR   = (2ND) + (1ST)     CF040490
                                          *                                 " MEASUREMENT = (2ND) - (1ST)    CF040500
2443      36        09C5  CCB5   (09C1)             BXUD    11,,$94                                          % 040510
2444      26R       09C6  F83C1C13                  FETD    3,,KAL_TEMP+13                                   CF040520
2445      32        09C8  9243   (00C3)             SUB     0,,CONNIE_LIMIT                                  CF040530
2446      40        09C9  7443   (00C3)             PTR     0,,CONNIE_LIMIT                                  CF040540
2447      50        09CA  FC0B0072                  ADDD    0,,MEASUREMENT_VARIANCE                          CF040550
2448      60        09CC  F82B0074                  SUBD    2,,MEASUREMENT                                   CF040560
2449      82        09CE  FC270072                  PTRD    2,,MEASUREMENT_VARIANCE                          CF040570
2450       8R *     09D0  F80D0A1E        $90       BSV     COMPUTE_BI_AND_C   "START MEASUREMENT PROCESSINGCF040580
2451      16  *     09D2  F80D0A64                  BSV     MEASUREMENT_UPDATE_X   "COMPLETE MEASUREMENT"    CF040590
                                          * MEASUREMENT UPDATE X ROUTINE                                     *H040600
                                          * RETURNS HERE ONLY IF A STATE                                     *H040610
                                          * VECTOR WAS UPDATED.                                              *H040620
                                          * IF NO STATE VECTORS WERE GEN-                                    *H040630
                                          * ERATED THEN IT RETURNS TO $10                                    *H040640
                                          * IF 'GOOD MEASUREMENT' IS FALSE                                   *H040650
                                          * TO TRY ANOTHER FREQ. OTHERWISE                                   *H040660
2452       6R       09D4  A575            $77       CLA     X7,5            "READ POINTER TO TRACKING FILTER CF040670
2453       8        09D5  A460                      CLA     6,0             "DATA FOR THIS FREQ TO PREPARE   CF040680
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                                        *                                   "FOR THE RESET OT FILTERS.        CF040690
2454    12    09D6  D0D2   (09D9)                BCF     $64                 "PHASE DIFFERENCE?"               %R040700
2455     2R   09D7  8045                         COM     4,5                                                   % 040710
                                        *                                   "IS THIS THE BASE                 *2040720
2456     6    09D8  D06A   (09E3)                BRE     $65                 "STATION?  (NEVER RESET BASE      CF040730
                                        *                                   "FILTER)"                         CF040740
2457     4R   09D9  8800                $64      SUBD    0,0                 "RESET TRACKING FILTER"           CF040750
                                        *                                   "                                 CF040760
                                        *                                   "OPEN ALL TRACKING FILTER         CF040770
                                        *                                   "VARIANCES                        CF040780
2458    16    09DA  F9671E03                     STAD    X6,,SIGMA_SQ_PHI_PHI_DOT                              CF040790
2459    24    09DC  9EE9   (00E9)                CLAD    0,,=DF((1)/12)                                        CF040800
2460    36    09DD  F9671E33                     STAD    X6,,SIGMA_SQ_PHI_PHI                                  CF040810
2461    46    09DF  FC0A1A8E                     CLAD    0,,=DF(.17765D-3) .006 PI **2                         CF040820
2462    58    09E1  F9671DD3                     STAD    X6,,SIGMA_SQ_PHI_DOT_PHI_DOT                          CF040830
2463     8R   09E3  F00A006F            $65      CLS     0,,DF_MKR           "COMPLIMENT DIFFERENCE FREQ MKR   CF040840
                                        *                                   "(= 0 IF NOT DIFF FREQ)           CF040850
2464    12    09E5  D064   (09EA)                BRE     $97                 "IS KALMAN IN DIFFERENCE FREQ?    %R040860
2465     4R   09E6  D051   (09E8)                BRL     $96                 "IS THIS THE FIRST FREQ?"         CF040870
2466     2R   09E7  9C00                         CLAM    0,,0                "RESET DIFF FREQ MKR              CF040880
2467    10R   09E8  F007006F            $96      STA     0,,DF_MKR           "SAVE NEW DIFF FREQ MKR           CF040890
2468     6R   09EA  F0654000            $97      RSL     6,,1                "UPDATE KALMAN DUMP COUNTS FOR    CF040900
                                        *                                   "THIS STATION FREQUENCY           CF040910
                                        *                                   "RESET COUNT TO 0 AT 100 FOR THE  CF040920
                                        *                                   "CONVENIENCE OF THE C/I PROGRAM   CF040930
2469    14    09EC  F56A1DBB                     CLA     X6,,SIGMA_SQ_N_COUNTER                                CF040940
2470    24    09EE  F0071DB9                     STA     0,,N_CTR_SAVE  SAVE INCASE OF MISFIRE IN DF    11  040950
2471    34    09F0  F0671DBA                     STA     6,,N_CTR_SAVE+1  R6 IS NCTR INDEX              11  040960
2472    42    09F2  E400010E                     EXT     0,0,HXFF00                                            CF040970
2473    48    09F4  965D   (00DD)                ADD     0,,HX0100                                             CF040980
2474    52    09F5  F8096400                     COMM    0,,X(6400)      99 DEC                                CF040990
2475    56    09F7  D051   (09F9)                BRL     $37                                                   % 041000
2476     2R   09F8  9C00                         CLAM    0,0                                                   CF041010
2477    10R   09F9  F1671DBB            $37      STA     X6,,SIGMA_SQ_N_COUNTER                                % 041020
                                        * RETURN HERE FROM MEASUREMENT                                        *H041030
                                        * UPDATE IF NO STATE VECTORS WERE                                     *H041040
                                        * GENERATED AND THE SYSTEM WAS                                        *H041050
                                        * NOT KICKED BECAUSE THE 'GOOD                                        *H041060
                                        * MEASUREMENT' MARKER WAS FALSE                                       *H041070
2478     2R   09FB  9CD1                $10      CLAM    13,,1               "INCREMENT POINTERS TO PREPARE    CF041080
                                        *                                   "FOR THE NEXT FREQ                CF041090
2479     4    09FC  9476                         ADDM    7,,6                INC T.F. ADDR                     CF041100
2480     6    09FD  9451                         ADDM    5,,1                STA                               CF041110
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2481      8          09FE  9441                        ADDM    4,,1          BASE                                    CF041120
                                                       *                     "ARE THERE MORE                         *1041130
2482      18         09FF  FC9C094E                    BXUD    9,,$11        "FREQUENCIES TO TRY?"                   CF041140
                                                       * RETURN HERE FROM MEASUREMENT                                *H041150
                                                       * UPDATE IF NO STATE VECTORS WERE                             *H041160
                                                       * GENERATED AND THE SYSTEM WAS                                *H041170
                                                       * KICKED OPEN.  THIS WILL PREVENT                             *H041180
                                                       * ANOTHER FREQ MEASUREMENT FROM                               *H041190
                                                       * THIS STATION NOW.                                           *H041200
2483      8R         0A01  F40A006F                    $92     CLA     0,,DF_MKR     RESTORE LOW FREQ NCTR IF      11  041210
2484      12         0A03  D024    (0A08)               BGE     $101          KICKED IN DIFF FREQ, I.E. DF    11  041220
2485      10R        0A04  FC0A1D89                    CLAD    0,,N_CTR_SAVE IS NEGATIVE                     11  041230
2486      20         0A06  F1171D88                    STA     X1,,SIGMA_SQ_N_COUNTER                        11  041240
2487      4R         0A08  F4F90022                    $101    ADDM    15,,34        "RELEASE SCRATCH STORAGE        11  041250
2488      8          0A0A  D00A    (0A15)               BUC     K_EXIT                                        CF041260
2489      36R        0A0B  CA66                        $91     FETD    I6,6          M MATRIX                        CF041270
2490      74         0A0C  FC671C06                    PTRD    6,,KAL_TEMP   "SAVE M1,2,3,4, MEAS, MEAS VAR     CF041280
                                                       *                     "AND KICK LIMIT FOR THE 1ST FREQ CF041290
2491      96         0A0E  F82C0072                    FETD    2,,MEASUREMENT_VARIANCE     C AND Y             CF041300
2492      104        0A10  8643    (00C3)               FET     0,,CONNIE_LIMIT                                   CF041310
2493      130        0A11  FC371C13                    PTRD    3,,KAL_TEMP+13                                    CF041320
2494      136        0A13  040009D4                    BUC     $77                                               CF041330
                                                       *          KALMAN COMPLETE                                   *H041340
                                                       * LOOK FOR CONFIRM AND EXECUTE                                *H041350
                                                       * PROPAGATION PREDICTION                                      *H041360
2495      6R         0A15  9E34    (0084)               K_EXIT  CLA     0,,PP_STATION "INCREMENT A COUNTER TO CYCLE ALL%S041370
                                                       *                     "STATIONS THROUGH PROP PREDICTIONCF041380
2496      8          0A16  9C17                        CLAM    1,,OS-1       "(ONE EVERY 10 SECONDS)         CF041390
2497      18         0A17  F40C0A1A                    BXU     0,,$30                                        % 041400
2498      8R         0A19  7010    (0090)               STA     0,,KAL_STA_FLG                            11  041410
2499      8R         0A1A  7034    (0084)               $30     STA     0,,PP_STATION                         % 041420
                                                       *                     "COMPUTE THETA1, THETA2 AND     *I041430
2500      16  *      0A1B  F80D0C49                    BSV     PROPAGATION_PREDICTION   "PROP C FOR 1 STATION" CF041440
2501      54         0A1D  D500                        BBK     13                                            CF041450
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                                        **                    3586          TOTAL    5602                    CF041460
                                        *                     COMPUTE BI AND C                               *H041470
                                        *                                                                    *H041480
                                        * THIS ROUTINE COMPUTES THE MEASUREMENT WEIGHTING VECTOR B           *H041490
                                        *                                                                    *H041500
2502                                    COMPUTE_BI_AND_C:                                                    CF041510
2502      8R *     0A1E  F80D08FB                 BSV       REG_SETUP      "INITIALIZE 1070 REGISTERS       CF041520
                                        *                                   "COMPUTE AND SAVE (P)(M)TRANSPOSECF041530
                                        *                                   "                                CF041540
                                        *                                   "COMPUTE (M)(P)(M)TRANSPOSE      CF041550
                                        *                                   "                                CF041560
                                        *                                            "Q = MPMT + MEAS VAR    CF041570
2503      2R       0A20  A46B            $5         CLA       6,11                                           % 041580
2504      4R       0A21  B822            $3         SUBD      2,2                                            % 041590
2505      8R       0A22  AF7C            $2         CLAD      IX7,12                                         % 041600
2506     26        0A23  6B76                       MPYD      IX7,6          P MATRIX                        CF041610
2507     30        0A24  BC20                       ADDD      2,0                                            CF041620
2508      8R       0A25  CC74    (0A22)  $1         BXUD      7,,$2                                          % 041630
2509      4R       0A26  AC02                       CLAD      0,2            KAL TEMP     PMT                CF041640
2510     14        0A27  7B9D                       STAD      IX9,13                                         CF041650
2511     32        0A28  6B9C                       MPYD      IX9,12                                         CF041660
2512     36        0A29  BC40                       ADDD      4,0              MPMT                          CF041670
2513     40        0A2A  F4690012                   ADDM      6,,18            INC P ADDR                    CF041680
2514     48        0A2C  CC9C    (0A21)             BXUD      9,,$3                                          % 041690
2515     10R       0A2D  FC4B0072                   ADDD      4,,MEASUREMENT_VARIANCE    Q = MPMT+C          CF041700
                                        *                      2016                                          CF041710
2516      8R       0A2F  AF7C            COMPUTE_BI CLAD      IX7,12                                         CF041720
2517     28        0A30  F976C05C                   MPYD      X7,,DIVERGENCE_CONTROL                          CF041730
                                        *                                   "COMPUTE B"                      CF041740
                                        *                                   "                                CF041750
                                        *                                   "B =(PMT + MT*E) / Q  (CODE 0)   CF041760
                                        *                                   "                                CF041770
                                        *                                   "OR"                             CF041780
2518     36        0A32  BF7D                       ADDD      IX7,13        "                                CF041790
                                        *                                   "B = Q / (PMT + MT*E)  (CODE 1)  CF041800
                                        *                                   "                                CF041810
                                        *                                   "SET B CODE TO DEFINE WHICH B WASCF041820
                                        *                                   "COMPUTED B(1) CODE IS IN BIT 16 CF041830
                                        *                                   "AND B(9) CODE IS IN BIT 8       CF041840
2519     40        0A33  AC20                       CLAD      2,0                                            CF041850
2520     44        0A34  D163    (0A48)             BRE       $1                                             % 041860
2521      4R       0A35  D031    (0A37)             BRG       $2                                             % 041870
2522      4R       0A36  A820                       CLSD      2,0                                            CF041880
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2523     4R    0A37  8824          $2        COMD    2,4                                  % 041890
2524     8     0A38  D05E   (0A47)           BRL     $3                                   % 041900
2525     4R    0A39  D037   (0A41)           BRG     $4                                   % 041910
2526     2R    0A3A  9800                    COMM    0,,0                                 CF041920
2527     6     0A3B  D052   (0A3E)           BRL     $5                                   % 041930
2528     8R    0A3C  9EF3   (00F3)           CLAD    0,,=DX(7FFFFFFF)                     CF041940
2529    12     0A3D  D00A   (0A48)           BUC     $1                                   % 041950
2530    10R    0A3E  FC0A1AB8      $5        CLAD    0,,=DX(80000001)                     % 041960
2531    14     0A40  D007   (0A48)           BUC     $1                                   % 041970
2532     4R    0A41  AC24          $4        CLAD    2,4                                  % 041980
2533   130     0A42  DC20                    DIVD    2,0          Q/PM(T)                 CF041990
2534   134     0A43  F4990040                ADDM    9,,X(40)                             CF042000
2535   138     0A45  AC02                    CLAD    0,2                                  CF042010
2536   142     0A46  D001   (0A48)           BUC     $1                                   % 042020
2537   126R    0A47  DC04          $3        DIVD    0,4                                  % 042030
2538    12R    0A48  F9771CD5      $1        STAD    X7,,BI                               % 042040
2539    14     0A4A  B499                    ADD     9,9          SHIFT B CODE            CF042050
2540    22     0A4B  CD7D   (0A2F)           BXUD    7,,COMPUTE_BI                        % 042060
2541    10R    0A4C  F0971CE7                STA     9,,BI+18     B CODE                  CF042070
2542    20     0A4E  F8481ABA                COMD    4,,=DF((1)/10)                       CF042080
                                   * DETERMINE KICK CRITERIA                               *H042090
2543    24     0A50  D052   (0A53)           BRL     $6           "IS Q LESS THAN 1/10?   CF042100
2544    10R    0A51  FC4A1ABA                CLAD    4,,=DF((1)/10) "SET Q = 1/10         CF042110
2545     6R    0A53  4C49          $6        MPIDM   4,,9         "MULTIPLY Q BY 9"       CF042120
2546    10     0A54  D08C   (0A61)           BAT     $7           "IS THIS A POSITION MEASUREMENT? CF042130
2547     6R    0A55  9E43   (00C3)           CLA     0,,CONNIE_LIMIT "COMPUTE UPPER KICK LIMIT = CF042140
2548    22     0A56  6800                    MPYD    0,0          " (KICK LIMIT)**2 + .75 CY**2 CF042150
2549    26     0A57  F4090018                ADDM    0,,F(.75B-10)  INCREASE MAXIMUM      CF042160
2550    30     0A59  8840                    COMD    4,0                                  CF042170
2551    34     0A5A  D041   (0A5C)           BLE     $10          "IS Q LESS THAN UPPER KICK LIMIT?CF042180
2552     4R    0A5B  AC40                    CLAD    4,0          "SET Q = UPPER KICK LIMIT CF042190
2553    10R    0A5C  FC4B1ABC      $10       ADDD    4,,=DF((.04)*.04B-10)                CF042200
                                   *                                                       CF042210
                                   *                            "ADD .04 CYCLE TO Q      CF042220
2554    12R    0A5E  F8470070      $8        STAD    4,,CONNIE    "SAVE KICK VALUE        CF042230
2555    50     0A60  D5D0                    BBK     13                                   CF042240
2556    10R    0A61  FC4B1ABE      $7        ADDD      4,,=DF(2*2*6076*6076/2.095D+7/2.095D+7B-6)  CF042250
2557    14     0A63  D806   (0A5E)           BUC     $8           "ADD 2 N MILE TO Q      CF042260
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                                                                                                                                CF042270
                                **                                                                                              CF042270
                                *                                MEASUREMENT UPDATE X                                           *H042280
                                *                                                                                               *H042290
                                * UPDATE STATE VECTORS WITH THIS MEASUREMENT                                                    *H042300
                                *                                                                                               *H042310
2558                            MEASUREMENT_UPDATE_X;                                                                          CF042320
                                *  FLAG A SET FOR FIXPOINT MEASUREMENT                                                         CF042330
2558      34R     0A64  F4D81C27        FETM    13,,X       "GENERATE POINTERS TO THE FIRST                                   CF042340
2559      42      0A66  F42A0084        CLA     2,,N        "STATE VECTOR AND THE FIRST SPARE                                 CF042350
2560      46      0A68  4424            MPIM    2,,4        "STORAGE FOR NEW STATE VECTORS                                    CF042360
2561      48      0A69  842D            ADD     2,13        "                                                                 CF042370
                  *                                         "SET AVERAGE STATE VECTOR (XXX)                                   CF042380
                  *                                         "    TO ZERO                                                      CF042390
2562      50      0A6A  9424            ADDM    2,,4        X(NN) BASE ADDR                                                   CF042400
2563      52      0A6B  A430            CLA     3,13        X (I)                                                             CF042410
2564      74      0A6C  8480            FETM    8,,0                                                                          CF042420
2565      116     0A6D  F4871C1E        PTR     8,,XXX      ZERO AVERAGE VECTOR                                               CF042430
2566      118     0A6F  A442            CLA     4,2         X(NN)                                                             CF042440
2567      10R     0A70  FC8A1AC0  $17   CLAD    11,,=DF(18-5) 2PI AT 2**6 PI   1 LANE                                       CF042450
                  *                                         "SET RESIDUAL INCREMENT = +1 LANE                                 CF042460
2568      16      0A72  C003            FET     0,3         X(I)                                                              CF042470
                  *                                         "GET STATE VECTOR - 4 ELEMENTS                                    *I042480
2569      24  *   0A73  F80D08A0        BSV     ASSEMBLE_XX "FROM MULTIPLE + 5 COMMON                                         CF042490
2570      32      0A75  F4081CED        FETM    0,,XX                                                                         % 042500
2571      40  *   0A77  F80D08ED        BSV     Y_MINUS_MX  "COMPUTE MEASUREMENT RESIDUAL                                     CF042510
2572      10R     0A79  FC5A0076  $98   CLAD    5,,MEASUREMENT_RESIDUAL                                                  135CF042520
                  *                                         "READ THE MEASUREMENT RESIDUAL                                    CF042530
2573      4R      0A7B  AC75        $4    CLAD    7,5         "FORM (RES +/- INC)**2 FOR                                        CF042540
                  *                                         "TESTING AGAINST KICK LIMIT                                       CF042550
2574      20      0A7C  6877            MPYD    7,7         (Y-MX)**2                                                         CF042560
2575      30      0A7D  F8780070        COMD    7,,CONNIE     K(MPM(T)+C)                                                     CF042570
                  *                                         "IS THIS RESIDUAL                                                 *I042580
2576      34      0A7F  D140    (0A90)  BLE     $1          "INSIDE THE ACCEPTABLE LIMIT?                                     CF042590
                  *                                         "IS THIS A                                                        *2042600
2577      4R      0A80  D0AF    (0A90)  BBT     $1          "POSITION FIX THAT HAS ALREADY                                    CF042610
                  *                                         "CAUSED A KICK?                                                   *H042620
                  * THE RESIDUAL INCREMENT WILL BE USED                                                                          *H042630
                  * TO TRY TO DRIVE THE RESIDUAL INSIDE                                                                         *H042640
                  * THE LIMITS.  THE INCREMENT MUST BE                                                                          *H042650
                  * THE OPPOSITE SIGN OF THE RESIDUAL.                                                                          *H042660
                  * THE INCREMENT IS + FIRST AND THEN                                                                           *H042670
                  * MINUS WHICH IS USED AS A MARKER TO                                                                          *H042680
                  * DEFINE PROCESS IS COMPLETE                                                                                  *H042690
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2578      4R      0A81  AC05                    CLAD     0,5                                  % 042700
2579      20      0A82  680B                    MPYD     0,11                                 % 042710
                                        *                                  "ARE THE RESIDUAL                *1042720
2580      24      0A83  D055   (0A89)           BRL      $6                 "AND INCREMENT OPPOSITE IN SIGN? CF042730
2581      4R      0A84  A8BB                    CLSD     11,11              "CHANGE SIGN OF INCREMENT SO THATCF042740
                                        *                                  "ALL VALUES OF RESIDUAL + OR -   CF042750
                                        *                                  "N LANES INSIDE LIMIT ARE USED   CF042760
                                        *                                  "IS THE INCREMENT                *2042770
2582      10      0A85  04030ADE                BRG      $2                 "BACK TO + AGAIN?"               CF042780
                                        *                                  "(PROCESS DONE)                  CF042790
2583      10R     0A87  FC5A0076                CLAD     5,,MEASUREMENT_RESIDUAL                         CF042800
                                        *                                  "READ ORIGINAL RESIDUAL AGAIN TO CF042810
                                        *                                  "TRY RESIDUE MINUS N LANES       CF042820
                                        * ENTER HERE IF IT IS DECIDED TO                                   *H042830
                                        * ELIMINTE THIS VECTOR AFTER UPDATE                                *H042840
                                        *                                                                 *H042850
                                        * ONLY INCREMENT TRACKING FILTER                                   *H042860
                                        * MEASUREMENTS BY LANES                                            *H042870
2584      6R      0A89  04080ADE        $6      BAT      $2                 "IS THIS A POSITION FIX?"        CF042880
2585      6R      0A8B  C003                    FET      0,3                                  % 042890
                                        *                                  "CREATE VECTOR AGAIN AS IT MAY BE*I042900
2586      14  *   0A8C  F80D0BA0                BSV      ASSEMBLE_XX        "CHANGED IN EARLIER PROCESSING   CF042910
2587      18      0A8E  BC5B                    ADDD     5,11               "INCREMENT RESIDUAL              CF042920
2588      22      0A8F  D905   (0A7B)           BUC      $4                                          CF042930
                                        * THIS RESIDUAL + OR - N LANES IS                                 *H042940
                                        * NOW WITHIN ACCEPTABLE LIMITS                                    *H042950
                                        * COMPUTE STATE VECTOR NOW AS THIS                                *H042960
                                        * MEASUREMENT FITS THIS VECTOR.                                   *H042970
2589      18R     0A90  F4580010        $1      FETM     5,,16              "SET UP TO GENERATE VECTOR (XX)  CF042980
2590      20      0A92  9C38                    CLAM     3,,8               "READ B CODE                     CF042990
2591      28      0A93  F4DA1CE7                CLA      13,,BI+18            B CODE                         CF043000
2592      4R      0A95  AC6B            $5      CLAD     6,11                 RESIDUAL                       CF043010
2593      14      0A96  FD4A1CD5                CLAD     X4,,BI                                      CF043020
2594      16      0A98  A4DD                    CLA      13,13              "COMPUTE XX(I)(NEW) = XX(I)      CF043030
                                        *                                  "    + RES * B (OR RES/1/B)      CF043040
                                        *                                  "    AS INDICATED BY B CODE FOR  CF043050
                                        *                                  "    THIS TERM                   CF043060
2595      20      0A99  D023   (0A9D)           BGE      $8                                          % 043070
2596      126R    0A9A  DC60                    DIVD     6,0                  Y(RES)/1/B                     CF043080
2597      130     0A9B  AC06                    CLAD     0,6                                         CF043090
2598      134     0A9C  D001   (0A9E)           BUC      $9                                          % 043100
2599      16R     0A9D  6806            $8      MPYD     0,6                                         % 043110
2600      8R      0A9E  96F1   (00F1)   $9      ADDD     0,,=DX(00008000)                            % 043120
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2601    16    0A9F  F52B1CED                ADD     X2,,XX                                  CF043130
2602    26    0AA1  F1271CED                STA     X2,,XX        R9= X(I)  RA = X(NN)      CF043140
2603    28    0AA3  B4DD                    ADD     13,13       INC CODE                    CF043150
2604    36    0AA4  C420   (0AA5)           BXU     2,,$7                                   % 043160
2605     8R   0AA5  CD41   (0A95)   $7      BXUD    4,,$5       "HAVE ALL TERMS BEEN COMPUTED?  %R043170
2606    18R   0AA6  D750                    PRN     5                                       % 043180
                                     *                          "DO 36 MILE TEST            *2043190
2607    22    0AA7  D0A8   (0AB0)           BBT     $22         "UNLESS POSITION FIX HAS"   %R043200
                                     *                          "KICKED SYSTEM?             CF043210
2608    10R   0AA8  FC0A1CED                CLAD    0,,XX       "EXAMINE POSITION ERROR IN THIS CF043220
2609    16    0AAA  6000                    MPY     0,0         "VECTOR (XX(1))**2 + (XX(2))**2 CF043230
2610    22    0AAB  6011                    MPY     1,1                                     CF043240
2611    24    0AAC  B401                    ADD     0,1         THETA2**2 + THETA3**2       CF043250
2612    28    0AAD  F8090392                COMM    0,,F(36*36/2.095/2.095D14*6076*6076B8)  CF043260
                                     *                          "IS THE POSITION            *2043270
2613    32    0AAF  DA27   (0A89)           BGE     $6          "ERROR MORE THAN 36 N MILE?  CF043280
                                     *                          "(REJECT VECTOR)            CF043290
2614     2R   0AB0  A4AA            $22     CLA     10,10       "EXAMINE NUMBER OF VECTORS  CF043300
                                     *                          "COMPUTED SO FAR            CF043310
                                     *                          "WAS THE VECTOR             *1043320
2615     6    0AB1  D260   (0AD2)           BRE     $10         "JUST GENERATED THE VERY FIRST? CF043330
2616     2R   0AB2  9C83                    CLAM    8,,3        "SET UP TO TEST VECTOR      CF043340
2617     4    0AB3  A412                    CLA     1,2         "FOR UNIQUENESS             CF043350
2618     2R   0AB4  9C70            $11     CLAM    7,,0        "SET TERM COUNT TO ZERO     CF043360
2619     8R   0AB5  F57A1CED        $15     CLA     X7,,XX      "FORM DIFFERENCE OF ONE TERM OF CF043370
2620    14    0AB7  B371                    SUB     IX7,1       "THE NEW VECTOR WITH CORRESPOND- CF043380
                                     *                          "ING TERM OF A VECTOR GENERATED CF043390
                                     *                          "PREVIOUSLY WITH THIS MEASUREMENTCF043400
2621    18    0AB8  D071   (0ABA)           BNO     $14         "DID THE DIFFERENCE OVERFLOW?  %R043410
2622     4R   0AB9  D004   (0ABE)           BUC     $13         "THE VECTOR IS UNIQUE       CF043420
2623     6R   0ABA  6000            $14     MPY     0,0         "EXAMINE THE SIZE OF THE    CF043430
                                     *                          "DIFFERENCE                 CF043440
2624    10    0ABB  D032   (0ABE)           BRG     $13         "IS THE DIFFERENCE SIGNIFICANT? CF043450
2625     8R   0ABC  C478   (0AB5)           BXU     7,,$15      "ARE THERE MORE TERMS TO TEST? CF043460
                                     *                          "DUPLICATE"                 CF043470
                                     *                          "DO NOT KEEP THIS VECTOR AND TRY CF043480
2626     4R   0ABD  0B05   (0A89)           BUC     $6          "FOR ANOTHER                CF043490
2627     2R   0ABE  9414            $13     ADDM    1,,4        "INCREMENT VECTOR COUNT     CF043500
2628     4    0ABF  8014                    COM     1,4                                     CF043510
                                     *                          "ARE THERE MORE             *1043520
2629     8    0AC0  D81D   (0AB4)           BNE     $11         "VECTORS TO COMPARE AGAINST?  CF043530
2630     2R   0AC1  98AF                    COMM    10,,15                                  % 043540
                                     *                          "IS THE VECTOR              *1043550
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2631      6        0AC2  D05F   (0AD2)          BRL     $10          "STORAGE AREA FULL?  (15 LIMIT)  %R043560
                                      * TOO MANY STATE VECTORS - MISFIRE                                *H043570
2632     10R       0AC3  8420                   FETM    2,,0         TOO MANY ESTIMATE VECTORS        CF043580
2633     18        0AC4  7004   (0084)          STA     0,,N                                          CF043590
2634     36        0AC5  F4271C27               PTR     2,,X         "REDUCE TO 1 VECTOR WITH 1ST 3   CF043600
2635     44        0AC7  F40A1CF9               CLA     0,,X2XX+3    "TERMS SET TO ZERO               CF043610
                                      *                                "IS THE 4TH TERM                 *I043620
2636     50        0AC9  04060B07               BRE     $25          "OF THE VECTOR (T ZERO DOT) OK?  CF043630
2637      2R       0ACB  9C00                   CLAM    0,,0         X2XX GREATER THAN .08625 MSEC/SECCF043640
2638     12        0ACC  F0071C2A               STA     0,,X+3       "SET 4TH TERM TO ZERO AND OPEN   CF043650
                                      *                                "UP P44 BECAUSE MISFIRE ROUTINE  CF043660
                                      *                                "DOES NOT OPEN UP T ZERO DOT     CF043670
                                      *                                "                                CF043680
                                      *                                "GO TO MISFIRE                   CF043690
2639     20        0ACE  9EF7   (00F7)          CLAD    0,,=DF((.25)*.25D-12B+36)                      CF043700
2640     32        0ACF  F8071D53               STAD    0,,P44                                        CF043710
2641     36        0AD1  D305   (0B07)          BUC     $25                                           CF043720
                                      * THE NEW STATE VECTOR IS GOOD                                    *H043730
2642      2R       0AD2  94A1           $10     ADDM    10,,1        "INCREMENT STATE VECTOR COUNT    CF043740
2643      8        0AD3  C00A                   FET     0,10         "MOVE VECTOR FROM TEMPORAY (XX)  CF043750
2644     16        0AD4  867F   (00FF)          FET     0,,XXX_ADD   "TO 'PERMANENT' SCRATCH          CF043760
2645     24        0AD5  F4081CED               FETM    0,,XX                                         CF043770
2646     44        0AD7  C230                   FET     I3,0                                          CF043780
2647     64        0AD8  763B                   PTR     I3,11        X(NN)                            CF043790
                                      *                                "INCORPORATE THIS VECTOR INTO    *I043800
2648     72  *     0AD9  F80D0B30               BSV     AVERAGE_X    "AVGERAGE AND AVERAGE VARIANCE   CF043810
2649     74        0ADB  9444                   ADDM    4,,4         INC X(NN)                        CF043820
                                      *                                "RETURN TO CONSIDER ANOTHER NEW  CF043830
2650     80        0ADC  04000A89               BUC     $6           "VECTOR FROM THE SAME OLD VECTOR CF043840
                                      * ALL POSSIBLE MEASUREMENTS FROM                                  *H043850
                                      * THIS OLD STATE VECTOR HAVE NOW                                  *H043860
                                      * BEEN MADE                                                       *H043870
2651      2R       0ADE  9434           $2      ADDM    3,,4         "INCREMENT POINTER TO OLD STATE  CF043880
2652      4        0ADF  8032                   COM     3,2          "VECTORS                         CF043890
2653     10        0AE0  04010A70               BNE     $17          "ARE THERE ANYMORE OLD VECTORS?  CF043900
2654      2R       0AE2  9C90                   CLAM    9,,0                                          % 043910
2655      4        0AE3  90A1                   SUBM    10,,1                                         % 043920
2656      8        0AE4  D150   (0AF5)          BRL     $19          "ARE THERE ANY NEW STATE VECTORS?%R043930
                                      *                                "UPDATE THE P MATRIX"            *I043940
2657      8R  *    0AE5  F80D0B79               BSV     MEASUREMENT_UPDATE_P                          CF043950
2658     10        0AE7  A40A                   CLA     0,10                                          % 043960
2659     16        0AE8  9A04   (0084)          COM     0,,N                                          % 043970
                                      *                                "ARE THERE MORE                  *2043980
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2660    20    0AE9  D034   (0AEE)          BRG     $52          "VECTORS THIS TIME THAN THERE    HH043990
                                   *                            "WERE BEFORE?                    CF044000
2661    26R   0AEA  F04C1C22                FET     4,,XXX+4     "SAVE THE NEW COMMON ELEMENTS    CF044010
2662    52    0AEC  F4471CE8                PTR     4,,XXXX      "FROM THE AVERAGE STATE VECTOR   CF044020
2663     8R   0AEE  7004   (0084)  $52      STA     0,,N                                          % 044030
2664    12    0AEF  44A4                    MPIM    10,,4                                         CF044040
2665    14    0AF0  94A3                    ADDM    10,,3                                         CF044050
2666     6R   0AF1  A792           $18      CLA     IX9,2                                         % 044060
2667    14    0AF2  739D                    STA     IX9,13       "TRANSFER ALL THE NEW VECTORS    CF044070
                                   *                            "INTO THE STORAGE AREA FOR OLD   CF044080
                                   *                            "VECTORS                         CF044090
2668    22    0AF3  C493   (0AF1)          BXU     9,,$18                                        % 044100
                                   *                            "EXIT"                           CF044110
2669    38R   0AF4  D5D0           $30      BBK     13           "MEASUREMENT COMPLETE"           CF044120
                                   * NO NEW STATE VECTORS                                         *H044130
2670     4R   0AF5  D186   (0B0C)  $19      BAT     $83          "IS THIS A POSITION FIX?"        CF044140
2671    10R   0AF6  FC0A1AC2                CLAD    0,,=DF((.15)*.158-10)                         % 044150
2672    20    0AF8  F8080070                COMD    0,,CONNIE                                     % 044160
                                   *                            "IS THE ACCEPT                   *1044170
2673    24    0AFA  D057   (0B02)          BRL     $24          "LIMIT LESS THAN (.15 CYCLE)**2? %R044180
2674    10R   0AFB  FC0B0070                ADDD    0,,CONNIE    "INCREMENT ACCEPTABLE LIMIT BY   CF044190
2675    22    0AFD  F8070070                STAD    0,,CONNIE    "(.15 CYCLE)**2 AND TRY AGAIN TO CF044200
                                   *                            "GENERATE STATE VECTORS          CF044210
2676    34R   0AFF  D7D0           $23      PRN     13                                            % 044220
2677    40    0B00  04000A64                BUC     MEASUREMENT_UPDATE_X                          CF044230
                                   *                            "IS THIS A GOOD                  *1044240
2678     4R   0B02  D0E4   (0B07)  $24      BDT     $25          "TRACKING FILTER MEASUREMENT?    CF044250
                                   * DO NOT MISFIRE                                               *H044260
2679     4R   0B03  FC0909F8       $28      CLAM    0,,TRACKING_FILTER_MEASUREMENT$10              CF044270
                                   *                            "MODIFY RETURN TO TRACKING FILTERCF044280
                                   *                            "MEASUREMENT TO BYPASS ANYMORE   CF044290
                                   *                            "PROCESSING OF THIS FREQ         CF044300
2680     8R   0B05  71E1           $27      STA     X14,,1       "PUT NEW RETURN ADDRESS IN R14   CF044310
                                   *                            "SUBROUTINE STACK                CF044320
2681    46    0B06  D5D0                    BBK     13           "RETURN"                         CF044330
2682     4R   0B07  D084   (0B0C)  $25      BAT     $83          "IS THIS A POSITION FIX?"        CF044340
2683     4R   0B08  D0D3   (0B0C)          BCF     $83          "IS THIS PHASE DIFFERENCE?       %R044350
2684     6R   0B09  9E36   (00B6)          CLA     0,,STATION_NUMBER                             % 044360
2685    12    0B0A  9A4C   (00CC)          COM     0,,BASE+1                                     % 044370
                                   *                            "                                *2044380
2686    16    0B0B  D869   (0B03)          BRE     $28          "IS THIS THE BASE STATION?       CF044390
                                   *                            "(NO MISFIRE)                    CF044400
2687     2R   0B0C  9C01           $83      CLAM    0,,1         "INCREMENT MISFIRE COUNT         CF044410
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2688    10      0B0D  F4081CFF              ADD     0,,MISFIRE_CNT                          CF044420
2689    20      0B0F  F0071CFF              STA     0,,MISFIRE_CNT                          CF044430
2690    42      0B11  F82C0C39              FETD    2,,NOISE        "READ P33 KICK VALUE    %S044440
2691    46      0B13  D082   (0B16)         BAT     $32             "IS THIS A POSITION FIX?"CF044450
                      *  NO KICK OF 833 AFTER MOD 8                                         044460
2692    10R     0B14  FC0A1D00      $35     CLAD    0,,SIGMA_SQ_KICK "READ SIGMA KICK FOR USE AS A CF044470
                      *                                              "LOWER LIMIT ON P11 AND P22 CF044480
2693    10R     0B16  F8081D17      $32     COMD    0,,P11          "EXAMINE P11"           CF044490
2694    14      0B18  D052   (0B1B)         BRL     $33             "IS SIGMA KICK LESS THAN P11? CF044500
2695    12R     0B19  F8071D17              STAD    0,,P11          "SET P11 = SIGMA KICK   CF044510
2696    10R     0B1B  F8081D28      $33     COMD    0,,P22          "EXAMINE P22            CF044520
2697    14      0B1D  D052   (0B20)         BRL     $34             "IS SIGMA KICK LESS THAN P22? CF044530
2698    12R     0B1E  F8071D28              STAD    0,,P22          "SET P22 = SIGMA KICK   CF044540
2699    10R     0B20  D710          $34     PRN     1               "SAVE NEW P33"          CF044550
2700    24      0B21  FC071D3F              PTRD    0,,P33                                  CF044560
2701    28      0B23  D089   (0B2D)         BAT     $26             "IS THIS A POSITION FIX?"  044570
2702     8R     0B24  F40A006F              CLA     0,,DF_MKR                               % 044580
                      *                                              "IS KALMAN IN           %1044590
2703    12      0B26  D013   (0B2A)         BNE     $20             "DIFFERENCE FREQUENCY NOW? CF044600
2704    12R     0B27  8430                  FETM    3,,0            "RESET FREQUENCY PAIR SELECT CF044610
2705    34      0B28  F4371D07              PTR     3,,DF_COUNTER   "COUNTERS FOR ALL STATIONS TO CF044620
                      *                                              "ALWAYS START DIFF FREQ WITH CF044630
                      *                                              "11-10 DIFF IF 3 FREQ AVAILABLE CF044640
2706    4R      0B2A  FC090A01      $20     CLAM    0,,TRACKING_FILTER_MEASUREMENT$92       CF044650
                      *                                              "MODIFY RETURN TO TRACKING FILTERCF044660
                      *                                              "MEASUREMENT TO BYPASS ANYMORE CF044670
                      *                                              "MEASUREMENTS FROM THIS STATION CF044680
2707    8       0B2C  DA08   (0B05)         BUC     $27             NO MEASUREMENT          CF044690
2708    2R      0B2D  9C02          $26     CLAM    0,,2                                    % 044700
                      *                                              "MODIFY THE RETURN TO POSITION CF044710
                      *                                              "MEASUREMENT TO INDICATE A CF044720
                      *                                              "MISFIRE                CF044730
2709    8       0B2E  B5E1                  ADD     X14,,1                                  CF044740
2710    12      0B2F  DA0B   (0B05)         BUC     $27                                     CF044750
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                                                  **                    446                                          CF044760
                                                  *                     AVERAGE X                                    *H044770
                                                  *                                                                  *H044780
                                                  * THIS ROUTINE WILL COMPUTE AN AVERAGE STATE VECTOR.  EACH TIME THIS    *H044790
                                                  * ROUTINE IS CALLED IT WILL UPDATE THE AVERAGE WITH ONE STATE VECTOR.   *H044800
                                                  * IT ALSO GENERATES THE VARIANCE OF EACH ELEMENT OVER THE SET OF STATE  *H044810
                                                  * VECTORS.  THE ARGUMENTS CONSIST OF POINTERS TO THE NEW VECTOR (XB) AND*H044820
                                                  * THE AVERAGE VECTOR (XC)  AND THE NUMBER OF THE NEW VECTOR (N).  THE   *H044830
                                                  * RESULTS ARE LEFT IN XXX (AVERAGE) AND X2XX (VARIANCE)                *H044840
                                                  *                                                                  *H044850
                                                  *X X(A) +(X(B)-X(C))/N  = X(A)NEW                                      CF044860
                                                  *  R2 = N                                                              CF044870
                                                  *  R1 = X(C) ADDR                                                      CF044880
                                                  *  R0 = X(B) ADDR                                                      CF044890
2711      8R      0B30  867F   (00FF)   AVERAGE_X   FET      0,,XXX_ADD                                                CF044900
2712      32      0B31  8498                        FETM     9,,8          I LIM                                       CF044910
2713      34      0B32  8C71                        CLSM     7,,1          1 =R6,7                                     CF044920
2714      36      0B33  A44D                        CLA      4,13          N =R4,5                                     CF044930
2715     162      0B34  DC64                        DIVD     6,4           "COMPUTE 1/N                                CF044940
2716     166      0B35  FCD91CF6                    CLAM     13,,X2XX                                                  CF044950
2717      6R      0B37  A78B            $1          CLA      IX8,11        "PROCESS THE ITH TERM"                      CF044960
2718      12      0B38  B38C                        SUB      IX8,12        "                                           CF044970
2719      16      0B39  AC40                        CLAD     4,0           "XXX = XXX + (XB - XC)/N                    CF044980
2720      32      0B3A  6844                        MPYD     4,4           "                                           CF044990
2721      48      0B3B  6846                        MPYD     4,6           DX*DX/N                                     CF045000
2722      54      0B3C  B64D                        ADD      I4,13         X2XX                                        CF045010
2723      58      0B3D  AC24                        CLAD     2,4           "X2XX = X2XX + ((XB - XC)**2)/N             CF045020
2724      74      0B3E  6826                        MPYD     2,6           "  + (X2XX + ((XB - XC)**2)/N)/N            CF045030
2725      78      0B3F  B842                        SUBD     4,2           (1-1/N)                                     CF045040
2726      86      0B40  724D                        STA      I4,13         X2XX                                        CF045050
2727      92      0B41  6006                        MPY      0,6           DX/N                                        CF045060
2728      98      0B42  B78A                        ADD      IX8,10                                                    CF045070
2729     106      0B43  738A                        STA      IX8,10        XXX (I)                                     CF045080
2730     108      0B44  94D1                        ADDM     13,,1         INC X2XX ADDR                               CF045090
2731     116      0B45  C48F   (0B37)               BXU      8,,$1         "ARE THERE MORE TERMS TO PROCESS?CF045100
2732      38R     0B46  D5D0                        BBK      13            "EXIT"                                      CF045110
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                                        **                                                                  CF045120
                                        *  THETA C RETURNED IN R0,1  2 REGS PRUNED                          CF045130
                                        *    R0 = STA  R1 = FREQ R2,3 = THETA 1                             CF045140
                                        *    ANSWER CORRECTED FOR DELTA T KI * PHI BASE                     CF045150
                                        *                          THETA C                                  *H045160
                                        *                                                                   *H045170
                                        * THIS ROUTINE WILL COMPUTE THE PEDICTED PHASE FROM A STATION TO THE  *H045180
                                        * CRAFT FOR ANY FREQUENCY.  IN PHASE DIFFERENCE NAVIGATION A CORRECTION *H045190
                                        * TERM IS ADDED.  THIS TERM IS THE TIME BETWEEN BASE STATION BURSTS AND *H045200
                                        * THIS STATION'S BURSTS TIMES THE PHASE ESTIMATE IN THE BASE STATION  *H045210
                                        * TRACKING FILTER FOR THIS FREQUENCY.  THE ARGUMENTS CONSIST OF THETA1, *H045220
                                        * FREQUENCY AND STATION NUMBER.                                      *H045230
                                        *                                                                   *H045240
                                        *                                                                   CF045250
2733      16R      0847  C053           THETA_C   FET     5,3          REPEAT THETA 1                       CF045260
2734      36       0848  F93616B2                 MPYD    X3,,LAMBDA_TABLE "CONVERT THETA1 TO CYCLES FOR  CF045270
2735      56       084A  F8061AC4                 MPYD    0,,=DF(3.14159265B-2)                           CF045280
2736      60       084C  BC00                     ADDD    0,0          "THIS FREQUENCY SCALED B10          CF045290
2737      64       084D  4423                     MPIM    2,,3                                             CF045300
2738      70       084E  F0354000                 RSL     3,,1                                             CF045310
2739      72       0850  B423                     ADD     2,3                                              CF045320
2740      86       0851  F96C1D0F                 FETD    X6,,PP_THETA2  "FORM THETA1 + THETA2 + THETA3    %S045330
2741      96       0853  F1961768                 MPY     X9,,TF_LAMBDA_CONSTANT_TABLE                      045340
2742     106       0855  FD4B1CB9                 ADDD    X4,,PP_THETA3  "          SCALED B10             CF045350
2743     116       0857  F8040400                 RSAD    0,,5                                             CF045360
2744     120       0859  BC20                     ADDD    2,0                                              CF045370
2745     124       085A  ACA2                     CLAD    10,2                                             CF045380
                                        *                                "IS THIS"                          *1045390
2746     128       085B  D0D5    (0861)           BCF     $1           "PHASE DIFFERENCE NAVIGATION?      %R045400
                                        *                                "SUB ALWAYS PHASE DIFFERENCE       CF045410
2747       2R      085C  A418                     CLA     1,8          STA                                CF045420
                                        *                                "SET UP STATION NO AND FREQ        CF045430
                                        *                                "ARGUMENT FOR D PHI KI ROUTINE     CF045440
2748       4       085D  A409                     CLA     0,9          FREQ                               CF045450
2749      12  *    085E  F80D0C05                 BSV     D_PHI_KI     "COMPUTE DELTA PHI CORRECTION      CF045460
2750      16       0860  BCA0                     ADDD    10,0         "THETA C = SUM THETA(I) + D PHI    CF045470
                                        *                                "              SCALED B10 CYCLESCF045480
2751      30R      0861  D590           $1        BBK     9            "EXIT"                             CF045490
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                                        ** ENTER WITH R0 = STA NUMBER                                          CF045500
                                        *          R1  CONTAINS ADDRESS OF RIJ TO BE USED                      CF045510
                                        *    RETURN  THETA 1  IN R0,1                                          CF045520
                                        *                        COMPUTE THETA1                                *H045530
                                        *                                                                      *H045540
                                        * THIS ROUTINE COMPUTES THE CENTRAL ANGLE BETWEEN ANY STATION AND THE  *H045550
                                        * CRAFT.  THE ARGUMENTS CONSIST OF THE STATION NUMBER AND A POINTER TO *H045560
                                        * THE POSITION VECTOR OF THE CRAFT.                                    *H045570
                                        *                                                                      *H045580
2752                                    COMPUTE_THETA1;                                                        CF045590
2752      4R        0B62  4406                    MPIM      0,,6                                               CF045600
2753       8        0B63  F409179B                ADDM      0,,STATION_VECTOR_TABLE                            CF045610
2754      16        0B65  C011                    FET       1,1            "READ R1 VECTOR AND CONVERT TO      CF045620
2755      44        0B66  CA41                    FETD      I4,1           "GEOCENTRIC COORDINATES             CF045630
                                        * 1960 FISHER EQ RADIUS =  6378166.0 METERS  = A = 20925741.47 FEET     045640
                                        *          POLAR RADIUS=  6356784.283 = B = 20855591.48 FEET            045650
                                        *   B**2/A**2 = 0.9933065781                                            045660
2756      64        0B67  F8061AC6                MPYD      0,,=DF(0.9933065781)                                045670
2757      80        0B69  C845                    FETD      4,5            REPEAT R1                           CF045680
2758     116        0B6A  CA6C                    FETD      I6,12                                              CF045690
2759     124  *     0B6B  F80D1714                BSV       REGISTER_CROSS                                     % 045700
2760     140        0B6D  C845                    FETD      4,5                                                CF045710
2761     148  *     0B6E  F80D1728                BSV       REGISTER_DOT                                       % 045720
2762     594        0B70  1000                    SQRT      0,0            "SIN(THETA) = MAG (S X R1)          %S045730
2763     598        0B71  ACA0                    CLAD      10,0           "                                   CF045740
2764     612        0B72  D730                    PRN       3              "COS(THETA) = R1 . S                CF045750
2765     640        0B73  CA48                    FETD      I4,8                                               CF045760
2766     648  *     0B74  F80D1728                BSV       REGISTER_DOT                                       % 045770
2767    1186        0B76  1800                    ATAN      0,,0                                               CF045780
2768    1190        0B77  AC20                    CLAD      2,0            "THETA1 = ARCTAN SIN/COS AT PI      %S045790
2769    1204        0B78  D510                    BBK       1                                                  CF045800
                                        *                                                                      CF045810
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                                        **                                                                  CF045820
                                        *                                                                   CF045830
                                        *                        MEASUREMENT UPDATE P                       *H045840
                                        *                                                                   *H045850
                                        * UPDATE THE COVARIANCE MATRIX IF NEW STATE VECTORS WERE GENERATED.  *H045860
                                        *                                                                   *H045870
2770                                    MEASUREMENT_UPDATE_P;                                               CF045880
2770      8R *     0B79  F80D0BF8                 BSV       REG_SETUP      "SET UP POINTERS AND COUNTERS   CF045890
                                        *                                  "UPDATE P"                      CF045900
                                        *                                  "COMPUTE (B)(M)(P)              CF045910
                                        *                                  "(M)(P) IS AVAILABLE FROM THE   CF045920
                                        *                                  "       Q COMPUTATION           CF045930
                                        *                                  "                               CF045940
                                        *                                  " USE B CODE TO CONTROL THE     CF045950
                                        *                                  " MULTIPLY BY (B)               CF045960
2771      12       0B7B  FC691CD5                 CLAM      6,,BI                                         CF045970
2772      20       0B7D  F45A1CE7                 CLA       5,,BI+18       CODE                           CF045980
2773       2R      0B7F  A445          $3         CLA       4,5                                           % 045990
2774       4       0B80  A497                     CLA       9,7                                           CF046000
2775       8R      0B81  AF9D          $2         CLAD      IX9,13                                        % 046010
2776      12       0B82  AC20                     CLAD      2,0                                           CF046020
2777      20       0B83  AF76                     CLAD      IX7,6          BI                             CF046030
2778      22       0B84  9850                     COMM      5,,0                                          CF046040
2779      26       0B85  D052    (0B88)           BRL       $4                                            % 046050
2780      16R      0B86  6820                     MPYD      2,0                                           CF046060
2781      20       0B87  D001    (0B89)           BUC       $5                                            % 046070
2782     126R      0B88  DC20          $4         DIVD      2,0                                           % 046080
2783       8R      0B89  AF7C          $5         CLAD      IX7,12                                        % 046090
                                        *                                  "COMPUTE (E)(M)TRANSPOSE"       *S046100
2784      28       0B8A  F976005C                 MPYD      X7,,DIVERGENCE_CONTROL                        CF046110
2785      32       0B8C  D067    (0B94)           BRE       $1             "IS (E)(M)T ZERO?"             CF046120
2786      12R      0B8D  CB96                     FETD      IX9,6          BI                             CF046130
2787      14       0B8E  9860                     COMM      6,,0           "COMPUTE  (E)(M)T(B)           CF046140
                                        *                                  "                               CF046150
                                        *                                  "USE B CODE TO CONTROL THE      CF046160
                                        *                                  "MULTIPLY BY (B)                CF046170
2788      18       0B8F  D052    (0B92)           BRL       $6                                            % 046180
2789      16R      0B90  6820                     MPYD      2,0                                           CF046190
2790      20       0B91  D001    (0B93)           BUC       $7                                            % 046200
2791     126R      0B92  DC20          $6         DIVD      2,0                                           % 046210
2792      10R      0B93  D710          $7         PRN       1                                             % 046220
2793       4R      0B94  B802          $1         SUBD      0,2                                           CF046230
2794      12       0B95  BF9B                     ADDD      IX9,11         "COMPUTE P(NEW)"               CF046240
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2795    22      0B96  7B9B                  STAD    IX9,11     "                                  CF046250
2796    24      0B97  B444                  ADD     4,4        "= P - (B)(M)(P) + (E)(M)T(B)      CF046260
2797    32      0B98  CD98   (0B81)         BXUD    9,,$2                                         % 046270
2798     4R     0B99  F4B90012              ADDM    11,,18                                        CF046280
2799     6      0B9B  B455                  ADD     5,5                                           CF046290
2800    14      0B9C  CD7E   (0B7F)         BXUD    7,,$3                                         % 046300
2801     8R *   0B9D  F80D0BD6              BSV     P_SYM      "FORCE P TO BE SYMETRICAL"         CF046310
2802    46      0B9F  D5D0                  BBK     13         "EXIT"                             CF046320
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                                                                                                                  CF046330
                                                                                                                  *H046340
                                                                                                                  *H046350
                                                                                                                  *H046360
                                                                                                                  *H046370
                                                                                                                  *H046380
                                                                                                                  *H046390
2803      26R      08A0  F04C1CE8      ASSEMBLE_XX FET      4,,XXXX      "READ 5 COMMON ELEMENTS                  CF046400
2804      46       08A2  C235                      FET      I3,5         "READ 4 UNIQUE ELEMENTS                  CF046410
2805      88       08A3  F4871CED                  PTR      8,,XX        "SAVE NEW 9 ELEMENT VECTOR               CF046420
2806     100       08A5  D500                      BBK      0                                                     CF046430
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                                                                                                                    CF046440
                                **                                                                                  CF046440
                                *                          PHI (P) PHI TRANSPOSE                                    *H046450
                                *                                                                                   *H046460
                                * THIS ROUTINE MULTIPLIES PHI BY (X), (P), OR (P)TRANSPOSE.  THE RESULT             *H046470
                                * REPLACES THE ORIGINAL MULTIPLIER.  THE 14 PHI ELEMENTS CONSIST OF                 *H046480
                                * 0, 0, PHI(1,8), 0, 0, 0, 0, PHI(2,9), PHI(3,4), PHI(5,5), PHI(6,6),              *H046490
                                * PHI(7,7), PHI(8,8) AND PHI(9,9).  THEY ARE ORDERED BY THE SEQUENCE OF             *H046500
                                * USEAGE WHEN ACCESSING PHI COLUMN BY COLUMN.  THE UNITY TERM OF THE               *H046510
                                * DIAGONAL ELEMENTS DOES NOT APPEAR AS IT IS HANDLED SEPARATELY.                   *H046520
                                *                                                                                 *H046530
                                *                                                                                 *H046540
                                * ENTER HERE WITH J = 18 AND I = 2                                                 *H046550
                                * TO MULTIPLY BY P.  ENTER HERE                                                    *H046560
                                * WITH J = 2 AND I = 18 TO MULTIPLY                                                *H046570
                                * BY P TRANSPOSE                                                                   *H046580
2807      32R   08A6  F4C81D17  PHI_P_PHIT  FETM    12,,P_MATRIX   "READ POINTER TO P AND CREATE                   CF046590
2808      34    08A8  9CB8                  CLAM    11,8           "13 REGISTERS                                  CF046600
                                *                                  "SET UP COUNTER K=9 TO PROCESS P               CF046610
                                * ENTER HERE WITH I = 1, POINTER TO                                                *H046620
                                * X, 13 REGISTERS AND COUNTER K=1                                                  *H046630
                                * TO PROCESS X (J IS NOT USED)                                                     *H046640
2809      4R    08A9  FC990010  $6          CLAM    9,,16          "SET UP TWO 9 COUNTERS M AND N                 CF046650
2810      6     08AB  A479                  CLA     7,9            "READ POINTER FOR TEMP VECTOR                  CF046660
2811      10    08AC  FC391C06              CLAM    3,,KAL_TEMP    "TO SAVE INTERMIDIATE RESULTS                  CF046670
2812      4R    08AE  FC59005C  $5          CLAM    5,,PHI_MATRIX  "READ POINTER TO START OF PHI                  CF046680
                                *                                  "MATRIX ELEMENTS                               CF046690
2813      6     08B0  A44C                  CLA     4,12           "COPY POINTER TO MULTIPLIER (P,X)              CF046700
2814      2R    08B1  A406      $3          CLA     0,6            "READ PHI CODE (N) FOR THIS                    CF046710
2815      8     08B2  FC0440C0              RSA     0,,1           "COLUMN                                        CF046720
2816      16    08B4  F50A0C30              CLA     X0,,PHI_CODE                                                  CF046730
2817      18    08B6  A420                  CLA     2,0                                                           CF046740
2818      22    08B7  B800                  SUBO    0,0                                                           CF046750
2819      32    08B8  7863                  STAD    IX6,3          "SET NTH ELEMENT OF TEMP = 0                   CF046760
2820      2R    08B9  9820      $2          COMM    2,,0           "EXAMINE MSB OF PHI CODE TO DE-                CF046770
                                *                                  "TERMINE IF THIS ELEMENT OF PHI                CF046780
                                *                                  "IS ONE OF THE 14 PROVIDED FOR                 CF046790
                                *                                  "IN PHI MATRIX                                 CF046800
                                *                                  "DOES THE (N,M)                                *1046810
2821      6     08BA  D058  (08C3)          BRL     $1             "ELEMENT OF PHI EXIST?"                        %R046820
2822      8R    08BB  AE04                  CLAD    10,4           "READ THE MTH ELEMENT OF THE                   CF046830
2823      10    08BC  9880                  COMM    11,,0          "KTH ROW OR COLUMN OF P OR X                   CF046840
2824      14    08BD  D011  (08BF)          BNE     $7             "IS THIS A P MATRIX TERM?"                     CF046850
2825      2R    08BE  9C10                  CLAM    1,,0           "X VECTOR TERM"                                CF046860
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                                        *                                                                  "CLEAR LOWER HALF OF DOUBLE       CF046870
                                        *                                                                  "REGISTER AS X IS ONLY 16 BITS    CF046880
2826    18R     08BF  6AC5              $7          MPYD        I0,5                                       "FORM PRODUCT OF MULTIPLIER       CF046890
2827    26      08C0  BF63                          ADDD        IX6,3                                      "ELEMENT AND PHI(N,M)             CF046900
2828    36      08C1  7B63                          STAD        IX6,3                                      "ADD RESULT TO THE MTH TERM OF    CF046910
                                        *                                                                  "TEMP                             CF046920
2829    38      08C2  9452                          ADDM        5,2                                        "INCREMENT PHI MATRIX POINTER TO  CF046930
                                        *                                                                  "THE NEXT ELEMENT OF PHI          CF046940
2830    2R      08C3  B422              $1          ADD         2,2                                        "SHIFT PHI CODE 1 TO GET READY    CF046950
                                        *                                                                  "FOR THE M+1 ELEMENT              CF046960
2831    4       08C4  B44D                          ADD         4,13                                       "ADD I TO MULTIPLIER POINTER TO   CF046970
                                        *                                                                  "SEQUENCE TO THE M+1 ELEMENT OF   CF046980
                                        *                                                                  "ROW OR COLUMN K. I=2 FOR P ROWS, CF046990
                                        *                                                                  "I=18 FOR P COLUMNS AND I=1 FOR X CF047000
                                        *                                                                  "INCREMENT M                      *1047010
2832    12      08C5  CC8D  (08B9)                  BXUD        8,,$2                                      "ARE THERE MORE ELEMENTS?"        CF047020
2833    2R      08C6  A44C                          CLA         4,12                                       "COPY POINTER TO MULTIPLIER (P,X) CF047030
                                        *                                                                  "TO START THE PROCESS OVER FOR    CF047040
                                        *                                                                  "THE N+1 COLUMN OF PHI            CF047050
                                        *                                                                  "INCREMENT N                      *2047060
2834    10      08C7  CD67  (08B1)                  BXUD        6,,$3                                      "ARE THERE MORE COLUMNS OF PHI    CF047070
                                        *                                                                  "TO PROCESS?                      CF047080
                                        * THE MULTIPLICATION IS COMPLETE                                                                  *H047090
                                        * EXCEPT FOR THE UNITY TERM IN                                                                    *H047100
                                        * THE PHI DIAGONAL ELEMENTS.                                                                      *H047110
                                        * NOTE - M, N ARE RESET NOW                                                                       *H047120
2835    8R      08C8  AF63              $4          CLAD        IX6,3                                      "READ MTH ELEMENT OF THE NEW      CF047130
2836    10      08C9  9880                          COMM        11,,0                                      "VECTOR IN TEMP                   CF047140
2837    14      08CA  D014  (08CF)                  BNE         $8                                         "IS THIS A P MATRIX MULTIPLY?     CF047150
2838    6R      08CB  B6C4                          ADD         I0,4                                       "X"                               CF047160
                                        *                                                                  "ADD X(M) TO TEMP TO GET THE      CF047170
                                        *                                                                  "FINAL RESULT                     CF047180
2839    14      08CC  96F1  (00F1)                  ADDD        0,,=DX(00008000)                           "ROUND THE RESULT                 CF047190
2840    22      08CD  7204                          STA         I0,4                                       "SAVE IN X(M)                     CF047200
2841    26      08CE  D002  (08D1)                  BUC         $9                                                                           CF047210
2842    8R      08CF  BE04              $8          ADDD        I0,4                                       "P"                               CF047220
                                        *                                                                  "ADD P(M,K) (OR P(K,M)) TO TEMP   CF047230
                                        *                                                                  "TO GET THE FINAL RESULT          CF047240
2843    18      08D0  7AC4                          STAD        I0,4                                       "SAVE IN P(M,K) (OR P(K,M))       CF047250
2844    2R      08D1  B44D              $9          ADD         4,13                                       "ADD I TO MULTIPLIER POINTER TO   CF047260
                                        *                                                                  "SEQUENCE TO THE M+1 ELEMENT OF   CF047270
                                        *                                                                  "ROW OR COLUMN K. I=2 FOR P ROWS, CF047280
                                        *                                                                  "I=18 FOR P COLUMNS AND I=1 FOR X CF047290
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                                        *                                  "INCREMENT M                          *1047300
2845      10      0BD2  CC6B   (0BC8)          BXUD       6,,$4           "ARE THERE MORE ELEMENTS?"            CF047310
                                        * PROCESSING IS COMPLETE IF X                                           *H047320
                                        * AS K ONLY COUNTS TO 1                                                 *H047330
2846       6R     0BD3  B6CF                   ADD        I12,15          "ADD J TO P MATRIX POINTER TO         CF047340
                                        *                                  "SEQUENCE TO THE K+1 ROW OR           CF047350
                                        *                                  "COLUMN OF P (J=18 FOR COLUMNS        CF047360
                                        *                                  "AND J=2 FOR ROWS)                    CF047370
                                        *                                  "INCREMENT K                          *2047380
2847      14      0BD4  C6A7   (0BAE)          BXU        10,,$5          "ARE THERE MORE ROWS OR COLUMNS       CF047390
                                        *                                  "OF P TO PROCESS?                     CF047400
2848      40R     0BD5  D5E0                   BBK        14              "EXIT"                                CF047410
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                                                  **                                                                  CF047420
                                                  *                          P SYM                                    *H047430
                                                  *                                                                   *H047440
                                                  * THIS ROUTINE WILL FORCE THE P MATRIX TO BE SYMETRIC AND THE DIAGONAL  *H047450
                                                  * ELEMENTS TO BE POSITIVE                                            *H047460
                                                  *                                                                   *H047470
2849    22R    0BD6  F4781D17          P_SYM      FETM      7,,P_MATRIX    "SET P(M,N) = P(N,M) FOR                CF047480
2850    26     0BD8  FC690010                     CLAM      6,,16          "                  M UNEQUAL N          CF047490
2851    28     0BDA  A446                         CLA       4,6            "SET P(M,N) = 0 IF N = M                CF047500
                                                  *                                "                AND P(M,N) MINUS CF047510
2852     2R    0BDB  A427              $3         CLA       2,7                                                    % 047520
2853     6     0BDC  F4290012                     ADDM      2,,18                                                  CF047530
2854    14     0BDE  AE07                         CLAD      I0,7                                                   CF047540
2855    18     0BDF  D027    (0BE7)               BGE       $1                                                     % 047550
2856     4R    0BE0  B800                         SUBD      0,0                                                    CF047560
2857    14     0BE1  7A07                         STAD      I0,7                                                   CF047570
2858    18     0BE2  D004    (0BE7)               BUC       $1                                                     % 047580
2859     8R    0BE3  AF37              $2         CLAD      IX3,7                                                  % 047590
2860    18     0BE4  7A02                         STAD      I0,2                                                   CF047600
2861    22     0BE5  F4290012                     ADDM      2,,18                                                  CF047610
2862     8R    0BE7  CC35    (0BE3)    $1         BXUD      3,,$2                                                  % 047620
2863     4R    0BE8  F4790014                     ADDM      7,,20                                                  CF047630
2864     6     0BEA  9042                         SUBM      4,,2                                                   CF047640
2865    14     0BEB  C051    (0BDB)               BXUD      5,,$3                                                  % 047650
2866    26R    0BEC  D570                         BBK       7                                                      CF047660
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                                                  **                                                                  CF047670
                                                  *                          MEASUREMENT RESIDUE                      *H047680
                                                  *                                                                   *H047690
                                                  * THIS ROUTINE COMPUTES THE RESIDUE Y - (M)(X).  THE ARGUMENT CONSISTS *H047700
                                                  * OF A POINTER TO X.                                                 *H047710
                                                  *                                                                   *H047720
                                                  *  X ADDRESS IN R0 UPON ENTRY R0 PRUNED   444                        CF047730
2867      18R      0BED  F4580010                 Y_MINUS_MX  FETM      5,,16                                        CF047740
2868       2R      0BEF  9C10                     $1          CLAM      1,,0                                         % 047750
2869       8       0BF0  A206                                 CLS       10,6          "COMPUTE  -(M)(X)              CF047760
2870      28       0BF1  F946004A                             MPYD      X4,,M_MATRIX  "ADD MEASUREMENT (Y)           CF047770
2871      32       0BF3  BC20                                 ADDD      2,0           "SAVE RESIDUE                  CF047780
2872      34       0BF4  9461                                 ADDM      6,,1                                         CF047790
2873      42       0BF5  CC47    (0BEF)                       BXUD      4,,$1                                        % 047800
2874      10R      0BF6  FC2B0074                             ADDD      2,,MEASUREMENT                               CF047810
2875      22       0BF8  F8270076                             STAD      2,,MEASUREMENT_RESIDUAL                      CF047820
2876      46       0BFA  D560                                 BBK       6                                            CF047830
                                                  *                                                                   CF047840
                                                  *                          REGISTER SET UP                          *H047850
                                                  *                                                                   *H047860
                                                  * THIS ROUTINE WILL CREATE 14 REGISTERS AND SET UP COMMON POINTERS   *H047870
                                                  *                                                                   *H047880
                                                  * D = KAL TEMP                                                       CF047890
                                                  * C = M MATRIX                                                       CF047900
                                                  * B = P.MATRIX                                                       CF047910
                                                  * A = 16                                                             CF047920
                                                  * 9 = 0                                                              CF047930
                                                  * 8 = 16                                                             CF047940
                                                  * 7,6,5,4,3,2,1 = 0                                                  CF047950
2877      34R      0BFB  F4D81C06                 REG_SETUP   FETM      13,,KAL_TEMP  "CREATE REGISTERS              CF047960
2878      38       0BFD  FCC9004A                             CLAM      12,,M_MATRIX  "SET POINTER TO TEMP VECTOR    CF047970
2879      42       0BFF  FCB91D17                             CLAM      11,,P_MATRIX  "SET POINTER TO M MATRIX       CF047980
2880      46       0C01  FCA90010                             CLAM      10,,16        "SET POINTER TO P MATRIX .     CF047990
2881      48       0C03  A48A                                 CLA       8,10          "SET UP TWO 9 COUNTERS         CF048000
2882      56       0C04  D5F0                                 BBK       15                                           CF048010
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                                                  **                                                                    CF048020
                                                  *  STA NUMBER (S) IN R1                                               CF048030
                                                  *  FREQ (D) IN R0                                                     CF048040
                                                  *  DELTA T (KI) * PHI (BASE) (I) AT 810 CYCLES IN R0,1                CF048050
                                                  *                          D PHI KI                                  *H048060
                                                  *                                                                    *H048070
                                                  * THIS ROUTINE COMPUTES A CORRECTION TERM THAT REPRESENTS WHAT IS    *H048080
                                                  * EXPECTED TO HAPPEN TO THE BASE STATION PHASE BETWEEN THE BASE STATION *H048090
                                                  * BURST TIME AND THE TIME OF A NON BASE STATION BURST FOR ANY FREQUENCY.*H048100
                                                  * THIS ROUTINE COMPUTES THE TIME DIFFERENCE AND USES THE PHASE ESTIMATE *H048110
                                                  * IN THE BASE STATION TRACKING FILTER AS THE EXPECTED CHANGE IN PHASE OF*H048120
                                                  * THE BASE STATION DURING A TEN SECOND PERIOD.  THE ARGUMENTS CONSIST OF*H048130
                                                  * THE STATION NUMBER AND THE FREQUENCY.                              *H048140
                                                  *                                                                    *H048150
2883        8R        0C05  8648    (00CB)        D_PHI_KI    FET         0,,BASE                                     CF048160
                                                  *                                       "SET DELTA T = 0              CF048170
                                                  *                                       "                             CF048180
2884       20         0C06  C032                              FET         3,2            "USE THE BASE STATION NUMBER AND CF048190
2885       22         0C07  B000                              SUB         0,0            "FREQ TO DETERMINE WHAT STATION  CF048200
2886       24         0C08  B412                              ADD         1,2            "IS SENDING 10.2 WHEN THE BASE ISCF048210
2887       34         0C09  F8154000                          RSLD        1,,1           "SENDING THIS FREQ. (BASE REF)   CF048220
2888       36         0C0B  9818                              COMM        1,,8                                         CF048230
2889       40         0C0C  D051    (0C0E)                    BRL         $1             "IS BASE REF IN RANGE OF 0 TO 7? CF048240
2890        2R        0C0D  9018                              SUBM        1,,8           "PUT BASE REF IN RANGE OF 0 TO 7 CF048250
2891        2R        0C0E  B432                  $1          ADD         3,2            "USE THE STATION NUMBER AND FREQ CF048260
                                                  *                                       "TO DETERMINE WHAT STATION IS    CF048270
                                                  *                                       "SENDING 10.2 WHEN THIS STATION  CF048280
2892        4         0C0F  9038                              SUBM        3,,8           "IS SENDING THIS FREQ (STA REF)    048290
2893        8         0C10  D021    (0C12)                    BGE         $3             "IS STA REF IN RANGE OF 0 TO 7?  CF048300
2894        2R        0C11  9438                  $2          ADDM        3,,8           "PUT STA REF IN RANGE OF 0 TO 7  CF048310
                                                  * IF THE STATION NUMBER IS THE                                       *H048320
                                                  * BASE STATION NUMBER THE TEST                                       *H048330
                                                  * BELOW WILL CAUSE THE CORR-                                         *H048340
                                                  * ECTION TO BE ZERO                                                  *H048350
2895        2R        0C12  8013                  $3          COM         1,3            "COMPARE STA REF AND BASE REF    CF048360
                                                  *                                       "IS THE STA REF                *1048370
2896        6         0C13  D067    (0C1B)                    BRE         $4             "NOW EQUAL TO THE BASE REF?      CF048380
2897        8R        0C14  F53B175A                          ADD         X3,,STATION_BURST_TIMES                      CF048390
2898       12         0C16  F4090050                          ADDM        0,,80          "ADD THE BURST COLLECTION TIME   CF048400
                                                  *                                       "FOR THIS STATION TO DELTA T     CF048410
                                                  *                                       "                             CF048420
                                                  *                                       "ADD .4 SECONDS TO DELTA T FOR   CF048430
                                                  *                                       "THE SLOT TIME AND TRUNCATED     CF048440
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                                        *                                  "BURST TIME                                CF048450
2899      14      0C18  9031                    SUBM      3,,1             "DECREMENT STA REF BY 1 TO PRE-            %S048460
                                        *                                  "PARE TO ADD IN THE NEXT TIME IF           CF048470
                                        *                                  "LOOP IS NOT COMPLETE                      CF048480
                                        *                                  "IS STA REF - 1                            *I048490
2900      18      0C19  D828   (0C12)           BGE       $3               "OUTSIDE OF THE RANGE 0 TO 7?              %R048500
2901       4R     0C1A  D80A   (0C11)           BUC       $2               "STA REF MUST BE IN RANGE 0 TO 7           CF048510
2902       4R     0C1B  FC1907D0          $4    CLAM      1,,2000          "COMPUTE D PHI"                            CF048520
                                        *                                  "= (DELTA T / 10 SEC) * PHI                CF048530
2903      36      0C1D  D401                    DIV       0,1              "          ESTIMATE(BASE)                  CF048540
2904      40      0C1E  4443                    MPIM      4,,3             BASE                                       CF048550
2905      42      0C1F  B445                    ADD       4,5              FREQ                                       CF048560
2906      62      0C20  F9461EA3                MPYD      X4,,PHI_ESTIMATE                                            CF048570
2907      66      0C22  AC50                    CLAD      5,0                                                         CF048580
2908      86      0C23  D540                    BBK       4                                                           CF048590
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                                **                                                                  CF048600
2909    0C24  A4FA4FA5  BETA_NRA      COND    F(((-1)/.05)/36008-7)                               CF048610
2910    0C26  A4FA4FA5  BETA_LOG      COND    F(((-1)/.05)/36008-7)                               CF048620
2911    0C28  A4FA4FA5  BETA_PSEUDO   COND    F(((-1)/.05)/36008-7)                               CF048630
2912    0C2A  00024200  SIGMA_NRA     COND    F((((20)*20)*1.7)*1.78-24)                          CF048640
2913    0C2C  00000D01  SIGMA_LOG     COND    F((((03)*03)*1.7)*1.78-24)                          CF048650
2914    0C2E  00009080  SIGMA_PSUDO   COND    F((((10)*10)*1.7)*1.78-24)                          CF048660
2915    0C30  3E7F      PHI_CODE      CON     X(3E7F)                                             CF048670
2916    0C31  3E7F                    CON     X(3E7F)                                             CF048680
2917    0C32  EFFF                    CON     X(EFFF)                                             CF048690
2918    0C33  FFFF                    CON     X(FFFF)                                             CF048700
2919    0C34  F7FF                    CON     X(F7FF)                                             CF048710
2920    0C35  FBFF                    CON     X(FBFF)                                             CF048720
2921    0C36  FDFF                    CON     X(FDFF)                                             CF048730
2922    0C37  FEFF                    CON     X(FEFF)                                             CF048740
2923    0C38  FF7F                    CON     X(FF7F)                                             CF048750
2924    0C39  011A3D3E  NOISE         COND      F(20*6076*20*6076/2.095D+7/2.095D+7B-8)           CF048760
2925    0C3B  2AAAAAAB                COND    F((1)/3)        MAX = 441.176 MICRO SEC             CF048770
2926    0C3D  04690000  DATA_TABLE    COND    X(04690000)                                         CF048780
2927    0C3F  04690000                COND    X(04690000)                                         CF048790
2928    0C41  40000000                COND    X(40000000)                                         CF048800
                                *                                                                   CF048810
2929    0C43  018E7000  M_4_TABLE     COND    F((10)*10.20D38-23)                                 CF048820
2930    0C45  02134000                COND    F((10)*13.60D38-23)                                 CF048830
2931    0C47  018A9400                COND    F((10)*11.33D38-23)                                 CF048840
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                                **                                                                  PP048850
                                *                    PROPAGATION PREDICTION                         *H048860
                                *                                                                   *H048870
                                * THIS PROGRAM WILL COMPUTE THE PREDICTED SPHEROIDAL AND PROPAGATION *H048880
                                * CORRECTIONS TO THE NOMINAL PREDICTED PHASE MEASUREMENTS FROM A GIVEN *H048890
                                * STATION.  IT ALSO COMPUTES AN ASSOCIATED VARIANCE.  THE THREE PARA- *H048900
                                * METERS ARE COMPUTED FOR ALL 3 FREQUENCIES AND SAVED IN MEMORY FOR EACH*H048910
                                * STATION.  THE TOTAL LANE COUNT FROM THE CORRECTED PREDICTED PHASE  *H048920
                                * REPLACES ANY LANE COUNTS CONTAINED IN THE MEASURED PHASE IN THE    *H048930
                                * TRACKING FILTER.  THE STATION NUMBER IS THE ONLY ARGUMENT.         *H048940
                                *                                                                   *H048950
                                *                        ENTER WITH STATION NUMBER IN R0            PP048960
                                *                                                                   PP048970
2932                            PROPAGATION_PREDICTION;                                              048980
2932    14R          0C49 F4381C63          FETM    3,,PROP_PRED_RESULTS                             048990
2933    18           0C4B FC29001A          CLAM    2,,26                                            049000
2934     8R          0C4D 7313      $10     STA     IX1,3          CLEAR RESULTS                     049010
2935    16           0C4E C412 (0C4D)       BXU     1,,$10                                           049020
2936     2R          0C4F 9C26              CLAM    2,,6                                             049030
2937     6           0C50 6424              MPI     2,4                                              049040
2938    16           0C51 D710              PRN     1                                                049050
2939    22           0C52 967E (00FE)       ADD     0,,SV_ADD                                        049060
2940    30           0C53 867D (00FD)       FET     0,,RIJ_ADD                                       049070
2941    36           0C54 C003              FET     0,3                                    34080     049080
2942    44 *         0C55 F80D0862          BSV     COMPUTE_THETA1                           81      049090
2943    54           0C57 780D (008D)       STAD    0,,INTEGRATION_COUNTER                   82      049100
2944    82           0C58 C252              FET     I5,2           GET STATION VECTOR AGAIN            PP049110
2945   120           0C59 F07C1F69          FET     7,,R11         GET 2 WORDS THEN R1 VECTOR          PP049120
2946   128 *         0C5B F80D1714          BSV     REGISTER_CROSS   STA CROSS R1                      PP049130
2947   144           0C5D C055              FET     5,5            DUP STA CROSS R1                    PP049140
2948   160           0C5E 6800              MPYD    0,0                                                PP049150
2949   176           0C5F 6822              MPYD    2,2                                                PP049160
2950   192           0C60 6844              MPYD    4,4                                                PP049170
2951   196           0C61 BC02              ADDD    0,2                                                PP049180
2952   200           0C62 BC04              ADDD    0,4            (STAXR1 DOT STAXR1)                 PP049190
2953   646           0C63 1000              SQRT    0,0                                                PP049200
2954   652           0C64 4C02              LSAD    0,,1                                               PP049210
2955   778           0C65 DC60              DIVD    6,0            -AX1                                PP049220
2956   904           0C66 DC80              DIVD    8,0            -AX2 AT B1                          PP049230
2957  1030           0C67 DCA0              DIVD    10,0           -AX3                                PP049240
2958  1032           0C68 A4DA              CLA     13,10          SINGLE PRECISION AX                 PP049250
2959  1034           0C69 A4C8              CLA     12,8                                               PP049260
2960  1036           0C6A A4B6              CLA     11,6                                               PP049270
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2961   1064   0C6B  D7A0                  PRN   10                                  PP049280
2962   1092   0C6C  C255                  FET   I5,5          INITIAL P = STATION VECTOR  PP049290
2963   1094   0C6D  A454                  CLA   5,4           SINGLE PRECISION            PP049300
2964   1100   0C6E  F0544000              RSA   5,,1          P3 AT B1                    PP049310
2965   1102   0C70  A442                  CLA   4,2                                       PP049320
2966   1108   0C71  F0444000              RSA   4,,1          P2 AT B1                    PP049330
2967   1110   0C73  A430                  CLA   3,0                                       PP049340
2968   1116   0C74  F0344000              RSA   3,,1          P1 AT B1                    PP049350
2969   1128   0C76  D720                  PRN   2                                         PP049360
2970   1146   0C77  F02C16AC              FET   2,,NORTH_MAGNETIC_POLE_VECTOR AT B0       PP049370
2971   1152   0C79  6006                  MPY   0,6                                       PP049380
2972   1158   0C7A  6017                  MPY   1,7                                       PP049390
2973   1164   0C7B  6028                  MPY   2,8                                       PP049400
2974   1166   0C7C  B421                  ADD   2,1                                       PP049410
2975   1168   0C7D  B420                  ADD   2,0           A2 AT B1                    PP049420
                                  *                                                       PP049430
                                  *                GET SEASON INDEX                       PP049440
                                  *                                                       PP049450
                                  *                AND DATE FOR SUN POSITION VECTOR         049460
2976   1180   0C7E  86BC   (00BC)         FETD  0,,TIME                                   049470
2977   1198   0C7F  42E7   (00E7)         MPYD  0,,=DF((((5D-3B31)/24)/3600)/1B11)        049480
2978   1206   0C80  96C4   (00C4)         ADDD  0,,DAY_SINCE_JAN1_1972    B11          01 049490
2979   1208   0C81  A420                  CLA   2,0                                       049500
2980   1214   0C82  F0240800              RSA   2,,4          SCALE DAYS AT B15           049510
2981   1216   0C84  DE01                  FLG   8                                         049520
2982     4R   0C85  FC39016D       $B1    CLAM  3,,365                                    049530
2983     2R   0C87  8023           $1     COM   2,3           GET DAYS MOD 365            049540
2984      6   0C88  D052   (0C8B)         BRL   $2                                        049550
2985     2R   0C89  B023                  SUB   2,3                                       049560
2986      6   0C8A  D804   (0C87)         BUC   $1                                        049570
2987     2R   0C8B  9C3C           $2     CLAM  3,,12         DEC 16 TO DEC 31            049580
2988      6   0C8C  F829015D              COMM  2,,349                                    049590
2989     10   0C8E  D03C   (0C9B)         BRG   $3                                        049600
2990     2R   0C8F  9C39                  CLAM  3,,9                                      049610
2991      6   0C90  F8290086              COMM  2,,182                                    049620
2992     10   0C92  D038   (0C9B)         BRG   $3                                        049630
2993     2R   0C93  9C36                  CLAM  3,,6                                      049640
2994      6   0C94  F829001F              COMM  2,,31                                     049650
2995     10   0C96  D034   (0C9B)         BRG   $3                                        049660
2996     2R   0C97  9C33                  CLAM  3,,3                                      049670
2997      4   0C98  982F                  COMM  2,,15                                     049680
2998      8   0C99  D031   (0C9B)         BRG   $3                                        049690
2999     2R   0C9A  9C30                  CLAM  3,,0                                      049700
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3000      4R        0C9B  D086  (0CA2)  $3        BBF   $82                                                    049710
3001      10R       0C9C  F0371C9F                 STA   3,,SEASON_INDEX_NORTH     SAVE NORTH VALUE      049720
3002      14        0C9E  F4290087                 ADDM  2,,183                   SET UP FOR            049730
3003      16        0CA0  DEA0                     FLG   BT+EOR+B                   SOUTHERN HEMI         049740
3004      20        0CA1  D9CD  (0C85)             BUC   $81                                                  049750
3005      10R       0CA2  F0371CA0        $82      STA   3,,SEASON_INDEX_SOUTH                               049760
3006      52        0CA4  F08C1748                 FET   8,,SUN_CONS      K2,K1D,K3D,K5,K4,K6,-K7          PP049770
3007      68        0CA6  6819                     MPYD  1,9               K1*DAYS @  PI84                  049780
3008      74        0CA7  FC140010                 LSAD  1,,4                                               049790
3009      76        0CA9  B401                     ADD   0,1               *K2 = LS AT PI                   PP049800
3010      92        0CAA  6839                     MPYD  3,9               K3*DAYS @  PI84                  049810
3011      98        0CAB  FC340010                 LSAD  3,,4              RESCALE TO PI                    049820
3012      100       0CAD  B436                     ADD   3,6               K3*D+K4 = MS @ PI                049830
3013      110       0CAE  F8940800                 RSAD  9,,4              RESCALE DAYS TO B15              049840
3014      114       0CB0  F4A97FFF                 ADDM  10,,X(7FFF)       ADD 1/2 DAY TO FORM MEAN         049850
                                                  *                       LONGITUDE OF THE SUN @ PI        049860
3015      122       0CB2  C804                     FETD  0,4               GET MS                           049870
3016      130   *   0CB3  F80D1656                 BSV   SIN                                                049880
3017      136       0CB5  6C90                     MPY   9,0               K6*SIN(MS) @ PI IN R9            049890
3018      138       0CB6  A402                     CLA   0,2               LS @ PI                          049900
3019      140       0CB7  B409                     ADD   0,9                                                049910
3020      148   *   0CB8  F80D1656                 BSV   SIN               SIN(LS + K6*SIN(MS)) @ B1        049920
3021      154       0CBA  6070                     MPY   7,0               K5*SIN(LS +K6*SIN(MS))= S1@B1    049930
3022      156       0CBB  A487                     CLA   11,7                                               049940
3023      158       0CBC  9C80                     CLAM  8,,0                                               PP049950
3024      174       0CBD  6877                     MPYD  7,7               S1**2                            PP049960
3025      182       0CBE  9EF5  (00F5)             CLAD  0,,=DF(1B-2)                                       PP049970
3026      186       0CBF  B807                     SUBD  0,7                                                PP049980
3027      632       0CC0  1000                     SQRT  0,0               (1-S1**2)**.5 AT B1              PP049990
3028      640       0CC1  8410                     FETM  1,,0              MAKE ROOM                        050000
3029      644       0CC2  9F44                     CLAM  IX4,4             2LS                              050010
3030      652   *   0CC3  F80D1656                 BSV   SIN                                                PP050020
3031      658       0CC5  600C                     MPY   0,12               -K7*SIN(2LS)                    PP050030
3032      660       0CC6  B408                     ADD   0,11              K6*SIN(MS)                       PP050040
3033      666       0CC7  B1F0                     SUB   X15,0             L AT PI                          PP050050
3034      1100      0CC8  1400                     SINCOS 0,0                                               PP050060
3035      1106      0CC9  6004                     MPY   0,4                                                PP050070
3036      1108      0CCA  B400                     ADD   0,0               S2 B1                            050080
3037      1114      0CCB  6024                     MPY   2,4                                                PP050090
3038      1116      0CCC  A412                     CLA   1,2                                                PP050100
3039      1118      0CCD  B411                     ADD   1,1               S3 B1                            050110
3040      1130      0CCE  7DF2                     PTRD  X15,2             SAVE ADJACENT TO S1              PP050120
3041      1162      0CCF  D7C0                     PRN   12                                                 PP050130
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                                *
                                *                    START INTEGRATION
                                *
3042   12R    0CD0  F4284000    $55    FETM  2,,F(18-1)          FM1,2,3 FOR COSX LESS THEN A
3043   22     0CD2  C02A               FET   2,10                GET P
3044   28     0CD3  6006               MPY   0,6                 P1 * S1
3045   34     0CD4  6017               MPY   1,7                 P2 * S2
3046   40     0CD5  6028               MPY   2,8                 P3 * S3
3047   42     0CD6  B421               ADD   2,1
3048   44     0CD7  B420               ADD   2,0                 P DOT S = COS (X) B2
3049   48     0CD8  F829F833           COMM  2,,F(-.158-2)       A
3050   52     0CDA  D155   (0CF0)      BRL   $20                 COS(X) LESS THAN -.15
3051    4R    0CDB  F829FE88           COMM  2,,F(-.048-2)       B
3052    8     0CDD  D048   (0CE6)      BLE   $15                 COS(X) LESS OR EQUAL THAN -.04
3053    2R    0CDE  9C50               CLAM  5,,0                FM1
3054    6     0CDF  FC492000           CLAM  4,,F(18-2)
3055    8     0CE1  B042               SUB   4,2                 1 - COS X
3056   12     0CE2  FC29428F           CLAM  2,,F(18-1+.048-1)   1 - B
3057   44     0CE4  D442               DIV   4,2                 FM2=(1-COSX)/(1-B) B1
3058   48     0CE5  D00A   (0CF0)      BUC   $20
3059    2R    0CE6  A452               CLA   5,2
3060    6     0CE7  F059FE88           SUBM  5,,F(-.048-2)       COSX - B  B2
3061   10     0CE9  FC49F833           CLAM  4,,F(-.158-2)
3062   12     0CEB  B042               SUB   4,2                 A - COSX  B2
3063   16     0CEC  FC29F8F6           CLAM  2,,F(-.158-1+.048-1) A-B B1
3064   48     0CEE  D442               DIV   4,2                 FM2 = (A - COSX)/(A-B)
3065   80     0CEF  D452               DIV   5,2                 FM1 = (COSX - B)/(A-B)
3066   12R    0CF0  D720               PRN   2                   $20
3067   30     0CF1  F02C16AC           FET   2,,NORTH_MAGNETIC_POLE_VECTOR
3068   36     0CF3  6008               MPY   0,11
3069   42     0CF4  601C               MPY   1,12
3070   48     0CF5  602D               MPY   2,13
3071   50     0CF6  B421               ADD   2,1
3072   52     0CF7  B420               ADD   2,0                 NP DOT P AT B1 = A5
3073   56     0CF8  D021   (0CFA)      BGE   $21
3074    2R    0CF9  A022               CLS   2,2                 A5 = ABSOLUTE(NP DOT P) B1
3075   14R    0CFA  C046               FET   4,6                 A5 IN R0
3076   22  *  0CFB  F80D16B8           BSV   ARCSIN
3077   24     0CFD  B400               ADD   0,0                 AA6 AT P1B-1 = MAGNETIC LATITUDE
3078   28     0CFE  B811               SUBD  1,1                 AAUR, BAUR
3079   38     0CFF  F4180E90           FETM  1,,AUR_DATA
3080   44     0D01  C002               FET   0,2                 AA6
3081    8R    0D02  F1180E78   $72     SUB   X1,,AUR_LIMITS
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3082    12    0D04  D044   (0D09)          BLE     $70                                  PP050570
3083     2R   0D05  9411                   ADDM    1,,1                                 PP050580
3084     4    0D06  9814                   COMM    1,,4        AA6 TOO LARGE THEREFORE  PP050590
3085     8    0D07  D164   (0D1C)          BRE     $71           AAUR = BAUR = 0 (IF E) PP050600
3086     4R   0D08  D8C7   (0D02)          BUC     $72                                  PP050610
3087     2R   0D09  9810            $70    COMM    1,,0        AA6 TOO SMALL THEREFORE  PP050620
3088     6    0D0A  D161   (0D1C)          BRE     $71           AAUR = BAUR = 0 (IF E) PP050630
3089     2R   0D0B  9011                   SUBM    1,,1        AA6 OK R1 = 0, 1, OR 2   PP050640
3090     6    0D0C  4416                   MPIM    1,,6        6 CONS FOR EACH LAT      PP050650
3091     8    0D0D  B421                   ADD     2,1         DATA ADDRESS FOR THIS LAT PP050660
3092    14    0D0E  A202                   CLS     I0,2        A1  PI-2B5               PP050670
3093    20    0D0F  6003                   MPY     0,3         *AA6 PIB-1               PP050680
3094    26    0D10  B121                   SUB     X2,,1       B   PI-1B4               PP050690
3095    32    0D11  6003                   MPY     0,3         *AA6                     PP050700
3096    38    0D12  B122                   SUB     X2,,2       C   B3                   PP050710
3097    44    0D13  465D   (00DD)          MPI     0,,HX0100   SHIFT LEFT 8   AAUR AT B-5 PP050720
3098    46    0D14  A440                   CLA     4,0                                  PP050730
3099    52    0D15  A123                   CLS     X2,,3       DA                       PP050740
3100    58    0D16  6003                   MPY     0,3         *AA6                     PP050750
3101    64    0D17  B124                   SUB     X2,,4       DB                       PP050760
3102    70    0D18  6003                   MPY     0,3         *AA6                     PP050770
3103    76    0D19  B125                   SUB     X2,,5       DC                       PP050780
3104    82    0D1A  465E   (00DE)          MPI     0,,HX0200   SHIFT LEFT 9   BAUR AT B-6 PP050790
3105    84    0D1B  A450                   CLA     5,0                                  PP050800
3106     6R   0D1C  60AA            $71    MPY     10,10       A5**2                    PP050810
3107    12    0D1D  9E62   (00E2)          CLA     0,,HX2000   1 B2                     PP050820
3108    14    0D1E  B00A                   SUB     0,10                                 PP050830
3109   460    0D1F  1000                   SQRT    0                                    PP050840
3110   468    0D20  C1F4                   FET     X15,,4      A2                       PP050850
3111   470    0D21  A000                   CLS     0,0                                  PP050860
3112   478    0D22  4263   (00E3)          MPY     0,,HX4000   SHIFT RIGHT 1            PP050870
3113   510    0D23  D401                   DIV     0,1         B1 AT B1                 PP050880
3114   514    0D24  FC194000               CLAM    1,,F(1B-1)                           PP050890
3115   516    0D26  A420                   CLA     2,0                                  PP050900
3116   522    0D27  6022                   MPY     2,2                                  PP050910
3117   526    0D28  4424                   LSA     2,,2        2B1**2 B1                PP050920
3118   528    0D29  B012                   SUB     1,2                                  PP050930
3119   532    0D2A  FC297FFF               CLAM    2,,X(7FFF)  PI/2  AT PIB-1           PP050940
3120   534    0D2C  B024                   SUB     2,4         -AA6 = B4 PIB-1          PP050950
3121   536    0D2D  A432                   CLA     3,2                                  PP050960
3122   542    0D2E  6033                   MPY     3,3         B4**2                    PP050970
3123   548    0D2F  6032                   MPY     3,2         B4**3 = AA6 AT PI+3B-3   PP050980
3124   554    0D30  6003                   MPY     0,3         AA2 AT PI+3B-2           PP050990
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3125  560        0031  6021                MPY   2,1          AA4 AT PI                          PP051000
3126  566        0032  6013                MPY   1,3          AA3 AT PI+38-2                     PP051010
3127  570        0033  FC891C80            CLAM  11,,AUR_SAVE                                    PP051020
3128  602        0035  7668                PTR   I6,11        SAVE AA2 - AA6, AAUR, BAUR         PP051030
                                     *                                                           PP051040
                                     *        DETERMINE CONDUCTIVITY LEVEL                       PP051050
                                     *                                                           PP051060
3129  604        0036  A40D                CLA   0,13         P1                                 PP051070
3130  608        0037  D053   (0038)       BRL   $83          SOUTHERN HEMISPHERE                 051080
3131    8R       0038  F48A1C9F            CLA   11,,SEASON_INDEX_NORTH                          051090
3132   12        003A  D002   (003D)       BUC   $84                                             051100
3133    8R       0038  F48A1CA0      $83   CLA   11,,SEASON_INDEX_SOUTH                        051110
3134    2R       003D  9C10          $84   CLAM  1,,0                                           051120
3135   10  *     003E  F80D1688            BSV   ARCSIN       LATITUDE                           PP051130
3136   18        0040  8410                FETM  1,,0                                           PP051140
3137   30        0041  C9F2                FETD  X15,2        P2 IN R0 AND P3 IN R1              PP051150
3138   32        0042  A421                CLA   2,1          P3                                 PP051160
3139  570        0043  1800                ATAN  0,0          LONGITUDE                          PP051170
3140  574        0044  F4294000            ADDM  2,,F(18-1)   = 90 DEGREES  0 = SOUTH POLE       PP051180
3141  580        0046  F0240024            MPYM  2,,F((180)/5B15) LAT WITH B1=5DEG               PP051190
3142  584        0048  FC090E39            SUBM  0,,F((20)/180) START AT 20 DEG EAST             PP051200
3143  592        004A  5263   (00E3)       MPLM  I0,,HX4000   SCALE AT 2PI AND POSITIVE         PP051210
3144    6R       004B  FC040048      $30   MPYM  0,,F((360)/5B15) LONG WITH B1 = 5 DEG           PP051220
3145    8        004D  9827                COMM  2,,7         TEST FOR 55 DEGREE LAT             PP051230
3146   12        004E  D022   (0051)       BGE   $31                                            PP051240
3147    6R       004F  FC044000            RSA   0,,1         LONG WITH B1 = 10 DEC              PP051250
3148   10R       0051  F12C1922      $31   FET   X2,,COND_TABLE GET ADDRESS FOR THIS LAT         PP051260
3149   12        0053  A420                CLA   2,0                                            PP051270
3150   20        0054  D700                PRN   0                                              PP051280
3151   22        0055  9C33                CLAM  3,,3          SET UP 4 COUNTER TO              PP051290
3152   24        0056  A423                CLA   2,3           TRIGGER FIRST TIME               PP051300
                                     *                                                           PP051310
3153    2R       0057  9C40          $32   CLAM  4,,0          CLEAR WORD FOR DOUBLE SHIFT      PP051320
3154   12        0058  F42C005C            BXU   2,,$35       TEST - TIME FOR NEXT WORD        PP051330
3155    6R       005A  A651                CLA   I5,1          YES-READ NEXT DATA WORD          PP051340
3156    8        005B  9411                ADDM  1,,1          AND INCREMENT ADDRESS            PP051350
3157    6R       005C  FC440010      $35   MPIDM 4,,16        PLACE NEXT 4 BITS IN UPPER WORD 5PP051360
3158    8        005E  984F                COMM  4,,15         IS IT WATER (F)                  PP051370
3159   12        005F  D019   (0069)       BNE   $36          IF YES FIGURE OUT HOW MANY       PP051380
3160    2R       0060  9C40                CLAM  4,,0          GET                              PP051390
3161   12        0061  F42C0065            BXU   2,,$37       NEXT                             PP051400
3162    6R       0063  A651                CLA   I5,1            4 BITS                        PP051410
3163    8        0064  9411                ADDM  1,,1            AND                           PP051420
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3164    6R    0D65  FC440010          $37    MPIDM   4,,16          DECREMENT LONGITUDE          PP051430
3165     8    0D67  B004                     SUB     0,4              COUNT WITH REPEAT CODE     PP051440
3166    10    0D68  9C4F                     CLAM    4,,15        CONDUCTIVITY LEVEL FOR WATER   PP051450
3167    2R    0D69  9001              $36    SUBM    0,,1         DECREMENT LONG COUNT           PP051460
3168     6    0D6A  D924    (0D57)          BGE     $32          DONE WHEN LONG COUNT NEGATIVE  PP051470
3169    4R    0D6B  4443                     MPIM    4,,3          SET LEVEL UP FOR THREE FREQ   PP051480
3170     6    0D6C  A454                     CLA     5,4                                         PP051490
3171    22    0D6D  D740                     PRN     4                                           PP051500
                                      *                                                           PP051510
                                      *                                                           PP051520
                                      * INTEGRATION OF TERMS THAT ARE A FUNCTION OF FREQUENCY     PP051530
                                      *                                                           PP051540
3172    32    0D6E  8422                     FETM    2,,2         FREQUENCY COUNTER JF           PP051550
3173    6R    0D6F  A5F8              $50    CLA     X15,8        GET ADDRESS OF RESULTS         PP051560
3174    12    0D70  C001                     FET     0,1          JF                             PP051570
3175    16    0D71  4409                     MPIM    0,,9         GET ADDRESS FOR THIS FREQUENCY PP051580
3176    18    0D72  B410                     ADD     1,0                                         PP051590
3177    20    0D73  A40C                     CLA     0,12         SEASON INDEX                   PP051600
3178    22    0D74  B402                     ADD     0,2          FOR THIS FREQ                  PP051610
3179    30    0D75  F50A16EE                 CLA     X0,,DIURNAL_CONSTANT_TABLE K                PP051620
3180    36    0D77  6007                     MPY     0,7          K*FM2                          PP051630
3181    38    0D78  B408                     ADD     0,8          F = FM1 + K*FM2  B1            PP051640
3182    46    0D79  C1F8                     FET     X15,8         INTEGRATION MARKER NONE ZERO  PP051650
3183    50    0D7A  D114    (0D8F)          BNE     $41            FIRST TIME THRU              PP051660
3184    6R    0D7B  A522                     CLA     X2,2          F(OLD)                        PP051670
3185     8    0D7C  B001                     SUB     0,1          F(OLD) - F  B1                 PP051680
3186    12    0D7D  4408                     LSA     0,,3         B-2                            PP051690
3187    18    0D7E  6000                     MPY     0,0                                         PP051700
3188    24    0D7F  C000                     FET     0,0                                         PP051710
3189    30    0D80  F0040888                 MPYM    0,,F(((6.70)/2)/3.14159B4) K11              PP051720
3190    38    0D82  6131                     MPY     X3,1         TIMES C21                      PP051730
3191    44    0D83  B530                     ADD     X3,0         + C11                          PP051740
3192    52    0D84  7530                     PTR     X3,0         C11  2PI B1                    PP051750
3193    58    0D85  F0040FEA                 MPYM    0,,F(((25.0)/2)/3.14159B5) K21                051760
3194    64    0D87  C001                     FET     0,1          F                              PP051770
3195    74    0D88  F14616AF                 MPY     X4,,ALPHA_0                                 PP051780
3196    76    0D8A  B400                     ADD     0,0          ALPHA * F B0                    051790
3197    84    0D8B  6131                     MPY     X3,1         C21*ALPHA*F  2PI B1            PP051800
3198    86    0D8C  B410                     ADD     1,0          C21                            PP051810
3199    94    0D8D  D700                     PRN     0                                           PP051820
3200    98    0D8E  D005    (0D94)          BUC     $42                                         PP051830
3201    2R    0D8F  A401              $41    CLA     0,1          F AT B1                        PP051840
3202    12    0D90  F13616AF                 MPY     X3,,ALPHA_0                                 PP051850
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3203   18   0D92  F004145F          MPYM   0,,F(((1)/2)/3.14159) C21(1) 2PI B1          PP051860
3204    8R  0D94  7521       $42    PTR    X2,1          C21 2PI B1                     PP051870
3205   16   0D95  7112              STA    X1,2          SAVE F FOR F(OLD)              PP051880
3206   24   0D96  C010              FET    1,0           F                              PP051890
3207   34   0D97  F8040040          RSAD   0,,9          DOUBLE F AT B10                PP051900
3208   42   0D99  BD33              ADDD   X3,3          GG B10                         PP051910
3209   54   0D9A  7D33              PTRD   X3,3                                         PP051920
3210   60   0D9B  C002              FET    0,2           JF                             PP051930
3211   72   0D9C  C965              FETD   X6,,5         BAUR, AAUR                     PP051940
3212   76   0D9D  4425              MPIM   2,,5                                         PP051950
3213   86   0D9E  8424              FETM   2,,4                                         PP051960
3214    8R  0D9F  F51A0E7C   $74    CLA    X1,,CAY_TABLE                                PP051970
3215   16   0DA1  631B              MPY    IX1,11        *AA(I)                         PP051980
3216   18   0DA2  B430              ADD    3,0           AAUR + SUM CAY(I)*AA(I) B-5    PP051990
3217   26   0DA3  F55A0E81          CLA    X5,,DCAY_TABLE                               PP052000
3218   34   0DA5  631B              MPY    IX1,11        *AA(I)                         PP052010
3219   36   0DA6  B440              ADD    4,0           BAUR + SUM DCAY(IC,I)*AA(I) B-6 PP052020
3220   38   0DA7  9451              ADDM   5,,1                                         PP052030
3221   46   0DA8  C41A   (0D9F)    BXU    1,,$74                                       PP052040
3222    2R  0DA9  A458              CLA    5,8           JF                             PP052050
3223    4   0DAA  B45A              ADD    5,10          +IC                            PP052060
3224   12   0DAB  F55A0E47          CLA    X5,,CAY1_TABLE B-5                           PP052070
3225   14   0DAD  B403              ADD    0,3                                          PP052080
3226   24   0DAE  F186171F          MPY    X8,,RAT_TABLE  FREQ CON B1                   PP052090
3227   26   0DB0  A430              CLA    3,0           A(JF) B-4                      PP052100
3228   34   0DB1  F55A0110          CLA    X5,,DCAY1_TABLE B-6                          PP052110
3229   36   0DB3  B404              ADD    0,4                                          PP052120
3230   46   0DB4  F186171F          MPY    X8,,RAT_TABLE                                PP052130
3231   48   0DB6  A440              CLA    4,0           B(JF) B-5                      PP052140
3232   60   0DB7  D720              PRN    2                                            PP052150
3233   62   0DB8  A421              CLA    2,1            B AT B-5                      PP052160
3234   68   0DB9  6013              MPY    1,3            B*F                           PP052170
3235   70   0DBA  B401              ADD    0,1           DELTA THETA 3 AT B-4           PP052180
3236   80   0DBB  4802              RSAD   0,,14         B10                            PP052190
3237   88   0DBC  BD47              ADDD   X4,7          THETA 3 B10                    PP052200
3238  100   0DBD  7D47              PTRD   X4,7                                         PP052210
3239  106   0DBE  A5F1              CLA    X15,1          P1                            PP052220
3240  112   0DBF  6000              MPY    0,0           P1**2 B2                       PP052230
3241  122   0DC0  F0060E77          MPY    0,,CI_TABLE   DELTA THETA 2 B-4                052240
3242  132   0DC2  F8040040          RSAD   0,,9          B5                             PP052250
3243  140   0DC4  BD25              ADDD   X2,5                                         PP052260
3244  152   0DC5  7D25              PTRD   X2,5           THETA 2 AT B10                PP052270
3245  162   0DC6  F41C0D6F          BXU    1,,$50        FREQUENCY INDEX                PP052280
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3246    22R   0DC8  D770                    PRN     7                                          PP052290
                                *                                                            PP052300
3247    24    0DC9  B0DD                    SUB     13,13          INTEGRATION MARKER EQUAL ZERO PP052310
                                *             TEST FOR END OF INTEGRATION                    PP052320
                                *                                                            PP052330
3248    36    0DCA  868D  (008D)             FETD    0,,INTEGRATION_COUNTER                     PP052340
3249    46    0DCB  F8CB1AC8                SUBD    0,,=DF((.01)/3.14159265)                   PP052350
3250    58    0DCD  7C0D  (008D)            PTRD    0,,INTEGRATION_COUNTER                     PP052360
3251    62    0DCE  D14C  (0DE8)            BLE     $60            DONE                        PP052370
3252    18R   0DCF  C068                    FET     6,11           GET AX AND P + 1 REGISTER   PP052380
3253    20    0DD0  A465                    CLA     6,5            AX CROSS P                  PP052390
3254    26    0DD1  6061                    MPY     6,1                                        PP052400
3255    32    0DD2  6013                    MPY     1,3                                        PP052410
3256    38    0DD3  6032                    MPY     3,2                                        PP052420
3257    44    0DD4  6024                    MPY     2,4                                        PP052430
3258    50    0DD5  6040                    MPY     4,0                                        PP052440
3259    56    0DD6  6005                    MPY     0,5                                        PP052450
3260    58    0DD7  B062                    SUB     6,2            1                           PP052460
3261    60    0DD8  B030                    SUB     3,0            2                           PP052470
3262    62    0DD9  B041                    SUB     4,1            3                           PP052480
3263    66    0DDA  FC29028F                CLAM    2,,F(.0181)    SIN(DTHETA) B-1             PP052490
3264    72    0DDC  6032                    MPY     3,2                                        PP052500
3265    78    0DDD  6042                    MPY     4,2                                        PP052510
3266    84    0DDE  6062                    MPY     6,2                                        PP052520
3267    96    0DDF  D720                    PRN     2                                          PP052530
3268    100   0DE0  FC297FFE                CLAM    2,,F(.99995)   COS DTHETA B0               PP052540
3269    106   0DE2  6092                    MPY     9,2                                        PP052550
3270    112   0DE3  60A2                    MPY     10,2                                       PP052560
3271    118   0DE4  60B2                    MPY     11,2                                       PP052570
3272    120   0DE5  B493                    ADD     9,3            NEW P1 B1                   PP052580
3273    122   0DE6  B4A0                    ADD     10,0           NEW P2                      PP052590
3274    124   0DE7  B481                    ADD     11,1           NEW P3                      PP052600
3275    138   0DE8  D730                    PRN     3                                          PP052610
3276    144   0DE9  04000CD0                BUC     $55                                        PP052620
                                *                                                            PP052630
                                *               INTEGRATION COMPLETE                         PP052640
                                *                                                            PP052650
3277    28R   0DEB  D7A0            $60     PRN     10                                         PP052660
3278    30    0DEC  A424                    CLA     2,4            STA N0                      PP052670
3279    34    0DED  4423                    MPIM    2,,3                                       PP052680
3280    48    0DEE  C041                    FET     4,1            THETA 1                     PP052690
3281    58    0DEF  F83B008D                SUBD    3,,INTEGRATION_COUNTER                     PP052700
3282    184   0DF1  DC13                    DIVD    1,3            AVERAGING CONSTANT AT B+0   PP052710
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3283   192        0DF2  867D   (00FD)          FET     0,,RIJ_ADD                                  052720
3284   200        0DF3  864C   (00CC)          FET     0,,BASE+1          "COMPUTE THETA1 FOR THE  *I052730
3285   208  *     0DF4  F80D0B62               BSV     COMPUTE_THETA1        "BASE STATION          052740
3286   212        0DF6  AC50                   CLAD    5,0                                          052750
3287   222        0DF7  D710                   PRN     1                                            052760
3288   230        0DF8  8414                   FETM    1,,4           FREQUENCY INDEX             PP052770
3289     6R       0DF9  C00A          $61      FET     0,10           DATA ADDRESS                PP052780
3290    12        0DFA  C001                   FET     0,1            JF                          PP052790
3291    16        0DFB  4409                   MPIM    0,,9                                         052800
3292    22        0DFC  F0044000               RSA     0,,1                                        PP052810
3293    24        0DFE  B410                   ADD     1,0            FREQ DATA ADDRESS           PP052820
3294    26        0DFF  A401                   CLA     0,1            DATA ADDRESS                PP052830
3295    28        0E00  9405                   ADDM    0,,5           INCREMENT DATA ADDRESS BY 5 PP052840
3296    36        0E01  8412                   FETM    1,,2           20 COUNTER                   052850
3297    12R       0E02  CB02          $80      FETD    IX0,2          AVERAGING                   PP052860
3298    28        0E03  6809                   MPYD    0,9               OF                       PP052870
3299    40        0E04  7F24                   PTRD    IX2,4                THETA'S               PP052880
3300    48        0E05  CC04   (0E02)          BXUD    0,,$80                                       052890
3301    12R       0E06  D720                   PRN     2                                           PP052900
3302    26        0E07  F91C176F               FETD    X1,,DCAY_ONE   DTHETA*DCAY AT PI           PP052910
3303    44        0E09  6923                   MPYD    X2,3           GG B10                      PP052920
3304   170        0E0A  DC0A                   DIVD    0,10           A=THETA 1 AT PI             PP052930
3305   180        0E0B  FD3B1795               ADDD    X3,,CAY_ONE    B10                         PP052940
3306   188        0E0D  BD27                   ADDD    X2,7           + THETA 3                   PP052950
3307     6R       0E0E  FC040020      PLOT17   LSAD    0,,5           SCALE CYCLES B5. SUBD 0 SMLTR PP052960
3308    16        0E10  F1C71CB9               STA     X12,,PP_THETA3                             PP052970
3309    24        0E12  AD20                   CLAD    X2,,0          C11 IN R1, C21 IN R0, AT 2PIB1 PP052980
3310    26        0E13  B401                   ADD     0,1            C = C21 + C11  B1 CYCLES    PP052990
3311    30        0E14  F409028F               ADDM    0,,F(.04B-1)   ADD 4 CEC'S                 PP053000
3312    36        0E16  6000                   MPY     0,0            C**2                        PP053010
3313    46        0E17  F1C71CA1               STA     X12,,PROP_C                                PP053020
3314    50        0E19  AC0A                   CLAD    0,10           THETA 1                     PP053030
3315    52        0E1A  94C1                   ADDM    12,,1          INCREMENT STATION FREQ POINTER PP053040
3316    60        0E1B  C013                   FET     1,3            FREQ                        PP053050
3317    66        0E1C  A5F2                   CLA     X15,,2         STA                         PP053060
3318    76        0E1D  F00C1C68               FET     0,,PROP_PRED_RESULTS+5                      053070
3319    86        0E1F  F5171D0F               PTR     X1,,PP_THETA2  CYCLES B5                    053080
                                      *                              "COMPUTE THETA C = PREDICTED *I053090
3320    94  *     0E21  F80D0B47               BSV     THETA_C        "PHASE FOR THIS STATION / FREQ PP053100
                                      *                              "IS THIS PHASE               *I053110
3321    98        0E23  D0D7   (0E2B)          BCF     $44            "     DIFFERENCE NAVIGATION? %R053120
                                      *                              "SUB ALWAYS PHASE DIFFERENCE PP053130
                                      *                              "                            PP053140
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                                        *                                   "SET UP ARGUMENTS FOR THETAC BASEPP053150
                                        *                                   "(THETA 1), FREQ, BASE STA NO)   PP053160
3322      8R      0E24  C019                  FET      1,9                   THETA 1 BASE                     PP053170
3323      14      0E25  C005                  FET      0,5                   FREQ                             PP053180
3324      22      0E26  864C   (00CC)         FET      0,,BASE+1                                              PP053190
                                        *                                   "COMPUTE THETA C FOR THE         *I053200
3325      30  *   0E27  F80D0847              BSV      THETA_C              "     BASE STATION               PP053210
3326      34      0E29  B820                  SUBD     2,0                   "THETA P = THETA C - THETA C BASEPP053220
                                        *                                   "                                PP053230
                                        *                                   "THETA P = PREDICTED TRACKING    PP053240
                                        *                                   "          FILTER MEASUREMENT    PP053250
                                        *                                   "          (FRACTIONS OF A CYCLE PP053260
                                        *                                   "          + THE TOTAL INTEGER   PP053270
                                        *                                   "          LANE COUNT)           PP053280
3327      38      0E2A  D005   (0E30)         BUC      $45                                                    PP053290
3328      14R     0E2B  F80C1C20      $44     FETD     0,,XXX+2              T ZERO                           PP053300
3329      34      0E2D  F9560E41              MPYD     X5,,FREQ_TABLE CYCLES B10                              PP053310
3330      38      0E2F  BC20                  ADDD     2,0                   "RHO - RHO NAVIGATION"           PP053320
                                        *                                   "                                PP053330
                                        *                                   "CORRECT PREDICTED PHASE FOR     PP053340
                                        *                                   "T ZERO TERM                     PP053350
                                        *                                   "THETA P = THETA C + T(0)        PP053360
3331      6R      0E30  A5F2          $45     CLA      X15,,2                STA NO                           PP053370
3332      10      0E31  4406                  MPIM     0,,6                  "COMPUTE POINTER TO THE TRACKING PP053380
                                        *                                   "FILTER PHASE ESTIMATE P         PP053390
3333      12      0E32  B405                  ADD      0,5                   FREQ                             PP053400
3334      26      0E33  F90C1EA3              FETD     X0,,PHI_ESTIMATE "UPDATE LANE COUNT"                  %S053410
3335      30      0E35  B804                  SUBD     0,4                                                    PP053420
                                        *                                   "                                PP053430
3336      36      0E36  FC040800              LSAD     0,,11                 "REPLACE THE INTEGER PART OF P   PP053440
3337      46      0E38  F8040010              RSAD     0,,11                 "(IN CYCLES) WITH THE INTEGER    PP053450
3338      50      0E3A  BC04                  ADDD     0,4                   "PART OF THETA P.  ADJUST THE    PP053460
3339      64      0E3B  FD271EA3              PTRD     X2,,PHI_ESTIMATE "LANE COUNT IN P BY 1 IF NECES-PP053470
3340      80      0E3D  D740                  PRN      4                     "SARY SO THAT THETA P AND P ARE  PP053480
                                        *                                   "WITHIN 1/2 CYCLE OF EACH OTHER  PP053490
                                        *                                   "ARE THERE MORE                  *I053500
3341      90      0E3E  FC0C0DF9              BXUD     0,,PROPAGATION_PREDICTION$61 "FREQ TO PROC?"           PP053510
                                        *                                   "EXIT"                           PP053520
                                        *                                   "                                PP053530
                                        *                                   "THE ARGUMENT IS UNDISTURBED     PP053540
                                        *                                   "45 WORDS HAVE BEEN ADDED TO THE PP053550
3342      32R     0E40  D5A0                  BBK      10                    "R15 PUSH DOWNSTACK              PP053560
                                        *                                                                    PP053570
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                                  *                                                                  PP053580
                                  *                                                                  PP053590
3343    0E41  008FFFF6            FREQ_TABLE  COND     F((441.176D-6)*10.2000D3B-10)                  PP053600
3344    0E43  008FFFF3                        COND     F((441.176D-6)*13.6000D3B-10)                  PP053610
3345    0E45  009FFFD6                        COND     F((441.176D-6)*11.3333D3B-10)                  PP053620
                                  *                                                                  PP053630
                                  *                                                                  PP053640
3346    0E47  E810                CAY1_TABLE  CON      F(((-27.0D-6)*.9974)*217.021B5)            10.2PP053650
3347    0E48  DC89                            CON      F(((-40.0D-6)*.9974)*217.021B5)            13.6PP053660
3348    0E49  E3A1                            CON      F(((-32.0D-6)*.9974)*217.021B5)            11.3PP053670
3349    0E4A  EE45                            CON      F(((-20.0D-6)*.9974)*217.021B5)                PP053680
3350    0E4B  E0F8                            CON      F(((-35.0D-6)*.9974)*217.021B5)                PP053690
3351    0E4C  E810                            CON      F(((-27.0D-6)*.9974)*217.021B5)                PP053700
3352    0E4D  07FB                            CON      F(((+09.0D-6)*.9974)*217.021B5)                PP053710
3353    0E4E  EB9C                            CON      F(((-23.0D-6)*.9974)*217.021B5)                PP053720
3354    0E4F  F8E8                            CON      F(((-08.0D-6)*.9974)*217.021B5)                PP053730
3355    0E50  1D42                            CON      F(((+33.0D-6)*.9974)*217.021B5)                PP053740
3356    0E51  1862                            CON      F(((+27.5D-6)*.9974)*217.021B5)                PP053750
3357    0E52  202F                            CON      F(((+36.3D-6)*.9974)*217.021B5)                PP053760
3358    0E53  15CF                            CON      F(((+24.6D-6)*.9974)*217.021B5)                PP053770
3359    0E54  2703                            CON      F(((+44.0D-6)*.9974)*217.021B5)                PP053780
3360    0E55  1CFE                            CON      F(((+32.7D-6)*.9974)*217.021B5)                PP053790
3361    0E56  0E74                            CON      F(((+16.3D-6)*.9974)*217.021B5)                PP053800
3362    0E57  2222                            CON      F(((+38.5D-6)*.9974)*217.021B5)                PP053810
3363    0E58  166E                            CON      F(((+25.3D-6)*.9974)*217.021B5)                PP053820
3364    0E59  0701                            CON      F(((+07.9D-6)*.9974)*217.021B5)                PP053830
3365    0E5A  1D6F                            CON      F(((+33.2D-6)*.9974)*217.021B5)                PP053840
3366    0E5B  10EF                            CON      F(((+19.1D-6)*.9974)*217.021B5)                PP053850
3367    0E5C  02D6                            CON      F(((+03.2D-6)*.9974)*217.021B5)                PP053860
3368    0E5D  1A99                            CON      F(((+30.0D-6)*.9974)*217.021B5)                PP053870
3369    0E5E  0D1F                            CON      F(((+14.8D-6)*.9974)*217.021B5)                PP053880
3370    0E5F  FFD3                            CON      F(((-00.2D-6)*.9974)*217.021B5)                PP053890
3371    0E60  1878                            CON      F(((+27.6D-6)*.9974)*217.021B5)                PP053900
3372    0E61  0AA4                            CON      F(((+12.0D-6)*.9974)*217.021B5)                PP053910
3373    0E62  FD57                            CON      F(((-03.0D-6)*.9974)*217.021B5)                PP053920
3374    0E63  16B2                            CON      F(((+25.6D-6)*.9974)*217.021B5)                PP053930
3375    0E64  0828                            CON      F(((+09.2D-6)*.9974)*217.021B5)                PP053940
3376    0E65  FB7A                            CON      F(((-05.1D-6)*.9974)*217.021B5)                PP053950
3377    0E66  151A                            CON      F(((+23.8D-6)*.9974)*217.021B5)                PP053960
3378    0E67  06A6                            CON      F(((+07.5D-6)*.9974)*217.021B5)                PP053970
3379    0E68  FA53                            CON      F(((-06.4D-6)*.9974)*217.021B5)                PP053980
3380    0E69  144E                            CON      F(((+22.9D-6)*.9974)*217.021B5)                PP053990
3381    0E6A  057F                            CON      F(((+06.2D-6)*.9974)*217.021B5)                PP054000
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3382    0E6B  F99E                  CON    F(((-07.2D-6)*.9974)*217.021B5)                PP054010
3383    0E6C  13AF                  CON    F(((+22.2D-6)*.9974)*217.021B5)                PP054020
3384    0E6D  049C                  CON    F(((+05.2D-6)*.9974)*217.021B5)                PP054030
3385    0E6E  F8E8                  CON    F(((-08.0D-6)*.9974)*217.021B5)                PP054040
3386    0E6F  1310                  CON    F(((+21.5D-6)*.9974)*217.021B5)                PP054050
3387    0E70  03FD                  CON    F(((+04.5D-6)*.9974)*217.021B5)                PP054060
3388    0E71  F833                  CON    F(((-08.8D-6)*.9974)*217.021B5)                PP054070
3389    0E72  129E                  CON    F(((+21.0D-6)*.9974)*217.021B5)                PP054080
3390    0E73  035E                  CON    F(((+03.8D-6)*.9974)*217.021B5)                PP054090
3391    0E74  F805                  CON    F(((-09.0D-6)*.9974)*217.021B5)                PP054100
3392    0E75  1271                  CON    F(((+20.8D-6)*.9974)*217.021B5)                PP054110
3393    0E76  0375                  CON    F(((+03.9D-6)*.9974)*217.021B5)                PP054120
                            *                                                             PP054130
                            *                                                             PP054140
3394    0E77  B08F          CI_TABLE  CON    F(((((-.336D-4)*.9974)*217.021B+6)*4)/3) 13.6    054150
                            *                                                             PP054160
                            *                                                             PP054170
3395    0E78  53E9          AUR_LIMITS CON   F((1.02974)/3.14159265B-1) PIB-1              PP054180
3396    0E79  0889                  CON    F((0.10472)/3.14159265B-1) PIB-1              PP054190
3397    0E7A  0222                  CON    F((0.02618)/3.14159265B-1) PIB-1              PP054200
3398    0E7B  149F                  CON    F((0.25307)/3.14159265B-1) PIB-1              PP054210
                            *                                                             PP054220
                            *                                                             PP054230
3399    0E7C  FD40          CAY_TABLE CON    F((((-0.4D-6)*217.021)*.9974)*31.0062B+3) PI-3B-PP054240
3400    0E7D  0000                  CON    0                                             PP054250
3401    0E7E  FE31                  CON    F((((-.65D-6)*217.021)*.9974)*3.14159B+5) PI-1B-PP054260
3402    0E7F  0000                  CON    0                                             PP054270
3403    0E80  01D7                  CON    F((((1.32D-6)*217.021)*.9974)*3.14159B+4) PI-1B-PP054280
                            *                                                             PP054290
                            *                                                             PP054300
                            *                                                             PP054310
                            *                                                             PP054320
3404    0E81  267D          DCAY_TABLE CON   F((((+2.80)*217.021)*.9974)*31.0062B+4D-6)  10.2PP054330
3405    0E82  EB62                  CON    F((((-1.50)*217.021)*.9974)*31.0062B+4D-6)  10.2PP054340
3406    0E83  039F                  CON    F((((+0.65)*217.021)*.9974)*3.14159B+6D-6)  10.2PP054350
3407    0E84  204D                  CON    F((((+4.70)*217.021)*.9974)*31.0062B+3D-6)  10.2PP054360
3408    0E85  FC53                  CON    F((((-1.32)*217.021)*.9974)*3.14159B+5D-6)  10.2PP054370
3409    0E86  1904                  CON    F((((+1.82)*217.021)*.9974)*31.0062B+4D-6)  13.6PP054380
3410    0E87  EC58                  CON    F((((-1.43)*217.021)*.9974)*31.0062B+4D-6)  13.6PP054390
3411    0E88  039F                  CON    F((((+0.65)*217.021)*.9974)*3.14159B+6D-6)  13.6PP054400
3412    0E89  1AAA                  CON    F((((+3.88)*217.021)*.9974)*31.0062B+3D-6)  13.6PP054410
3413    0E8A  FC53                  CON    F((((-1.32)*217.021)*.9974)*3.14159B+5D-6)  13.6PP054420
3414    0E8B  2070                  CON    F((((+2.36)*217.021)*.9974)*31.0062B+4D-6)  11.3PP054430
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3415                    0E8C  EC35                    CON     F((((-1.44)*217.021)*.9974)*31.0062B+4D-6)  11.3PP054440
3416                    0E8D  039F                    CON     F((((+0.65)*217.021)*.9974)*3.141598+6D-6)  11.3PP054450
3417                    0E8E  1001                    CON     F((((+4.22)*217.021)*.9974)*31.0062B+3D-6)  11.3PP054460
3418                    0E8F  FC53                    CON     F((((-1.32)*217.021)*.9974)*3.141598+5D-6)  11.3PP054470
                                              *                                                           PP054480
                                              *                                                           PP054490
3419                    0E90  02A6            AUR_DATA  CON     F((((00310.04)*9.869598-5)*.9974)*217.021D-6)  PP054500
3420                    0E91  FC83                    CON     F((((-0641.39)*3.141598-4)*.9974)*217.021D-6)  PP054510
3421                    0E92  0126                    CON     F(((00331.718-3)*.9974)*217.021D-6)            PP054520
3422                    0E93  07F3                    CON     F((((00930.13)*9.869598-5)*.9974)*217.021D-6)  PP054530
3423                    0E94  F5A3                    CON     F((((-1905.09)*3.141598-4)*.9974)*217.021D-6)  PP054540
3424                    0E95  0361                    CON     F(((00975.478-3)*.9974)*217.021D-6)            PP054550
3425                    0E96  F092                    CON     F((((-1805.55)*9.869598-5)*.9974)*217.021D-6)  PP054560
3426                    0E97  168D                    CON     F((((04179.73)*3.141598-4)*.9974)*217.021D-6)  PP054570
3427                    0E98  F7A3                    CON     F(((-2414.908-3)*.9974)*217.021D-6)            PP054580
3428                    0E99  0395                    CON     F((((-5197.77)*9.869598-5)*.9974)*217.021D-6)  PP054590
3429                    0E9A  406A                    CON     F((((11840.17)*3.141598-4)*.9974)*217.021D-6)  PP054600
3430                    0E9B  E880                    CON     F(((-6731.368-3)*.9974)*217.021D-6)            PP054610
3431                    0E9C  0084                    CON     F((((00060.30)*9.869598-5)*.9974)*217.021D-6)  PP054620
3432                    0E9D  FF11                    CON     F((((-0171.32)*3.141598-4)*.9974)*217.021D-6)  PP054630
3433                    0E9E  006C                    CON     F(((00121.658-3)*.9974)*217.021D-6)            PP054640
3434                    0E9F  FF33                    CON     F((((-0093.80)*9.869598-5)*.9974)*217.021D-6)  PP054650
3435                    0EA0  011F                    CON     F((((00206.28)*3.141598-4)*.9974)*217.021D-6)  PP054660
3436                    0EA1  FFA4                    CON     F(((-0104.138-3)*.9974)*217.021D-6)            PP054670
                                              * PROGRAMMER CONTROLLER ROUTINE DISPLAYS 2 HEX DIGITS FOR TEST RESULTS  054680
                                              * IN ITS LED AND OPERATES GO - NOGO - LIGHTS.                           054690
                                              * ALSO SEE THE IOC X(8CC0) IN THE SYNC ROUTINE.                         054700
3437                 8R 0EA2  F80F8C80        OPER_P_C  IOC     0,,X(8C80)      TURN OFF NOGO TIMER         054710
3438                 22 0EA4  F80C002E                  FETD    0,,TEST_FAIL_TEMP  GET FAIL WORDS           054720
3439                 28 0EA6  C001                      FET     0,1             SWAP WORDS                  054730
3440                 36 0EA7  F42A00D0                  CLA     2,,HX0100       GIVES ZERO IF NO ERRER      054740
3441                168 0EA9  0D02                      NMLD    0,2             REG 2 GETS -(SHIFT COUNT)   054750
3442                178 0EAA  F0271EE8                  STA     2,,AVIONICS     SAVE SHIFT COUNT FOR PC OUTP 054760
3443                182 0EAC  0062    (0EAF)           BRE     $1                                          054770
3444                 8R 0EAD  F80F8C00                  IOC     0,,X(8C00)      TURN ON NOGO                054780
3445                10R 0EAF  FC0D1EE8        $1        PCP     0,,AVIONICS     OUTPUT 2 HEX DIGITS TO PC   054790
3446                 30 0EB1  D540                      BBK     4               RETURN                      054800
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                                                  **                                                                  DP054810
                                                  *                          PANEL MAIN                               *H054820
                                                  *                                                                   *H054830
                                                  * THIS ROUTINE PROCESSES ALL DATA INSERTED THROUGH THE CONTROL INDICATOR*H054840
                                                  * PANEL AND GENERATES ALL DATA DISPLAYED ON THE PANEL.  IT IS A NON  *H054850
                                                  * OMEGA TASK THAT IS EXECUTED 10 TIMES A SECOND.                     *H054860
                                                  *                                                                   *H054870
3447      8R      0EB2  D700                      PANEL_MAIN  PRN        0              PRUNE ONE EXEC REGISTER       DP054880
3448      16      0EB3  F40A1F47                              CLA        0,,PANELMODE   "READ PANEL MODE              DP054890
                                                  *                                     "                             *2054900
3449      22      0EB5  04051027                              BRL        PANEL_TEST     "IS THE PANEL IN THE TEST MODE? DP054910
                                                  *                                     "(MODE NEGATIVE)              DP054920
                                                  *                                     "                             *2054930
3450      4R      0EB7  D162    (0ECA)                        BRE        $11            "IS THE PANEL QUIESCENT?"     DP054940
                                                  *                                     "(MODE ZERO)                  DP054950
                                                  *                                                                   DP054960
3451      18R     0EB8  F02C1F40                              FET        2,,CALLWORD    "READ PANEL PARAMETERS        DP054970
                                                  *                                     "CALL = NUMBER DEFINING MAJOR DP054980
                                                  *                                     "       PANEL SUBROUTINE BASED ONDP054990
                                                  *                                     "       LOWER KEYBOARD BUTTONS DP055000
                                                  *                                     "ARG1, ARG2 = TEMPORARY STORAGE DP055010
                                                  *                                     "             USED BY VARIOUS DP055020
                                                  *                                     "             ROUTINES TO SAVE DP055030
                                                  *                                     "             INFORMATION DURING DP055040
                                                  *                                     "             BUTTON PUSHING  DP055050
                                                  *                                     "             PROCEDURES      DP055060
3452      20      0EBA  9831                                  COMM       3,,1           TEST MODE AGAIN               DP055070
                                                  *                                     "                             *2055080
3453      26      0EBB  04061248                              BRE        PANELOUTPUT    "IS THE PANEL IN THE DISPLAY MODEDP055090
                                                  *                                     "(MODE = 1)                   DP055100
                                                  * THE MODE IS INSERT (2) INDICATING                                 *H055110
                                                  * THAT THE ACCEPT BUTTON HAS JUST                                   *H055120
                                                  * BEEN DEPRESSED TO COMPLETE A PRO-                                 *H055130
                                                  * CEDURE AND THE DATA DISPLAYED ON                                  *H055140
                                                  * THE PANEL NOW SHOULD BE PROCESSED                                 *H055150
3454      22R     0EBD  F03C0005                              FET        3,,C_I_RIGHT_DISPLAY AND BOTH LEGENDS       DP055160
                                                  *                                     "READ THE LEFT LEGEND, RIGHT  DP055170
                                                  *                                     "LEGEND AND THE LEFT DISPLAY  DP055180
                                                  *                                     "REGISTER (DISPLAY IS A 6 DIGIT DP055190
                                                  *                                     "BCD WORD)                    DP055200
                                                  *                                     "CONVERT DISPLAY TO INTEGER IN *I055210
3455      30  *   0EBF  F80D1564                              BSV        BCDTOBIN       "UNITS OF LSB OF THE DISPLAY  DP055220
3456      44      0EC1  F01C0003                              FET        1,,C_I_LEFT_DISPLAY "READ RIGHT DISPLAY REGISTERDP055230
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3479    12    0EE2  F00C1F8C                FET     0,,FLOATER     "USE MARKER                      DP055670
3480    20    0EE4  D700                    PRN     0              "IS THE LOOP                     DP055680
3481    24    0EE5  D012   (0EE8)           BNE     $35            "ANTENNA IN USE?                 %R055690
3482     4R   0EE6  F4090018                ADDM    0,,X(0018)     "TURN OFF THE FLOATER LAMP AND   DP055700
                                   *                                "TURN ON THE LOOP ANTENNA IN USE DP055710
                                   *                                "LAMP                            DP055720
3483     4R   0EE8  FC1920F8       $35      CLAM    1,,X(20F8)     "MASK FOR STATUS LAMP              055730
3484    16    0EEA  E0010009                MRG     0,1,C_I_OUTPUT_MALFUNCTION_STATUS_INDICATORS       055740
                                   *                                "OUTPUT THE STATE OF THE STATUS  DP055750
                                   *                                "LAMPS TO THE C/I                DP055760
3485    30    0EEC  D510                    BBK     1              "EXIT PANEL ROUTINE"             %S055770
                                   *                                                                 CI055780
3486          0EED  0EFA           $1       CON     $5             INPUTS                           DP055790
3487          0EEE  0F09                    CON     $12            1 SPARE                          DP055800
3488          0EEF  0F09                    CON     $12            SPARE                              055810
3489          0EF0  0000                    CON     0              SIGMA - SPARE                    DP055820
3490          0EF1  0F09                    CON     $12            4 SPARE                          DP055830
3491          0EF2  0F0A                    CON     $3             D-GMT                              055840
3492          0EF3  0F09                    CON     $12            6 SPARE                          DP055850
3493          0EF4  0F09                    CON     $12                                             DP055860
3494          0EF5  0F64                    CON     $4             MAN H/S                            055870
3495          0EF6  0F09                    CON     $12            SPARE                              055880
3496          0EF7  0F09                    CON     $12            SPARE                              055890
3497          0EF8  0F7A                    CON     $7             POS                                055900
3498          0EF9  0F09                    CON     $12            SPARE                              055910
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                                        **                                                                  DP055920
                                        * OMEGA DR INSERT                                                   *H055930
                                        *                                                                   *H055940
                                        * NOTE - A SINGLE 16 BIT WORD                                       *H055950
                                        *        DEFINES THE CURRENT                                        *H055960
                                        *        LIST OF STATIONS AVAIL-                                    *H055970
                                        *        ABLE AND NAV MODE THAT                                     *H055980
                                        *        HAVE BEEN SELECTED BY                                      *H055990
                                        *        THE OPERATOR                                               *H056000
3499    10R     0EFA  FC1A1F3D          $5          CLAD     1,,IMAGE11        -,UL,UR                      056010
3500    18      0EFC  E40200DE                      EXT      0,2,HX0200        MAN BIT FROM UR              056020
3501    20      0EFE  B020                          SUB      2,0                                            056030
3502    22      0EFF  B401                          ADD      0,1               ADD AUTO BIT FROM UL         056040
3503    28      0F00  F0254000                      RSL      2,,1                                           056050
3504    30      0F02  B402                          ADD      0,2               FORM STATIONS IN USE WORD    056060
3505     2R     0F03  A010              $97         CLS      1,0                                          % 056070
                                        *                                   "FORM COMPLIMENT TO MAINTAIN    DP056080
                                        *                                   "A GOOD CHECKSUM                DP056090
                                        *                                   "PROGRAM MONITOR UNIT COULD STOP *I056100
3506    10      0F04  F00F8E20                      SET      0,,DISABLE_MEMORY_PROTECT "IF NOT DISABLED      DP056110
3507    20      0F06  7865   (00E5)                STAD     0,,STATIONS_IN_USE "SAVE UPDATED STATIONS AND   DP056120
                                        *                                   "NAV MODE"                      DP056130
3508    28      0F07  F00F8E21                      SET      0,,ENABLE_MEMORY_PROTECT "ENABLE PMU"           DP056140
3509    28R     0F09  D580              $12         BBK      8                 "EXIT"                        DP056150
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                                        **                                                                  DP056160
                                        * DATE TIME INSERT                                                  *H056170
3510      8R      0F0A  F42A002A        $3          CLA       2,,ACCEPT_OLD  "READ ACCEPT OLD MARKER        DP056180
                                        *                                    "DID THE OPERATOR              *2056190
3511      14      0F0C  04010F5B                    BNE       $33            "TAKE THE OPTION OF ACCEPTING THEDP056200
                                        *                                    "DISPLAYED TIME?               DP056210
                                        * A NEW TIME WAS INSERTED                                           *H056220
3512      8R      0F0E  F42A0009                    CLA       2,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES    DP056230
3513      12      0F10  4422                        LSA       2,,1           "EXAMINE THE ENTER TIME LAMP     056240
                                        *                                    "IS THIS TIME                  *2056250
3514      16      0F11  D028    (0F1A)              BGE       $61            "INSERT THE FIRST TIME INSERT  %R056260
                                        *                                    "SINCE TURN ON?                DP056270
3515      10R     0F12  8420                        FETM      2,,0           "SET DELTAV2, 3 = 0            DP056280
3516      22      0F13  7C39    (00B9)              PTRD      0,,DELTA_V2    "RESTART KALMAN IF IT HAS      DP056290
                                        *                                    "   ALREADY STARTED            DP056300
                                        *                                    "SET POSITION VARIANCES TO AN 'A'DP056310
                                        *                                    "   FIX FOR KALMAN RESTART     DP056320
3517      30      0F14  7437    (00B7)              PTR       0,,COLD_START_MKR RESTART KALMAN              DP056330
3518      44      0F15  F80C1776                    FETD      0,,POS_NOISE_TABLE SET A FIX                  DP056340
3519      52      0F17  C011                        FET       1,1                                           DP056350
3520      74      0F18  FC271F96                    PTRD      2,,SAVE_POSITION_VARIANCES                    DP056360
3521      10R     0F1A  FC2A0003        $61         CLAD      2,,C_I_LEFT_DISPLAY BCD DATE                  DP056370
3522      18  *   0F1C  F80D100F                    BSV       MAKE_TWO_BINARY   YEAR                        DP056380
3523      22      0F1E  F0590048                    SUBM      5,,72          YEARS  SINCE  1972               056390
3524      24      0F20  A405                        CLA       0,5                                           DP056400
3525      28      0F21  F404016D                    MPIM      0,,365                                        DP056410
3526      30      0F23  B066                        SUB       6,6            ZERO R6                          056420
3527      40      0F24  F8542000                    RSAD      5,,2           II IN R5   FF IN R6              056430
3528      42      0F26  B405                        ADD       0,5             D + II =  D                     056440
3529      50  *   0F27  F80D100F                    BSV       MAKE_TWO_BINARY    MONTH OF YEAR              DP056450
3530      60      0F29  F05700C9                    STA       5,,DAY+1                                      DP056460
3531      62      0F2B  9860                        COMM      6,,0           TEST FOR LEAP YEAR               056470
3532      66      0F2C  D013    (0F30)              BNE       $31            NOT LEAP YR                    DP056480
3533      2R      0F2D  9852                        COMM      5,,2           LEAP YR  BUT IS IT FEB           056490
3534      6       0F2E  D031    (0F30)              BRG       $31                     OR EARLIER            DP056500
3535      2R      0F2F  9001                        SUBM      0,,1           YES IT IS   D - 1 =  D           056510
3536      8R      0F30  F55B16C0        $31         ADD       X5,,DAYS_BY_MONTH-1                           DP056520
3537      16  *   0F32  F80D100F                    BSV       MAKE_TWO_BINARY   DAY OF MONTH                DP056530
3538      26      0F34  F05700C8                    STA       5,,DAY                                        DP056540
3539      28      0F36  B405                        ADD       0,5                                           DP056550
                                        *                                    DAYS  AT  B15                    056560
3540      30      0F37  A480                        CLA       8,0            SAVE IN R8                     DP056570
                                        *   TIME PROCESSING                                                 DP056580
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3541    40        0F38  FC2A0005                  CLAD    2,,C_I_RIGHT_DISPLAY BCD TIME                  DP056590
3542    48  *     0F3A  F80D100F                  BSV     MAKE_TWO_BINARY    HOURS (0 TO 23)             DP056600
3543    52        0F3C  AC64                      CLAD    6,4                                            DP056610
3544    56        0F3D  F474003C                  MPIM    7,,60          CONVERT TO MINUTES              DP056620
3545    64  *     0F3F  F80D100F                  BSV     MAKE_TWO_BINARY   MINUTES (0 TO 59)            DP056630
3546    66        0F41  B475                      ADD     7,5                                            DP056640
3547    72        0F42  FC64003C                  MPIDM   6,,60          CONVERT TO SECONDS              DP056650
3548    80  *     0F44  F80D100F                  BSV     MAKE_TWO_BINARY    SECONDS (0 TO 59)           DP056660
3549    84        0F46  BC64                      ADDD    6,4                                            DP056670
3550    90        0F47  FC6400C8                  MPIDM   6,,200         CONVERT TO UNITS OF 5 MILLISECS DP056680
3551   102        0F49  F86700C6                  STAD    6,,GMT         SAVE NEW GMT                    DP056690
3552   112        0F4B  F86B00BC                  SUBD    6,,TIME                                        DP056700
3553   132        0F4D  F86600E7                  MPYD    6,,=DF((((5D-3B31)/24)/3600)/1B11)               056710
3554   136        0F4F  F4840010                  LSA     8,,4                                             056720
3555   138        0F51  B468                      ADD     6,8                                            DP056730
3556   150        0F52  F86700C4                  STAD    6,,DAY_SINCE_JAN1_1972                           056740
3557   158        0F54  F41A00E2                  CLA     1,,HX2000                                        056750
3558   166        0F56  E4110009                  EXT     1,1,C_I_OUTPUT_MALFUNCTION_STATUS_INDICATORS     056760
3559   170        0F58  D012   (0F5B)             BNE     $33                                          11  056770
3560     8R  *    0F59  F80D1613                  BSV     CALC_TIME_CORRECTION     CORRECT TIME            056780
3561     8R       0F5B  F41A00E3          $33     CLA     1,,HX4000      "READ CURRENT STATE OF ENTER TIME 056790
3562    16        0F5D  E4010009                  EXT     0,1,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES    DP056800
3563    20        0F5F  4402                      LSA     0,,1           "LAMP.  IF IT IS ON TURN IT OFF   056810
3564    22        0F60  B410                      ADD     1,0            "AND TURN THE ENTER POSITION    DP056820
                                          *                              "LAMP ON                        DP056830
3565    12R       0F61  E0010009          $43     MRG     0,1,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES    DP056840
                                          *                              "OUTPUT NEW STATE OF ENTER TIME DP056850
3566    40        0F63  D580                      BBK     8              "AND / OR ENTER POSITION LAMP   DP056860
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                                        **                                                                  DP056870
                                        * MANUAL VELOCITY INSERT                                            *H056880
3567      8R      0F64  C011            $4          FET       1,1          SWAP  HEADING                     056890
3568      12      0F65  AC24                        CLAD      2,4           AND SPEED                        056900
3569      16      0F66  AC40                        CLAD      4,0                                            056910
3570      26      0F67  D710                        PRN       1                                              056920
3571      28      0F68  987C                        COMM      7,,12        IS THIS RZ VELOCITY               056930
3572      34      0F69  04060FE6                    BRE       $9           YES                               056940
3573      4R      0F6B  FC092F66                    CLAM      0,,F(.3703)  "CONVERT SPEED FROM INTEGER        056950
3574      36      0F6D  D410                        DIV       1,0          "NUMBER OF KNOTS TO FEET/SECOND  DP056960
                                        *                                  "SCALED B11                      DP056970
                                        *                                  "SUBTRACT 1/16 FT/SEC SO THAT AN DP056980
                                        *                                  "INSERTED ZERO WILL GIVE A ZERO  DP056990
                                        *                                  "VELOCITY (DIVIDE FORCES THE LSB DP057000
                                        *                                  "TO A 1)                         DP057010
                                        *                                  "SAVE IN V INSERT                DP057020
3575      38      0F6E  9011                        SUBM      1,,1         GET ZERO IF ZERO ENTERED         DP057030
3576      48      0F6F  F0171FF4                    STA       1,,V_INSERT                                   DP057040
3577      58      0F71  FC4A1ACA                    CLAD      4,,=DI(180000)                                %5057050
3578      62      0F73  8824                        SUBD      2,4                                            057060
3579     188      0F74  DC24                        DIVD      2,4                                            057070
3580     192      0F75  F4298000                    ADDM      2,,X(8000)                                     057080
3581     202      0F77  F0271F88                    STA       2,,PSI_INSERT                                  057090
3582     230      0F79  D580                        BBK       8                                             DP057100
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                                        **                                                                  DP057110
                                        * POSITION INSERT                                                   *H057120
                                        *                                                                   DP057130
                                        *                                   "SCALE LATITUDE AND LONGITUDE PI *I057140
3583      8R *     0F7A  F80D101A       $7          BSV     LAT_LONG_SCALING   "AND ADJUST FOR N/S AND E/W  DP057150
3584      10       0F7C  987B                       COMM    7,,11              "ARG1 DEFINES POSITION TYPE     DP057160
                                        *                                   "BUTTON (0-9 = DESTINATION,      DP057170
                                        *                                   "        11 = SUB)               DP057180
                                        *                                   "IS THIS POSITION                *1057190
3585      16       0F7D  04030FD8                   BRG     $71                "RZ (12) OR SUB (11)"           DP057200
3586      4R       0F7F  D066    (0F86)             BRE     $72                                                057210
                                        *   POS 0 TO 9                                                      DP057220
3587      2R       0F80  B477                       ADD     7,7                DOUBLE DESTINATION INDEX        DP057230
                                        *                                   "SAVE LATITUDE AND LONGITUDE IN  DP057240
                                        *                                   "TABLE OF DESTINATIONS INDEXED   DP057250
                                        *                                   "BY DESTINATION NUMBER IN ARG1   DP057260
3588      14R      0F81  FD771FDE       $112       2PTRD    X7,,DESTINATION_LATITUDE                       % 057270
3589      12R      0F83  F9571FC4       $113       2STAD    X5,,DESTINATION_LONGITUDE                      % 057280
3590      36       0F85  D560                       BBK     6                                               DP057290
                                        *   POS A/C                                                         DP057300
3591      2R       0F86  B488           $72         ADD     8,8                "ARG2 DEFINES QUALITY (A, B OR C)DP057310
                                        *                                   "OF POSITION INSERT              DP057320
                                        *                                   "READ VARIANCE ASSOCIATED WITH   DP057330
                                        *                                   "QUALITY A = .5, B = 5, C = 20 MIDP057340
                                        *                                   "EXAMINE THE ENTER POSITION LAMP %S057350
3592      16       0F87  F98C1776                   FETD    X8,,POS_NOISE_TABLE                            DP057360
3593      24       0F89  F46A0009                   CLA     6,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES     DP057370
                                        *                                   "IS THIS THE"                    *1057380
3594      28       0F8B  D054    (0F90)             BRL     $17                "FIRST POSITION INSERT?"        DP057390
3595      8R       0F8C  F46A00B7                   CLA     6,,COLD_START_MKR                              % 057400
3596      12       0F8E  D21A    (0FB9)             BNE     $73                "HAS KALMAN BEEN INITIATED YET?  DP057410
                                        *                                   "TREAT THIS POSITION LIKE A      DP057420
3597      4R       0F8F  D005    (0F95)             BUC     $16                "FIRST POSITION INSERT          DP057430
3598      8R       0F90  F46A002A       $17         CLA     6,,ACCEPT_OLD      "FIRST INSERT"                  DP057440
                                        *                                   "DID THE OPERATOR                *2057450
3599      12       0F92  D062    (0F95)             BRE     $16                "TAKE THE OPTION OF ACCEPTING THE%R057460
                                        *                                   "DISPLAYED POS?                  DP057470
3600      14R      0F93  D730                       PRN     3                  "DO NOT CHANGE POSITION"        DP057480
3601      18       0F94  D00E    (0FA3)             BUC     $19                                             DP057490
3602      6R       0F95  4C04           $16         LSAD    0,,2               "RESCALE POSITION VARIANCE FOR   DP057500
3603      14       0F96  C011                       FET     1,1                "KALMAN TO USE AS INITIAL VALUE  DP057510
3604      36       0F97  FC271F96                   PTRD    2,,SAVE_POSITION_VARIANCES                     DP057520
3605      44 *     0F99  F80D0FA6                   BSV     PANEL_MAIN$8       "COMPUTE NEW POSITION MATRIX RIJ DP057530
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3606      54      0F9B  F0670087                  STA     6,,COLD_START_MKR "SET MARKER TO FORCE KALMAN TODP057540
                                        *                                  "RESTART IF IT HAS STARTED      DP057550
3607     124      0F9D  F4F71F69                  PTR     15,,RIJ          "SAVE RIJ MATRIX                DP057560
3608     136      0F9F  F8071F79                  STAD    0,,R33           "SET MARKER TO RESET THE        DP057570
3609     142      0FA1  8400                      FETM    0,,0             "TRACKING FILTERS               DP057580
3610     150      0FA2  7400    (0080)            PTR     0,,RESET_TF                                      DP057590
3611      12R     0FA3  86E3    (00E3)    $19     FETD    0,,HX4000        "TURN OFF ENTER POSITION LAMP     057600
3612      18      0FA4  04000F61                  BUC     $43                                              DP057610
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                                        **                                                                  DP057620
                                        *                        POSITION MATRIX COMPUTATION                *H057630
                                        *                                                                  *H057640
                                        * THIS ROUTINES COMPUTES A NINE ELEMENT POSITION MATRIX WITH THE NUMBER *H057650
                                        * 3 AXIS POINTING NORTH.  THE ARGUMENTS CONSIST OF THE LATITUDE AND  *H057660
                                        * LONGITUDE                                                         *H057670
                                        *                                                                  *H057680
                                        *                        A=LAT, B=LONG                             DP057690
3613     434R     0FA6  1400            $8        SINCOS    0          CA,SA,B                            DP057700
                                        *                              "R11 = SIN (LAT)                   DP057710
                                        *                              "R12 = COS (LAT) * COS (LONG)      DP057720
                                        *                              "R13 = COS (LAT) * SIN (LONG)      DP057730
                                        *                              "R21 = 0                           DP057740
                                        *                              "R22 = - SIN (LONG)                DP057750
                                        *                              "R23 =   COS (LONG)                DP057760
                                        *                              "R31 =   COS (LAT)                 DP057770
                                        *                              "R32 = - SIN (LAT) * COS (LONG)    DP057780
                                        *                              "R33 = - SIN (LAT) * SIN (LONG)    DP057790
3614     442      0FA7  C015                      FET       1,5        "        (SCALED B1)               DP057800
3615     448      0FA8  9663   (00E3)            ADD       0,,HX4000  B+PI/2                             DP057810
3616     882      0FA9  1400                      SINCOS    0          -SB,CB,CA,SA,A                     DP057820
3617     886      0FAA  AC86                      CLAD      8,6              ...     ,SA                   DP057830
3618     902      0FAB  6880                      MPYD      8,0              ...     ,-SASB                DP057840
3619     906      0FAC  BC88                      ADDD      8,8                                            DP057850
3620     922      0FAD  C057                      FET       5,7        CB,CA,SA,-SB,CB,CA,SA,-SASB        DP057860
3621     938      0FAE  68C8                      MPYD      12,8             ...     ...     ,SACB,-SASB   DP057870
3622     942      0FAF  BCCC                      ADDD      12,12                                          DP057880
3623     946      0FB0  A8CC                      CLSD      12,12            ...     ...     ,-SACB,SASB   DP057890
3624     962      0FB1  6826                      MPYD      2,6          ,-CASB,     ...                   DP057900
3625     966      0FB2  BC22                      ADDD      2,2                                            DP057910
3626     970      0FB3  A822                      CLSD      2,2          ,CASB,      ...                   DP057920
3627     986      0FB4  680A                      MPYD      0,10       CACB,     ...                      DP057930
3628     990      0FB5  BC00                      ADDD      0,0                                            DP057940
3629     998      0FB6  C015                      FET       1,5        SA,       ...                      DP057950
3630    1002      0FB7  B866                      SUBD      6,6                                            DP057960
3631    1010      0FB8  D5F0                      BBK       15                                             DP057970
                                        * POSITION UPDATE                                                  *H057980
3632      12R     0FB9  C035            $73       FET       3,5                                            DP057990
3633      20      0FBA  867D   (00FD)            FET       0,,RIJ_ADD "READ POINTER TO R1 VECTOR          DP058000
3634      28  *   0FBB  F80D14A7                 BSV       MAKE_LAT_LONG  "COMPUTE CRAFT PRESENT POSITION DP058010
3635      32      0FBD  B840                      SUBD      4,0        "COMPUTE POSITION ERROR            DP058020
3636      36      0FBE  B862                      SUBD      6,2        "ERROR NORTH = LAT(NEW) - LAT      DP058030
                                        *                              "ERROR EAST = COS (LAT)            DP058040
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3637    44  *       0F8F  F80D1655                  BSV     COS                                     % 058050
                                                *                       "COMPUTE RADIAL ERROR SQUARED   DP058060
3638    60          0FC1  6860                      MPYD    6,0         " = (ERR N)**2 + (ERR E)**2     DP058070
3639    64          0FC2  BC66                      ADDD    6,6                                         058080
3640    68          0FC3  AC04                      CLAD    0,4                                         DP058090
3641    72          0FC4  AC26                      CLAD    2,6                                         DP058100
3642    88          0FC5  6800                      MPYD    0,0                                         DP058110
3643   104          0FC6  6822                      MPYD    2,2                                         DP058120
3644   108          0FC7  BC02                      ADDD    0,2                                         DP058130
3645   118          0FC8  F8081ACC                  COMD    0,,=DF((((1.2)*1.2)/180)/180) 72 MILES      DP058140
                                                *                       "DOES THE RADIAL                *I058150
3646   122          0FCA  D052    (0FCD)            BRL     $74         "ERROR EXCEED 72 N MILE?"       %R058160
3647    22R         0FCB  D770                      PRN     7           "ERROR TOO LARGE"               DP058170
                                                *                       "PROCESS THIS INSERT LIKE A FIRSTDP058180
3648    26          0FCC  D808    (0F95)            BUC     $16         "POSITION INSERT                DP058190
3649    10R         0FCD  F80A1ACE          $74     CLSD    0,,=DF((1)/3.141592658+3)                   DP058200
3650   136          0FCF  DC40                      DIVD    4,0         "SCALE ERRORS IN RADIANS AT B-3 DP058210
3651   262          0FD0  DC60                      DIVD    6,0         "SAVE FOR KALMAN                DP058220
3652   276          0FD1  D730                      PRN     3           "SET POSITION FIX MARKER TO     DP058230
3653   298          0FD2  F4371CD1                  PTR     3,,ERROR_NORTH "NOTIFY KALMAN               DP058240
3654   308          0FD4  F0170DA6                  STA     1,,PC_INSERT "SAVE ASSOCIATED VARIANCE      DP058250
3655   320          0FD6  7C01    (0081)            PTRD    0,,POSITION_NOISE                           DP058260
3656   348          0FD7  D580                      BBK     8                                           DP058270
                                                * ENTER HERE FOR A MOVING DESTINATION                   *H058280
                                                * POSITION INSERT                                       *H058290
                                                *                       "CONVERT LAT AND LONG FROM .1 MIN*I058300
3657     8R         0FD8  C013          $71         FET     1,3         LONG                            058310
3658   442          0FD9  1400                      SINCOS  0                                           DP058320
3659   450          0FDA  C015                      FET     1,5         LAT                             DP058330
3660   884          0FDB  1400                      SINCOS  0                                           DP058340
3661   888          0FDC  BC00                      ADDD    0,0         "COMPUTE MOVING DESTINATION     DP058350
3662   904          0FDD  6860                      MPYD    6,0         "POSITION VECTOR RZ SCALED BI   DP058360
3663   920          0FDE  6840                      MPYD    4,0         "RZ1 = SIN (LAT)                DP058370
3664   930          0FDF  D710                      PRN     1           "RZ2 = COS (LAT) * COS (LONG)   DP058380
3665   960          0FE0  F4571FB8                  PTR     5,,RZ_POS   "RZ3 = COS (LAT) * SIN (LONG)   DP058390
3666   972          0FE2  D720                      PRN     2                                           DP058400
3667   980          0FE3  F40A1FDA                  CLA     0,,RZ_ALPHA                                 DP058410
3668   984          0FE5  D100    (0FF6)            BUC     $91         COMPUTE BETA                    DP058420
                                                * ENTER HERE FOR A MOVING DESTINATION                   *H058430
                                                * VELOCITY - HEADING INSERT                             *H058440
3669     4R         0FE6  FC095ECC          $9          CLAM    0,,F(.7406) "RESCALE VEL FROM INTEGER KNOTS DP058450
3670    36          0FE8  D410                      DIV     1,0         "TO FT/SEC AT 812 SAVE IN RZ VEL DP058460
3671    38          0FE9  9011                      SUBM    1,,1        GET ZERO IF ZERO ENTERED        DP058470
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3672     48    0FEA  FC4A1ACA                CLAD    4,,=DI(180000)                                  058480
3673     52    0FEC  B824                    SUBD    2,4                                             058490
3674    178    0FED  DC24                    DIVD    2,4                                             058500
3675    182    0FEE  F4298000                ADDM    2,,X(8000)                                      058510
3676    184    0FF0  A432                    CLA     3,2                                             058520
3677    194    0FF1  F0171FDB                STA     1,,RZ_VEL                                      DP058530
3678    206    0FF3  D720                    PRN     2                                              DP058540
3679    216    0FF4  F0071FDA                STA     0,,RZ_ALPHA                                    DP058550
3680    434R   0FF6  1400          $91        SINCOS  0          "COMPUTE THE VECTOR BETA THAT IS DP058560
3681    464    0FF7  F05C1FB8                FET     5,,RZ_POS  "PERPENDICULAR TO THE PLANE OF   DP058570
3682    476    0FF9  C035                    FET     3,5        "MOTION OF THE MOVING DESTINATIONDP058580
3683    492    0FFA  6800                    MPYD    0,0        "                                DP058590
3684    508    0FFB  6822                    MPYD    2,2        "BETA = (RZ POS) X (VEL VECTOR)  DP058600
3685    512    0FFC  8C02                    ADDD    0,2        "                                DP058610
3686    958    0FFD  1000                    SQRT    0          "K = (RZ2**2 + RZ3**2)**.5       DP058620
3687    974    0FFE  684C                    MPYD    4,12       "USE SIN/COS ALPHA FOR VEL VECTORDP058630
3688    978    0FFF  BC44                    ADDD    4,4        "                                DP058640
3689    982    1000  A824                    CLSD    2,4        " BETA1 = SIN(ALPHA)*K           DP058650
3690    998    1001  6848                    MPYD    4,8        " BETA3 = (-RZ3*RZ1*SIN          DP058660
3691   1014    1002  6826                    MPYD    2,6        "          -RZ2*COS)/K           DP058670
3692   1030    1003  688A                    MPYD    8,10       " BETA2 = (-RZ2*RZ1*SIN          DP058680
3693   1046    1004  686A                    MPYD    6,10       "          +RZ3*COS)/K           DP058690
3694   1050    1005  BC28                    ADDD    2,8        "                                DP058700
3695   1054    1006  BC46                    ADDD    4,6        "SAVE BETA SCALED B1             DP058710
3696   1058    1007  A844                    CLSD    4,4                                         DP058720
3697   1184    1008  DC20                    DIVD    2,0        BETA 2  B1                       DP058730
3698   1310    1009  DC40                    DIVD    4,0        BETA 3  B1                       DP058740
3699   1326    100A  680C                    MPYD    0,12       BETA 1  B2                       DP058750
3700   1330    100B  BC00                    ADDD    0,0        BETA 1  B1                       DP058760
3701   1360    100C  F4571FBE                PTR     5,,RZ_BETA                                  DP058770
                                   *                            "INSERT PROCESSING COMPLETE      *S058780
3702   1394    100E  D5B0                    BBK     11         "RETURN TO PANEL MAIN            DP058790
                                   *                                                              DP058800
3703           0F81                PLOT3     EQU     PANEL_MAIN$112                                DP058810
3704           0F83                PLOT4     EQU     PANEL_MAIN$113                                DP058820
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                                        **                                                                  DP058830
                                        *                        BCD TO BINARY                              *H058840
                                        *                                                                   *H058850
                                        * THIS ROUTINE WILL CONVERT 2 BCD CHARACTERS TO BINARY.  THE ARGUMENT  *H058860
                                        * IS A 32 BIT WORD WITH THE 2 DIGITS IN THE MOST SIGNIFICANT BITS.  THE *H058870
                                        * ARGUMENT IS SHIFTED LEFT END AROUND ON RETURN                      *H058880
                                        *                                                                   *H058890
                                        *      TWO M. S. DIGITS IN R2,3 WHICH ARE LEFT CYCLED 8 BITS         DP058900
                                        *       ANSWER IN R5    R1 IS USED                                   DP058910
3705                                    MAKE_TWO_BINARY;                                                    DP058920
3705      8R      100F  FC250010                LSED      2,,4          "SHIFT FIRST CHARACTER FROM MSB'SDP058930
3706      16      1011  E413177D                EXT       1,3,HX000F    "TO LSB'S AND EXTRACT 4 BITS    DP058940
3707      24      1013  FC250010                LSED      2,,4          "SHIFT SECOND CHARACTER FROM    DP058950
3708      32      1015  E453177D                EXT       5,3,HX000F    "MSB'S TO LSB'S AND EXTRACT 4   DP058960
3709      36      1017  441A                    MPIM      1,,10         "BITS                           DP058970
3710      38      1018  B451                    ADD       5,1           "                               DP058980
3711      46      1019  D5F0                    BBK       15            "RESULT = 2ND CHAR + 10 * 1ST CHRDP058990
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                                                  **                                                                  DP059000
                                                  *                  LATITUDE / LONGITUDE SCALING                     *H059010
                                                  *                                                                   *H059020
                                                  * THIS ROUTINE TAKES LAT AND LONG THAT HAS BEEN CONVERTED TO BINARY AND *H059030
                                                  * CHANGES IT TO RADIANS SCALED PI AFTER CORRECTING FOR S LAT AND W LONG *H059040
                                                  *                                                                   *H059050
                                                  *    CONVERT R2,3 AND R4,5 TO LATITUDE AND LONGITUDE                DP059060
3712                                              LAT_LONG_SCALING;                                                   DP059070
3712      14R      101A  F80C1AD0                        FETD      0,,=D108000    "DIVIDE LAT / LONG BY THE NUMBER DP059080
3713      140      101C  DC20                            DIVD      2,0            "OF .1 MINUTES IN PI RADIANS     DP059090
3714      266      101D  DC40                            DIVD      4,0            "TO SCALE PI RADIANS             DP059100
3715      270      101E  F869A02E                        COMM      6,,X(A02E)     "EXAMINE LEFT DISPLAY LEGEND     %S059110
3716      274      1020  D061    (1022)                  BRE       $1             "IS THIS A SOUTH LATITUDE?"      %R059120
3717       4R      1021  A822                            CLSD      2,2            "COMPLIMENT THE LATITUDE         DP059130
3718       4R      1022  F879A025                $1      COMM      7,,X(A025)     "EXAMINE RIGHT DISPLAY LEGEND    DP059140
3719       8       1024  D061    (1026)                  BRE       $2             "IS THIS A WEST LONGITUDE?"      %R059150
3720       4R      1025  A844                            CLSD      4,4            "COMPLIMENT THE LONGITUDE        DP059160
3721      14R      1026  D510                    $2      BBK       1              "RETURN"                         DP059170
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                                        **                                                                  CI059180
                                        *                        PANEL TEST                                 *H059190
                                        *                                                                   *H059200
                                        * THIS PART OF THE C/I PROGRAM IS EXECUTED AFTER THE OPERATOR DEPRESSES *H059210
                                        * THE PANEL TEST BUTTON.  IT CYCLES ALL OF THE LAMPS AND DISPLAYS ON THE *H059220
                                        * PANEL IN 10 SECONDS.  IT ALSO TURNS OFF THE MALFUNCTION LAMP.        *H059230
                                        *                                                                   *H059240
3722      4R      1027  F809FFFC        PANEL_TEST  COMM      0,,I(-4)      "EXAMINE PANEL MODE             DP059250
                                        *                                   "                               *2059260
3723      8       1029  D112   (103C)              BNE       $3            "IS THIS THE FIRST ENTRY TO TEST?%R059270
                                        *                                   "(MODE = -4)                    DP059280
                                        *                                   "RESET THE SYSTEM OK BIT TO TURN *I059290
3724      18R *   102A  2EDD   (00DD)              FAILD     I0,,HX0100    "ON THE MALF LAMP               DP059300
3725      32      102B  F01C0009                   FET       1,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES     CI059310
3726      40      102D  701E   (009E)              STA       0,,IMAGE9     "SAVE CURRENT STATE OF ALL STATUSDP059320
                                        *                                   "AND MISCELLANEOUS LAMPS FOR    DP059330
                                        *                                   "RESTORATION AFTER TEST FINISH  DP059340
                                        *                                   "                               DP059350
                                        *                                   "SET UP BIT PATTERN TO TURN ON  DP059360
                                        *                                   "ALL LAMPS ON THE PANEL         DP059370
                                        *   SET UP DMA BIT PATTERN IN REGS 0 - 10                           CI059380
3727      48      102E  8EEB   (00EB)              CLSD      0,,=D1        FFFF  12, 13                   DP059390
3728      58      102F  C020                       FET       2,0           FFFF  11, 10, 9                DP059400
3729      66      1030  8410                       FETM      1,,0          8, 7                             059410
3730      74      1031  F408FFFF                   FETM      0,,X(FFFF)    6                                059420
3731      10R     1033  C020            $1         FET       2,0           "OUTPUT STATE OF ALL LAMPS TO C/IDP059430
3732      60      1034  F4A70003                   PTR       10,,C_I_LEFT_DISPLAY                         CI059440
3733      70      1036  F4180013                   FETM      1,,19         "SET UP A TIMER TO DELAY TWO    %S059450
                                        *                                   "SECONDS BEFORE PROCEDING TO THE DP059460
3734      72      1038  9421                       ADDM      2,,1          "NEXT PART OF THE TEST          DP059470
3735      18R     1039  F4271F45        $2         PTR       2,,PANELTIME  "SAVE PANEL MODE AND PRESENT    DP059480
                                        *                                   "VALUE OF THE TIMER             DP059490
3736      26      103B  D5F0                       BBK       15            "EXIT PANEL PROGRAM"            %S059500
                                        *   TEST FOR END OF 5 SECOND DECAY                                  CI059510
3737      14R     103C  F80C1F45        $3         FETD      0,,PANELTIME  "READ PRESENT VALUE OF TIMER    DP059520
                                        *                                   "INCREMENT TIMER                *1059530
3738      22      103E  C406   (1039)              BXU       0,,$2         "IS THE TIME UP?"               %R059540
3739      4R      103F  FC09E03F                   CLAM      0,,X(E03F)    "SET UP LEGEND                   059550
3740      8       1041  F829FFFE                   COMM      2,,I(-2)      "DISPLAYS IN CASE THE MODE IS -2 DP059560
                                        *                                   "IS THIS THE                    *2059570
3741      1[illegible]  1043  D059   (104D)              BRL       $4            "START OF THE SECOND PART OF THE DP059580
                                        *                                   "TEST? (MODE=-3)                DP059590
                                        *                                   "IS THIS THE                    *2059600
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3742    4R    1044  D061   (1046)          BRE     $6                "START OF THE THIRD PART OF THE  DP059610
                                   *                                  "TEST? (MODE=-2)                 DP059620
3743    4R    1045  D00E   (1054)          BUC     $5                "TEST COMPLETE"                   059630
3744    2R    1046  A410           $6      CLA     1,0               "SET SAME BIT PATTERN IN RIGHT   DP059640
3745    4     1047  8C21                   CLSM    2,,1              "LEGEND AS LEFT LEGEND           DP059650
                                   *                                  "OUTPUT LEGEND DISPLAYS TO C/I   DP059660
                                   *                                  "SET MODE = -1                   DP059670
3746    18    1048  FC070007               PTRD    0,,C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION       DP059680
3747    28    104A  F4180013               FETM    1,,19             "SET TIMER TO DELAY 2 SECONDS     059690
3748    32    104C  D904   (1039)          BUC     $2                                                 DP059700
                                   *   CHANGE DMA BIT PATTERN                                         CI059710
3749    4R    104D  B800           $4      SUBD    0,0               "SET BIT PATTERN TO TURN OFF ALL DP059720
3750    20    104E  8450                   FETM    5,,0              "LAMPS ON THE C/I                DP059730
3751    28    104F  867A   (00FA)          FET     0,,HX0B00                                          DP059740
                                   *                                  "SET THE SYSTEM OK AND COMPUTER  *I059750
3752    42 *  1050  2E7A   (00FA)          FAIL    I0,,HX0B00        "OK BITS TO TURN MALF LAMP OFF   DP059760
                                   * NOTE - THIS HAS THE EFFECT OF                                    *H059770
                                   *        'RESETTING' THE MALF                                      *H059780
                                   *        LAMP IF A SYSTEM FAILURE                                  *H059790
                                   *        HAD TURNED IT ON PRIOR                                    *H059800
                                   *        TO INITIATING PANEL TEST                                  *H059810
3753    46    1051  FC098888               CLAM    0,,X(8888)                                         059820
3754    50    1053  DA01   (1033)          BUC     $1                FFFF 5,4,3 AND START DELAY       * 059830
                                   *   RESTORE QUIESCENT MODE                                         CI059840
3755    4R    1054  B800           $5      SUBD    0,0               "TEST COMPLETE"                   059850
3756    16    1055  F807002E               STAD    0,,TEST_FAIL_TEMP                                  059860
3757    24    1057  9E9E   (009E)          CLAD    0,,IMAGE9                                          059870
                                   *                                  "RESTORE STATUS AND MISCELLANEOUSDP059880
                                   *                                  "LAMPS TO THEIR STATE AT THE     DP059890
                                   *                                  "START OF TEST                   DP059900
3758    38    1058  FC070009               PTRD    0,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES       DP059910
3759    46    105A  867A   (00FA)          FET     0,,HX0B00         "PUT BITS INTO C/I INPUT WORD TO DP059920
                                   *                                  "SIMULATE THE DEPRESSING OF MORE DP059930
                                   *                                  "THAN ONE BUTTON.  THIS WILL     DP059940
                                   *                                  "CAUSE THE PANEL INPUT ROUTINE TODP059950
                                   *                                  "CLEAR THE PANEL                 DP059960
3760    56    105B  F4070001               PTR     0,,C_I_INPUT_MISCELLANEOUS_SWITCHES (CLEAR)      DP059970
3761    58    105D  9C00                   CLAM    0,,0              "SET MODE = 0 = QUIESENT         DP059980
3762    68    105E  F4071F47               PTR     0,,PANELMODE                                       CI059990
                                   * SEQUENCE TO PANEL INPUT ROUTINE                                  *H060000
                                   * TO FORCE A PANEL CLEAR OPERATION                                 *H060010
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                                **                                                                  DP060020
                                *                        PANEL INPUT                                *H060030
                                *                                                                   *H060040
                                * THIS PROGRAM PROCESSES ALL C/I PANEL INPUTS.  IT IS AN INTERRUPT  *H060050
                                * ROUTINE ENTERED WHENEVER A BUTTON IS DEPRESSED ON THE PANEL.  IT IS *H060060
                                * ALSO ENTERED AFTER PANEL TEST.  THE PANEL INPUT WORDS WILL CONTAIN A *H060070
                                * BIT THAT IDENTIFIES WHICH BUTTON WAS DEPRESSED.  THIS ROUTINE CONTROLS*H060080
                                * ALL INSERT AND DISPLAY PROCEDURES.                                 *H060090
                                *                                                                   *H060100
                                *                                                                   CI060110
                                * CONTROL AND INDICATOR PANEL INPUT INTERRUPT ROUTINE                CI060120
                                *       REGISTER ALLOCATION                                         CI060130
                                *         0        7 LEFT LEG                                       CI060140
                                *         1        8 RIGHT LEG                                      CI060150
                                *         2  DMA   9 SWITCH LAMPS                                   CI060160
                                *         3       10 MALF LAMPS                                     CI060170
                                *         4  WORD 11 TOP LEFT  ) KEY-                               CI060180
                                *         5       12 TOP RIGHT ) BOARD                              CI060190
                                *         6       13 LOWER     ) LAMPS                              CI060200
                                *                                                                   CI060210
                                *         7       PANEL MODE                                        CI060220
                                *         8       SWITCH MASK                                       CI060230
                                *         9       KEYBRD MASK, AND INPUT                            CI060240
                                *         A       DIGIT COUNT                                       CI060250
                                *                                                                   CI060260
                                *         B       THREE                                             CI060270
                                *         C       WORKING                                           CI060280
                                *         D       REGISTERS                                         CI060290
                                *                                                                   CI060300
3763  10R  1060  842E           PANEL_INPUT FETM    2,,14          "SET UP NORMALIZE COUNTER TO     DP060310
3764  32   1061  F03C1F47                FET     3,,PANELMODE   "DETERMINE WHICH BUTTON             DP060320
                                *                                  "READ PANEL MODE, SWITCH MASK,   DP060330
                                *                                  "KEYBOARD MASK AND DIGIT COUNT   DP060340
                                *                                  "                                *2060350
3765  38   1063  040510A5                BRL     PANOUT$3       "IS THE PANEL IN THE TEST MODE?  DP060360
                                *                                  "(MODE NEGATIVE)                 DP060370
                                * NOTE - ALL BUTTONS ARE IGNORED                                     *H060380
                                *        DURING PANEL TEST                                          *H060390
3766  34R  1065  F06C0007           FET     6,,C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION              CI060400
                                *                                  "READ CURRENT STATE OF ALL PANEL DP060410
                                *                                  "LAMPS AND LEGENDS FOR USE BY THEDP060420
                                *                                  "VARIOUS PROCEDURES              DP060430
3767  44   1067  EC880001           EXTD    11,8,C_I_INPUT_MISCELLANEOUS_SWITCHES                   CI060440
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                                        *                                   "LOGICALLY 'AND' THE C/I INPUT   DP060450
                                        *                                   "WORDS WITH THE SWITCH AND KEY-  DP060460
                                        *                                   "BOARD MASKS.  THE MASKS DEFINE  DP060470
                                        *                                   "THE VALID BUTTON INPUTS.        DP060480
3768    54      1069  F8B80001                  COMD      11,,C_I_INPUT_MISCELLANEOUS_SWITCHES           CI060490
                                        *                                   "WERE ANY INVALID                *1060500
3769    60      106B  040110AA                  BNE       INPUTERROR      "BUTTONS DEPRESSED?"             DP060510
3770    10R     106D  F8BB00EB                  SUBD      11,,=D1                                          % 060520
3771    20      106F  ECBB0001                  EXTD      11,11,C_I_INPUT_MISCELLANEOUS_SWITCHES           % 060530
                                        *                                   "WAS MORE THAN                   *1060540
3772    24      1071  D318    (10AA)            BNE       INPUTERROR      "ONE BUTTON DEPRESSED?"          DP060550
                                        * ONE VALID BUTTON HAS BEEN DEPRESSED                                *H060560
3773     8R     1072  F4CA0001                  CLA       12,,C_I_INPUT_MISCELLANEOUS_SWITCHES              060570
3774    12      1074  D116    (108B)            BNE       $3                                                060580
3775     8R     1075  F4CA0002                  CLA       12,,C_I_INPUT_KEYBOARD_SWITCHES                  % 060590
3776    16      1077  E4BC112D                  EXT       11,12,HXE000                                      060600
3777    20      1079  D018    (1082)            BNE       $1              HOLD,DISPLAY,CLEAR OR             060610
                                        *                                   INSERT ACCEPT IN R11              060620
                                        * KEYBOARD BUTTON ONLY OCCURS                                        *H060630
                                        * AFTER A PROCEDURE HAS BEEN                                         *H060640
                                        * INITIATED                                                          *H060650
3778     2R     107A  A49C                      CLA       9,12            "SAVE KEYBOARD INPUT WORD WHICH  DP060660
                                        *                                   "IDENTIFIES THE BUTTON           DP060670
                                        *                                   "NORMALIZE INPUT WORD TO GET THE DP060680
                                        *                                   "NUMBER OF THE KEYBOARD BUTTON   DP060690
                                        *                                   "O/A/POS BUTTON = 0              DP060700
3779    38      107B  D6CD                      NML       12,13           "S/W/SUB V/H BUTTON = 14         DP060710
3780    48      107C  F00C1F44                  FET       0,,PROCWORD     TEST FOR LOOP/FLOAT FIX-          060720
3781    56      107E  D700                      PRN       0               PREVENTS PRORAM HALT WHEN         060730
3782    60      107F  D26A    (10AA)            BRE       INPUTERROR      SWITCH NOT SENDING CODE.          060740
                                        *                                   "RESUME PROCEDURE"               *S060750
                                        *                                   "PROCWORD POINTS TO THE NEXT     DP060760
3783    10R     1080  06001F44                  BUC       I,,PROCWORD     "INSTRUCTION IN THE PROCEDURE    DP060770
                                        * SWITCH INPUT - THESE BUTTONS                                       *H060780
                                        * EITHER START OR END PROCEDURES                                     *H060790
3784     4R     1082  D25C    (10AF)    $1      BRL       HCONTROL        HOLD/NORMAL                       060800
3785    36R     1083  D6BD                      NML       11,13                                             060810
3786    38      1084  90DD                      SUBM      13,,13                                            060820
3787    48      1085  07D01087                  BUC       IX13,,$2                                          060830
3788            1087  112F              $2      CON       INSACC          ACCEPT/INSERT                     060840
3789            1088  10C5                      CON       DISTART         CLEAR/DISPLAY                     060850
3790            1089  10AD                      CON       PANTEST         PANEL TEST                        060860
3791            108A  10BD                      CON       FLOAT_LOOP      TOGGLE ANTENNA                    060870
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3792    36R    108B  06CD        $3        NML     12,13                060880
3793    38     108C  94D2                  ADDM    13,,2                060890
3794    48     108D  07001087              BUC     IX13,,$2             060900
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                                                  **                                                                  DP060910
                                                  *                        WITH ACCEPT LAMP                           *H060920
                                                  *                                                                   *H060930
                                                  * THIS ROUTINE WILL TURN ON THE ACCEPT LAMP IN ADDITION TO ANY OTHER  *H060940
                                                  * LAMPS ALREADY ENABLED AND REQUEST ONE BUTTON INPUT.  IF THE NEXT    *H060950
                                                  * BUTTON IS NOT ACCEPT IT WILL TURN OFF THE ACCEPT LAMP AND RETURN TO *H060960
                                                  * THE INPUT PROCEDURE                                                 *H060970
                                                  *                                                                   *H060980
3795      4R      108F  F4290400                  OUTWAL    ADDM      2,,X(0400)     "TURN ON ACCEPT LAMP AND ENABLE    060990
3796      8       1091  F4892000                            ADDM      8,,X(2000)     "ACCEPT IN KEYBOARD/SWITCH MASK    061000
                                                  *                                    "WAIT FOR ONE BUTTON - DO NOT     *I061010
3797      78      1093  1C01                                INPUT     UPPER_LEFT_KEY   "RETURN IF ACCEPT IS DEPRESSED DP061020
3798      82      1094  F0290400                            SUBM      2,,X(0400)     "TURN OFF ACCEPT LAMP AND DELETE   061030
3799      86      1096  FC892000                            SUBM      8,,X(2000)     "ACCEPT FROM SWITCH MASK           061040
                                                  *                                    "DISPLAYED DATA WAS NOT ACCEPTED  *I061050
3800      94  *   1098  F80D122D                            BSV       DISCLEAR$1     "CLEAR DISPLAY BEFORE CONTINUING DP061060
                                                  *                                    "RETURN TO PROCEDURE IN PROCESS   DP061070
3801      104     109A  06001F43                            BUC       I,,LINKWORD    "THROUGH LINKWORD POINTER         DP061080
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                                        **                                                                  DP061090
                                        *                        INPUT KEYBOARD BUTTON                      *H061100
                                        *                                                                   *H061110
                                        * THIS ROUTINE IS USED TO EXIT THE PANEL INTERRUPT ROUTINE WHILE A  *H061120
                                        * PROCEDURE IS IN PROCESS.  FIRST IT BUILDS THE KEYBOARD MASK FROM THE *H061130
                                        * LAMPS TURNED ON BY THE PROCEDURE AND THEN IT OUTPUTS THE STATE OF ALL *H061140
                                        * LAMPS AND LEGENDS TO THE C/I PANEL.                               *H061150
                                        *                                                                   *H061160
3802      2R      109C  9C60            PANOUT    CLAM      6,,0          "INPUT UPPER LEFT KEY ENTRY      DP061170
                                        *                                  "                                DP061180
                                        *                                  "TURN OFF LOWER KEYBOARD LAMPS   DP061190
3803      2R      109D  A494            $1        CLA       9,4           "INPUT LOWER KEY ENTRY"          DP061200
3804      4       109E  B495                      ADD       9,5           "                                DP061210
3805      6       109F  B496                      ADD       9,6           "FORM KEYBOARD SWITCH MASK       DP061220
3806     14       10A0  E4D81788                  EXT       13,8,HXF000                                      061230
3807     16       10A2  B49D                      ADD       9,13                                             061240
                                        *                                  "= UPPER LEFT LAMPS + UPPER RIGHTDP061250
                                        *                                  "  LAMPS + LOWER LAMPS           DP061260
3808     34R      10A3  F4670007        $2        PTR       6,,C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION      CI061270
                                        *                                  "OUTPUT ALL LAMPS AND LEGENDS    DP061280
                                        *                                  "TO C/I                          DP061290
3809     22R      10A5  F4371F47        $3        PTR       3,,PANELMODE  "SAVE MODE, MASKS, DIGIT COUNT   DP061300
3810     38       10A7  D520                      BBK       2             "EXIT PANEL INTERRUPT"           %S061310
3811      2R      10A8  9C40            $4        CLAM      4,,0          "INPUT UPPER RIGHT KEY ENTRY     DP061320
                                        *                                  "                                DP061330
3812      6       10A9  D80E   (109C)             BUC       PANOUT        "TURN OFF UPPER LEFT LAMPS       DP061340
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                                        **                                                                  CI061350
                                        * CLEAR CR ERROR ENTRY                                              *H061360
                                        *   INPUT ERROR                                                     CI061370
                                        *                                   "PLACE PANEL IN QUIESCENT STATE  *I061380
3813    70R     10AA  1C00              INPUTERRCR  INPUT     CLEAR_PANEL   "MODE=0,INSERT,ACCEPT,DISPLAY OFFDP061390
                                        *                                   "TURN ON INSERT, DISPLAY - EXIT  DP061400
3814    76      10AB  04001110                      BUC       DISFINAL$2    "INTERRUPT ROUTINE AT DISFINAL$2 DP061410
                                        * PANEL TEST ENTRY                                                  *H061420
3815     2R     10AD  8C74              PANTEST     CLSM      7,,4          "SET PANEL MODE = TEST (-4)      DP061430
3816     6      10AE  D80C    (10A3)                BUC       PANOUT$2                                     CI061440
                                        * HOLD / NORMAL ENTRY                                               *H061450
3817     6R     10AF  5428              HCONTROL    LSE       2,,3          "EXAMINE HOLD LAMP                 061460
3818    10      10B0  D057    (10B8)                BRL       $1            "HOLD ON                           061470
                                        *                                   "START HOLD MODE"                *I061480
3819     8R *   10B1  F80D14EE                      BSV       VARSAVE       "TRANSFER VARIABLES FOR DISPLAY  DP061490
3820    14      10B3  F4252000                      LSE       2,,13                                            061500
3821    18      10B5  F4291000                      ADDM      2,,X(1000)    "TURN HOLD ON                      061510
3822    22      10B7  D905    (10A3)                BUC       PANOUT$2                                         061520
3823     6R     10B8  F4252000          $1          LSE       2,,13                                            061530
3824    10      10BA  F0291000                      SUBM      2,,X(1000)    "TURN HOLD OFF                     061540
3825    14      10BC  D90A    (10A3)                BUC       PANOUT$2                                     CI061550
                                        *                                                                    DP061560
3826    10R     10BD  F00C1F8C          FLOAT_LOOP  FET       0,,FLOATER    TOGGLE FLOATER MARKER              061570
3827    12      10BF  9001                          SUBM      0,,1                                             061580
3828    16      10C0  D061    (10C2)                BRE       $1                                               061590
3829     2R     10C1  9402                          ADDM      0,,2                                             061600
3830    10R     10C2  F4071F8C          $1          PTR       0,,FLOATER                                       061610
3831    14      10C4  DA02    (10A3)                BUC       PANOUT$2                                         061620
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                                                  **                                                                  DP061630
                                                  *                        DISPLAY PROCEDURES                         *H061640
                                                  *                                                                   *H061650
                                                  * ENTER HERE WHEN THE DISPLAY BUTTON IS DEPRESSED.  ALL DISPLAY PRO-  *H061660
                                                  * CEDURES ARE INITIATED AND CONTROLED FROM HERE                      *H061670
                                                  *                                                                   *H061680
                                                  *                                   "PLACE PANEL IN QUIESCENT STATE  *I061690
3832      70R      10C5  1C00                     DISTART   INPUT     CLEAR_PANEL    "MODE=0,INSERT,ACCEPT,DISPLAY OFFDP061700
3833      74       10C6  FC691FFF                           CLAM      6,,X(1FFF)     "TURN ON ALL LOWER LAMPS AS EACH DP061710
                                                  *                                   "ONE IS A VALID DISPLAY          DP061720
                                                  *                                   "WAIT FOR OPERATOR TO SELECT A   *I061730
3834      144      10C8  1C03                               INPUT     LOWER_KEY      "DISPLAY WITH A LOWER BUTTON     DP061740
3835      154      10C9  F0D71F40                           STA       13,,CALLWORD   "SAVE SELECTED PROCEDURE IN CALL DP061750
                                                  *                                   "FOR USE BY THE DISPLAY ROUTINE  DP061760
                                                  *                                   "AFTER THE PROCEDURE IS COMPLETE DP061770
3836      164      10CB  F0971F3F                           STA       9,,IMAGE13     "                                DP061780
                                                  *                                   "SAVE BIT THAT TURNS ON THE LAMP DP061790
                                                  *                                   "FOR THIS PROCEDURE IN IMAGE13   DP061800
                                                  *                                   "FOR USE WHEN THE PROCEDURE IS   DP061810
                                                  *                                   "COMPLETE                        DP061820
                                                  *                                   "GO TO SELECTED PROCEDURE"       %S061830
                                                  *                                   "USE PROCEDURE NUMBER (BASED ON  DP061840
                                                  *                                   "THE NUMBER OF THE SELECTED LOWERDP061850
                                                  *                                   "KEY) TO INDEX A TABLE OF POINT- DP061860
                                                  *                                   "ERS TO THE CORRECT PROCEDURE    DP061870
3837      174      10CD  07D010CF                           BUC       IX13,,$10                                     CI061880
                                                  * EACH PROCEDURE   0 = DISFINAL                                      *H061890
                                                  * WILL CONTROL     1 = $55            SYNC                           *H061900
                                                  * ALL OPERATOR     2 = DISFINAL                                      *H061910
                                                  * STEPS NECESSARY  3 = NCT_DISPLAY                                   *H061920
                                                  * TO DEFINE THE    4 = $3             CSE-ETE                        *H061930
                                                  * DESIRED DISPLAY  5 = DISFINAL       D_GMT                          *H061940
                                                  * DISFINAL INDI-   6 = $5             LOP                            *H061950
                                                  * CATES THAT NO    7 = DISFINAL       CAL H/S                        *H061960
                                                  * FURTHER STEPS    8 = $21            MAN H/S                        *H061970
                                                  * ARE REQUIRED     9 = DISFINAL       AUTO H/S                       *H061980
                                                  *                10 = $4             BRG/RNG                        *H061990
                                                  *                11 = $1             POSITION                       *H062000
                                                  *                12 = NCT_DISPLAY    COH                            *H062010
3838                10CF  110B                     $10       CON       DISFINAL       INPUTS                           062020
3839                10D0  10F6                               CON       $55            SYNC                           CI062030
3840                10D1  110B                               CON       DISFINAL                                      DP062040
3841                10D2  1121                               CON       NCT_DISPLAY                                     062050
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                                                                                  062060
3842          10D3  10E1                  CON     $3          CSE - ETE           062070
3843          10D4  110B                  CON     DISFINAL    D-GMT               062080
3844          10D5  10F1                  CON     $5          LOP                 062090
3845          10D6  110B                  CON     DISFINAL    CAL H/S             062100
3846          10D7  10DC                  CON     $21         MAN H/S             062110
3847          10D8  110B                  CON     DISFINAL    AUTO H/S            062120
3848          10D9  10E5                  CON     $4          BRG/RNG             062130
3849          10DA  10DF                  CON     $1          POSITION            062140
3850          10DB  1121                  CON     NCT_DISPLAY COH                 062150
                                  * ENTER HERE FOR MAN H/S                        062160
3851    4R    10DC  F4491800      $21     ADDM    4,,X(1800)  "TURN ON SUB - RZ"  062170
3852    8     10DE  D004   (10E3)         BUC     $33
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                                        **                                                                  DP062180
                                        * ENTER HERE FOR POSITION                                           *H062190
3853      4R      10DF  F4490800        $1          ADDM        4,,X(0800)     "TURN ON SUB                  062200
                                        * ENTER HERE FOR ETE - CSE                                          *H062210
3854      4R      10E1  F44913FF        $3          ADDM        4,,X(13FF)     "TURN ON 0-9,RZ UPPER LEFT LAMPS  062220
                                        *                                      "TO SELECT POSITION TO BE DIS-  DP062230
                                        *                                      "PLAYED OR DESTINATION FOR ETE  DP062240
                                        *                                      "WAIT FOR NEXT BUTTON - SAVE NO. *I062250
3855     80R      10E3  1C0C            $33         ACCEPT      ARGUMENT       "IN ARG1 AND LAMP BIT IN IMAGE11 DP062260
3856      84      10E4  D206   (110B)               BUC         DISFINAL       "PROCEDURE COMPLETE"            DP062270
                                        * ENTER HERE FOR R-BRG                                              *H062280
3857      4R      10E5  F44918FF        $4          ADDM        4,,X(18FF)     "TURN ON SUB, 0-9, RZ LAMPS TO    062290
                                        *                                      "SELECT START POINT FOR RANGE   DP062300
                                        *                                      "WAIT FOR NEXT BUTTON - SAVE NO. *I062310
3858      84      10E7  1C0C                        ACCEPT      ARGUMENT       "IN ARG1 AND LAMP BIT IN IMAGE11 DP062320
3859      86      10E8  B049                        SUB         4,9            "TURN OFF THE SELECTED START    DP062330
                                        *                                      "POINT TO FORCE OPERATOR TO     DP062340
                                        *                                      "SELECT AN END POINT DIFFERENT  DP062350
                                        *                                      "THAN THE START POINT           DP062360
                                        *                                      "TURN OFF THE 'SUB' LAMP AS     DP062370
                                        *                                      "DISPLAY ROUTINE CANNOT PROCESS DP062380
3860      94      10E9  E444112C                    EXT         4,4,HX17FF     "SUB AS THE END POINT             062390
3861     164      10EB  1C01                        INPUT       UPPER_LEFT_KEY   "WAIT FOR NEXT BUTTON"         DP062400
3862     174      10EC  F0D71F42                    STA         13,,ARGWORD2   "SAVE BUTTON NO. OF END POINT IN DP062410
                                        *                                      "ARG2 FOR DISPLAY ROUTINE       DP062420
                                        *                                      "SAVE LAMP BIT IN IMAGE11 WITH  DP062430
3863     186      10EE  E0991F3D                    MRG         9,9,IMAGE11    "BIT OF START POINT LAMP        DP062440
                                        *                                      "                               DP062450
3864     190      10F0  D10A   (110B)               BUC         DISFINAL       "PROCEDURE COMPLETE"            DP062460
                                        * ENTER HERE FOR LOP                                                *H062470
                                        *                                      "WAIT FOR 2 BUTTONS - SELECTED  *I062480
3865     80R      10F1  1C0A            $5          ACCEPT      LEFT_STATION_PAIR   "PAIR IN LEFT LEGEND DISPLAYDP062490
                                        *                                      "WAIT FOR 2 BUTTONS - CHOSEN PAIR*I062500
3866     160      10F2  1C0B                        ACCEPT      RIGHT_STATION_PAIR   "IN RIGHT LEGEND DISPLAY  DP062510
3867     162      10F3  9C4E                        CLAM        4,14           "TURN ON 1, 2 AND 3               062520
3868     232      10F4  1C01                        INPUT       UPPER_LEFT_KEY                                   062530
3869     236      10F5  D006   (10FC)               BUC         $6                                               062540
                                        * ENTER HERE FOR STATUS DISPLAY                                     *H062550
3870      2R      10F6  9C4E            $55         CLAM        4,14           "TURN ON 1, 2, 3 AND              062560
3871       6      10F7  FC691001                    CLAM        6,X(1001)      "COH AND INPUTS                   062570
3872      76      10F9  1C03                        INPUT       LOWER_KEY      "WAIT FOR 1 BUTTON                062580
3873      86      10FA  F0D71F42                    STA         13,ARGWORD2    "SAVE FOR STATUS DECODE           062590
3874      2R      10FC  90D1            $6          SUBM        13,1           "CHECK IF INPUTS                  062600
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3875      6     10FD  D057   (1105)                BRL     STATUS_INPUTS  "YES                          062610
3876      2R    10FE  9807                         COMM    13,7           "CHECK IF COH                 062620
3877      6     10FF  D035   (1105)                BRG     STATUS_INPUTS  "YES                          062630
3878     10R    1100  F0D71F41                     STA     13,ARGWORD1    "SAVE SELECTED FREQUENCY      062640
3879     20     1102  F0971F3D                     STA     9,IMAGE11      "AND LAMP BIT                 062650
3880     24     1104  D006   (1108)                BUC     DISFINAL                                     062660
3881                                   STATUS_INPUTS;                                                   062670
3881      2R    1105  DE50                         FLG     A+L            "FLAG A TRUE IF INPUTS        062680
3882      4     1106  9492                         ADDM    9,2            "KEEP STATUS LIT              062690
3883     14     1107  F0971F3F                     STA     9,IMAGE13                                    062700
3884     16     1109  9C40                         CLAM    4,0                                          062710
3885     20     110A  D196   (1121)                BAF     NCT_DISPLAY                                  062720
                                       * FALL INTO DISFINAL IF INPUTS                                   062730
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                                        **                                                                  DP062740
                                        * DISPLAY PROCEDURE COMPLETE                                        *H062750
                                        * THIS ROUTINE IS USED TO EXIT                                      *H062760
                                        * THE PANEL INTERRUPT ROUTINE                                       *H062770
                                        * AT THE END OF A PROCEDURE                                         *H062780
3886      2R      110B  9C71            DISFINAL   CLAM      7,,1          "SET DISPLAY MODE (= 1) THIS WILLDP062790
                                        *                                  "CAUSE THE C/I PANEL NON OMEGA   DP062800
                                        *                                  "TASK ROUTINE TO GENERATE THE    DP062810
                                        *                                  "REQUESTED DISPLAY               DP062820
3887      10R     110C  FC4A1F3D        $1         CLAD      4,,IMAGE11    "TURN ON KEYBOARD LAMPS FROM     DP062830
                                        *                                  "IMAGE11,12,13 TO REFLECT THE    DP062840
                                        *                                  "PROCEDURE SELECTED BY THE       DP062850
3888      18      110E  F46A1F3F                   CLA       6,,IMAGE13    "OPERATOR                        DP062860
3889      4R      1110  F4290A00        $2         ADDM      2,,X(0A00)    "TURN ON INSERT AND DISPLAY LAMPS  062870
                                        *                                  "WHICH WERE TURNED OFF BY THE    DP062880
                                        *                                  "CLEAR ROUTINE AFTER THE DISPLAY DP062890
3890      8       1112  F4896000                   ADDM      8,,X(6000)    "BUTTON WAS SELECTED               062900
3891      16      1114  E422112A                   EXT       2,2,HXFEFF    "TURN OFF CLEAR                    062910
                                        *                                  "EXIT PANEL PROCEDURE WITH DUMMY *I062920
3892      70R     1116  1C03            $3         INPUT     LOWER_KEY     "REQUEST FOR ANOTHER BUTTON      DP062930
                                        *                                  "IF THE OPERATOR SELECTS ONE OF  DP062940
                                        *                                  "THE ILLUMINATED LAMPS NOW IT IS DP062950
3893      76      1117  040010AA                   BUC       INPUTERROR    "AN ILLEGAL PROCEDURE            DP062960
                                        * ENTER HERE TO END AN INSERT                                       *H062970
                                        * PROCEDURE AFTER THE ACCEPT                                        *H062980
                                        * BUTTON IS SELECTED                                                *H062990
3894      4R      1119  F0290400        $4         SUBM      2,,X(0400)    "TURN OFF THE ACCEPT LAMP AND      063000
3895      8       111B  F0892000                   SUBM      8,,X(2000)    "DELETE IT FROM THE MASK           063010
3896      18      111D  F077002A                   STA       7,,ACCEPT_OLD "                                DP063020
                                        *                                  "SAVE MODE IN ACCEPT OLD MARKER  DP063030
                                        *                                  "THE MODE WILL BE ZERO UNLESS THEDP063040
                                        *                                  "OPERATOR WAS IN A PROCEDURE     DP063050
                                        *                                  "WHERE THE OLD DATA WAS DISPLAYEDDP063060
                                        *                                  "ON THE PANEL (MODE = 1) AND IT  DP063070
                                        *                                  "WAS ACCEPTED WITHOUT CHANGE     DP063080
3897      20      111F  9C72                       CLAM      7,,2          "SET INSERT MODE (2)  THIS WILL  %S063090
                                        *                                  "CAUSE THE C/I PANEL NON OMEGA   DP063100
                                        *                                  "TASK ROUTINE TO PROCESS THE     DP063110
                                        *                                  "INSERTED DATA                   DP063120
3898      24      1120  D905   (110C)              BUC       $1                                             CI063130
                                        * ENTER HERE FOR NCTR OR COH                                        *H063140
3899      4R      1121  FC5901FE        NCT_DISPLAY CLAM     5,,OSHEX      "TURN ON STATION LAMPS             063150
                                        *                                  "WAIT FOR ONE BUTTON - OPERATOR  *I063160
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3900    70R    1123  1C01          $1          INPUT    UPPER_LEFT_KEY   "WILL SELECT A STATION          DP063170
3901    80     1124  F0971F3E                   STA      9,,IMAGE12      "SAVE LAMP BIT IN IMAGE12 FOR    DP063180
3902    82     1126  90D1                       SUBM     13,,1                                            HH063190
                                    *                                    "UPPER RIGHT KEY DISPLAY AT END  DP063200
                                    *                                    "OF PROCEDURE                    DP063210
3903    92     1127  F0D71F41                   STA      13,,ARGWORD1    "SAVE BUTTON NO. IN ARG1 FOR USE DP063220
                                    *                                    "BY DISPLAY ROUTINE              DP063230
                                    *                                    "                                DP063240
                                    *                                    "PROCEDURE COMPLETE"             DP063250
3904    96     1129  D90F   (110B)              BUC      DISFINAL                                         DP063260
3905           112A  FEFF          HXFEFF       CON      X(FEFF)                                           063270
3906           112B  FFF0          HXFFF0       CON      X(FFF0)                                           063280
3907           112C  17FF          HX17FF       CON      X(17FF)                                           063290
3908           112D  E000          HXE000       CON      X(E000)                                           063300
3909           112E  F0FF          HXF0FF       CON      X(F0FF)                                           063310
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                                                  **                                                                  CI063320
                                                  *                          INSERT PROCEDURES                        *H063330
                                                  *                                                                   *H063340
                                                  * ENTER HERE WHEN THE ACCEPT/INSERT BUTTON IS DEPPRESSED.  ALL INSERT   *H063350
                                                  * PROCEDURES ARE INITIATED AND CONTROLLED HERE.  IF THE ACCEPT LAMP IS  *H063360
                                                  * ON THEN AN INSERT PROCEDURE IS COMPLETE OTHERWISE THE INSERT LAMP IS  *H063370
                                                  * ON AND A PROCEDURE IS TO BE INITIATED.                               *H063380
                                                  *                                                                   *H063390
3910        8R      112F  E49200DF                INSACC     EXT        9,2,HX0400     "EXAMINE THE ACCEPT LAMP          063400
3911        12      1131  D919   (1119)                      BNE        DISFINAL$4     "WAS THE ACCEPT BUTTON DEPRESSED?DP063410
                                                  * THE INSERT BUTTON WAS DEPRESSED                                   *H063420
                                                  *                                     "PLACE PANEL IN QUIESCENT STATE  *I063430
3912        70R     1132  1C00                               INPUT      CLEAR_PANEL    "MODE=0,ACCEPT,INSERT,DISPLAY OFFDP063440
3913        74      1133  FC690921                           CLAM       6,,X(0921)     "TURN ON VALID LAMPS              063450
                                                  *                                     "VALID INSERTS  POS, RZ-POS,     DP063460
                                                  *                                     "D-GMT, MAN-V/H, OMEGA-DR, RZ-V/HDP063470
                                                  *                                     "WAIT FOR OPERATOR TO SELECT AN  *I063480
3914        144     1135  1C03                               INPUT      LOWER_KEY      "INSERT WITH A LOWER BUTTON      DP063490
3915        154     1136  F0D71F40                           STA        13,,CALLWORD   "SAVE BUTTON NUMBER IN CALL FOR  DP063500
                                                  *                                     "USE BY THE INSERT ROUTINE AFTER DP063510
                                                  *                                     "THE PROCEDURE IS COMPLETE. IT   DP063520
                                                  *                                     "WILL ALSO BE USED BY THE DISPLAYDP063530
                                                  *                                     "ROUTINE IF THE INSERT PROCEDURE DP063540
                                                  *                                     "REQUIRES THE DISPLAY OF OLD DATADP063550
                                                  *                                     "                                DP063560
3916        164     1138  F0D71F42                           STA        13,,ARGWORD2   "MAKE ARG2 POSITIVE AS A MARKER  DP063570
                                                  *                                     "INDICATING A GENERAL INSERT     DP063580
                                                  *                                     "                                DP063590
3917        174     113A  F0971F3F                           STA        9,,IMAGE13     "SAVE LAMP BIT IN IMAGE13 TO TURNDP063600
                                                  *                                     "ON THE SELECTED LOWER LAMP AT   DP063610
                                                  *                                     "THE END OF THE PROCEDURE        DP063620
3918        176     113C  98D8                               COMM       13,,11         POSITION                          063630
                                                  * THE BUTTON NO.   2 = $21 RZ POS                                    *H063640
                                                  * IS USED TO SE-   8 = $9  D-GMT                                     *H063650
                                                  * LECT THE INSERT  9 = $10 MAN-V/H                                   *H063660
                                                  * PROCEDURE FROM  10 = $11 OMEGA-DR                                  *H063670
                                                  * A TABLE OF      12 = $10 RZ-V/H                                    *H063680
                                                  * POINTERS UNLESS                                                    *H063690
                                                  * THE BUTTON IS                                                      *H063700
                                                  * POS (=0)                                                           *H063710
                                                  *                                                                   *H063720
                                                  * $7 IS THE ADDRESS OF THE INSERT TABLE                              *H063730
                                                  *                                     "WAS THE POSITION                *1063740
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3919    186    113D  07D51161                BRL       IX13,,$7        "INSERT PROCEDURE SELECTED        %R063750
                                   * POSITION INSERT                                                    *H063760
3920     4R    113F  FC4913FF      $1        CLAM      4,,X(13FF)      "TURN ON RZ,DIGITS 0-9 TO          063770
                                   *                                     "SELECT A DESTINATION POSITION    DP063780
3921     12    1141  E4D200E3                EXT       13,2,HX4000                                        063790
3922     16    1143  D012   (1146)           BNE       $19             "IS THE ENTER TIME LAMP OFF?      %R063800
3923     4R    1144  F4490800                ADDM      4,,X(0800)      "ALLOW SHIP POSITION INSERTS       063810
                                   *                                     "TURN ON SUB LAMP                 DP063820
                                   *                                     "WAIT FOR NEXT BUTTON - SAVE NO.  *I063830
3924     80R   1146  1C0C          $19       ACCEPT    ARGUMENT        "IN ARG1 AND LAMP BIT IN IMAGE11 DP063840
                                   * ENTER HERE FOR RZ POS                                              *H063850
3925     4R    1147  FC590801      $21       CLAM      5,,X(0801)      "TURN ON N AND S LAMPS FOR         063860
3926     6     1149  9C40                    CLAM      4,,0                                               063870
3927     8     114A  98DB                    COMM      13,,11          "THE LATITUDE                     DP063880
                                   *                                     "IS THIS A DEST-                  *I063890
3928     12    114B  D019   (1155)           BNE       $2                                                 063900
                                   * CRAFT POSITION INSERT                                              *H063910
3929     2R    114C  8CD1                    CLSM      13,,1           "CHANGE ARG2 TO NEGATIVE TO MARK DP063920
                                   *                                     "A SPECIAL INSERT                 DP063930
                                   *                                     "NOTE - THIS MARKER IS USED BY    DP063940
                                   *                                     "       THE ROUTINE ACCEPTING     DP063950
                                   *                                     "       DIGITS TO SELECT THE      DP063960
3930     12    114D  F0D71F42                STA       13,,ARGWORD2    "       POSITION QUALITY BEFORE   DP063970
3931     20    114F  E4D200E4                EXT       13,2,HX8000                                        063980
                                   *                                     "IS THIS THE"                     *2063990
3932     24    1151  D063   (1155)           BRE       $2              "FIRST POSITION INSERT?"          %R064000
                                   *                                     "(ENTER P ON)                     DP064010
3933     2R    1152  9C71                    CLAM      7,,1            "ALLOW OPERATOR TO SELECT CURRENTDP064020
                                   *                                     "CRAFT POSITION WITHOUT CHANGE    DP064030
                                   *                                     "                                 DP064040
                                   *                                     "SET MODE = 1 TO DISPLAY POSITIONDP064050
                                   *                                     "WAIT FOR 1 BUTTON (N OR S) END   *I064060
3934     72    1153  1C04                    INPUT     WITH_ACCEPT_LIGHT   "PROCEDURE IF ACCEPT PUSHED DP064070
                                   *                                     "N OR S IS NOW IN - THE REST OF   DP064080
                                   *                                     "THE PROCEDURE IS COMMON TO       DP064090
3935     76    1154  D001   (1156)           BUC       $3              "DESTINATION PROCEDURE            DP064100
                                   * DEST 0-9 RZ                                                        DP064110
                                   *                                     "WAIT FOR OPERATOR TO SELECT      *I064120
3936     70R   1155  1C02          $2        INPUT     UPPER_RIGHT_KEY  "NORTH OR SOUTH                   064130
3937     4R    1156  FC09A02E      $3        CLAM      0,,X(A02E)      "SET UP TO DISPLAY N IN THE LEFT   064140
                                   *                                     "LEGEND AND PUNCTUATION IN LEFT   DP064150
3938     6     1158  98DB                    COMM      13,,11          "DISPLAY REGISTER"                 064160
                                   *                                     "WAS NORTH"                       *1064170
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3939      10      1159  D062   (115C)              BRE       $4              "SELECTED BY THE OPERATOR?"      DP064180
3940       4R     115A  FC09A033                   CLAM      0,,X(A033)      "CHANGE LEGEND TO S                064190
3941      80R     115C  1C07            $4         ACCEPT    FIVE_DIGITS     "WAIT FOR 5 DIGIT LATITUDE INSERTDP064200
                                        *                                     "WAIT FOR OPERATOR TO SELECT E/W *I064210
3942     160      115D  1C09                       ACCEPT    EAST_OR_WEST    "SET UP RIGHT LEGEND WITH E OR W DP064220
3943     164      115E  F419A000                   ADDM      1,,X(A000)      "DISPLAY PUNCTUATION IN THE RIGHTDP064230
                                        *                                     "DISPLAY REGISTER                DP064240
                                        *                                     "FINISH PROCEDURE"               *I064250
3944     244      1160  1C08                       ACCEPT    SIX_DIGITS      "6 DIGIT LONG/A,B,C IF SUB/ACCEPTDP064260
                                        *                                                                      CI064270
3945              1161  1189            $7         CON       $11             INPUTS                             064280
3946              1162  0000                       CON       0                                                DP064290
3947              1163  0000                       CON       0                                                DP064300
3948              1164  0000                       CON       0                                                DP064310
3949              1165  0000                       CON       0                                                DP064320
3950              1166  116A                       CON       $9              D-GMT                              064330
3951              1167  0000                       CON       0                                                  064340
3952              1168  0000                       CON       0                                                  064350
3953              1169  1179                       CON       $10             MAN H/S                            064360
                                        * ENTER HERE FOR D-GMT                                                 *H064370
3954       8R     116A  E4D200E3        $9         EXT       13,2,HX4000     "EXAMINE THE ENTER TIME LAMP       064380
                                        *                                     "IS THIS THE"                    *2064390
3955      12      116C  D06A   (1177)              BRE       $91             "FIRST TIME INSERT?"             %R064400
                                        *                                     "(ENTER T ON)                    DP064410
                                        *                                     "ALLOW OPERATOR TO SELECT CURRENTDP064420
                                        *                                     "DATE - TIME WITHOUT CHANGE      DP064430
                                        *                                     "                                DP064440
                                        *                                     "SET MODE = 1 TO DISPLAY DATE    DP064450
3956       2R     116D  9C71                       CLAM      7,,1            "AND TIME                        DP064460
3957       6      116E  FC4903FF                   CLAM      4,,X(03FF)      "TURN ON DIGITS 0 - 9            DP064470
                                        *                                     "WAIT FOR 1ST DIGIT OF DATE  END *I064480
3958      76      1170  1C04                       INPUT     WITH_ACCEPT_LIGHT   "PROCEDURE IF ACCEPT PUSHED DP064490
3959      80      1171  FCB91178                   CLAM      11,,$92         "THE OPERATOR IS INSERTING A NEW DP064500
3960      90      1173  F0B71F43                   STA       11,,LINKWORD    "TIME - SET UP TO ENTER DIGIT    DP064510
3961      92      1175  8CAA                       CLSM      10,,10          "ACCEPT ROUTINE FOR 6 DIGITS AND DP064520
                                        *                                     "RETURN TO $92.  THIS WILL MAKE  DP064530
                                        *                                     "THE PROGRAM APPEAR TO FOLLOW THEDP064540
                                        *                                     "SEQUENCE FOR D-GMT INSERTS THAT DP064550
3962      96      1176  D302   (11A9)              BUC       INSSIX$4        "ARE NOT THE FIRST               DP064560
                                        *                                     "WAIT FOR 6 DIGIT DATE TO BE     *I064570
3963      80R     1177  1C08            $91        ACCEPT    SIX_DIGITS      "INSERTED BY THE OPERATOR        DP064580
                                        *                                     "FINISH PROCEDURE"               *I064590
3964      80R     1178  1C08            $92        ACCEPT    SIX_DIGITS      "GET 6 DIGIT TIME AND ACCEPT     DP064600
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                                        * ENTER HERE FOR MAN-V/H                                                    *H064610
                                        * ENTER HERE FOR RZ-V/H                                                     *H064620
3965      4R      1179  FC491800        $10        CLAM       4,,X(1800)      "TURN ON SHIP AND RZ                  064630
3966      84      117B  1C0C                       ACCEPT     ARGUMENT                                              064640
3967      88      117C  FC098024                   CLAM       0,,X(8024)      "DISPLAY D IN LEFT DISPLAY            064650
3968      98      117E  F0071C03                   STA        0,,HEADING_GROUP  "FLAG HEADING AS SPECIAL            064660
                                        *                                      "TURN ON PUNCTUATION IN LEFT         DP064670
                                        *                                      "DISPLAY REGISTER                    DP064680
3969     178      1180  1C08                       ACCEPT     SIX_DIGITS      "WAIT FOR 3 DIGIT HDG INSERT          064690
3970     182      1181  FC19202B                   CLAM       1,,X(202B)      "TURN ON PUNCTUATION IN RIGHT         064700
                                        *                                      "DISPLAY REGISTER                    DP064710
                                        *                                      "FINISH PROCEDURE"                   *I064720
3971     192      1183  F00C1F41                   FET        0,,ARGWORD1                                           064730
3972     194      1185  980C                       COMM       0,,12           TEST FOR RZ V/H                       064740
3973     202      1186  D700                       PRN        0                                                     064750
3974     206      1187  D163    (119B)             BRE        PLOT11$1                                              064760
3975      80R     1188  1C06                       ACCEPT     THREE_DIGITS    "GET 3 DIGIT VELOCITY / ACCEPT        064770
                                        * ENTER HERE FOR INPUTS                                                     064780
3976      4R      1189  FC490400        $11        CLAM       4,,X(0400)      "TURN ON ALL STATION LAMPS            064790
3977      8       118B  FC5903FE                   CLAM       5,,X(03FE)      "AND AUTO AND MAN                     064800
3978      12      118D  F4290400                   ADDM       2,,X(0400)      "TURN ON ACCEPT LAMP AND ENABLE       064810
3979      16      118F  F4892000                   ADDM       8,,X(2000)      "ACCEPT IN THE SWITCH MASK - THIS     064820
                                        *                                      "WILL ALLOW THE OPERATOR TO          DP064830
                                        *                                      "ACCEPT WHEN THE OMEGA STATION       DP064840
                                        *                                      "LAMPS ON ARE THE CORRECT SET        DP064850
3980      12R     1191  F8471F3D        $12        STAD       4,,IMAGE11      "SAVE LAMPS NOW ON IN                 064860
                                        *                                      "IMAGE11/12 FOR DISPLAY AT END OF     064870
                                        *                                      "PROCEDURE AND INSERT ROUTINE        DP064880
                                        *                                      "WAIT FOR 1 STATION TO BE TURNED     *I064890
3981      82      1193  1C01                       INPUT      UPPER_LEFT_KEY  "OFF - END PROCEDURE IF ACCEPT        064900
3982      92      1194  F84A00EB                   CLSD       4,,=D1          "TURN OFF SELECTED LAMPS              064910
3983      94      1196  B049                       SUB        4,9             "                                     064920
3984      96      1197  B059                       SUB        5,9             "ALLOW OPERATOR TO TURN OFF           064930
3985     106      1198  EC441F3D                   EXTD       4,4,IMAGE11     "ANOTHER                              064940
3986     110      119A  D80A    (1191)             BUC        $12             "LAMP                                 064950
3987              113F                  PLOT11     EQU        INSACC$1                                             PT064960
3988      80R     119B  1C0D            $1         ACCEPT     FOUR_DIGITS     4 DIGIT VELOXITY FOR RZ               064970
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                                                                                                                    CI064980
                                **                                                                                  CI064980
                                *                          DIGIT INPUT                                              *H064990
                                *                                                                                   *H065000
                                * THIS ROUTINE PROCESSES STRINGS OF DIGITS AS REQUESTED BY THE CALLING              *H065010
                                * PROGRAM.  IT HAS ENTRIES FOR STRINGS OF 2, 3, 5 AND 6 DIGITS.  ALL               *H065020
                                * DIGITS ARE DISPLAYED IN THE APPROPIATE REGISTER AS INDICATED BY                  *H065030
                                * WINDOWAD.  IT IS ASSUMMED THAT THE LAST DIGIT IN GOES INTO THE RIGHT            *H065040
                                * MOST DIGIT OF THE DISPLAY AND ALL OTHERS ARE PLACED ACCORDINGLY.  IT            *H065050
                                * HAS SPECIAL PROVISIONS TO INCREMENT THE WINDOWAD BY 2 AT THE END OF             *H065060
                                * EACH SEQUENCE.  IT WILL LOOK FOR A SPECIAL INSERT AND REQUEST POSITION         *H065070
                                * QUALITY DATA IF REQUIRED.  IF THE DISPLAY REGISTER IS THE RIGHT DIS-            *H065080
                                * PLAY IT WILL TURN ON THE ACCEPT LAMP AT THE END OF THE SEQUENCE                  *H065090
                                *                                                                                 *H065100
3989        2R    119C  8CA2        INSTWO    CLSM    10,,2          "INITIALIZE COUNTER FOR 2 DIGITS           DP065110
3990        6     119D  D007  (11A5)          BUC     INSSIX$1                                                  DP065120
3991        2R    119E  8CA4        INSTHREE  CLSM    10,,4          "INITIALIZE COUNTER FOR 3 DIGITS           DP065130
3992        6     119F  D005  (11A5)          BUC     INSSIX$1                                                  CI065140
3993        2R    11A0  8CA6        INSFOUR   CLSM    10,,6          "INITIALIZE COUNTER FOR 4 DIGITS            065150
3994        6     11A1  D003  (11A5)          BUC     INSSIX$1                                                   065160
3995        2R    11A2  8CA8        INSFIVE   CLSM    10,,8          "INITIALIZE COUNTER FOR 5 DIGITS           DP065170
3996        6     11A3  D001  (11A5)          BUC     INSSIX$1                                                  CI065180
3997        2R    11A4  8CAA        INSSIX    CLSM    10,,10         "INITIALIZE COUNTER FOR 6 DIGITS           DP065190
3998        4R    11A5  FC4903FF    $1        CLAM    4,,X(03FF)     "TURN ON DIGIT LAMPS 0 - 9                 DP065200
3999        6     11A7  9C50                  CLAM    5,,0           "CLEAR UPPER RIGHT KEYS                     065210
                                *                                    "WAIT FOR THE OPERATOR TO SELECT           *I065220
4000        70R   11A8  1C01        $3        INPUT   UPPER_LEFT_KEY   "ONE DIGIT                               DP065230
4001        14R   11A9  FEBA00A5    $4        CLAD    I11,,WINDOWAD  "READ LEFT OR RIGHT DISPLAY USING         DP065240
                                *                                    "WINDOWAD AS A POINTER                     DP065250
                                *                                    "EACH DIGIT IN THE DISPLAY NOT             DP065260
                                *                                    "YET INSERTED IS A BLANK WHICH IS          DP065270
                                *                                    "A BCD 15                                  DP065280
                                *                                    "FORM INSERTED DIGIT NUMBER - 15           DP065290
                                *                                    "SO THAT IT WILL BE CORRECT AFTER          DP065300
4002        16    11AB  90DF                  SUBM    13,,15         "IT IS ADDED TO THE DISPLAY                DP065310
                                *                                    "USE DIGIT COUNT TO DETERMINE              *S065320
                                *                                    "THE NUMBER OF SHIFTS NECESSARY            DP065330
                                *                                    "TO PLACE THE DIGIT IN THE COR-            DP065340
                                *                                    "RECT DISPLAY CHARACTER                    DP065350
                                *                                    "                                          DP065360
                                *                                    "BRANCH INDEXED BY DIGIT COUNT             DP065370
                                *                                    "TO A TABLE OF SHIFT INSTRUCTIONS          DP065380
                                *                                    "$6 IS JUST A REFERENCE POINT              DP065390
4003        22    11AC  05A01188              BUC     X10,,$6        "IN THE TABLE FOR INDEXING                 DP065400
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                                    * ENTER HERE FOR SIXTH POSITION                                                  *H065410
4004      4R      11AE  F4D4001C             LSA       13,,4          "SHIFT DIGIT OVER 1 CHARACTER                 DP065420
                                    * ENTER HERE FOR FIFTH POSITION                                                  *H065430
4005      8       11B0  F4D40010             LSA       13,,4          "SHIFT DIGIT OVER 1 CHARACTER                 DP065440
                                    * ENTER HERE FOR FOURTH POSITION                                                 *H065450
4006      12      11B2  F4D40010             LSA       13,,4          "SHIFT DIGIT OVER 1 CHARACTER                 DP065460
                                    * ENTER HERE FOR THIRD POSITION                                                  *H065470
4007      14      11B4  B48D                 ADD       11,13          "ADD DIGIT TO THE DISPLAY WORD                DP065480
4008      18      11B5  D005   (11BB)        18UC      $7             "FOR THE 4 HIGH ORDER DIGITS                  DP065490
                                    * ENTER HERE FOR SECOND POSITION                                                 *H065500
4009      4R      11B6  F4D40010             LSA       13,,4          "SHIFT DIGIT OVER 1 CHARACTER                 DP065510
                                    * ENTER HERE FOR FIRST POSITION                                                  *H065520
4010      4R      11B8  F4D40100   $6        LSA       13,,8                                                        % 065530
                                    *                                  "SHIFT DIGIT OVER 2 CHARACTERS                DP065540
                                    *                                  "BECAUSE 2 LOW ORDER DIGITS OCCURD            P065550
                                    *                                  "IN THE MOST SIGNIFICANT BITS OF              DP065560
                                    *                                  "THE WORD                                     DP065570
4011      6       11BA  B4CD                 ADD       12,13          "ADD DIGIT TO THE DISPLAY WORD                DP065580
4012      16R     11BB  FA8700A5   $7        STAD      I11,,WINDOWAD  "RESTORE UPDATED DISPLAY FOR                 DP065590
                                    *                                  "OUTPUT TO THE C/I PANEL                      DP065600
4013      24      11BD  F48A1C03             CLA       11,,HEADING_GROUP  "TEST FOR HEADING                        065610
4014      28      11BF  D066   (11C6)        BRE       $9                 "AND                                      065620
4015      4R      11C0  F8A9FFFA             COMM      10,,-6             "EXIT AFTER                               065630
4016      8       11C2  D013   (11C6)        BNE       $9                 "INSERT OF THREE                          065640
4017      2R      11C3  B0AA                 SUB       10,10              "DIGITS                                   065650
4018      12      11C4  F0A71C03             STA       10,,HEADING_GROUP                                            065660
4019      2R      11C6  9CB0         $9      CLAM      11,,0                                                        065670
                                    *                                  "INCREMENT DIGIT                              *2065680
4020      10      11C7  CEA3   (11A5)        BXUD      10,,$1         "COUNT - IS THE DIGIT SEQUENCE                %R065690
                                    *                                  "COMPLETE?                                    DP065700
4021      2R      11C8  9C40               CLAM      4,,0           "TURN OFF DIGIT LAMPS 0 - 9                   DP065710
4022      10      11C9  F4DA00A5             CLA       13,,WINDOWAD   "INCREMENT WINDOWAD WHICH WILL                DP065720
                                    *                                  "CHANGE IT TO RIGHT IF IT WAS                 DP065730
                                    *                                  "LEFT (CLEAR SETS IT TO LEFT)                 DP065740
                                    *                                  "NOTE - ALL PROCEDURES REQUIRE                DP065750
                                    *                                  "       THAT THE LEFT DIGITS BE               DP065760
4023      12      11CB  94D2                 ADDM      13,,2          "       ENTERED FIRST.  MOST                  DP065770
                                    *                                  "       PROCEDURES END WITH THE               DP065780
4024      22      11CC  F0D700A5             STA       13,,WINDOWAD   "       RIGHT DIGITS                          DP065790
4025      24      11CE  98D5                 COMM      13,,C_I_RIGHT_DISPLAY                                        CI065800
                                    * IF THIS IS THE END OF THE LEFT                                                 *H065810
                                    * DISPLAY SEQUENCE THE ROUTINE                                                   *H065820
                                    * WILL RETURN TO THE NEXT STEP                                                  *H065830
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                                        * IN THE PROCEDURE WHICH IS                                          *H065840
                                        * CONTAINED IN LINK                                                  *H065850
                                        *                                   "WAS A LEFT                      *1065860
4026      34      11CF  06061F43                BRE       I,,LINKWORD     "DISPLAY REGISTER JUST COMPLETED?DP065870
4027       8R     11D1  F40A1F42                CLA       13,,ARGWORD2                                   % 065880
                                        * RIGHT DISPLAY - PREPARE TO                                         *H065890
                                        * END INSERT PROCEDURE                                               *H065900
                                        *                                   "IS THIS A                       *1065910
4028      12      11D3  D026   (11DA)           BGE       $8              "GENERAL INSERT PROCEDURE?       DP065920
4029       2R     11D4  9C5E                    CLAM      5,,14           "SPECIAL"                         065930
                                        *                                   "TURN ON A, B AND C FOR POSITION DP065940
                                        *                                   "QUALITY                         DP065950
                                        *                                   "WAIT FOR OPERATOR"              *I065960
4030      72      11D5  1C02                    INPUT     UPPER_RIGHT_KEY   "TO SELECT QUALITY"           DP065970
4031      74      11D6  90D1                    SUBM      13,,1                                             065980
4032      84      11D7  F0D71F42                STA       13,,ARGWORD2    "SAVE QUALITY BUTTON NO. IN ARG2 DP065990
                                        *                                   "FOR INSERT ROUTINE              DP066000
                                        *                                   "KEEP THE QUALITY LAMP ON        DP066010
4033      86      11D9  A459                    CLA       5,9             "FOR ACCEPT                      DP066020
                                        *   INSERT FINAL                                                     CI066030
                                        *                                   "ALLOW OPERATOR TO ACCEPT THE    *I066040
4034      70R     11DA  1C04            $8      INPUT     WITH_ACCEPT_LIGHT   "INSERTED DATA             DP066050
                                        *                                   "ERROR IF OPERATOR PUSHES ANY    DP066060
4035      76      11DB  040010AA                BUC       INPUTERROR      "OTHER BUTTON                    DP066070
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                                                **                                                                  DP066080
                                                *                    STATION PAIR                                   *H066090
                                                *                                                                   *H066100
                                                * THIS ROUTINE IS USED BY THE LOP DISPLAY PROCEDURE TO ALLOW THE    *H066110
                                                * OPERATOR TO SELECT A PAIR OF STATIONS AND DISPLAY THE SELECTED PAIR *H066120
                                                * IN THE LEGENDS                                                    *H066130
                                                *                                                                   *H066140
                                                * ENTER HERE FOR LEFT STATION PAIR                                  *H066150
4036      2R        11DD  9CA0                  STAPAIR   CLAM      10,,0          "SET MARKER = 0 FOR LEFT       DP066160
4037      6         11DE  D001   (11E0)                   BUC       $2                                            CI066170
                                                * ENTER HERE FOR RIGHT STATION PAIR                                *H066180
4038      2R        11DF  9CA1                  $1        CLAM      10,,1          "SET MARKER = 1 FOR RIGHT      DP066190
4039      4R        11E0  FC5901FE              $2        CLAM      5,,OSHEX       "TURN ON STATION LAMPS         DP066200
4040      8         11E2  FC3917D4                       CLAM      3,,ASCII-1     "WAIT FOR OPERATOR TO SELECT THE *I066210
4041      78        11E4  1C02                           INPUT     UPPER_RIGHT_KEY   "FIRST STATION OF THE PAIR   DP066220
4042      80        11E5  B059                           SUB       5,9                                           066230
4043      82        11E6  B4D3                           ADD       13,3                                          066240
4044      88  *     11E7  F1AD11F4                       XEQ       X10,,$3        "USE MARKER TO DISPLAY STATION INDP066250
                                                *                                 "RIGHT OR LEFT DISPLAY LEGEND  DP066260
                                                *                                 "TURN OFF SELECTED STATION LAMP  066270
                                                *                                 "SO THAT THE SECOND STATION WILL DP066280
                                                *                                 "BE DIFFERENT THAN THE FIRST   DP066290
                                                *                                 "WAIT FOR OPERATOR TO SELECT THE *I066300
4045      158       11E9  1C02                           INPUT     UPPER_RIGHT_KEY   "SECOND STATION OF THE PAIR  DP066310
4046      164 *     11EA  F1AD11F6                       XEQ       X10,,$4                                       066320
4047      166       11EC  B4D3                           ADD       13,3                                          066330
4048      172 *     11EE  F1AD11F9                       XEQ       X10,,$5                                       066340
4049      178 *     11EF  F1AD11F8                       XEQ       X10,,$6                                       066350
4050      180       11F1  9C50                           CLAM      5,,0           "TURN OFF ALL STATION LAMPS    DP066360
                                                *                                 "RETURN TO THE DISPLAY PROCEDURE DP066370
4051      190       11F2  06001F43                       BUC       I,,LINKWORD    "WHICH IS DEFINED IN LINK      DP066380
4052      6R        11F4  A60D                $3         CLA       I0,13                                         % 066390
4053      12        11F5  A61D                           CLA       I1,13                                         % 066400
4054      6R        11F6  4658   (00D8)       $4        1MPI      0,,HX0040                                     % 066410
4055      10        11F7  F4140040                       LSA       1,,6                                          % 066420
4056      6R        11F9  B60D                $5         ADD       I0,13                                         % 066430
4057      12        11FA  B61D                           ADD       I1,13                                         % 066440
4058      6R        11FB  9663   (00E3)       $6         ADD       0,,HX4000                                     % 066450
4059      14        11FC  F41800E3                       ADD       1,,HX4000                                     % 066460
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                                        **                                                                  DP066470
                                        *                        INPUT EAST OR WEST                         *H066480
                                        *                                                                   *H066490
                                        * THIS ROUTINE WILL ALLOW THE OPERATOR TO SELECT EAST OR WEST LONGITUDE *H066500
                                        * AND DISPLAY THE E OR W IN THE RIGHT DISPLAY LEGEND                *H066510
                                        *                                                                   *H066520
4060      4R      11FE  FC591400        ENTEREW    CLAM      5,,X(1400)     "TURN ON E AND W LAMPS          DP066530
                                        *                                   "WAIT FOR OPERATOR TO SELECT    *I066540
4061      74      1200  1C02                       INPUT     UPPER_RIGHT_KEY   "EAST OR WEST"              DP066550
4062      78      1201  FC190025                   CLAM      1,,X(0025)     "SET UP TO DISPLAY E IN THE RIGHTDP066560
4063      80      1203  98DC                       COMM      13,,12         "LEGEND                         DP066570
4064      84      1204  D062   (1207)              BRE       $1             "DID THE OPERATOR SELECT EAST?  DP066580
4065      4R      1205  FC190037                   CLAM      1,,X(0037)     "CHANGE LEGEND DISPLAY TO WEST  DP066590
4066      2R      1207  9CD5            $1         CLAM      13,,C_I_RIGHT_DISPLAY GUARANTEE                CI066600
                                        *                                   "SET WINDOWAD TO RIGHT SO THAT  DP066610
                                        *                                   "NEXT DIGIT SEQUENCE WILL       DP066620
4067      12      1208  F0D700A5                   STA       13,,WINDOWAD   "TERMINATE WITH ACCEPT          DP066630
4068      14      120A  9C50                       CLAM      5,,0           "TURN OFF E AND W LAMPS         DP066640
                                        *                                   "CONTINUE PROCEDURE BY RETURNING DP066650
4069      24      120B  06001F43                   BUC       I,,LINKWORD    "TO LINK POINTER                DP066660
                                        *                        ARGUMENT INPUT                             *H066670
                                        *                                                                   *H066680
                                        * THIS ROUTINE WILL EXECUTE AN 'INPUT UPPER LEFT KEY' AND SAVE THE     *H066690
                                        * BUTTON NUMBER IN ARG1 AND THE LAMP BIT IN IMAGE11.  IT IS USED BY    *H066700
                                        * PROCEDURES THAT WANT TO PASS THE BUTTON NUMBER (UPPER LEFT) TO THE   *H066710
                                        * DISPLAY OR INSERT ROUTINES.                                         *H066720
                                        *                                                                   *H066730
4070      70R     120D  1C01            ARGINPUT   INPUT     UPPER_LEFT_KEY   "WAIT FOR 1 BUTTON"           DP066740
4071      80      120E  F0971F3D                   STA       9,,IMAGE11     "SAVE NUMBER IN ARG1            DP066750
4072      90      1210  F0D71F41                   STA       13,,ARGWORD1   "SAVE LAMP BIT IN IMAGE11       DP066760
                                        *                                   "USE LINK POINTER TO RETURN     DP066770
4073     100      1212  06001F43                   BUC       I,,LINKWORD    "TO PROCESS                     DP066780
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                                                **                                                                  DP066790
                                                *                        PANEL PIN SUBROUTINE                       *H066800
                                                *                                                                   *H066810
                                                * THIS SUBROUTINE IS AN ENTRY POINT FOR ALL PANEL PROCEDURE SUBROUTINES.*H066820
                                                * THESE ROUTINES ALL HAVE THE FEATURE OF NOT RETURNING TO THE CALLING  *H066830
                                                * PROCEDURE UNTIL THE OPERATOR DEPRESSES A BUTTON.  THE PANEL INPUT    *H066840
                                                * PROGRAM IS AN INTERRUPT PROGRAM THAT REQUIRES AN ORDERLY RETURN TO   *H066850
                                                * THE INTERRUPTED PROGRAM AND THEREFORE NORMAL SUBROUTINE ENTRIES CAN  *H066860
                                                * NOT BE USED IN THE PANEL INTERRUPT PROGRAM.  THIS SPECIAL ROUTINE    *H066870
                                                * REMOVES THE RETURN ADDRESS FROM THE R14 PUSHDOWN STACK AND SAVES IT  *H066880
                                                * IN SPECIAL LINKAGES FOR USE AFTER A BUTTON HAS BEEN DEPRESSED.  THIS *H066890
                                                * ROUTINE THEN ENTERS THE SELECTED SUBROUTINE WHICH WILL TURN ON THE   *H066900
                                                * APPROPIATE LAMPS AND EXIT FROM THE PANEL INTERRUPT PROGRAM.  THE     *H066910
                                                * RETURN FROM THE SELECTED SUBROUTINE ACTUALLY OCCURS AFTER THE NEXT   *H066920
                                                * BUTTON HAS BEEN READ AND INTERPRETED AT WHICH TIME THE PANEL INTERRUPT*H066930
                                                * PROGRAM WILL CONTINUE THE PROCEDURE BY USING THE LINKAGE FOR A RETURN.*H066940
                                                * THE ARGUMENT CONSISTS OF A POINTER TO SELECT A SUBROUTINE FROM A TABLE*H066950
                                                *                                                                   *H066960
                                                *                                        "WAS THE CLEAR             *2066970
4074        4R        1214  D068    (1220)      PANEL_PIN   BRE        $2                "ROUTINE SELECTED?"        DP066980
                                                *                                        "(POINTER = 0)             DP066990
4075        8R        1215  C1E1                            FET        X14,,1            "READ RETURN ADDRESS FROM R14  DP067000
                                                *                                        "PUSH DOWN STACK           DP067010
4076        10        1216  9814                            COMM       1,,ACCEPT_GROUP                              CI067020
                                                * ALLOW 2 LEVELS OF NESTING                                          *H067030
                                                * THE ACCEPT GROUP MAY ALSO                                          *H067040
                                                * REQUEST BUTTON INPUTS                                              *H067050
                                                *                                        "IS THIS ROUTINE           *1067060
4077        14        1217  D052    (121A)                  BRL        $1                "IN THE ACCEPT GROUP?      %R067070
4078        10R       1218  F0071F43                        STA        0,,LINKWORD       "SAVE RETURN IN LINK LINKAGE  DP067080
                                                * ACCEPT ROUTINES WILL CALL                                          *H067090
                                                * FOR AN INPUT ROUTINE AS                                            *H067100
                                                * THE INPUT ROUTINES ARE THE                                         *H067110
                                                * ONLY ONES THAT EXIT THE                                            *H067120
                                                * PANEL INTERRUPT PROGRAM                                            *H067130
4079        10R       121A  F4071F44              $1          PTR        0,,PROCWORD       "SAVE RETURN IN PROC LINKAGE  DP067140
                                                * PANEL INTERRUPT WILL ALWAYS                                        *H067150
                                                * RETURN TO PROC LINKAGE WHEN                                        *H067160
                                                * EVER A KEYBOARD IS DEPRESSED                                       *H067170
                                                * THE ACCEPT GROUP WILL ALWAYS                                       *H067180
                                                * RETURN TO THE LINK LINKAGE WHICH                                   *H067190
                                                * WILL ALWAYS POINT TO A BASIC                                       *H067200
                                                * PROCEDURE                                                          *H067210
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4080    18    121C  F50A123A                  CLA     X0,,PPT        "READ START ADDRESS OF SELECTED  DP067220
                                     *                                 "SUBROUTINE FROM TABLE AND WRITE DP067230
                                     *                                 "INTO R14 PUSH DOWN STACK WHERE  DP067240
4081    26    121E  71E1                      STA     X14,,1         "CALLING PROGRAM RETURN WAS.     DP067250
                                     *                                 "ENTER SUBROUTINE BY EXECUTING A *S067260
                                     *                                 "BBK (SUBROUTINE RETURN) WHICH   DP067270
                                     *                                 "WILL RESTORE THE R14 POINTER TO DP067280
4082    38    121F  D500                      BBK     0              "ITS PROPER VALUE                DP067290
                                     *   PIN ENTRY TO DISCLEAR                                        CI067300
4083    8R    1220  D700             $2       PRN     0              "ADJUST R15 AND SEQUENCE TO CLEARDP067310
                                     *                                                                *H067320
                                     * CLEAR PANEL - PUT PROGRAM AND PANEL IN QUIESCENT STATE         *H067330
                                     *                                                                *H067340
4084    8R    1221  E422112E         DISCLEAR EXT     2,2,HXFOFF     "TURN OFF ACCEPT, INSERT AND     DP067350
4085    12    1223  F4290100                  ADDM    2,,X(0100)     "TURN ON CLEAR                    067360
4086    16    1225  FC898003                  CLAM    8,,X(8003)     "DISPLAY LAMPS                    067370
4087    20    1227  B844                      SUBD    4,4            "SWITCH MASK                     DP067380
4088    22    1228  9C60                      CLAM    6,,0           "TURN OFF ALL KEYBOARD LAMPS     DP067390
4089    34    1229  F8471F3D                  STAD    4,,IMAGE11     "AND CLEAR KEYBOARD IMAGE        DP067400
4090    44    122B  F0671F3F                  STA     6,,IMAGE13                                      CI067410
                                     * ENTER HERE TO BLANK DISPLAYS                                   *H067420
                                     * AND LEGENDS AND SET MODE = 0                                   *H067430
4091    2R    122D  9C03             $1       CLAM    0,,C_I_LEFT_DISPLAY INITIALIZE                  CI067440
4092    10    122E  7025   (00A5)             STA     0,,WINDOWAD    "INITIALIZE WINDOWAD TO POINT TO DP067450
4093    12    122F  8C01                      CLSM    0,,1           "LEFT DISPLAY AND GUARANTEE THAT DP067460
4094    16    1230  FC19FF00                  CLAM    1,,X(FF00)     "NEXT DIGIT SEQUENCE WILL BE LEFTDP067470
4095    28    1232  F8070003                  STAD    0,,C_I_LEFT_DISPLAY BLANK                       CI067480
4096    40    1234  F8070005                  STAD    0,,C_I_RIGHT_DISPLAY WINDOWS                    CI067490
4097    44    1236  B800                      SUBD    0,0            "BLANK LEFT, RIGHT DISPLAYS AND  DP067500
4098    46    1237  9C70                      CLAM    7,,0           "LEGENDS                         DP067510
4099    56    1238  F0071C03                  STA     0,,HEADING_GROUP                                DP067520
4100    64    123A  D5F0                      BBK     15             "SET MODE = 0 = QUIESCENT        DP067530
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                                 **                                                                  CI067540
                                 *   TABLE OF ENTRY POINTS TO PANEL PINS                             CI067550
4101                             PANEL_PIN_TABLE,;                                                   CI067560
4101          123B  109C         PT1        CON        PANOUT         INPUT                         CI067570
4102          123C  10A8         PT2        CON        PANOUT$4       INPUT                         CI067580
4103          123D  109D         PT3        CON        PANOUT$1       INPUT                         CI067590
4104                             START_ACCEPT_GROUP,;                                                CI067600
4104          123E  108F         PT4        CON        OUTWAL         INPUT (SPECIAL)               CI067610
4105          123F  119C         PT5        CON        INSTWO                                       DP067620
4106          1240  119E         PT6        CON        INSTHREE       ACCEPT                        DP067630
4107          1241  11A2         PT7        CON        INSFIVE        ACCEPT                        CI067640
4108          1242  11A4         PT8        CON        INSSIX         ACCEPT                        CI067650
4109          1243  11FE         PT9        CON        ENTEREW        ACCEPT                        CI067660
4110          1244  11DD         PT10       CON        STAPAIR        ACCEPT                        CI067670
4111          1245  11DF         PT11       CON        STAPAIR$1      ACCEPT                        CI067680
4112          1246  120D         PT12       CON        ARGINPUT       ACCEPT                        CI067690
4113          1247  11A0         PT13       CON        INSFOUR        ACCEPT                          067700
4114          123A               PPT        EQU        PANEL_PIN_TABLE-1                            CI067710
4115                             ACCEPT_GROUP;                                                       CI067720
4115          0004                          EQU        START_ACCEPT_GROUP-PPT                       CI067730
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                                 **                                                    CI067740
                                 *   LABELS FOR PANEL PINS                             CI067750
                                 *       INPUT GROUP                                   CI067760
4116        0000                 CLEAR_PANEL EQU        0            DUMMY             CI067770
4117                             UPPER_LEFT_KEY;                                       CI067780
4117        0001                             EQU        PT1-PPT                       CI067790
4118                             UPPER_RIGHT_KEY;                                      CI067800
4118        0002                             EQU        PT2-PPT                       CI067810
4119        0003                 LOWER_KEY   EQU        PT3-PPT                       CI067820
4120                             WITH_ACCEPT_LIGHT;                                    CI067830
4120        0004                             EQU        PT4-PPT      (SPECIAL)        CI067840
                                 *       ACCEPT GROUP                                  CI067850
4121        0005                 TWO_DIGITS  EQU        PT5-PPT                       DP067860
4122                             THREE_DIGITS;                                         DP067870
4122        0006                             EQU        PT6-PPT                       DP067880
4123        0007                 FIVE_DIGITS EQU        PT7-PPT                       CI067890
4124        0008                 SIX_DIGITS  EQU        PT8-PPT                       CI067900
4125                             EAST_OR_WEST;                                         CI067910
4125        0009                             EQU        PT9-PPT                       CI067920
4126                             LEFT_STATION_PAIR;                                    CI067930
4126        000A                             EQU        PT10-PPT                      CI067940
4127                             RIGHT_STATION_PAIR;                                   CI067950
4127        000B                             EQU        PT11-PPT                      CI067960
4128        000C                 ARGUMENT    EQU        PT12-PPT                      CI067970
4129        000D                 FOUR_DIGITS EQU        PT13-PPT                        067980
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                                                **                                                                  DP067990
                                                *                        DISPLAY PROGRAM                            *H068000
                                                *                                                                   *H068010
                                                * THIS ROUTINE IS ENTERED FROM THE MAIN PANEL PROGRAM 10 TIMES A SECOND *H068020
                                                * WHENEVER THE PANEL IS IN THE DISPLAY MODE (1).  IT GENERATES A NEW    *H068030
                                                * DISPLAY EVERY SECOND BASED ON THE PROCEDURE IDENTIFIED IN CALL.       *H068040
                                                *                                                                   *H068050
4130        8R      1248  F43A003E      PANELOUTPUT CLA       3,,PANEL_COUNT "READ DISPLAY PANEL 10 COUNTER        DP068060
4131        12      124A  D066   (1251)             BRE       $2             "IS IT TIME FOR A DISPLAY UPDATE?     DP068070
4132        2R      124B  9431                      ADDM      3,,1           "INCREMENT 10 COUNTER                 DP068080
4133        10R     124C  F037003E      $1          STA       3,,PANEL_COUNT "SAVE 10 COUNTER                      DP068090
                                                *                            "                                     DP068100
                                                *                            "DISPLAY PROGRAM COMPLETE"            DP068110
                                                *                            "RETURN TO MAIN PANEL PROGRAM TO      DP068120
                                                *                            "GENERATE STATUS DISPLAYS             DP068130
4134        22      124E  D720                      PRN       2                                                    DP068140
4135        28      124F  04000ECA                  BUC       PANEL_MAIN$11                                        DP068150
4136        8R      1251  F43A0009      $2          CLA       3,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES           DP068160
                                                *                            "EXAMINE THE HOLD LAMP                DP068170
4137        12      1253  4438                      LSA       3,,3           "                                      068180
4138        16      1254  D052   (1257)             BRL       $3             "DOES THE OPERATOR HAVE THE HOLD      DP068190
                                                *                            "MODE ON?"                            DP068200
4139        8R *    1255  F80D14EE                  BSV       VARSAVE        "TRANSFER VARIABLES FOR DISPLAY       DP068210
4140        8R      1257  F43A00CA      $3          CLA       3,,MODE        "SET PROGRAM FLAG C TO DEFINE         DP068220
                                                *                            "NAVIGATION MODE                      DP068230
                                                *                            "  TRUE = PHASE DIFFERENCE            DP068240
                                                *                            " FALSE = RHO - RHO                   DP068250
                                                *                            "                                     DP068260
4141        10      1259  DE62                      FLG       C+E            "SUB ALWAYS PHASE DIFFERENCE          DP068270
                                                * USE PARAMETER              0 = POP11                             *H068280
                                                * IN CALL TO                 1 = POP2                              *H068290
                                                * DEFINE DISPLAY             2 = POP4                              *H068300
                                                * SUBROUTINE                 3 = POP12                             *H068310
                                                *                            4 = POP7                              *H068320
                                                *                            5 = POP9                              *H068330
                                                *                            6 = POP5                              *H068340
                                                *                            7 = POP14                             *H068350
                                                *                            8 = POP10                             *H068360
                                                *                            9 = POP15                             *H068370
                                                *                           10 = POP6                              *H068380
                                                *                           11 = POP1                              *H068390
                                                *                           12 = POP8                              *H068400
                                                *                            "SELECT DISPLAY SUBROUTINE"           *I068410
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4142    22 *    125A  F80D1263                BSV       IX0,,$4      "FROM DISPLAY TABLE"          DP068420
                                        * THE GENERATION OF THE DISPLAY                                *H068430
                                        * IS NOW COMPLETE AND THE DATA                                 *H068440
                                        * IS READY FOR OUTPUT                                          *H068450
4143    24      125C  9C63                    CLAM      6,,C_I_LEFT_DISPLAY                           DP068460
4144    36      125D  7D60                    PTRD      X6,,0        "OUTPUT LEFT DISLAY            DP068470
4145    44      125E  7544                    PTR       X4,,4        "       LEFT LEGEND            DP068480
4146    56      125F  7D32                    PTRD      X3,,2        "      RIGHT DISPLAY           DP068490
4147    64      1260  7515                    PTR       X1,,5        "      RIGHT LEGEND            DP068500
                                        * RETURN HERE (WITH PROPER                                     *H068510
                                        * HANDLING OF R14) IF THE                                      *H068520
                                        * DISPLAY SUBROUTINE SET UP                                    *H068530
                                        * ITS OWN DISPLAYS                                             *H068540
4148    2R      1261  8C39            $5      CLSM      3,,9         "RESET PANEL COUNT TO 10 TO    DP068550
4149    6       1262  D907    (124C)          BUC       $1           "DELAY ANOTHER SECOND          DP068560
                                        *   JUMP TABLE FOR DISPLAY ROUTINES                            DP068570
4150            1263  146A            $4      CON       POP11        INPUTS                           068580
4151            1264  1293                    CON       POP2         SYNC                           DP068590
4152            1265  12C2                    CON       POP4         POS VAR                          068600
4153            1266  142D                    CON       POP12        N COUNTER                        068610
4154            1267  12CE                    CON       POP7         CSE-ETE                          068620
4155            1268  1386                    CON       POP9         D-GMT                            068630
4156            1269  13D9                    CON       POP5         LOP                              068640
4157            126A  148B                    CON       POP14        CAL H/S   (GS-TK)                068650
4158            126B  145F                    CON       POP10        MAN-H/S                          068660
4159            126C  1498                    CON       POP15        AUTO H/S                         068670
4160            126D  12C9                    CON       POP6         BGR/RWG                          068680
4161            126E  1270                    CON       POP1         POSITION  SHIP  0-9 RZ           068690
4162            126F  12E2                    CON       POP8         COH                              068700
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                                        **                                                                  DP068710
                                        * ENTER HERE FOR POSITION DISPLAY                                   *H068720
4163      2R      1270  9818            POP1      COMM      1,,11          "EXAMINE ARG1                    DP068730
4164      6       1271  D068   (127A)              BRE       $2             "SHIP                              068740
                                        * DISPLAY DESTINATION POSITION                                      *H068750
                                        * OR INTERCEPT POSITION                                             *H068760
4165      2R      1272  B411                       ADD       1,1            DOUBLE DESTINATION INDEX         DP068770
                                        *                                   "READ LONGITUDE                  DP068780
4166     14R      1273  F91C1FC4        $118      2FETD     X1,,DESTINATION_LONGITUDE                      % 068790
                                        *                                   "CONVERT LONGITUDE FOR DISPLAY   *I068800
4167    590       1275  0C02                       GEN       LONGITUDE_DISPLAY   "AND SET UP LEGEND"         DP068810
                                        *                                   "READ LATITUDE                   DP068820
4168     14R      1276  F94C1FDE        $119      2FETD     X4,,DESTINATION_LATITUDE                       % 068830
                                        *                                   "CONVERT LATITUDE FOR DISPLAY    *I068840
4169    590       1278  0C01                       GEN       LATITUDE_DISPLAY   "AND SET UP LEGEND"          DP068850
4170    598       1279  D5F0                       BBK       15             "RETURN TO MAIN DISPLAY ROUTINE  DP068860
                                        * ENTER HERE FOR CRAFT POSITION                                     *H068870
4171      8R      127A  F4081F55        $2        FETM      0,,RIJ_STAR    "READ POINTER TO R1 VECTOR       DP068880
                                        *                                   "CONVERT POSITION VECTOR TO      *I068890
4172      8R *    127C  F80D14A7        $21       BSV       MAKE_LAT_LONG   "LATITUDE AND LONGITUDE         DP068900
4173     12       127E  AC60                       CLAD      6,0                                            % 068910
4174     22       127F  D710                       PRN       1                                              % 068920
                                        *                                   "CONVERT LONGITUDE FOR DISPLAY   *I068930
4175    598       1280  0C02                       GEN       LONGITUDE_DISPLAY   "AND SET UP LEGEND          DP068940
4176    606       1281  C016                       FET       1,6                                            % 068950
                                        *                                   "CONVERT LATITUDE FOR DISPLAY    *I068960
4177   1182       1282  0C01                       GEN       LATITUDE_DISPLAY   "AND SET UP LEGEND           DP068970
4178   1190       1283  D5F0                       BBK       15             "RETURN TO MAIN DISPLAY ROUTINE  DP068980
4179              1273                  PLOT2     EQU       POP1$118                                        PT068990
4180              1276                  PLOT5     EQU       POP1$119                                        PT069000
                                        *                                                                     069010
4181     14R      1284  F80C002E        STATUS_FAIL FETD    0,,TEST_FAIL_TEMP                                069020
4182     16       1286  A421                       CLA       2,1                                              069030
4183     26       1287  F8050080                   RSLD      0,,8                                             069040
4184     32       1289  F0150080                   RSL       1,,8                                             069050
4185     36       128B  F4240100                   LSA       2,,8                                             069060
4186     38       128D  B402                       ADD       0,2                                              069070
4187     52       128E  FC07000B                   PTRD      0,,C_I_UPPER_LEFT_KEYBOARD_LAMPS                 069080
4188     62       1290  8420                       FETM      2,,0                                             069090
4189     70       1291  92EB   (00EB)              SUBD      0,,=DX(1)                                        069100
4190     74       1292  D20C   (128F)              BUC       BLANKS_GEN                                       069110
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                                        **                                                                  DP069120
                                        * ENTER HERE FOR STATUS DISPLAY                                     *H069130
4191      2R    1293  9021              POP2      SUBM      2,1          "TEST ARGWORD2                      069140
4192      6     1294  D951    (1284)              BRL       STATUS_FAIL                                      069150
4193      2R    1295  9823                        COMM      2,3                                              069160
4194      8     1296  040312E0                    BRG       STATUS_CCOH                                      069170
4195     30R    1298  F05C1ED3                    FET       5,,Q_STORAGE  "READ DATA FOR SYNC PERCENT          069180
                                        *                                 "COMPLETION DISPLAY               DP069190
4196     36     129A  9E1A    (009A)              CLA       0,,CALIBRATE_COMPUTED_MARKER                     DP069200
                                        *                                 "IS THE SYNC                      *1069210
4197     40     129B  D164    (12B0)              BRE       $4           "PROCESS GOING ON NOW?             DP069220
                                        * BURST DISPLAY                                                     *H069230
4198      2R    129C  A447                        CLA       4,7          "CONVERT FREQ NUMBER IN ARG1 TO    DP069240
4199      6     129D  4448                        MPIM      4,,8         "INDEX FOR READING THE 8 Q BURSTSDP069250
4200      8     129E  A454                        CLA       5,4          "FOR 1 FREQUENCY                   DP069260
4201     10     129F  9457                        ADDM      5,,7         "CLEAR DOUBLE REGISTER FOR DIGITSDP069270
4202     14     12A0  B822                        SUBD      2,2                                             DP069280
4203      8R    12A1  F54A1ED3          $3        CLA       X4,,Q_STORAGE "READ 1 Q BURST SCALED BI          DP069290
4204     12     12A3  4402                        LSA       0,,1                                            DP069300
4205     16     12A4  D022    (12A7)              BGE       $1           "IS THIS Q GREATER THAN 1?         %R069310
4206      2R    12A5  9C09                        CLAM      0,,9         "SET DISPLAY DIGIT TO A 9 WHICH    DP069320
4207      6     12A6  D002    (12A9)              BUC       $2           "IS THE MAXIMUM DISPLAY            DP069330
4208    446R    12A7  1000              $1        SQRT      0            "FORM 9 * Q**.5 AT B15             DP069340
                                        *                                 "   THIS WILL GIVE A NUMBER FROM   DP069350
                                        *                                 "   0 TO 8 IN THE LSB'S OF THE     DP069360
                                        *                                 "   WORD WHICH IS ALMOST           DP069370
                                        *                                 "   EQUAL TO THE TENTH'S PLACE     DP069380
4209    452     12A8  5009                        MPLM      0,,9         "   OF Q**.5                       DP069390
4210      6R    12A9  FC240010          $2        LSAD      2,,4         "SHIFT DISPLAY OVER 1 DIGIT        DP069400
4211      8     12AB  B430                        ADD       3,0          "ADD IN THE NEXT DIGIT             DP069410
                                        *                                 "ARE THERE MORE                    *1069420
4212     16     12AC  C44C    (12A1)              BXU       4,,$3        "Q'S FOR THIS FREQUENCY?"          DP069430
4213      2R    12AD  A402                        CLA       0,2          "SET UP THE 8 DIGITS TO DISPLAY    DP069440
                                        *                                 "IN THE 4 LEFT DIGITS OF EACH      DP069450
                                        *                                 "REGISTER                          DP069460
4214      4     12AE  8C11                        CLSM      1,,1         "BLANK THE REMAINING DIGITS OF     DP069470
4215      8     12AF  D00B    (12BB)              BUC       $10          "THE LEFT DISPLAY REGISTER         DP069480
4216      4R    12B0  AC04              $4        CLAD      0,4          "DURING SYNC Q STORAGE + 2         DP069490
                                        *                                 "CONTAINS DELTA C - CD WHERE       DP069500
                                        *                                 "DELTA C = C(LARGEST) - C(2ND      DP069510
                                        *                                 "LARGEST) WITH THE 2 C'S NOT       DP069520
                                        *                                 "ADJACENT.  Q STORAGE + 4 CON-     DP069530
                                        *                                 "TAINS CD                          DP069540
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                                                                                                                    "                                                                   DP069550
4217        8       12B1  8C02                                    ADDD        0,2                                   "FORM DELTA C                                                       DP069560
                                                                                                                    "IS THE 1ST SYNC                                                    *2069570
4218        12      12B2  D061    (12B4)                          BRE         $20                                   "10 SEC PERIOD COMPETE YET?                                         %R069580
                                                                                                                    "(DELTA C NOT 0)                                                    DP069590
4219        126R    12B3  DC04                                    DIVD        0,4                                   "COMPUTE DELTA C / CD                                               DP069600
                                                                                                                    "WHICH EQUALS PERCENTAGE / 100                                      DP069610
4220        10R     12B4  480A                    $20             MPYDM       0,,10                                 "FORM PERCENTAGE * 10/2**15 TO                                      DP069620
                                                                                                                    "GIVE THE TENS DIGIT IN THE LOW                                     DP069630
                                                                                                                    "BITS OF THE LEFT HALF OF A 32                                      DP069640
                                                                                                                    "BIT REGISTER                                                       DP069650
                                                                                                                    "                                                                   DP069660
4221        16      12B5  F0155000                                MPLM        1,,X(5000)                            "FORM REMAINDER * 10/2**4 (IGNOREDP069670
                                                                                                                    "THE SIGN BIT IN THIS OPERATION)                                    DP069680
                                                                                                                    "TO GIVE THE ONES DIGIT IN THE                                      DP069690
                                                                                                                    "MSB'S OF THE RIGHT HALF OF THE                                     DP069700
                                                                                                                    "32 BIT REGISTER                                                    DP069710
                                                                                                                    "                                                                   DP069720
4222        26      12B7  F8040800                                RSAD        0,,4                                  "SHIFT THE DOUBLE REGISTER RIGHT                                    DP069730
                                                                                                                    "ONE CHARACTER TO ALIGN THE                                         DP069740
                                                                                                                    "DIGITS WITH THE 2 LOW DIGITS OF                                    DP069750
                                                                                                                    "THE LEFT DISPLAY REGISTER                                          DP069760
                                                                                                                    "                                                                   DP069770
4223        28      12B9  8C01                                    CLSM        0,,1                                  "BLANK THE 4 HIGH CHARACTERS OF                                     DP069780
4224        30      12BA  8C31                                    CLSM        3,,1                                  "THE LEFT AND RIGHT DISPLAYS                                        DP069790
4225        2R      12B8  8C41                    $10             CLSM        4,,1                                  "BLANK THE 2 LOW DIGITS IN THE                                      DP069800
4226        4       12BC  B055                                    SUB         5,5                                   "RIGHT DISPLAY                                                      DP069810
4227        6       12BD  B022                                    SUB         2,2                                   "CLEAR BOTH LEGENDS                                                 DP069820
                                                                                                                    "                                                                   DP069830
4228        14      12BE  D5F0                                    BBK         15                                    "RETURN TO MAIN DISPLAY ROUTINE                                     DP069840
                                                                                                                                BLANKS                                                  *H069850
                                                                                                                                                                                        *H069860
                                                                                                                                                                                        *H069870
                                                                                                                                                                                        *H069880
4229        10R     12BF  8420                    BLANKS_GEN      FETM        2,,0                                  "CREATE 3 REGISTERS FOR THE                                         DP069890
                                                                                                                    "DISPLAY                                                            DP069900
4230        18      12C0  92E8    (00E8)                          SUBD        0,,=01                                "ZERO THE LEGEND                                                    DP069910
4231        26      12C1  D5F0                                    BBK         15                                    "BLANK THE DISPLAY REGISTER                                         DP069920
                                                                                                                                                                                        *H069930
4232        14R     12C2  F80C1F96                POP4            FETD        0,,SAVE_POSITION_VARIANCES                                                                            DP069940
4233        24      12C4  FC081F98                                ADDD        0,,SAVE_POSITION_VARIANCES+2                                                                          DP069950
4234        470     12C6  1000                                    SQRT        0                                     "COMPUTE (P11 + P22)**.5                                            DP069960
                                                                                                                    "CONVERT POS VAR FOR DISPLAY                                        *I069970
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4235    1046        12C7  0C07                  GEN     SIG_DISPLAY    "IN NAUTICAL MILES                DP069980
                                        *                              "BLANK THE LEFT DISPLAY           DP069990
4236    1050        12C8  D80A   (12BF)         BUC     BLANKS_GEN     "RETURN TO MAIN DISPLAY ROUTINE   DP070000
                                        * ENTER HERE FOR RANGE AND BEARING                                *H070010
                                        * RANGE START POINT IS IN ARG1                                    *H070020
                                        * RANGE END POINT IS IN ARG2                                      *H070030
                                        *                              "COMPUTE AND CONVERT BEARING      *I070040
4237      8R *      12C9  F80D14B3      POP6    BSV     MAKE_RANGE_AND_BEARING   "COMPUTE RANGE"         DP070050
4238     584        12CB  0C04                  GEN     RANGE_DISPLAY   "CONVERT RANGE FOR DISPLAY       DP070060
4239     590        12CC  040014A1              BUC     SWAP           "INTERCHANGE LEFT & RIGHT           070070
                                        * ENTER HERE FOR ETE - CSE                                        *H070080
4240      2R        12CE  A421          POP7    CLA     2,1            "MOVE ARG1 TO ARG2 AND SET CRAFT DP070090
                                        *                              "IN ARG1 TO GET RANGE AND BEARINGDP070100
                                        *                              "FROM CRAFT TO SELECTED           DP070110
4241       4        12CF  9C1B                  CLAM    1,,11          "DESTINATION                        070120
                                        *                              "COMPUTE AND CONVERT BEARING      *I070130
4242      12 *      12D0  F80D14B3              BSV     MAKE_RANGE_AND_BEARING   "COMPUTE RANGE"         DP070140
4243      26        12D2  F80C1F4E              FETD    0,,VC2_STAR                                      * 070150
                                        *                              "COMPUTE CRAFT SPEED FROM         *I070160
4244      34 *      12D4  F80D1751              BSV     MAKE_VELOCITY   "VC2 AND VC3"                    DP070170
4245      54        12D6  F8261AD2              MPYD    2,,=DF(.004458345) "DIVIDE RANGE BY 100 HOURS (MDP070180
                                        *                              "IMUM DISPLAY) TO GET MINIMUM     DP070190
4246      58        12D8  8820                  COMD    2,0            "ACCEPTABLE VELOCITY              DP070200
4247      62        12D9  D051   (12DB)         BRL     $1             "IS THE VELOCITY HIGH ENOUGH?     DP070210
4248      4R        12DA  AC20                  CLAD    2,0            "TOO SLOW"                        DP070220
                                        *                              "SET RANGE = VEL TO GET 100 HR    DP070230
4249     126R       12DB  DC20          $1      DIVD    2,0            "COMPUTE TIME TO GO               DP070240
4250     136        12DC  D710                  PRN     1              "= RANGE / VELOCITY               DP070250
4251     576R       12DD  0C06          $3      GEN     ETE_DISPLAY    "CONVERT ETE FOR DISPLAY          DP070260
4252     582        12DE  040014A1              BUC     SWAP           "EXCHANGE                           070270
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                                        **                                                                  DP070280
                                        * ENTER HERE FOR COHERENCY                                          *H070290
4253      2R      12E0  DE01            STATUS_CCOH FLG      B              SET FLAG B                        070300
4254      6       12E1  D001    (12E3)              BUC      POP8$53                                          070310
4255      2R      12E2  DEAD            POP8        FLG      BT+EOR+8       RESET FLAG B                      070320
4256      6R      12E3  9E4C    (00CC)  $53         CLA      0,,BASE+1      "READ BASE STATION NUMBER         070330
                                        *                                    "IS THIS PHASE                   *1070340
4257     10       12E4  D0D3    (12E8)              BCF      $10            "DIFFERENCE NAVIGATION?"         %R070350
4258      2R      12E5  8001                        COM      0,1            "SUB ALWAYS PHASE DIFFERENCE     DP070360
                                        *                                    "IS THE SELECTED                 *1070370
4259      8       12E6  04061369                    BRE      $20            "STATION (ARG1) THE BASE STATION?DP070380
4260      6R      12E8  4C03            $10         MPIDM    0,,3           "COMPUTE POINTERS TO PHI ESTIMATEDP070390
4261     10       12E9  AC20                        CLAD     2,0            "AND THETA 3 (STA AND BASE)      DP070400
4262     12       12EA  B411                        ADD      1,1                                             DP070410
4263     16       12EB  F4191EA3                    ADDM     1,,PHI_ESTIMATE                                 DP070420
4264     20       12ED  F4291CB9                    ADDM     2,,PP_THETA3   "                                DP070430
4265     24       12EF  F4391CB9                    ADDM     3,,PP_THETA3   "SET UP COUNTER TO CYCLE THE 3   DP070440
4266     40       12F1  8454                        FETM     5,,4           "FREQ AND CREATE 14 SCRATCH      DP070450
4267     42       12F2  90FE                        SUBM     15,,14         "WORDS IN R15 STACK              DP070460
4268     50       12F3  F43A1C2A                    CLA      3,,X+3                 CALCULATE UPDATED         070470
4269     56       12F5  F0340118                    MPYM     3,,F(3.814/441.17643)  OSCILLATOR START          070480
4270     64       12F7  F436C0B5                    MPI      3,,STATION_COUNTER     TIME FOR USE IF NOT       070490
4271     72       12F9  F43B1C29                    ADD      3,,X+2                 PHASE DIFF NAVIGATION     070500
4272      6R      12FB  A209            $1          CLS      I0,9           -THETA 3 (STATION)               070510
                                        *                                    "IS THIS PHASE                   *1070520
4273     10       12FC  D0DA    (1307)              BCF      $5             "DIFFERENCE NAVIGATION?"         %R070530
4274     10R      12FD  F00C1F41                    FET      0,,ARGWORD1    "SUB ALWAYS PHASE DIFFERENCE     DP070540
4275     16       12FF  C005                        FET      0,5            FREQ                             DP070550
                                        *                                    "COMPUTE PHASE CORRECTION FOR    *I070560
4276     24  *    1300  F80D0C05                    BSV      D_PHI_KI       "TIME DIFFERENCE BETWEEN BASE/STADP070570
4277     30       1302  FC040020                    LSAD     0,,5           "RESCALE TO B5                    070580
4278     32       1304  B020                        SUB      2,0            "APPLY CORR TO -THETA 3           070590
4279     42       1305  D710                        PRN      1                                               DP070600
4280     48       1306  B608                        ADD      I0,8           "ADD THETA 3 BASE                 070610
4281      4R      1307  D0B6    (130E)  $5          BBF      $52                                              070620
4282      4R      1308  D0C5    (130E)              BCT      $52                                              070630
4283      2R      1309  A420                        CLA      2,0            "CORRECT FOR TO IF NOT            070640
4284     10       130A  F14A1722                    CLS      X4,,V_LAMBDA   "PHASE DIFF                       070650
4285     16       130C  6003                        MPY      0,3                                              070660
4286     18       130D  B402                        ADD      0,2                                              070670
4287     10R      130E  F8040400        $52         RSAD     0,5                                              070680
4288     18       1310  BF47                        ADDD     IX4,7          "ADD PHI ESTIMATE FROM            070690
                                        *                                    "THE TRACKING FILTER              070700
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4289   24     1311  FC040800                LSAD    0,,11          "DISCARD LANE COUNT                 070710
4290   32     1313  734F                    STA     IX4,15         "SAVE IN SCRATCH STORAGE           DP070720
4291   34     1314  9481                    ADDM    8,,1                                              DP070730
4292   36     1315  9491                    ADDM    9,,1                                              DP070740
                                    *                              "ARE THERE MORE                    *1070750
4293   44     1316  CD4C    (12FB)          BXUD    4,,$1          "FREQUENCIES TO PROCESS?           DP070760
4294    8R    1317  ADF0                    CLAD    X15,,0         "SET UP ANGLES IN STORAGE IN       DP070770
4295   18     1318  79F6                    STAD    X15,,6         "ORDER OF DISPLAY  EACH WILL BE    DP070780
4296   20     1319  94F2                    ADDM    15,,2          "DISPLAYED IN 2 DIGITS ON PANEL    DP070790
4297   24     131A  D3B1    (134C)          BBF     $6                                                070800
4298    8R    131B  F49A1F41                CLA     9,,ARGWORD1    STATION NUMBER                     070810
4299   16     131D  F48A00CC                CLA     8,,BASE+1                                         070820
4300   18     131F  A409                    CLA     0,9                                               070830
4301   22     1320  FC191F55                CLAM    1,,RIJ_STAR                                       070840
4302   30  *  1322  F80D0B62                BSV     COMPUTE_THETA1                                    070850
4303   34     1324  AC20                    CLAD    2,0            SAVE THETA1 STATION                070860
4304   38     1325  D0D6    (132C)          BCF     $7             "SUB ALWAYS PHASE DIFF             070870
4305    2R    1326  A408                    CLA     0,8            BASE                               070880
4306    6     1327  FC191F55                CLAM    1,,RIJ_STAR                                       070890
4307   14  *  1329  F80D0B62                BSV     COMPUTE_THETA1                                    070900
4308   18     132B  B820                    SUBD    2,0            THETA1  STATION - BASE             070910
4309    4R    132C  AC02            $7      CLAD    0,2            GET THETA                          070920
4310   24     132D  F94616B2                MPYD    X4,,LAMBDA_TABLE                                  070930
4311   44     132F  F8061AC4                MPYD    0,,=DF(3.14159265B-2)                             070940
4312   48     1331  BC00                    ADDD    0,0                                               070950
4313   62     1332  F99C1D0F                FETD    X9,,PP_THETA2                                     070960
4314   66     1334  D0D2    (1337)          BCF     $71                                               070970
4315    8R    1335  F1AB1D0F                SUB     X10,,PP_THETA2                                    070980
4316   10R    1337  F1661768        $71     MPY     X6,,TF_LAMBDA_CONSTANT_TABLE                      070990
4317   20     1339  F8040400                RSAD    0,,5                                              071000
4318   24     133B  BC02                    ADDD    0,2            R0 = CHART VALUE                   071010
4319   30     133C  FC040800                LSAD    0,,11          REMOVE LANE COUNT                  071020
4320   32     133E  9468                    ADDM    6,,8           INCREASE STACK POINTER             071030
4321   42     133F  7B6F                    STAD    IX6,15                                            071040
4322   44     1340  9068                    SUBM    6,,8                                              071050
4323   54     1341  D710                    PRN     1                                                 071060
4324   62     1342  CD47    (132C)          BXUD    4,,$7                                             071070
4325    8R    1343  ADF6                    CLAD    X15,,6         10.2                               071080
4326   12     1344  AC60                    CLAD    6,0            SAVE 10.2                          071090
4327   20     1345  ADF8                    CLAD    X15,,8         13.6                               071100
4328   30     1346  79F6                    STAD    X15,,6         13 IN FIRST SLOT FROM RIGHT        071110
4329   38     1347  ADFA                    CLAD    X15,,10              ON DISPLAY                   071120
4330   48     1348  79F8                    STAD    X15,,8         11 IN SECOND                       071130
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4331      52        1349  AC06                    CLAD    0,6                                    071140
4332      62        134A  79FA                    STAD    X15,,10     10 IN THIRD                071150
4333      66        134B  D009   (1355)           BUC     $2-1                                   071160
4334       8R       134C  ADF0             $6     CLAD    X15,,0                                 071170
4335      16        134D  B9F4                    SUBD    X15,,4      "REGISTERS                 DP071180
4336      26        134E  79F6                    STAD    X15,,6      "ORDER =  13.6, 11.3, 10.2,DP071190
4337      34        134F  ADF0                    CLAD    X15,,0      "13.6 - 10.2, 13.6 - 11.3, DP071200
4338      42        1350  B9F2                    SUBD    X15,,2      "11.3 - 10.2               DP071210
4339      52        1351  79F8                    STAD    X15,,8      "                          DP071220
4340      60        1352  ADF2                    CLAD    X15,,2      "SET UP COUNTER TO CYCLE THE DP071230
4341      68        1353  B9F4                    SUBD    X15,,4      "6 DISPLAYS                DP071240
4342      78        1354  79FA                    STAD    X15,,10     "RELEASE 2 OF THE SCRATCH WORDS DP071250
4343      80        1355  9C5A                    CLAM    5,,10                                  DP071260
4344       6R       1356  A74F             $2     CLA     IX4,15      "READ WORD INTO UPPER HALF OF A DP071270
4345       8        1357  9C10                    CLAM    1,,0        "32 BIT REGISTER           DP071280
4346      16        1358  5C0A                    MIEDM   0,,10       "MULTIPLY END AROUND BY 10 TO GETDP071290
4347      22        1359  5005                    MPLM    0,,5        "TENTHS OF CYCLE IN LSB'S OF DP071300
4348      28        135A  FC041000                LSAD    0,,12       "SECOND HALF OF WORD       DP071310
                                                *                     "MULTIPLY FIRST HALF BY 10/2**16 DP071320
                                                *                     "TO GET THE HUNDREDTHS DIGIT IN DP071330
                                                *                     "THE LSB'S OF THE FIRST HALF DP071340
                                                *                     "SHIFT BOTH DIGITS LEFT TO THE DP071350
                                                *                     "MSB'S                     DP071360
4349      38        135C  784F                    STAD    IX4,15      "SAVE IN SCRATCH WORD      DP071370
                                                *                     "ARE THERE MORE            *1071380
4350      46        135D  CC48   (1356)           BXUD    4,,$2       "WORDS TO CONVERT?"        DP071390
4351       2R       135E  9C65                    CLAM    6,,5        "SET UP 6 COUNTER TO PACK THE 6 DP071400
4352       4        135F  9C50                    CLAM    5,,0        "DIGITS OF ONE DISPLAY REGISTER DP071410
                                                *                     "PACK DIGITS OF 1ST 3 WORDS FOR *I071420
4353      12  *     1360  F80D1364                BSV     $3          "THE LEFT DISPLAY REGISTER DP071430
4354      16        1362  AC30                    CLAD    3,0         "MOVE DATA FROM LEFT DISPLAY TO DP071440
4355      18        1363  9C20                    CLAM    2,,0        "THE RIGHT DISPLAY         DP071450
4356      10R       1364  F8050800         $3     RSLD    0,,4        "SHIFT DOUBLE WORD RIGHT 1 DIGIT DP071460
4357      16        1366  875F                    ADD     IX5,15      "ADD 1 DIGIT TO THE DISPLAY FROM DP071470
                                                *                     "SCRATCH STORAGE           DP071480
                                                *                     "ARE THERE MORE            *1071490
4358      24        1367  C454   (1364)           BXU     5,,$3       "DIGITS TO ADD TO THE DISPLAY DP071500
                                                *                     "RETURN AND RELEASE 6 SCRATCH DP071510
                                                *                     "AFTER SECOND ENTRY ALL DATA IS DP071520
                                                *                     "SET UP FOR DISPLAY AND THE DP071530
                                                *                     "RETURN GOES TO MAIN DISPLAY DP071540
4359       8R       1368  D5F6                    88K     15,6        "ROUTINE                   DP071550
                                                * BASE STATION TRACKING FILTER DISPLAY          *H071560
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4360        4R      1369  4406          $20       MPIM    0,,6                "COMPUTE POINTER TO PHI ESTIMATE DP071570
4361        8       136A  F4091EA3                ADDM    0,,PHI_ESTIMATE "CREATE REGISTERS FOR LEFT/RIGHTDP071580
4362       24       136C  8450                     FETM    5,,0                "DISPLAY AND LEGENDS             DP071590
4363       32       136D  8414                     FETM    1,,4                "SET UP A 3 COUNTER FOR 3 FREQ   DP071600
4364       12R      136E  CB08          $22       FETD    IX0,8               "READ PHI ESTIMATE               DP071610
                                        *                                     "CONVERT AND POSITION 4 DIGITS   *I071620
4365       20  *    136F  F80D1373                BSV     $21                 "FOR DISPLAY AS FUNCTION OF FREQ DP071630
                                        *                                     "ARE THERE MORE                  *I071640
4366       28       1371  CC04   (136E)           BXUO    0,,$22              "FREQUENCIES TO PROCESS?"        DP071650
4367       14R      1372  D510                     BBK     1                   "RETURN TO MAIN DISPLAY ROUTINE  DP071660
                                        * SCALE PHI IN CYCLES/10 SEC AND                                      *H071670
                                        * DISPLAY 4 DIGITS TO RIGHT OF                                        *H071680
                                        * DECIMAL.  THE 12 DIGITS ON THE                                      *H071690
                                        * DISPLAY WILL READ 10.2, 13.6                                        *H071700
                                        * AND 11.3 FROM LEFT TO RIGHT                                        *H071710
4368        6R      1373  FC040400      $21       LSAD    0,,10               "DELETE LANE COUNT               DP071720
                                        *                                     "SCALE CYCLES / 10 SECONDS       DP071730
4369       10       1375  D021   (1377)           BGE     $23                 "IS THE RESULT NEGATIVE          %R071740
4370        6R      1376  9664   (00E4)           ADD     0,,HX8000           "ADD 1 CYCLE TO FORCE POSITIVE   DP071750
4371      576R      1377  0C08          $23       GEN     BASE_DISPLAY        "CONVERT FOR DISPLAY (4 DIGITS)  DP071760
4372      578       1378  9832                     COMM    3,,2                                                 % 071770
4373      582       1379  D024   (137E)           BGE     $24                 "IS THIS 10.2?"                  %R071780
4374        6R      137A  FC040100                 LSAD    0,,8                "SHIFT DISPLAY OVER 2 DIGITS AND DP071790
4375        8       137C  A450                     CLA     5,0                 "PLACE IN LEFT 4 DIGITS OF LEFT  DP071800
4376       24       137D  D520                     BBK     2                   "DISPLAY                         DP071810
4377        4R      137E  D035   (1384)  $24       BRG     $25                 "IS THIS 13.6?"                  %R071820
4378        4R      137F  F4040100                 LSA     0,,8                "MOVE 2 HIGH ORDER DIGITS TO LOW DP071830
4379        6       1381  8481                     ADD     8,1                 "DIGITS OF LEFT DISPLAY AND 2 LOWDP071840
4380        8       1382  8460                     ADD     6,0                 "ORDER DIGITS TO THE 2 HIGH ORDERDP071850
4381       24       1383  D520                     BBK     2                   "DIGITS OF THE RIGHT DISPLAY     DP071860
4382        4R      1384  BC80          $25       ADDD    8,0                 "11.3"                           DP071870
                                        *                                     "PLACE THE 4 DIGITS INTO THE 4   DP071880
4383       20       1385  D520                     BBK     2                   "LOW DIGITS OF THE RIGHT DISPLAY DP071890
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                                                  **                                                                  DP071900
                                                  * ENTER HERE FOR D-GMT DISPLAY                                      *H071910
4384    16R     1386  8450                  POP9        FETM     5,,0                                                DP071920
4385    26      1387  FC6A00E7                          CLAD     6,,=DF((((5D-3831)/24)/3600)/1811)                   071930
4386    36      1389  FC8A00C4                          CLAD     8,,DAY_SINCE_JAN1_1972                               071940
4387    10R     138B  FC1A1F4C              $9          CLAD     1,,TIME_STAR                                        DP071950
4388    26      138D  6816                              MPYD     1,6          CONVERT TO DAYS                        DP071960
4389    30      138E  BC18                              ADDD     1,8                                                 DP071970
4390    40      138F  FC1B1A92                          ADDD     1,,=DF((.5)/86400B11) ROUND DISPLAY TO NEAREST S     071980
4391    42      1391  A461                              CLA      6,1          SAVE FOR DATE DISPLAY                  DP071990
4392    48      1392  F0650800                          RSL      6,,4         RESCALE DAYS TO B15                    HH072000
4393    56      1394  E411177D                          EXT      1,1,HX000F   REMOVE INTEGER PART                      072010
4394    62      1396  4C13                              MPIDM    1,,3         CONVERT TO HOURS AT B15                 072020
4395    72      1397  F8154000                          RSLD     1,,1                                                 072030
4396    80  *   1399  F80D13D2                          BSV      $7           MAKE TWO BCD                           DP072040
4397     6R     139B  FC14003C              $8          MPIDM    1,,60                                               DP072050
4398    14  *   139D  F80D13D2                          BSV      $7           MINUTES                                DP072060
4399    20      139F  FC14003C                          MPIDM    1,,60                                               DP072070
4400    28  *   13A1  F80D13D2                          BSV      $7           SECONDS                                DP072080
                                                  *   PROCESS DATE                                                    DP072090
4401    30      13A3  DEEF                              FLG      DT+EOR+D     RESET FLG D                             072100
4402    46      13A4  F448016D                          FETM     4,,365                                               072110
4403    48      13A6  9C13                              CLAM     1,,3                                                 072120
4404    50      13A7  A42B                              CLA      2,11         DAYS SINCE TO R2                        072130
4405    52      13A8  8024                              COM      2,4                                                  072140
4406    56      13A9  D048    (13B2)                    BLE      $2           LESS THAN 365                           072150
4407     4R     13AA  D004    (13AF)                    BUC      $11                                                  072160
4408     2R     13AB  B024                  $10         SUB      2,4                                                  072170
4409     4      13AC  9431                              ADDM     3,,1                                                 072180
4410     6      13AD  8024                              COM      2,4                                                  072190
4411    10      13AE  D043    (13B2)                    BLE      $2                                                   072200
4412     8R     13AF  C405    (13AB)        $11         BXU      0,,$10                                               072210
4413     2R     13B0  9021                              SUBM     2,,1         SUB 1 IF LEAP YEAR PASSED OVER          072220
4414     6      13B1  D807    (13AB)                    BUC      $10                                                  072230
4415     2R     13B2  9800                  $2          COMM     0,,0                                                 072240
4416     6      13B3  D016    (13BA)                    BNE      $3                                                   072250
4417     4R     13B4  F8290038                          COMM     2,,59                                                072260
4418     8      13B6  D033    (13BA)                    BRG      $3                                                   072270
4419     2R     13B7  DE63                              FLG      E+D                                                  072280
4420     6      13B8  D061    (13BA)                    BRE      $3                                                   072290
4421     2R     13B9  9421                              ADDM     2,,1                                                 072300
4422    10R     13BA  D710                  $3          PRN      1                                                    072310
4423    14      13BB  F4190048                          ADDM     1,,72                                                072320
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4424   22 *   13BD  F80D13D2                 BSV     $7          YEAR                          DP072330
4425   24      13BF  9C11                     CLAM    1,,1        INDEX FOR MONTH SEARCH        DP072340
4426    8R     13C0  F11816C1        $4       COM     X1,,DAYS_BY_MONTH                         DP072350
4427   12      13C2  D041   (13C4)            BLE     $5                                        DP072360
4428    8R     13C3  C414   (13C0)            BXU     1,,$4       COUNT THE MONTHS              DP072370
4429    8R     13C4  F11B16C0        $5       SUB     X1,,DAYS_BY_MONTH-1                       DP072380
4430   16 *   13C6  F80D13D2                 BSV     $7          MONTH                         DP072390
4431   18      13C8  A410                     CLA     1,0         DAY OF MONTH                  DP072400
4432   22      13C9  D0F1   (13CB)            BDF     $1          SKIP UNLESS D                 DP072410
4433    2R     13CA  9411                     ADDM    1,,1        MAKE FEB 29 IF LEAP YEAR        072420
4434    8R *   13CB  F80D13D2        $1       BSV     $7          DAY                           DP072430
4435   10      13CD  9C50                     CLAM    5,,0        CLEAR RIGHT LEGEND            DP072440
4436   26      13CE  D520                     BBK     2                                         DP072450
                                     *   MAKE R1 INTO 2 BCD CHARACTERS, SHIFTED INTO R3,4, LEAVING R1=0  DP072460
4437    2R     13CF  901A            $6       SUBM    1,,10       DIVIDE BY 10 LOOP             DP072470
4438    6      13D0  F4490010                 ADDM    4,,16                                     DP072480
4439    2R     13D2  981A            $7       COMM    1,,10       (ENTRY POINT)                 DP072490
4440    6      13D3  D825   (13CF)            BGE     $6                                        DP072500
4441    2R     13D4  B441                     ADD     4,1         REMAINDER                     DP072510
4442    4      13D5  9C10                     CLAM    1,,0        CLEAN UP                      DP072520
4443   10      13D6  FC340100                 LSAD    3,,8                                      DP072530
4444   18      13D8  D5F0                     BBK     15                                        DP072540
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                                        **                                                                  DP072550
                                        * ENTER HERE FOR LOP                                                *H072560
4445      2R      13D9  B411            POP5      ADD       1,1              "SAVE FREQUENCY IDENTIFIER      DP072570
4446      12      13DA  F0171F3C                  STA       1,,PHI_OFFSET    "  FROM ARG1                    DP072580
                                        *                                    "COMPUTE LOP FOR RIGHT STATION  *I072590
4447      20  *   13DC  F80D13E9                  BSV       PROCESS_RIGHT_PAIR   "PAIR"                    DP072600
                                        *                                    "ADD 900 LANE OFFSET AND CONVERT *I072610
4448      28  *   13DE  F80D13E2                  BSV       $1               "FOR DISPLAY                    DP072620
                                        *                                    "COMPUTE LOP FOR LEFT STATION   *I072630
4449      36  *   13E0  F80D13EC                  BSV       PROCESS_LEFT_PAIR   "PAIR"                     DP072640
                                        * ENTER HERE AS SUBROUTINE TO                                       *H072650
                                        * CONVERT RIGHT DISPLAY.                                            *H072660
                                        * FALL INTO ROUTINE TO CONVERT                                      *H072670
                                        * LEFT DISPLAY AND EXIT                                             *H072680
4450      10R     13E2  F8044000        $1        RSAD      0,,1             "RESCALE LOP TO CYCLES B11 AND  DP072690
4451      14      13E4  F4093840                  ADDM      0,,F(900B-11)    "ADD 900 CYCLE OFFSET           DP072700
4452      590     13E6  0C03                      GEN       LOP_DISPLAY      "CONVERT LOP FOR DISPLAY        DP072710
                                        *                                    "MOVE DATA INTO PROPER REGISTERS  072720
                                        *                                    "FOR DISPLAY                    DP072730
                                        *                                    "ADD DOT TO LEGEND              DP072740
                                        *                                    "EXIT"                          DP072750
4453      594     13E7  AC40                      CLAD      4,0              "1ST TIME RETURNS TO LOP DISPLAY DP072760
4454      612     13E8  D530                      BBK       3                "2ND TIME RETURNS TO MAIN DISPLAYDP072770
                                        *                       COMPUTE LOP                                 *H072780
                                        *                                                                   *H072790
                                        * THIS ROUTINE WILL COMPUTE THE LOP FOR THE STATION PAIR DISPLAYED IN  *H072800
                                        * THE LEFT OR RIGHT LEGEND                                          *H072810
                                        *                                                                   *H072820
                                        * ENTER HERE FOR RIGHT DISPLAY                                      *H072830
4455                                    PROCESS_RIGHT_PAIR;                                                 DP072840
4455      10R     13E9  F00C0008                  FET       0,,C_I_RIGHT_DISPLAY_LEGEND_AND_PUNCTUATION     DP072850
4456      14      13EB  D002   (13EE)             BUC       ALLSTATIONS      "READ RIGHT LEGEND              DP072860
                                        * ENTER HERE FOR LEFT DISPLAY                                      *H072870
4457                                    PROCESS_LEFT_PAIR;                                                  DP072880
4457      10R     13EC  F00C0007                  FET       0,,C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION      DP072890
                                        *                                    "READ LEFT LEGEND               DP072900
4458      4R      13EE  F0090041        ALLSTATIONS SUBM    0,,X(0041)       ADJUST ASCII FOR INDEXING         072910
4459      12      13F0  C010                      FET       1,0              P,P,P                             072920
4460      22      13F1  EC00177C                  EXTD      0,0,HD03C0       N1,N2,P   N1=0-7X2**6  N2=0-7     072930
4461      28      13F3  F0050200                  RSL       0,,6                     MOVE N1 INTO             072940
4462      30      13F5  A420                      CLA       2,0              N1,N2,P  DISPLAY POSITION         072950
4463      40      13F6  C021                      FET       2,1              N2,N1,N2,N1,N2,P                  072960
4464      42      13F7  8001                      COM       0,1              FIND LARGEST STATION NUMBER       072970
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4465    46    13F8  D032   (13FB)          BRG     $4              ORDER IS OK                          072980
4466     4R   13F9  AC30                   CLAD    3,0             N2,N1,N2,N2,N1,P                     072990
4467     8    13FA  AC13                   CLAD    1,3             N2,N2,N1,N2,N1,P                     073000
4468     4R   13FB  F4040040        $4     LSA     0,,6                                                 073010
4469     6    13FD  B450                   ADD     5,0             TOGGLE DISPLAY                       073020
4470    10    13FE  F4594861               ADDM    5,,X(4861)      ADD LEGEND AND FORCE TO ASCII        073030
4471    14    1400  BC11                   ADDD    1,1                                                  DP073040
4472    20    1401  4C13                   MPIDM   1,,3            -,6N1,6N2,N1,N2,P                    DP073050
4473    28    1402  F40A1F3C               CLA     0,,PHI_OFFSET   "                                    DP073060
4474    30    1404  B410                   ADD     1,0             "USE STATION NUMBERS AND FREQ TO DP073070
4475    32    1405  B420                   ADD     2,0             "COMPUTE POINTERS TO PHI ESTIMATEDP073080
                                    *                              "IS THIS PHASE                       *1073090
4476    36    1406  D1D4   (141B)          BCF     $10             "DIFFERENCE NAVIGATION?"             %R073100
4477     2R   1407  DEAD                   FLG     BT+EOR+B        "SUB ALWAYS PHASE DIFFERENCE         DP073110
                                    *                              "                                    DP073120
4478    10    1408  F03800CC               COM     3,,BASE+1       "RESET PROGRAM FLAG B                DP073130
                                    *                              "IS THE FIRST                        *1073140
4479    14    140A  D013   (140E)          BNE     $1              "STATION THE BASE STATION?           %R073150
4480     2R   140B  A414                   CLA     1,4             STA 2 INDEX (TF POINTER IN R2)       DP073160
                                    *                              "PHI ESTIMATE ALREADY CONTAINS       DP073170
                                    *                              "THE LOP EXCEPT THAT THE SIGN        DP073180
                                    *                              "IS WRONG                            DP073190
                                    *                              "SET UP SECOND STATION NUMBER AS DP073200
4481     4    140C  DE01                   FLG     B               "ARGUMENT FOR D PHI KI ROUTINE       DP073210
4482     8    140D  D005   (1413)          BUC     $2              "SET PROGRAM FLAG B TRUE             DP073220
4483     8R   140E  F04800CC        $1     COM     4,,BASE+1       "EXAMINE THE SECOND STATION          DP073230
                                    *                              "IS THE SECOND                       *1073240
4484    12    1410  D01A   (141B)          BNE     $10             "STATION THE BASE STATION?           %R073250
4485     2R   1411  A421                   CLA     2,1             STA 1 TF POINTER                     DP073260
                                    *                              "PHI ESTIMATE ALREADY CONTAINS       DP073270
                                    *                              "THE LOP                             DP073280
                                    *                              "SET UP FIRST STATION NUMBER AS      DP073290
                                    *                              "ARGUMENT FOR D PHI KI ROUTINE       DP073300
4486     4    1412  A413                   CLA     1,3             STA 1 INDEX                          DP073310
                                    *                              "COMPUTE CORRECTION FOR TIME DIF-*I073320
4487     8R *  1413  F80D0C05        $2     BSV     D_PHI_KI        "FERENCE BETWEEN STATION AND BASEDP073330
4488    12    1415  A800                   CLSD    0,0             "FORM PHI ESTIMATE - CORRECTION      DP073340
4489    22    1416  FD2B1EA3               ADDD    X2,,PHI_ESTIMATE "    = + OR - LOP                   DP073350
                                    *                              "                                    *2073360
4490    26    1418  D081   (141A)          BBF     $3              "IS THIS THE CORRECT LOP?            DP073370
                                    *                              "(FLAG B FALSE)                      DP073380
4491     4R   1419  A800                   CLSD    0,0             "COMPLIMENT TO GET + LOP             DP073390
4492     8R   141A  D5F0            $3     BBK     15              "EXIT"                               DP073400
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4493   10R      141B  FD1A1EA3      $10      CLAD   X1,,PHI_ESTIMATE "FORM LOP = PHI EST (1)      DP073410
4494   20       141D  F92B1EA3               SUBD   X2,,PHI_ESTIMATE "          - PHI EST (2)      DP073420
4495   24       141F  D0C1   (1421)          BCT    $11            CORRECT IF PHASE DIFF          11  073430
4496    8R      1420  D5F0                   BBK    15                                            DP073440
4497   14R      1421  F01C1F3C      $11      FET    1,,PHI_OFFSET   GET FREQ                      11  073450
4498   16       1423  A440                   CLA    4,0             SAVE FOR N1                   11  073460
4499   18       1424  A416                   CLA    1,6             N2                            11  073470
4500   26  *    1425  F80D0C05               BSV    D_PHI_KI                                      11  073480
4501   30       1427  BC20                   ADDD   2,0             LOP + N2 CORR                 11  073490
4502   34       1428  AC04                   CLAD   0,4                                           11  073500
4503   42  *    1429  F80D0C05               BSV    D_PHI_KI                                      11  073510
4504   46       142B  B820                   SUBD   2,0             LOP + N2 - N1 CORR            11  073520
4505   60       142C  D510                   BBK    1                                             11  073530
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                                                  **                                                                    NC073540
                                                  * ENTER HERE FOR NCTR DISPLAY                                         *H073550
4506      26R       142D  84A0                    POP12     FETM      10,,0          "COMPUTE POINTERS FOR THE 32 BIT DP073560
4507      28        142E  A48C                              CLA       11,12          "SIGMA SQ PHI PHI AND THE 16 BIT DP073570
4508      32        142F  44B6                              MPIM      11,,6          "SIGMA SQ N COUNTER FOR THIS     DP073580
4509      36        1430  44C3                              MPIM      12,,3          "STATION (ARG1)                  DP073590
4510      40        1431  F4C91DB8                          ADDM      12,,SIGMA_SQ_N_COUNTER                          NC073600
                                                  *                                    "READ AND CONVERT THE 2 DIGIT    *I073610
4511      48  *     1433  F80D1459                          BSV       NCT$1          "KALMAN DUMPS FOR 10.2           DP073620
                                                  *                                    "GET SIGMA AND N FOR 10.2 (2 DIG-*I073630
4512      56  *     1435  F80D1444                          BSV       NCT            "ITS) AND K DUMPS FOR 13.6 (2)   DP073640
4513      60        1437  AC53                              CLAD      5,3            "SET UP FIRST 6 DIGITS FOR THE   DP073650
4514      64        1438  B833                              SUBD      3,3            "LEFT DISPLAY REGISTER           DP073660
                                                  *                                    "GET SIGMA AND N FOR 13.6 (2 DIG-*I073670
4515      72  *     1439  F80D1444                          BSV       NCT            "ITS) AND K DUMPS FOR 11-3 (2)   DP073680
4516      78        143B  FC340100                          LSAD      3,,8           "SET UP THESE 4 DIGITS FOR THE 4 DP073690
                                                  *                                    "HIGH ORDER DIGITS OF THE RIGHT  DP073700
4517      82        143D  AC83                              CLAD      8,3            "DISPLAY                         DP073710
                                                  *                                    "GET SIGMA AND N FOR 11-3 (2 DIG-*I073720
4518      90  *     143E  F80D1444                          BSV       NCT            "ITS) - IGNORE REMAINING 2 DIGITSDP073730
4519      96        1440  FC340100                          LSAD      3,,8           "PLACE LAST 2 DIGITS INTO THE LOWDP073740
4520     100        1442  AC93                              CLAD      9,3            "DIGITS OF THE RIGHT DISPLAY     DP073750
                                                  *                                    "                                DP073760
4521     120        1443  D540                              BBK       4              "RETURN TO MAIN DISPLAY ROUTINE  DP073770
                                                  *                                                                    NC073780
                                                  *                  CONVERT N, KALMAN DUMPS AND VARIANCE                *H073790
                                                  *                                                                    *H073800
                                                  * THIS ROUTINE IS USE BY THE NCTR DISPLAY ROUTINE TO GET THE N COUNTS,  *H073810
                                                  * KALMAN DUMPS AND SQURE ROOT OF THE TRACKING FILTER VARIANCE.  THE     *H073820
                                                  * ARGUMENTS CONSIST OF POINTERS TO N COUNT AND SIGMA.  THE OUTPUT DIGITS*H073830
                                                  * ARE LEFT IN THE 6 MOST SIGNIFICANT DIGITS OF A 32 BIT REGISTER.       *H073840
                                                  *                                                                    *H073850
4522       6R        1444  A60C                    NCT       CLA       10,12          "READ AND EXTRACT THE 1 DIGIT N  DP073860
4523      14        1445  E400177D                          EXT       0,0,HX000F     "COUNT (N NEVER EXCEEDS 7)       DP073870
4524      18        1447  F4040010                          LSA       0,,4           "PLACE DIGIT IN 2ND POSITION OF  DP073880
4525      20        1449  B440                              ADD       4,0            "THE 32 BIT REGISTER             DP073890
4526      30        144A  FDBA1E33                          CLAD      X11,,SIGMA_SQ_PHI_PHI                           DP073900
4527     476        144C  1000                              SQRT      0              "COMPUTE SQUARE ROOT OF SIGMA SQ DP073910
4528     486        144D  F8040064                          MPYDM     0,,100         "PHI PHI + .005 CYCLE            DP073920
4529     494        144F  96F1    (00F1)                    ADDD      0,,=DX(00008000) "     SCALED .01B15             DP073930
4530     496        1450  9809                              COMM      0,,9                                            DP073940
                                                  *                                    "IS THE RESULT                   *I073950
4531     500        1451  D051    (1453)                    BRL       $2             "GREATER THAN .08 CYCLES?"       %R073960
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4532      2R      1452  9C09                  CLAM     0,,9          "SET DISPLAY DIGIT TO 9 FOR MAX  DP073970
                                      *                              "STANDARD DEVIATION              DP073980
4533      2R      1453  B440          $2      ADD      4,0           "ADD STANDARD DEVIATION DIGIT    DP073990
4534      8       1454  FC340100              LSAD     3,,8          "TO THE LOW DIGIT OF THE 32 BIT  DP074000
                                      *                              "REGISTER AND SHIFT REGISTER LEFTDP074010
                                      *                              "2 DIGITS                        DP074020
4535      10      1456  9482                  ADDM     11,,2         "INCREMENT POINTERS TO N AND     %S074030
4536      12      1457  B011                  SUB      1,1           "SIGMA FOR THE NEXT FREQUENCY    DP074040
4537      14      1458  94C1                  ADDM     12,,1         INCREMENT N CT ADDRESS           NC074050
                                      * ENTER HERE FOR KALMAN DUMPS ONLY                                *H074060
4538      6R      1459  A62C          $1      CLA      I2,12         "GET 8 BIT KALMAN DUMP COUNT     DP074070
                                      *                              "(NEVER EXCEEDS 99) FROM N COUNT DP074080
4539      12      145A  FC140100              LSAD     1,,8          "WORD                            DP074090
                                      *                              "CONVERT DUMPS TO BCD AND SHIFT  *I074100
4540      20  *   145C  F80D13D2              BSV      POP9$7        "INTO 32 BIT REGISTER            DP074110
4541      28      145E  D5F0                  BBK      15            "EXIT"                           DP074120
                                      *                                                               NC074130
                                      * ENTER HERE FOR MAN V/H                                        *H074140
4542      2R      145F  981C          POP10   COMM     1,,12         SHIP OR RZ                        074150
4543      6       1460  D16B   (147C)         BRE      POP13         RZ                                074160
4544      14R     1461  F80C1F8B              FETD     0,,PSI_INSERT "READ INSERTED HEADING            074170
4545      590     1463  0C00                  GEN      BEARING_DISPLAY   "CONVERT HEADING FOR DISPLAY  DP074180
4546      604     1464  F80C1FF4              FETD     0,,V_INSERT   "READ INSERTED VELOCITY         DP074190
4547      606     1466  9C10                  CLAM     1,,0          "      SCALE AT B12 FT/SEC        DP074200
4548      614     1467  4263   (00E3)         MPY      0,,HX4000                                     DP074210
4549      1190    1468  0C05                  GEN      SPEED_DISPLAY   "CONVERT VELOCITY FOR DISPLAY  DP074220
4550      1194    1469  D307   (14A1)         BUC      SWAP                                           074230
                                      * ENTER HERE FOR OMEGA - DR                                     *H074240
4551      6R      146A  9E65   (00E5)  POP11   CLA      0,,STATIONS_IN_USE "READ OMEGA STATIONS AND NAV DP074250
                                      *                              "MODE SELECTED BY THE OPERATOR   DP074260
                                      *                              "AND DISPLAY IN THE UPPER RIGHT  DP074270
                                      *                              "KEYBOARD LAMPS                  DP074280
4552      8R      146B  E420010F      $1      EXT      2,0,HX00FF                                     074290
4553      10      146D  B422                  ADD      2,2                                            074300
4554      18      146E  E41000DF              EXT      1,0,HX0400    GET AUTO BIT FOR UL               074310
4555      26      1470  E40000DE              EXT      0,0,HX0200    GET MAN  BIT FOR UR               074320
4556      28      1472  B420                  ADD      2,0                                            074330
4557      34      1473  9E4C   (00CC)         CLA      0,,BASE+1     "READ LAMP BIT CORRESPONDING TO  %S074340
                                      *                              "THE BASE STATION NUMBER AND     DP074350
                                      *                              "DISPLAY IN THE UPPER LEFT       DP074360
                                      *                              "KEYBOARD LAMPS                  DP074370
4558      42      1474  F50A00D6              CLA      X0,,POWERS_OF_TWO+1                            074380
4559      44      1476  B410                  ADD      1,0                                            074390
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4560      56      1477  F817000B                  STAD      1,,C_I_UPPER_LEFT_KEYBOARD_LAMPS                 074400
4561      58      1479  94E2                      ADOM      14,,2          "THIS ROUTINE DID NOT DEVELOP AN %S074410
                                        *                                  "IMAGE OF THE DISPLAY REGISTERS  DP074420
                                        *                                  "AND LEGENDS SO IT MUST MAKE AN  DP074430
                                        *                                  "ABNORMAL RETURN TO THE MAIN     DP074440
                                        *                                  "DISPLAY ROUTINE                 DP074450
                                        *                                  "ADJUST R14 RETURN STACK         DP074460
                                        *                                  "BRANCH DIRECTLY TO MAIN DISPLAY DP074470
                                        *                                  "ROUTINE                         DP074480
4562      64      147A  04C01261                  BUC       PANELOUTPUT$5                                    DP074490
                                        * ENTER HERE FOR RZ V/H                                              *H074500
4563      30R     147C  F05C1FBE        POP13     FET       5,,RZ_BETA     "COMPUTE GREAT CIRCLE HEADING    DP074510
4564      50      147E  F8261FBC                  MPYD      2,,RZ_POS+4    "= ARCTAN (BETA1)/(BETA2*RZ POS3 DP074520
4565      70      1480  F8461FBA                  MPYD      4,,RZ_POS+2    "      - BETA3*RZ POS2)          DP074530
4566      74      1482  B824                      SUBD      2,4                                             DP074540
4567      78      1483  BC22                      ADDD      2,2            RESCALE  B1                      DP074550
4568      82      1484  AC40                      CLAD      4,0                                             DP074560
4569      92      1485  D710                      PRN       1                                               DP074570
4570     630      1486  1800                      ATAN      0                                               DP074580
4571    1206      1487  0C00                      GEN       BEARING_DISPLAY   "CONVERT HEADING FOR DISPLAY   DP074590
4572    1220      1488  F80C1FDB                  FETD      0,,RZ_VEL      "READ INSERTED RZ VELOCITY       DP074600
4573    1224      148A  D104    (149F)            BUC       POP15$1                                         DP074610
                                        * ENTER HERE FOR OMEGA V/TK                                         *H074620
4574      22R     148B  F03C1F4C        POP14     FET       3,,VC2_STAR-2  "COMPUTE TRACK ANGLE             DP074630
4575      24      148D  A403                      CLA       0,3            "= ARCTAN (VC2 / VC3) - THETA P  DP074640
4576     562      148E  1800                      ATAN      0,0                                             DP074650
4577     572      148F  F80B1F50                  SUBD      0,,THA_P_STAR                                   DP074660
4578    1148      1491  0C00                      GEN       BEARING_DISPLAY   "CONVERT TRACK FOR DISPLAY    DP074670
4579    1162      1492  F80C1F4E                  FETD      0,,VC2_STAR                                     % 074680
4580    1170  *   1494  F80D1751                  BSV       MAKE_VELOCITY   "COMPUTE SPEED FROM VC2, 3      DP074690
4581    1746      1496  0C05                      GEN       SPEED_DISPLAY   "CONVERT SPEED FOR DISPLAY      DP074700
4582    1750      1497  D009    (14A1)            BUC       SWAP                                             074710
                                        * ENTER HERE FOR SUB V/H                                            *H074720
4583      14R     1498  F80C1F53        POP15     FETD      0,,SMOOTH_DATA_STAR   AUTO HEADING               074730
4584     590      149A  0C00                      GEN       BEARING_DISPLAY   "CONVERT HEADING FOR DISPLAY   DP074740
4585     604      149B  F80C1F4B                  FETD      0,,V_TAS_STAR  "READ SHIP'S LOG                 DP074750
4586     614      149D  F8044000                  RSAD      0,,1           SCALE B12                        DP074760
4587     576R     149F  0C05            $1        GEN       SPEED_DISPLAY   "CONVERT V FOR DISPLAY"         DP074770
4588     580      14A0  D800    (14A1)            BUC       SWAP                                             074780
                                        *                                                                    074790
                                        *                                                                    074800
                                        *                                                                    074810
4589      10R     14A1  C022            SWAP      FET       2,2            SWAP LEFT AND RIGHT DISPLAYS      074820
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4590    14    14A2  AC47    CLAD    4,7     074830
4591    16    14A3  A436    CLA     3,6     074840
4592    20    14A4  AC71    CLAD    7,1     074850
4593    22    14A5  A460    CLA     6,0     074860
4594    38    14A6  D520    BBK     2       074870
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                                                                                                                  DP074880
                                                                                                                  *H074890
                                                                                                                  *H074900
                                                                                                                  *H074910
                                                                                                                  *H074920
                                                                                                                  *H074930
                                                                                                                  DP074940
                                                                                                                  DP074950
                                                                                                                  DP074960
                                                                                                                  DP074970
                                                                                                                  DP074980
                                                                                                                  DP074990
                                                                                                                  DP075000
                                                                                                                  DP075010
                                                                                                                  DP075020
                                                                                                                  DP075030
                                                                                                                  DP075040
                                                                                                                  DP075050
                                                                                                                  DP075060
                                                                                                                  DP075070
                                                                                                                  DP075080
                                                                                                                  DP075090
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                                                  **
                                                  *                        MAKE LAT LONG
                                                  *
                                                  * THIS ROUTINE WILL COMPUTE LATITUDE AND LONGITUDE FROM A POSITION
                                                  * VECTOR.  THE ARGUMENT CONSISTS OF A POINTER TO THE VECTOR
                                                  *
                                                  *       ENTER WITH ADDRESS OF V IN R0:
                                                  *       V1 = SIN LAT, V2 = COS LAT.COS LONG, V3 = COS LAT.SIN LONG
                                                  *       EXIT WITH LAT IN R0,1   LONG IN R2,3   (3 REGISTERS ADDED)
4595                                              MAKE_LAT_LONG;
4595      28R      14A7  C250                          FET       I5,0          V1,V2,V3
4596       40      14A8  C035                          FET       3,5           V2,V3
4597      578      14A9  1800                          ATAN      0,0           LONGITUDE
4598      594      14AA  6866                          MPYD      6,6           "LAT = ARCTAN  R1 / (R3**2
4599      610      14AB  6844                          MPYD      4,4           "       + R2**2)**.5
4600      614      14AC  BC46                          ADDD      4,6           COS LAT SQUARED
4601      618      14AD  AC70                          CLAD      7,0           "LONG = ARCTAN R3 / R2
4602      622      14AE  AC04                          CLAD      0,4
4603     1068      14AF  1000                          SQRT      0,0
4604     1606      14B0  1800                          ATAN      0,0           LATITUDE
4605     1610      14B1  AC30                          CLAD      3,0
4606     1626      14B2  D520                          BBK       2
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                                                  **                                                                  DP075100
                                                  *                        MAKE RANGE AND BEARING                     *H075110
                                                  *                                                                   *H075120
                                                  *THIS ROUTINE WILL COMPUTE THE RANGE AND BEARING BETWEEN 2 POINTS AND *H075130
                                                  * CONVERT THE BEARING FOR DISPLAY.  THE ARGUMENTS CONSIST OF POINTERS *H075140
                                                  * TO THE SELECTED DESTINATIONS (13 INDICATES THAT THE CRAFT IS TO BE *H075150
                                                  * USED AS THE START POINT).                                          *H075160
                                                  *                                                                   *H075170
4607                                              MAKE_RANGE_AND_BEARING:                                             CI075180
4607      4R        14B3  9F22                          CLAM      IX2,2          "READ END POINTER                   DP075190
                                                  *                                "COMPUTE POSITION VECTOR TO THE *I075200
4608      12  *     14B4  F80D173E                      BSV       MAKE_DESTINATION_VECTOR   "SELECTED END POINT"  DP075210
4609      42        14B6  F4571F30                      PTR       5,,BEARING_TEMPS "SAVE VECTOR (D)                DP075220
4610      44        14B8  981B                          COMM      1,,11           SHIP                              075230
                                                  *                                "WAS THE CRAFT                  *1075240
4611      48        14B9  D017   (14C1)                 BNE       $1             "SELECTED AS THE START POINT?   %R075250
4612      10R       14BA  F82A00C0                      CLSD      2,,THETA_P     "SET ALPHA = - THETA P           DP075260
4613      80        14BC  F0FC1F57                      FET       15,,RIJ_STAR+2 "READ RIJ POSITION MATRIX        DP075270
4614      94        14BE  F80C1F55                      FETD      0,,RIJ_STAR                                     DP075280
4615      98        14C0  D008   (14C9)                 BUC       $2                                              DP075290
4616      2R        14C1  B411                  $1      ADD       1,1            "SET ALPHA = 0                   DP075300
4617      6         14C2  B822                          SUBD      2,2            "READ SELECTED START POINT       DP075310
                                                  *                                "LATITUDE AND LONGITUDE          DP075320
4618      20        14C3  F91C1FC4                      FETD      X1,,DESTINATION_LONGITUDE                       DP075330
4619      34        14C5  F93C1FDE                      FETD      X3,,DESTINATION_LATITUDE                        DP075340
                                                  *                                "COMPUTE POSITION MATRIX (RIJ)  *I075350
4620      42  *     14C7  F80D0FA6                      BSV       PANEL_MAIN$8   "FOR SELECTED START POINT        DP075360
4621      30R       14C9  F4571F36              $2      PTR       5,,BEARING_TEMPS+6 "COMPUTE BEARING             DP075370
                                                  *                                "= -ARCTAN (-R2.D/R3.D) + ALPHA  DP075380
4622      60        14CB  F05C1F30                      FET       5,,BEARING_TEMPS                                DP075390
4623      68  *     14CD  F80D1728                      BSV       REGISTER_DOT                                    % 075400
4624      72        14CF  A880                          CLSD      8,0                                             DP075410
4625      82        14D0  D710                          PRN       1                                               DP075420
4626     112        14D1  F05C1F30                      FET       5,,BEARING_TEMPS                                DP075430
4627     120  *     14D3  F80D1728                      BSV       REGISTER_DOT                                    % 075440
4628     658        14D5  1800                          ATAN      0                                               DP075450
4629     666        14D6  C013                          FET       1,3                                             DP075460
4630     670        14D7  B802                          SUBD      0,2                                             DP075470
4631    1246        14D8  0C00                          GEN       BEARING_DISPLAY   "CONVERT BEARING FOR DISPLAY  DP075480
4632    1284        14D9  F07C1F2E                      FET       7,,BEARING_TEMPS-2                              CI075490
4633    1314        14DB  F05C1F36                      FET       5,,BEARING_TEMPS+6                              DP075500
4634    1322  *     14DD  F80D1714                      BSV       REGISTER_CROSS                                  % 075510
4635    1338        14DF  6800                          MPYD      0,0            "COMPUTE CENTRAL ANGLE FOR RANGE DP075520
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4636    1354        14E0  6822                    MPYD     2,2              "= ARCTAN (MAG(D X R1)/D.R1)     DP075530
4637    1370        14E1  6844                    MPYD     4,4                                               CI075540
4638    1374        14E2  8C02                    ADDD     0,2                                               CI075550
4639    1378        14E3  8C04                    ADDD     0,4                                               CI075560
4640    1824        14E4  1000                    SQRT     0                                                 CI075570
4641    1854        14E5  F05C1F30                FET      5,,BEARING_TEMPS                                  CI075580
4642    1884        14E7  F05C1F36                FET      5,,BEARING_TEMPS+6                                DP075590
4643    1892  *     14E9  F80D1728                BSV      REGISTER_DOT                                      % 075600
4644    2430        14EB  1800                    ATAN     0                                                 CI075610
4645    2434        14EC  AC60                    CLAD     6,0                                               CI075620
4646    2456        14ED  D550                    BBK      5                                                 CI075630
                                        *                    VARSAVE                                          *H075640
                                        *                                                                     *H075650
                                        * THIS ROUTINE TRANSFERS THE CRAFT RELATED DATA USED BY THE VARIOUS   *H075660
                                        * DISPLAY PROGRAMS INTO A SPECIAL STORAGE AREA.  THIS TRANSFER DOES NOT *H075670
                                        * OCCUR DURING THE HOLD MODE                                          *H075680
                                        *                                                                     *H075690
4647      12R       14EE  F4280013      VARSAVE  FETM     2,,PANEL_BOUND-PANEL_DATA-1                       CI075700
                                        *                                  "TRANSFER PARAMETERS THAT RESIDE DP075710
                                        *                                  "IN THE UPPER END OF MEMORY INTO DP075720
                                        *                                  "THE HOLD AREA.  (RIJ AND V SEA) DP075730
4648       8R       14F0  F51A1F67      $1       CLA      X1,,PANEL_DATA                                    % 075740
4649      18        14F2  F1171F53                STA      X1,,PANEL_BUFFER                                  CI075750
4650      26        14F4  C415   (14F0)           BXU      1,,$1                                             % 075760
4651      38R       14F5  F07C00BB                FET      7,,V_TAS         "TRANSFER PARAMETERS THAT RESIDE %S075770
4652      76        14F7  F4771F48                PTR      7,,V_TAS_STAR    "IN THE LOWER END OF MEMORY INTO DP075780
                                        *                                  "THE HOLD AREA.  (V LOG, TIME,   DP075790
4653      92        14F9  D520                    BBK      2                "VC2, VC3, THETA P, PSI A)       DP075800
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                                                                                  DP075810
                                                                                  *H075820
                                                                                  *H075830
                                                                                  *H075840
                                                                                  *H075850
                                                                                  *H075860
                                                                                  *H075870
                                                                                  *H075880
                                                                                  *H075890
                                                                                  *H075900
                                                                                  *H075910
                                                                                  *H075920
                                                                                  *H075930
                                                                                  *H075940
                                                                                  *H075950
                                                                                  *H075960
                                                                                  *H075970
                                                                                  *H075980
                                                                                  *H075990
                                                                                  *H076000
                                                                                  *H076010
                                                                                  *H076020
                                                                                  *H076030
                                                                                  *H076040
                                                                                  *H076050
                                                                                  *H076060
                                                                                  *H076070
                                                                                  *H076080
                                                                                  *H076090
                                                                                  *H076100
                                                                                  *H076110
                                                                                  *H076120
                                                                                  *H076130
                                                                                  *H076140
                                                                                  *H076150
                                                                                  *H076160
                                                                                  *H076170
                                                                                  *H076180
                                                                                  DP076190
                                                                                  DP076200
4654        4R        14FA  4403        GEN_PIN     MPIM        0,,3          "FIX POINTER FOR 3 WORDS      DP076210
4655        6         14FB  DEAD                    FLG         BT+EOR+B      "PER ENTRY                      076220
                                                                              "IS IT POINTING               *1076230
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4656    10     14FC  D013   (1500)          BNE     $10          "TO THE FIRST TABLE ENTRY?        %R076240
4657    10R    14FD  F8154000               RSLD    1,,1         "RESCALE ANGLE TO 2PI OR 360 DEG DP076250
                                     *                            "AND MAKE IT POSITIVE             DP076260
4658    12     14FF  DE01                   FLG     B            "FLAG HEADING TO FORCE BLANKS       076270
                                     *                            "IN LAST THREE DIGITS               076280
4659     4R    1500  F4091541       $10     ADDM    0,,CONVERSION_DATA                             CI076290
4660    20     1502  C220                   FET     I2,0         "READ SCALE FACTOR AND            DP076300
4661    34     1503  8440                   FETM    4,,0         "CONTROL WORD                     DP076310
                                     *      SCALE, AND ADJUST FOR SIGN                                CI076320
                                     *   REGISTERS:   0,0,0,0,0F00,SCALE FACTOR,,LEGEND,INDEX,NUMBER,,  CI076330
4662    50     1504  6895                   MPYD    9,5          "RESCALE INPUT WORD WITH          DP076340
                                     *                            "SCALE FACTOR                     DP076350
4663    54     1505  D026   (150C)          BGE     $2           "IS THE RESULT NEGATIVE?"         %R076360
4664     2R    1506  9475                   ADDM    7,,5         "CHANGE LEGEND FROM N OR E TO S     076370
4665     6     1507  F879A133               CCMM    7,,X(A133)   "OR J AND TEST IF S                 076380
4666    10     1509  D061   (150B)          BRE     $1           "YES                                076390
4667     2R    150A  947D                   ADDM    7,,13        "CHANGE J TO W                      076400
                                     *                                                                076410
4668     4R    150B  A899           $1      CLSD    9,9          "COMPLIMENT INPUT WORD              076420
4669     8R    150C  E487173D       $2      EXT     8,7,HX0F00   "EXTRACT LEADING BLANKS FROM        076430
4670    14     150E  F0850080               RSL     8,,8         "CONTROL WORD AND SHIFT             076440
                                     *                            "RIGHT 8 BITS                       076450
                                     *                            "SET NUMBER FOR ROUNDING          DP076460
                                     *                            "    = .5 D5B-13                  DP076470
                                     *      ROUND UP                                                  CI076480
4671    18     1510  FC39053E               CLAM    3,,F((1)/2D5B-13)                              CI076490
4672    22     1512  D0B3   (1516)          BBF     $85          IS IT HEADING                       076500
4673    10R    1513  FC9B1562               ADDD    9,,ROUND_FOR_H YES, SO USE THIS                   076510
4674    14     1515  D006   (151C)          BUC     $86                                              076520
4675     2R    1516  9870           $85     CCMM    7,,0                                             076530
                                     *                            "IS THIS A                        *1076540
4676     6     1517  D023   (151B)          BGE     $9           "LATITUDE OR LONGITUDE DISPLAY?   %R076550
4677     4R    1518  D0A2   (151B)          BBT     $9           "BYPASS IF HEADING                  076560
4678     4R    1519  F439037F               ADDM    3,,F((1)/3D5B-13) "ADD 1/3 D5B-13 TO ROUNDING    DP076570
                                     *                            "NUMBER BECAUSE LAT AND LONG WILLDP076580
                                     *                            "BE CONVERTED TO MINUTES LATER    DP076590
4679     4R    151B  BC92           $9      ADDD    9,2          "ROUND INPUT"                     DP076600
                                     *                            "                                 DP076610
                                     *                            "CLEAR DOUBLE REGISTER FOR        DP076620
                                     *                            "THE BCD CHARACTERS               DP076630
                                     *                            "                                 DP076640
                                     *                            "SET UP 2 AND 3 COUNTS TO CONVERTDP076650
                                     *                            "THE SIX DIGITS.  THE TWO COUNT- DP076660
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                                                                                                                                    "ERS ARE USED BECAUSE LAT AND      DP076670
                                                                                                                                    "LONG ARE CONVERTED IN 2 GROUPS    DP076680
                                                                                                                                    "OF 3 DIGITS                       DP076690
4680      4R    151C  8855                  $86          SUBD        5,5                                                                                          076700
4681      6     151D  9C32                               CLAM        3,,2                           COUNT OF 3                    CI076710
4682      8     151E  9C11                               CLAM        1,,1                           COUNT OF 2                    CI076720
4683      12    151F  D008    (1528)                     BUC         $6                                                           CI076730
                                                * THE ENTRY TO THE CONVERSION                                                   *H076740
                                                * LOOP IS AT $6                                                                 *H076750
                                                *   REGISTERS:   0,1,0,2,0F00/0800,DIGIT WORDS,,LEGEND,BLANKS,NUMBER,,         CI076760
4684      2R    1520  9870                  $3           COMM        7,,0                           "EXAMINE HIGH DEGREE BIT      DP076770
                                                *                                                  "IS THIS A                    *1076780
4685      6     1521  D023    (1525)                     BGE         $4                             "LATITUDE OR LONGITUDE DISPLAY? %R076790
4686      4R    1522  D1A7    (153A)                     BBT         $30                            "END CONVERSION IF HEADING     076800
4687      6R    1523  4C96                               MPIDM       9,,6                           "MULTIPLY BY 6 INSTEAD OF 10 THISDP076810
                                                *                                                  "TIME TO CONVERT FRACTIONS OF A DP076820
                                                *                                                  "DEGREE TO 10'S OF MINUTES     DP076830
4688      10    1524  D001    (1526)                     BUC         $5                                                           CI076840
4689      6R    1525  4C9A                  $4           MPIDM       9,,10                          "MULTIPLY REMAINDER BY 10 TO GET DP076850
                                                *                                                  "THE NEXT BCD CHARACTER        DP076860
4690      6R    1526  FC540010              $5           LSAD        5,,4                           "SHIFT PREVIOUS DIGITS OVER    DP076870
                                                *                                                  "1 DIGIT TO MAKE ROOM FOR      DP076880
                                                *                                                  "THE NEXT DIGIT                DP076890
4691      8R    1528  E4091788              $6           EXT         0,9,HXF000                     "EXTRACT THE NEW DIGIT         DP076900
4692      12    152A  D015    (1530)                     BNE         $7                             "IS THIS DIGIT A ZERO?        %R076910
                                                * BCD WORD IS INITIALLY ALL ZERO'S                                              *H076920
4693      2R    152B  9880                               COMM        8,,0                           "                             % 076930
                                                *                                                  "IS THE BLANK                 *1076940
4694      6     152C  D047    (1534)                     BLE         $8                             "COUNT DOWN TO ZERO YET?"      DP076950
4695      4R    152D  F4690F00                           ADDM        6,,X(0F00)                     "SET NEW DIGIT IN THE BCD WORD DP076960
4696      8     152F  D004    (1534)                     BUC         $8                             "TO A BLANK                    DP076970
4697      2R    1530  8090                  $7           SUB         9,0                            "DELETE THIS DIGIT FROM        DP076980
4698      4     1531  8C81                               CLSM        8,,1                           "CONVERSION WORD               DP076990
4699      12    1532  5260    (00E0)                     MPLM        10,,HX0800                     "INHIBIT ANY MORE BLANKS NOW THATDP077000
4700      14    1533  8460                               ADD         6,0                            "THERE IS A NON ZERO DIGIT     DP077010
                                                *                                                  "                              DP077020
                                                *                                                  "ADD NEW DIGIT TO THE BCD WORD DP077030
4701      2R    1534  9081                  $8           SUBM        8,,1                           "DECREMENT BLANKS COUNT BY 1   DP077040
                                                *                                                  "HAS THE SET OF 3              *1077050
4702      10    1535  C521    (1525)                     BXU         2,,$4                          "DIGITS BEEN CONVERTED YET?   %R077060
                                                *                                                  "HAVE THE 2 SETS               *1077070
4703      8R    1536  C517    (1520)                     BXU         1,,$3                          "OF 3 DIGITS BEEN CONVERTED YET? %R077080
4704      2R    1537  A4A7                  $29          CLA         10,7                           "CONVERSION COMPLETE"          077090
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4705      6     1538  AC85                    CLAD     8,5          "REPOSSITION RESULTS FOR DISPLAY DP077100
4706     32     1539  D570                    BBK      7                                           CI077110
4707     6R     153A  FC541000      $30       LSAD     5,,12        "SHIFT TO DEGREES POSITION        077120
4708      8     153C  8C61                    CLSM     6,,1         "FORCE BLANKS IN LAST             077130
4709     16     153D  E4551128                EXT      5,5,HXFFF0   "3 DIGITS IF                      077140
4710     18     153F  945F                    ADDM     5,,15        "HEADING"                         077150
4711     22     1540  D80A   (1537)           BUC      $29                                            077160
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                                 **  PARAMETER BLOCKS FOR GEN PIN                                    DP077170
4712                             CONVERSION_DATA;                                                   DP077180
4712        1541  3999999A                   COND      F(360/10283)                                  077190
4713        1543  8024                       CON       X(8024)        DEG , 0 BLANKS                 DP077200
4714                             BEARING_DISPLAY;                                                   DP077210
4714        0000                             EQU       0              BEARING MUST HAVE ZERO CODE    DP077220
4715        0715                 CDD         EQU       CONVERSION_DATA/3   (CONVERSION DATA DIVIDED) DP077230
                                 *                                                                  DP077240
4716        1544  1CCCCCCD       CD2         COND      F(.225)        180/100,B-3                    DP077250
4717        1546  A12E                       CON       X(A12E)        DEGREE , DOT , 1 BLANK , N      077260
4718                             LATITUDE_DISPLAY;                                                  DP077270
4718        0001                             EQU       CD2/3-CDD                                     DP077280
                                 *                                                                  DP077290
4719        1547  1CCCCCCD       CD3         COND      F(.225)        180/100B-3                      077300
4720        1549  A025                       CON       X(A025)        DEGREE , DOT, E                 077310
4721                             LONGITUDE_DISPLAY;                                                  077320
4721        0002                             EQU       CD3/3-CDD                                     077330
                                 *                                                                  DP077340
4722        154A  20C498A6       CD4         COND      F(.128B1)                                     DP077350
4723        154C  4300                       CON       X(4300)        HIGH DOT, 3 BLANKS              077360
4724        0003                 LOP_DISPLAY EQU       CD4/3-CDD                                     DP077370
                                 *                                                                  DP077380
4725        154D  114FB49C       CD5         COND      F(.135244919)  PI*2.0926/6.0761033,B-3        DP077390
4726        154F  242D                       CON       X(242D)        LOW  DOT, 4 BLANKS, M           077400
4727                             RANGE_DISPLAY;                                                     DP077410
4727        0004                             EQU       CD5/3-CDD                                     DP077420
                                 *                                                                  DP077430
                                 *                                                                  DP077440
4728        1550  03E23001       CD7         COND      F(.030340195)                                 DP077450
4729        1552  232B                       CON       X(232B)        LOW DOT, 3 BLANKS, K            077460
4730                             SPEED_DISPLAY;                                                     DP077470
4730        0005                             EQU       CD7/3-CDD                                     DP077480
                                 *                                                                  DP077490
4731        1553  0199999A       CD8         COND      F((1)/80)                                     DP077500
4732        1555  2428                       CON       X(2428)        LOW DOT, 4 BLANKS, H            077510
4733        0006                 ETE_DISPLAY EQU       CD8/3-CDD                                     DP077520
                                 *                                                                  DP077530
4734        1556  Q03E6264       CD9         COND      X(003E6264)                                   DP077540
4735        1558  242D                       CON       X(242D)        LOW DOT, 4 BLANKS, M            077550
4736        0007                 SIG_DISPLAY EQU       CD9/3-CDD                                     DP077560
                                 *                                                                  DP077570
4737        1559  0199999A       CD11        COND      F((1)/10B3)                                   DP077580
4738        155B  0000                       CON       X(0000)                                       DP077590
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                                BASE_DISPLAY;                                                   DP077600
0008                                    EQU     CD11/3-CDD                                      DP077610
155C  0051F000          CD12            COND    X(0051F000)                                      077620
155E  222E                              CON     X(222E)         2 BLANKS XXX.X                   077630
0009                    T_0_PEAVG       EQU     CD12/3-CDD      USED FOR PCI TEST                077640
155F  000FA000          CD13            COND    F(18-21D+3)     THIS MAKES FULL SCALE = 3.8      077650
1561  212E                              CON     X(212E)         LOW DOT 3 BLNKS,  XXX.XX         077660
000A                    T_0_DOT_CVT     EQU     CD13/3-CDD                                       077670
1562  00147AE1          ROUND_FOR_H     COND    F((1)/202B3)                                     077680
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                                        **                                                                  CI077690
                                        *                        BCD TO BINARY                              *H077700
                                        *                                                                   *H077710
                                        * THIS ROUTINE WILL CONVERT THE 6 CHARACTER DISPLAY IMAGE TO BINARY *H077720
                                        * WITH THE LSB OF THE BINARY WORD EQUAL TO 1 COUNT IN THE LSD OF THE *H077730
                                        * DISPLAY.  THE BIT IN THE LEGEND THAT TURNS ON THE HIGH ORDER DEGREE *H077740
                                        * LAMP ON THE DISPLAY IS USED AS A MARKER TO SIGNIFY A LATITUDE OR LONG-*H077750
                                        * ITUDE CONVERSION.                                                  *H077760
                                        *                                                                   *H077770
4747    20R    1564  8472               BCDTOBIN  FETM    7,,2          "SET UP A 3 COUNT AND 2 COUNT TO DP077780
4748    22     1565  9C51                         CLAM    5,,1          "CONTROL THE 6 DIGIT CONVERSION  DP077790
4749    26     1566  D007   (156E)                BUC     $3                AND 5 WORKING REGS           CI077800
4750     8R    1567  F41A0007           $1        CLA     1,,C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION     CI077810
                                        *                                "EXAMINE THE HIGH DEGREE BIT     DP077820
                                        *                                "IS THIS A                       *1077830
4751    12     1569  4414                         LSA     1,,2          "BYPASS IF HEADING                 077840
4752    16     156A  D022   (156D)                BGE     $2                                               077850
4753     6R    156B  4C26                         MPIDM   2,,6          "MULTIPLY BY 6 TO CONVERT        DP077860
4754    10     156C  D001   (156E)                BUC     $3            "DEGREES TO 10'S OF MINUTES      DP077870
4755     6R    156D  4C2A               $2        MPIDM   2,,10         "MULTIPLY CONVERTED DATA BY 10   DP077880
                                        *                                "BEFORE ADDING IN THE NEXT DIGIT DP077890
4756     8R    156E  FC850010           $3        LSED    8,,4          "SHIFT BCD CHARACTERS END AROUND DP077900
4757    16     1570  E419177D                     EXT     1,9,HX000F    "LEFT TO GET NEXT MOST SIGNIFI-  DP077910
                                        *                                "CANT DIGIT IN THE LOW BITS AND  DP077920
4758    18     1572  9819                         COMM    1,,X(9)       "EXTRACT THE NEW DIGIT           DP077930
                                        *                                "                                *2077940
4759    22     1573  D031   (1575)                BRG     $5            "IS THIS DIGIT GREATER THAN 9?   DP077950
                                        *                                "(BLANK IS 15)                   DP077960
4760     4R    1574  BC20               $4        ADDD    2,0           "ADD NEW DIGIT TO BINARY         DP077970
                                        *                                "ACCUMULATION                    DP077980
                                        *                                "HAS THE SET OF 3                *1077990
4761     8R    1575  C469   (156D)      $5        BXU     6,,$2         "DIGITS BEEN CONVERTED YET?      %R078000
                                        *                                "HAVE THE 2 SETS                 *1078010
4762     8R    1576  C550   (1567)                BXU     5,,$1         "OF 3 DIGITS BEEN CONVERTED YET? %R078020
4763     4R    1577  AC82                         CLAD    8,2           "REPOSITION RESULTS"             DP078030
4764    30     1578  D570                         BBK     7                                              CI078040
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                                                                                                                  DP078050
                                                                                                                  *H078060
                                                                                                                  *H078070
                                                                                                                  *H078080
                                                                                                                  *H078090
                                                                                                                  *H078100
4765    12R     1579  8430                RZ_UPDATE   FETM      3,,0          "COMPUTE AND SAVE RZ RATE IN        DP078110
4766    20      157A  F42A1FD8                        CLA       2,,RZ_VEL     "RADIANS/SEC AT B-14                DP078120
4767    30      157C  FC0A1FB8                        CLAD      0,,RZ_POS     "                                   DP078130
4768    46      157E  6800                            MPYD      0,0           B2                                  DP078140
4769    66      157F  F8061AD4                        MPYD      0,,=DF(((-3.36D-5)*20.926428D6)/1B24)              DP078150
4770    76      1581  FC0B1AD6                        ADDD      0,,=DF((20.926428D6)/1B26)                         DP078160
4771   202      1583  DC20                            DIVD      2,0           "RZ RATE = RZ VEL/EARTH RADIUS      DP078170
4772   214      1584  F8271FF2                        STAD      2,,RZ_RATE    "WHERE ER = RHO(1 - K*RZ1**2)       DP078180
4773   224      1586  4824                            RSAD      2,,13         SCALE RAD/SEC B-1                   DP078190
4774   254      1587  F05C1FB8                        FET       5,,RZ_POS                                         DP078200
4775   292      1589  F07C1FBE                        FET       7,,RZ_BETA                                        DP078210
4776   300  *   158B  F80D1714                        BSV       REGISTER_CROSS   "COMPUTE RZ C = BETA X RZ POS     DP078220
4777   316      158D  C055                            FET       5,5           REPEAT                              DP078230
4778   346      158E  F4571FB2                        PTR       5,,RZ_C       "SAVE RZ C AT B2                    DP078240
4779   362      1590  680A                            MPYD      0,10          "UPDATE RZ POS"                     %S078250
4780   378      1591  682A                            MPYD      2,10          "NEW RZ POS = OLD RZ POS +          DP078260
4781   394      1592  684A                            MPYD      4,10          "              (RZ RATE)*(RZ C)     DP078270
4782   424      1593  F05C1FB8                        FET       5,,RZ_POS                                         DP078280
4783   428      1595  BC06                            ADDD      0,6           NEW RZ                              DP078290
4784   432      1596  BC28                            ADDD      2,8                                               DP078300
4785   436      1597  BC4A                            ADDD      4,10                                              DP078310
4786   466      1598  F4571FB8                        PTR       5,,RZ_POS                                         DP078320
4787   504      159A  D5D0                            BBK       13                                                DP078330
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                                        **                                                                    DP078340
                                        *          RZ TIME UPDATE                                             *H078350
                                        *                                                                     *H078360
                                        * THIS ROUTINE IS A SLOW NON OMEGA TASK                               *H078370
                                        * (ONCE PER SEC) THAT DETERMINES THE                                  *H078380
                                        * POINT OF INTERCEPTION OF THE MOVING                                 *H078390
                                        * DESTINATION AND THE CRAFT (ASSUMING                                 *H078400
                                        * THE CRAFT CHANGES COURSE TO THE OPTIMUM                             *H078410
                                        * HEADING)                                                            *H078420
4788                                    RZ_TIME_UPDATE;                                                       DP078430
4788      30R        159B  F05C1F69                FET       5,,RIJ          "READ VECTORS R1 AND RZ C TO      DP078440
                                        *                                     "FORM SIN OF ANGLE BETWEEN CRAFT DP078450
4789      60         159D  F05C1FB2                FET       5,,RZ_C         "AND MOVING DESTINATION           DP078460
                                        *                                     "THE SIN WILL BE PLUS IF THE      DP078470
                                        *                                     "DEST IS MOVING TOWARDS THE CRAFTDP078480
                                        *                                     "OTHERWISE IT WILL BE MINUS       DP078490
                                        *                                     "CL1 = SIN(GAMMA) = R1 . RZ C     *I078500
4790      68  *      159F  F80D1728                BSV       REGISTER_DOT    "                 SCALED B2       DP078510
4791      72         15A1  8C00                    ADDD      0,0             CL1 B2                            DP078520
4792     102         15A2  F05C1F69                FET       5,,RIJ          "READ VECTORS R1 AND RZ POS TO    DP078530
                                        *                                     "FORM COS OF ANGLE BETWEEN CRAFT DP078540
4793     132         15A4  F05C1FB8                FET       5,,RZ_POS       "AND MOVING DESTINATION           DP078550
                                        *                                     "BL1 = COS(GAMMA) = R1 . RZ POS   *I078560
4794     140  *      15A6  F80D1728                BSV       REGISTER_DOT    "                 SCALED B2       DP078570
4795     152         15A8  C033                    FET       3,3             REPEAT CL1, BL1                   DP078580
4796     168         15A9  6800                    MPYD      0,0             "COMPUTE (BL1**2 + CL1**2)**.5    DP078590
4797     184         15AA  6822                    MPYD      2,2             "          FOR F(T) COMPUTATION   DP078600
4798     188         15AB  8C20                    ADDD      2,0                                               DP078610
4799     198         15AC  D710                    PRN       1                                                 DP078620
4800     644         15AD  1001                    SQRT      1               (CL1**2 + BL1**2)**.5    B2       DP078630
4801     656         15AE  C035                    FET       3,5             "COMPUTE GAMMA = ATAN (CL1/BL1)   DP078640
4802    1194         15AF  1800                    ATAN      0               "          FOR F(T) COMPUTATION   DP078650
4803    1206         15B0  86BE    (00BE)          FETD      0,,VC2          FT/SEC B12                        DP078660
4804    1214  *      15B1  F80D1751                BSV       MAKE_VELOCITY    "COMPUTE CRAFT GROUND SPEED (GS)DP078670
4805    1228         15B3  F80C1F69                FETD      0,,R11          "CRAFT RATE = GS/EARTH RADIUS     DP078680
4806    1244         15B5  6800                    MPYD      0,0             "WHERE ER = RHO(1 - K*R11**2)     DP078690
4807    1264         15B6  F8061AD4                MPYD      0,,=DF(((-3.36D-5)*20.926428D6)/1B24)             DP078700
4808    1274         15B8  FC0B1AD6                ADDD      0,,=DF((20.926428D6)/1B26)                        DP078710
4309    1400         15BA  DC20                    DIVD      2,0             A/C RATE RAD/SEC B-14             DP078720
4810    1410         15BB  FC0A1FF2                CLAD      0,,RZ_RATE                                        DP078730
4811    1424         15BD  F80C1AD8                FETD      0,,=DF(((5)*3600)/3.14159265B14) "SET FIRST GUES%S078740
                                        *                                     "T(0) = 5 HOURS                   DP078750
4812    1432         15BF  8410                    FETM      1,,0                                              DP078760
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4813   1434          15C0  9880                    COMM    8,,0          ALPHA                                  DP078770
                                                   *                     "IS THE DEST                           *2078780
4814   1438          15C1  D058  (15CA)             BRL     $10           "MOVING AWAY FROM THE CRAFT?           DP078790
                                                   *                     "(GAMMA MINUS)                         DP078800
4815     4R          15C2  AC08                    CLAD    0,8                                                  DP078810
4816     8           15C3  8804                    COMD    0,4                                                  DP078820
4817    12           15C4  D025  (15CA)             BGE     $10            CHECK FOR OVERFLOW                    % 078830
4818   126R          15C5  DC04                    DIVD    0,4           "COMPUTE TIME FOR DEST TO ARRIVE       DP078840
                                                   *                     "AT CRAFT IF IT WAS HEADING AT         DP078850
4819   130           15C6  8802                    COMD    0,2           "THE CRAFTS CURRENT POSITION           DP078860
                                                   *                     "IS THE TIME TO                        *1078870
4820   134           15C7  D022  (15CA)             BGE     $10           "ARRIVE MORE THEN T(0)?  (5 HR)        DP078880
4821     2R          15C8  DE00                    FLG     A             "SET T(0) = TIME TO ARRIVE             DP078890
                                                   *                     "                                      DP078900
                                                   *                     "SET PROGRAM FLAG A TRUE FOR           DP078910
                                                   *                     "LATER FIXUP OF DELTA T IF THIS        DP078920
                                                   *                     "NEW T(0) IS TOO LARGE                 DP078930
                                                   *                     "                                      DP078940
                                                   *                     "THIS PATH IS NECESSARY TO INSUREDP078950
                                                   *                     "THAT THE INTERCEPT POINT WILL         DP078960
                                                   *                     "OCCUR BETWEEN THE DEST AND THE        DP078970
                                                   *                     "CRAFT AND NOT AFTER THE DEST          DP078980
4822     6           15C9  AC20                    CLAD    2,0           "HAS PASSED THE CRAFT                  DP078990
4823    10R          15CA  FC0A1ADA        $10     CLAD    0,,=DF(((10)*3600)/3.141592658 14) 10 HR             DP079000
4824    14           15CC  B802                    SUBD    0,2           "SET DELTA T = 10 HOUR - T(0)          DP079010
                                                   *         R0,1  =  DELTA T   SECONDS AT PI B14                 DP079020
                                                   *         R2,3  =        T   SECONDS AT PI B14                 DP079030
                                                   *         R4,5  =  RZ RATE   RAD / SEC B-14                    DP079040
                                                   *         R6,7  =  A/C RATE  RAD / SEC B-14                    DP079050
                                                   *         R8,9  =  ATAN (CL1/BL1) RAD AT PI                    DP079060
                                                   *         RA,B  =  SQRT (BL1**2 + CL1**2) AT B2                DP079070
                                                   *         RC,D  =  BL1  B2                                     DP079080
                                                   *         (RF,RF+1) = CL1 B2                                   DP079090
                                                   *                                                              DP079100
4825    10R          15CD  F8044000        $1      RSAD    0,,1          "REDUCE DELTA T BY HALF FOR USE        DP079110
4826    18           15CF  C015                    FET     1,5           "AT THE END OF THIS ITERATION          DP079120
4827    34           15D0  6804                    MPYD    0,4           "COMPUTE F(T)"                         DP079130
4828    38           15D1  B80A                    SUBD    0,10          "= ((BL1**2 + CL1**2)**.5)*            DP079140
4829    46  *        15D2  F80D1655                BSV     COS                                                  % 079150
4830    62           15D4  680C                    MPYD    0,12          "  COS((RZ RATE)*T(0) - GAMMA)         DP079160
4831    68           15D5  4C04                    LSAD    0,,2          "  - COS((CRAFT RATE)*T(0))            DP079170
4832    76           15D6  C019                    FET     1,9           A/C RATE                               DP079180
4833    92           15D7  6806                    MPYD    0,6           T                                      DP079190
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4834  100  *   15D8  F80D1655                BSV   COS                                  % 079200
4835  104      15DA  8820                    SUBD  2,0          F(T)                    DP079210
                                 *                              "IS F(T) NEGATIVE       *2079220
4836  108      15DB  D056   (15E2)           BRL   $2           "(INDICATING THAT T(0) SHOULD BE DP079230
                                 *                              "LARGER)?               DP079240
4837   4R      15DC  D093   (15E0)           BAF   $11          "IS PROGRAM FLAG A TRUE?  %R079250
4838   4R      15DD  AC46                    CLAD  4,6          "SPECIAL FIXUP OF DELTA T" DP079260
4839  14       15DE  F8444000                RSAD  4,,1         "DELTA T = T(0)/2        DP079270
4840   4R      15E0  8864           $11      SUBD  6,4          "NEW T = T - DELTA T     DP079280
4841   8       15E1  D001   (15E3)           BUC   $3                                    DP079290
4842   4R      15E2  8C64           $2       ADDD  6,4          "NEW T = T + DELTA T     DP079300
4843   2R      15E3  DE8C           $3       FLG   AT+EOR+A     "RESET PROGRAM FLAG A    DP079310
4844  16       15E4  D730                    PRN   3                                     DP079320
4845  26       15E5  F8081ADC                CGMD  0,,=DF((1)/3.14159265814) 1 SEC      DP079330
                                 *                              "ARE MORE ITERA-        *2079340
4846  30       15E7  D038   (15CD)           BRG   $1           "TIONS NEEDED? (DELTA T GREATER DP079350
                                 *                              "THEN 1 SECOND)         DP079360
4847  12R      15E8  F8271FD8                STAD  2,,RZ_TIME   "THE TIME TO INTERCEPT IS NOW DP079370
                                 *                              "AVAILABLE              DP079380
4848  28       15EA  6842                    MPYD  4,2          "COMPUTE ANGLE THAT DESTINATION DP079390
                                 *                              "WILL MOVE THROUGH DURING TIME T DP079400
4849  38       15EB  7A4F                    STAD  I4,15        "ANGLE = RZ RATE * T     DP079410
4850  72       15EC  D7D0                    PRN   13           GET RID OF SOME REGISTERS DP079420
4851  506      15ED  1400                    SINCOS 0                                    DP079430
4852  526      15EE  8474                    FETM  7,,4                                  DP079440
4853  528      15EF  90F6                    SUBM  15,,6                                 DP079450
4854  10R      15F0  FD6A1FB2         $20      CLAD  X6,,RZ_C     "COMPUTE POSITION OF INTERCEPT BYDP079460
4855  14       15F2  AC20                    CLAD  2,0          "ROTATING RZ POS THROUGH ANGLE DP079470
4856  30       15F3  682A                    MPYD  2,10         "INTERCEPT VECTOR = (RZ POS)*COS DP079480
4857  36       15F4  4C22                    LSAD  2,,1         "                 + (RZ C)*SIN DP079490
4858  46       15F5  FD6A1FB8                CLAD  X6,,RZ_POS                            DP079500
4859  62       15F7  6808                    MPYD  0,8          COS                      DP079510
4860  66       15F8  BC02                    ADDD  0,2                                   DP079520
4861  72       15F9  4C02                    LSAD  0,,1                                  DP079530
4862  82       15FA  7B6F                    STAD  IX6,15       INTERCEPT POS            DP079540
                                 *                              "HAVE ALL THREE         *2079550
4863  90       15FB  CC6C   (15F0)           BXUD  6,,$20       "ELEMENTS OF THE VECTOR BEEN %R079560
                                 *                              "COMPUTED?              DP079570
4864   2R      15FC  A40F                    CLA   0,15                                  % 079580
                                 *                              "CONVERT INTERCEPT POSITION *I079590
4865  10  *    15FD  F80D14A7                BSV   MAKE_LAT_LONG  "VECTOR TO LATITUDE / LONGITUDE DP079600
4866  22       15FF  F8071FF6                STAD  0,,INTERCEPT_LAT "SAVE INTERCEPT POSITION FOR DP079610
4867  34       1601  F8271FDC                STAD  2,,INTERCEPT_LONG "DISPLAY WITH OTHER FIXED  DP079620
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4868    46    1603  D720          PRN     2       EVEN UP F          DP079630
4869    84    1604  D5D6          BBK     13,6    "DESTINATIONS      DP079640
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                                                  **                                                                  PB079650
                                                  *                          BEARING SUBROUTINE                       PB079660
                                                  *                                                                   PB079670
                                                  * ENTER WITH ADDRESS OF R2 IN R0 AND ADDRESS OF D IN R1.  THE ROUTINE  PB079680
                                                  * WILL COMPUTE - ARCTAN (-D.R3, D.R2) AND LEAVE IT IN R0, R1          PB079690
                                                  *                          BEARING                                  *H079700
                                                  *                                                                   *H079710
                                                  * THIS ROUTINE WILL COMPUTE THE ANGLE BETWEEN THE R3 AXIS AND A VECTOR *H079720
                                                  * IN THE PLANE OF R2,R3 POINTING AT A FIXED POSITION.  THE ARGUMENTS  *H079730
                                                  * CONSIST OF A POINTER TO THE R2 VECTOR OF THE RIJ MATRIX AND A POINTER *H079740
                                                  * TO A VECTOR THAT DEFINES THE FIXED POSITION.                       *H079750
                                                  *                                                                   *H079760
                                                  *                                                                   PB079770
4870      8R      1605  8506                      BEARING   FETM     X0,,6      ADDRESS OF R3                          PB079780
4871      28      1606  8474                                FETM     7,,4       "COMPUTE BEARING                       PB079790
4872      8R      1607  AF68                      $1        CLAD     IX6,8                                             % 079800
4873      26      1608  6B6A                                MPYD     IX6,10     "                                      PB079810
4874      30      1609  BC20                                ADDD     2,0        D.R3                                   PB079820
4875      38      160A  AF69                                CLAD     IX6,9      "= - ARCTAN - (D . R2) / (D . R3)PB079830
4876      56      160B  6B6A                                MPYD     IX6,10     "                                      PB079840
4877      60      160C  BC40                                ADDD     4,0        D.R2                                   PB079850
4878      68      160D  CC67   (1607)                       BXUD     6,,$1                                             % 079860
4879      10R     160E  D710                                PRN      1          "                  SCALED PI           PB079870
4880      14      160F  A822                                CLSD     2,2        -D.R3                                  PB079880
4881     552      1610  1800                                ATAN     0,0                                               PB079890
4882     556      1611  A850                                CLSD     5,0        - ANGLE                                PB079900
4883     576      1612  D540                                BBK      4                                                 PB079910
```

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                                **
                                *   CORRECT TIME ENTRY TO CLOSEST SYNC TIME MOD 10 SECONDS                          079920
                                *                                                                                   079930
                                CALC_TIME_CORRECTION:                                                               079940
4884                                                                                                                079950
4884        30R     1613  F05C00C6          FET     5,,GMT          GMT PLUS 4 REGISTERS                          079960
4885        38      1615  92BC   (00BC)     SUBD    0,,TIME                                                       079970
4886        46      1616  9688   (0088)     ADDD    0,,START_SYNC_TIME R0 IS GMT SINCE SYNC                       079980
4887        56      1617  FC081785          ADDD    0,,LEAP_SECOND                                                079990
4888        60      1619  AC40              CLAD    4,0             SAVE GMT SYNC SYNC                          1079990
4889        70      161A  FC2A1ADE          CLAD    2,,=DF((.005)/10)                                             080000
4890        86      161C  6802              MPYD    0,2             RESCALE TO  10 SECONDS AT 831               3080010
4891       212      161D  DC02              DIVD    0,2             IN ORDER TO ROUND                           4080020
4892       216      161E  B804              SUBD    0,4             CORR TO GMT                                 5080030
4893       220      161F  AC40              CLAD    4,0                                                         6080040
4894       228      1620  96C6   (00C6)     ADDD    0,,GMT                                                      7080050
4895       238      1621  7846   (00C6)     STAD    0,,GMT                                                      8080060
4896       258      1622  F84600E7          MPYD    4,,=DF((((50-3831)/24)/3600)/1811)                          9080070
4897       268      1624  FC4800C4          ADDD    4,,DAY_SINCE_JAN1_1972                                     10080080
4898       280      1626  F84700C4          STAD    4,,DAY_SINCE_JAN1_1972                                     11080090
4899       302      1628  D550              BBK     5                                                          12080100
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                                                                                                                    080110
                **                                                                                                  080110
                *                                SQUARE ROOT                                                        *H080120
                *                                                                                                   *H080130
                * THIS ROUTINE WILL TAKE THE SQUARE ROOT OF THE ARGUMENT.  A NEGATIVE                               *H080140
                * ARGUMENT WILL RESULT IN AN ANSWER THAT IS THE INITIAL ARGUMENT NORMA-                             *H080150
                * LIZED.  A ZERO ARGUMENT WILL GIVE A ZERO RESULT.                                                 *H080160
                *                                                                                                   *H080170
                *   INCLUDE TABLE OF ASCENDING POWERS OF TWO LABELED POWERS_OF_TWO                                   080180
                *    DOUBLE PRECISION SQUARE ROOT                                                                   080190
                *   ARGUMENT IN R0,1.  RESULT IN R0,1.                                                              080200
                *   TIME IN MICROSECONDS:                                                                           080210
                *       296 + 4N IF N IS ODD  (1 THROUGH 31)                                                        080220
                *       318 + 4N IF N IS EVEN (2 THROUGH 30)                                                        080230
                *        54      IF N IS 32   (ARGUMENT ZERO)                                                       080240
                *   WHERE N IS THE NUMBER OF LEADING ZEROS IN THE ARGUMENT                                          080250
4900      4R    1629 FC09001F   SQUARE_ROOT CLAM     0,,31                                                        080260
4901     136    1628 DD10                   NMLD     1,0          "NORMALIZE ARGUMENT (G)                         080270
                *                                                 "COMPUTE N = 31 - NUMBER OF LEFT                080280
4902     146    162C C023                   FET      2,3          "SHIFTS NECESSARY TO NORMALIZE                  080290
                *                                                 "IS THE ARGUMENT                                *I080300
4903     150    162D D14E   (164C)          BLE      $2           "EQUAL TO ZERO OR NEGATIVE?                     080310
4904      6R    162E F004E5D6               MPYM     0,,F(-.204406) "OBTAIN FIRST APPROXIMATION FOR               080320
4905      10    1630 F40971F2               ADDM     0,,F(+.890194) "NEWTON'S FORMULA                             080330
4906      16    1632 6004                   MPY      0,4          "                                               080340
4907      20    1633 F4092823               ADDM     0,,F(+.313567) "X(0) = A + (B - C*G)*G                       080350
4908      22    1635 A424                   CLA      2,4          USE NEWTON'S ALGORITHM                          080360
4909      24    1636 8020                   COM      2,0                                                          080370
4910      28    1637 D042   (163A)          BLE      $3           "IS THE ARGUMENT GREATER THAN X?                %R080380
4911      4R    1638 F4090015               ADDM     0,,21        "ADJUST X(C) BY ADDING K TO                     080390
                *                                                 "PREVENT POSSIBLE UNDERFLOW                     080400
4912     32R    163A D420                   $3       DIV      2,0          "FIRST ITERATION"                       080410
4913      34    163B B402                   ADD      0,2          "                                               080420
4914      42    163C 5263   (00E3)          MPLM     I0,,HX4000   "X(1) = (X(0) + G/X(0))/2                     080430
4915     168    163D DC40                   DIVD     4,0          "SECOND ITERATION"                              %S080440
4916     172    163E BC04                   ADDD     0,4          "                                               080450
4917     184    163F 5A63   (00E3)          MPLDM    I0,,HX4000   "X(2) = (G/X(1) + G)/2                        080460
                * CORRECT FOR NORMALIZATION                                                                         *H080470
4918     190    1640 F4358000               LSE      3,,15        "COMPUTE N/2 (TRUNCATED)                        080480
4919     194    1642 D054   (1647)          BRL      $1           "WAS N ODD?"                                    %R080490
4920      20R   1643 F8061640               MPYD     0,,$4        "MODIFY X(2) BY SQUARE ROOT OF 2                080500
4921      24    1645 F4398000               ADDM     3,,X(8000)   "TO START NORMALIZATION FIX                    080510
4922      4R    1647 F43980D5   $1          ADDM     3,,POWERS_OF_TWO+X(8000)                                     080520
4923      10    1649 A633                   CLA      I3,3         "MULTIPLY X(2) BY 2**(-N/2)                     080530
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4924    20    164A  5930                  MPLDM   X3,0          "TO GET FINAL RESULT          080540
4925    24    164B  AC40                  CLAD    4,0                                         080550
4926    18R   164C  D530          $2      BBK     3             "EXIT"                        080560
4927          164D  5A82799A      $4      COND    F(.7071067812)    (SQUARE ROOT OF .5)       080570
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                                                                                                                    080580
                                **                                                                                  080580
                                *                          SINE - COSINE                                           *H080590
                                *                                                                                  *H080600
                                * THIS SUBROUTINE WILL COMPUTE THE SIN AND COS OF ANY ANGLE SCALED PI               *H080610
                                * THE OUTPUTS ARE SCALED B1.  IT HAS SEPARATE ENTRIES FOR SIN OR COS               *H080620
                                * ONLY.                                                                            *H080630
                                *                                                                                  *H080640
                                * ENTER WITH ANGLE X SCALED PI IN R0,1                                              080650
                                * RETURN WITH SINE IN R2,3 AND COSINE IN R0,1 (2 REGISTERS ADDED)                   080660
                                *   MAXIMUM TIME IN MICROSECONDS:                                                  080670
                                *       SIN 188,  COS 192, SIN_COS 414.                                            080680
4928     8R        164F  D700   SC_ENTRY     PRN         0              "COPY THE ANGLE X TO SAVE FOR COS          080690
4929     12R       1650  C031   SIN_COS      FET         3,1                                                      % 080700
                                *                                       "USE THE SEPARATE ENTRY TO                 *I080710
4930     20  *     1651  F8001656           BSV         SIN            "COMPUTE THE SIN FIRST                      080720
4931     24        1653  AC40               CLAD        4,0            "SAVE THE SIN                               080730
                                *                                       "FALL INTO THE SEPARATE COS ENTRY          080740
4932     34        1654  0710               PRN         1              "AND THEN RETURN                            080750
                                * SINGLE FUNCTION ENTRIES                                                          080760
                                * FOR EITHER ENTRY, THE RESULT REPLACES X IN R0,1                                   080770
                                * ENTER HERE FOR COS ONLY                                                          *H080780
4933     6R        1655  9663   (00E3) COS          ADD         0,,HX4000      "FORM X + PI/2 SINCE                080790
                                *                                       "       COS X = SIN X + PI/2                080800
                                * ENTER HERE FOR SIN ONLY                                                          *H080810
4934     16R       1656  F4481670     SIN          FETM        4,,$5          "READ POINTER TO S COEFFICIENTS     080820
4935     20        1658  AC25               CLAD        2,5            "COMPUTE 2X     (= Y IF 1ST OR              080830
4936     24        1659  BC22               ADDD        2,2            "4TH QUADRANT)                              080840
                                *                                       "WAS X IN THE 2ND                          *1080850
4937     28        165A  D071   (165C)      BND         $1             "OR 3RD QUADRANTS?"                        %R080860
4938     4R        1658  A822               CLSD        2,2            "COMPLIMENT RESULT   2(1- X) = Y            080870
                                *                                       "IF X IN 2ND OR  -2(1 + X) = Y              080880
                                *                                       "IF X IN 3RD QUADRANT                       080890
4939     4R        165C  F82948CF     $1           COMM        2,,F((+62)/109) "CHECK Y TO DETERMINE WHICH        080900
4940     8         165E  D033   (1662)      BRG         $2                                                       % 080910
4941     4R        165F  F8298731           COMM        2,,F((-62)/109) "SERIES TO USE                              080920
                                *                                       "IS Y OUTSIDE THE                          *1080930
4942     8         1661  D023   (1665)      BGE         $3             "RANGE OF +62/109 TO -62/109?              %R080940
4943     2R        1662  944A     $2           ADDM        4,,$6-$5       "CHANGE POINTER TO POINT TO THE              080950
4944     6         1663  BC22               ADDD        2,2            "C COEFFICIENTS                             080960
                                *                                       "COMPUTE Z = 1 - ABSOLUTE Y                 080970
4945     10        1664  D001   (1666)      BUC         $4             "RESCALED BY 2                              080980
4946     4R        1665  AC52     $3           CLAD        5,2            "SAVE Y FOR FINAL MULTIPLY IN               080990
                                *                                       "THE S SERIES                               081000
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4947    16R    1666  6822          $4    MPYD   2,2          "COMPUTE POWER SERIES"                 081010
4948    20     1667  AC02                CLAD   0,2          "IN X**2 OR Z**2                       081020
4949    38     1668  6940                MPYD   X4,,0        "                                      081030
4950    46     1669  BD42                ADDD   X4,,2        "((S7X**2 + S5)X**2 + S3)X**2 +S1      081040
4951    62     166A  6802                MPYD   0,2          "            OR                        081050
4952    70     166B  BD44                ADDD   X4,,4        "((C7Z**2 + C5)Z**2 + C3)Z**2 +C1      081060
4953    86     166C  6802                MPYD   0,2                                                 081070
4954    94     166D  BD46                ADDD   X4,,6                                               081080
4955   100     166E  05400008            BUC    X4,,8        "EXIT TO S END OR C END                081090
4956           1670  FF84FDE4      $5    COND   F(-.002289069985)  C7                              081100
4957           1672  05195681            COND   F(+.039835751436)  C5 SINE                          081110
4958           1674  D6A88C08            COND   F(-.322981354578)  C3 COEFFICIENTS                  081120
4959           1676  6487ED41            COND   F(+.785398156180)  C1                              081130
4960    16R    1678  6850                MPYD   5,0          "S END"                                081140
4961    36     1679  D540                BBK    4            "SIN X = Y * (SERIES)                  081150
4962           167A  FFFABF46      $6    COND   F(-.000160303804)  C6                              081160
4963           167C  0103B73E            COND   F(+.007925896961)  C4 COSINE                        081170
4964           167E  EC42C4DA            COND   F(-.154212373234)  C2 COEFFICIENTS                  081180
4965           1680  3FFFFFF5            COND   F(+.499999995214)  C0                              081190
4966     2R    1682  9850                COMM   5,,0         "C END"                                081200
                                   *                        "ABSOLUTE SIN X = (SERIES)             081210
4967     6     1683  D022   (1686)       BGE    $7           "IS X POSITIVE?"                       081220
4968     4R    1684  A850                CLSD   5,0          "SIN X = - (SERIES)                    081230
4969    24     1685  D540                BBK    4                                                   081240
4970     4R    1686  AC50          $7    CLAD   5,0          "SIN X = (SERIES)                      081250
4971    24     1687  D540                BBK    4                                                   081260
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                                                                                                                    081270
                                                                                                                   *H081280
                                                                                                                   *H081290
                                                                                                                   *H081300
                                                                                                                   *H081310
                                                                                                                   *H081320
                                                                                                                   *H081330
                                                                                                                    081340
                                                                                                                    081350
                                                                                                                    081360
                                                                                                                    081370
4972      8R    1688  D700          ATAN_ENTRY  PRN       0              "ADJUST R15 STACK                        081380
                                    * ENTER HERE WHEN NOT USING PIN ENTRY                                         *H081390
4973     10R    1689  F8044000      ARCTAN      RSAD      0,,1           HALVE COS                                081400
4974     12     168B  DE52                      FLG       5,2            "PUT THE SIGN OF THE COS AND SIN         081410
                                                                          "INTO PROGRAM FLAGS C AND D RE-          081420
                                                                          "SPECTFULLY (FLAG TRUE IF MINUS)         081430
                                                                          "                                        081440
                                                                          "COMPUTE ABSOLUTE VALUE OF SIN/2         081450
                                                                          "AND COS/2                               081460
                                                                          "                                        081470
                                                                          "READ POINTER TO COEFFICIENTS            081480
                                                                          "AND SET UP TERM COUNT                   081490
4975     16     168C  D021  (168E)              BGE       $1                                                    % 081500
4976      4R    168D  A800                      CLSD      0,0            TAKE MAGNITUDE                           081510
4977     12R    168E  F42816CE      $1          FETM      2,,ATC                                                % 081520
4978     14     1690  9C0C                      CLAM      0,,ATC1-ATC                                              081530
4979     22     1691  C016                      FET       1,6                                                      081540
4980     32     1692  F8044000                  RSAD      0,,1           HALVE SINE                               081550
4981     34     1694  DE53                      FLG       5,3            SET D IF .LT.                            081560
4982     38     1695  D021  (1697)              BGE       $2                                                    % 081570
4983      4R    1696  A800                      CLSD      0,0            TAKE MAGNITUDE                           081580
4984      4R    1697  AC70          $2          CLAD      7,0                                                   % 081590
4985      8     1698  B875                      SUBD      7,5            "COMPUTE X = (S - C) / (S + C)          %S081600
4986     12     1699  BC05                      ADDD      0,5            "  WHERE S AND C BOTH POSITIVE           081610
4987    138     169A  DC70                      DIVD      7,0            "                                        081620
4988    142     169B  AC57                      CLAD      5,7            "  Z = X**2                              081630
4989    158     169C  6855                      MPYD      5,5            Z=X**2                                   081640
4990    166     169D  AD4E                      CLAD      X4,,ATC2-ATC                                             081650
4991     16R    169E  6805          $3          MPYD      0,5                                                   % 081660
                                                                          "COMPUTE SERIES"                         081670
                                                                          "                                        081680
                                                                          "=(((((((T7Z +T6)Z + T5)Z + T4)Z         081690
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                                        *                                  "  + T3)Z + T2)Z + T1)Z + T0)X      081700
4992    24      169F  BF24                      ADDD     IX2,4                                              081710
4993    32      16A0  CC23   (169E)             BXUD     2,,$3                                            % 081720
4994    16R     16A1  6807                      MPYD     0,7          FINISH ODD SERIES IN X                081730
4995    18      16A2  DEEE                      FLG      14,14        "SET FLAG C TRUE IF SIN OR COS       %S081740
                                        *                              "ARE MINUS BUT NOT BOTH MINUS         081750
                                        *                              "(FLAC C .EOR. FLAG D)                081760
                                        *                              "IS THE PRODUCT                     *1081770
4996    22      16A3  D0D1   (16A5)             BCF      $4           "OF THE 'SIGN'S' NEGATIVE?           %R081780
4997     4R     16A4  A800                      CLSD     0,0          "FORM - (SERIES)                      081790
4998     6R     16A5  4022                $4    ROF      2,,2         "USE FLAGS D AND C +45 DEGREES TO     081800
4999    10      16A6  F4244000                  LSA      2,,14        "FIX THE QUADRANT                     081810
5000    16      16A8  F5292000                  ADDM     X2,,F(.25)   "D TRUE = 180, C TRUE = 90 DEG        081820
5001    20      16AA  AC70                      CLAD     7,0          MOVE ANSWER                           081830
5002    44      16AB  D560                      BBK      6            PRUNE SEVEN AND RETURN                081840
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                                                  **                                                                  081850
                                                  *                                                                   081860
5003                                              NORTH_MAGNETIC_POLE_VECTOR;                                         PP081870
5003                    16AC  7BA3                          CON        F(.9659)                                     PP081880
5004                    16AD  0094                          CON        F(.004529)                                   PP081890
5005                    16AE  DEE0                          CON        F(-.2588)                                    PP081900
                                                  *                                                                   081910
5006                    16AF  7478                ALPHA_0   CON        F(.91)          10.2                         PP081920
5007                    16B0  7852                          CON        F(.94)          13.6                         PP081930
5008                    16B1  7666                          CON        F(.925)         11.3                         PP081940
                                                  *                                                                   081950
5009                                              LAMBDA_TABLE;                                                       CF081960
5009                    16B2  361D3851                      COND       F((217.021)*.99748-9)       10.2             CF081970
5010                    16B4  4826F9C1                      COND       F((((217.021)*.99748-9)*4)/3) 13.6           CF081980
5011                    16B6  3C207ACC                      COND       F((((217.021)*.99748-9)*10)/9) 11.3          CF081990
                                                  *                                                                   082000
                                                  *                                                                   082010
                                                  *                          ARCSINE                                  *H082020
                                                  *                                                                   *H082030
                                                  * THIS ROUTINE WILL COMPUTE AN ANGLE SCALED PI FROM A SINE ARGUMENT (B1)*H082040
                                                  *                                                                   *H082050
                                                  *   REQUIRES SQUARE ROOT AND ARCTAN ROUTINES                          082060
                                                  *       ENTER WITH SINE SCALED 2 IN R0,1                              082070
                                                  *       RETURN WITH ANGLE SCALED PI IN R0,1 (SAME SIGN)               082080
5012        8R          16B8  C011                ARCSIN    FET        1,1             "COMPUTE COS"                 082090
5013       12           16B9  A800                          CLSD       0,0             "= (1 - SIN**2)**.5           082100
5014       28           16BA  6802                          MPYD       0,2             "                             082110
5015       34           16BB  9662    (00E2)                ADD        0,,HX2000       "SET COS = 0 IF SIN MORE THAN 1  082120
5016       38           16BC  D021    (16BE)                BGE        $1              "                             % 082130
5017        4R          16BD  B800                          SUBD       0,0              GREATER THAN ONE             082140
5018      446R          16BE  1000                $1        SQRT       0,0             "                             % 082150
                                                  *                                     "COMPUTE ANGLE"               %S082160
                                                  *                                     "= ARCTAN SIN/COS             082170
                                                  *                                     "                             082180
5019      452           16BF  04001689                      2BUC       ARCTAN          "(EXIT ASIN FROM ARCTAN)      082190
                                                  *                                                                   082200
                                                  *                                                                   082210
                                                  *   CUMULATIVE DAYS BY MONTH                                        DP082220
5020                                              DAYS_BY_MONTH;                                                      DP082230
5020                    16C1  0000                          CON        0               JAN                          DP082240
5021                    16C2  001F                          CON        31              FEB                          DP082250
5022                    16C3  003B                          CON        59              MAR                          DP082260
5023                    16C4  005A                          CON        90              APR                          DP082270
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5024   16C5  0078                  CON     120     MAY                    DP082280
5025   16C6  0097                  CON     151     JUN                    DP082290
5026   16C7  00B5                  CON     181     JUL                    DP082300
5027   16C8  00D4                  CON     212     AUG                    DP082310
5028   16C9  00F3                  CON     243     SEP                    DP082320
5029   16CA  0111                  CON     273     OCT                    DP082330
5030   16CB  0130                  CON     304     NOV                    DP082340
5031   16CC  014E                  CON     334     DEC                    DP082350
5032   16CD  016D                  CON     365     JAN (NEXT YEAR)        DP082360
                          *                                                DP082370
                          *   CONSTANTS FOR ARCTAN                           082380
5033   16CE  28BE6096     ATC      COND    F(+.318309854667)                 082390
5034   16D0  F26B58E6              COND    F(-.106099021806)                 082400
5035   16D2  0822EAF2              COND    F(+.063565605401)                 082410
5036   16D4  FA49B711              COND    F(-.044625393671)                 082420
5037   16D6  040A1927              COND    F(+.031558174030)                 082430
5038   16D8  FD9388D0              COND    F(-.018935106721)                 082440
5039   16DA  00FCF634     ATC1     COND    F(+.007719779427)                 082450
5040   16DC  FFCF0C20     ATC2     COND    F(-.001493916081)                 082460
                          *                                                  082470
5041                      SYNC_LIMIT_TABLE;                                SY082480
5041   16DE  0000                  CON     0                                SY082490
5042   16DF  0008                  CON     8                                SY082500
5043   16E0  0016                  CON     22                               SY082510
5044   16E1  0009                  CON     9                                SY082520
5045   16E2  002E                  CON     46                               SY082530
5046   16E3  000A                  CON     10                               SY082540
5047   16E4  0048                  CON     72                               SY082550
5048   16E5  000B                  CON     11                               SY082560
5049   16E6  0064                  CON     100                              SY082570
5050   16E7  000A                  CON     10                               SY082580
5051   16E8  007E                  CON     126                              SY082590
5052   16E9  0008                  CON     8                                SY082600
5053   16EA  0094                  CON     148                              SY082610
5054   16EB  000B                  CON     11                               SY082620
5055   16EC  00B0                  CON     176                              SY082630
5056   16ED  0009                  CON     9                                SY082640
                          *                                                SY082650
5057                      DIURNAL_CONSTANT_TABLE;                          PP082660
5057   16EE  22B0                  CON     F(.271)     IS=0   10.2          PP082670
5058   16EF  1B23                  CON     F(.212)     IS=0   13.6          PP082680
5059   16F0  1ED9                  CON     F(.241)     IS=0  11.3           PP082690
5060   16F1  2666                  CON     F(.300)     IS=1   10.2          PP082700
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5061                16F2  1E56                CON     F(.237)          IS=1  13.6      PP082710
5062                16F3  224E                CON     F(.268)          IS=1  11.3      PP082720
5063                16F4  2B85                CON     F(.340)          IS=2  10.2      PP082730
5064                16F5  226F                CON     F(.269)          IS=2  13.6      PP082740
5065                16F6  26E9                CON     F(.304)          IS=2  11.3      PP082750
5066                16F7  1AE1                CON     F(.210)          IS=3  10.2      PP082760
5067                16F8  14BC                CON     F(.162)          IS=3  13.6      PP082770
5068                16F9  17CF                CON     F(.186)          IS=3  11.3      PP082780
5069                16FA  1E68                CON     F(.240)          IS=4  10.2      PP082790
5070                16FB  17F0                CON     F(.187)          IS=4  13.6      PP082800
5071                16FC  1864                CON     F(.214)          IS=4  11.3      PP082810
                    *                                                                  PP082820
5072                TF_SIGMA_SQ_DATA_ADDRESSES;                                        TF082830
5072                16FD  1DD3                CON     SIGMA_SQ_PHI_DOT_PHI_DOT         TF082840
5073                16FE  1E03                CON     SIGMA_SQ_PHI_PHI_DOT             TF082850
5074                16FF  1E33                CON     SIGMA_SQ_PHI_PHI                 TF082860
5075                1700  1D88                CON     SIGMA_SQ_N_COUNTER               TF082870
                    *                                                                    082880
5076                TF_PHI_DATA_ADDRESSES;                                             TF082890
5076                1701  0085                CON     TF_TEMP                          TF082900
5077                1702  1798                CON     STATION_VECTOR_TABLE             TF082910
5078                1703  1F69                CON     RIJ                              TF082920
5079                1704  1E63                CON     PHI_DOT_DR                       TF082930
5080                1705  1E73                CON     PHI_DOT_ESTIMATE                 TF082940
5081                1706  1EA3                CON     PHI_ESTIMATE                     TF082950
                    *                                                                    082960
                    *                       VECTOR BY MATRIX MULTIPLY                  *H082970
                    *                                                                  *H082980
                    * THIS ROUTINE MULTIPLIES A 3X3 MATRIX (R) BY A VECTOR U TO GET A NEW *H082990
                    * VECTOR X.  THE ARGUMENTS CONSIST OF POINTERS TO R, U AND X.       *H083000
                    *                                                                  *H083010
                    *   MATRIX 3 - MULTIPLY 3X3 MATRIX (POINTER IN R2) DOUBLE            083020
                    *                INTO 3-VECTOR     (POINTER IN R1) PRECISION         083030
                    *                  ANSWER TO       (POINTER IN R0) ARITHMETIC        083040
                    *       TIME: 362 MICROSECONDS                                     083050
                    *       ALL POINTERS PRUNED                                        083060
5082      16R       1707  8454    MATRIX_3D   FETM    5,,4          WORKING STORAGE (6)  083070
5083       8R       1708  AE28    $1          CLAD    I2,8                             $ 083080
5084       26       1709  6A27                MPYD    I2,7          *X = V*R           083090
5085       34       170A  AD82                CLAD    X8,,2         *                  083100
5086       52       1708  6972                MPYD    X7,,2         *X1 = SUM V(I)*R(I)1, I = 1 TO 3  083110
5087       56       170C  BC20                ADDD    2,0           *X2 = SUM V(I)*R(I)2, I = 1 TO 3  083120
5088       64       170D  AD84                CLAD    X8,,4         *X3 = SUM V(I)*R(I)3, I = 1 TO 3  083130
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5089      82      170E  6974                  MPYD      X7,,4                                  083140
5090      86      170F  BC02                  ADDD      0,2                                    083150
5091      96      1710  7846                  STAD      IX4,6                                  083160
5092      98      1711  9486                  ADDM      8,,6                                   083170
5093     106      1712  CC48   (1708)         BXUD      4,,$1                                 % 083180
5094      28R     1713  D580                  BBK       8                                      083190
                                        *                                                        083200
                                        *                    CROSS PRODUCT                      *H083210
                                        *                                                       *H083220
                                        * THIS ROUTINE COMPUTES THE CROSS PRODUCT OF TWO VECTORS U AND V *H083230
                                        *                                                       *H083240
                                        *   CROSS PRODUCT UXV IN R0 TO R5                        DP083250
                                        *       U IN R0 TO R6                                    DP083260
                                        *       V IN R8 TO R13                                   DP083270
5095                                    REGISTER_CROSS;                                          DP083280
5095       4R     1714  AC6C                  CLAD      6,12          "X = U X V                *H083290
5096      20      1715  6862                  MPYD      6,2           "                          083300
5097      36      1716  6828                  MPYD      2,8           "X1 = U2*V3 - U3*V2        083310
5098      52      1717  6884                  MPYD      8,4           "X2 = U3*V1 - U1*V3        083320
5099      68      1718  684A                  MPYD      4,10          "X3 = U1*V2 - U2*V1        083330
5100      84      1719  68A0                  MPYD      10,0          U1V2                      DP083340
5101     100      171A  680C                  MPYD      0,12          U1V3                      DP083350
5102     104      171B  B864                  SUBD      6,4           X1=U2V3-U3V2              DP083360
5103     108      171C  B880                  SUBD      8,0           X2=U3V1-U1V3              DP083370
5104     112      171D  B8A2                  SUBD      10,2          X3=U1V2-U2V1              CI083380
5105     134      171E  D550                  BBK       5             PRUNE 5                   CI083390
                                        *                                                        083400
5106              171F  4000            RAT_TABLE CON       F(18-1)       10.2                      PP083410
5107              1720  5555                  CON       F((4)/3B1)    13.6                      PP083420
5108              1721  471C                  CON       F((10)/9B1)   11.3                      PP083430
                                        *                                                        083440
                                        *                                                        083450
5109              1722  12000000        V_LAMBDA  COND      X(12000000)   10.2D3(441D-6)/2**5      CF083460
5110              1724  18000000                COND      X(18000000)                             CF083470
5111              1726  14000000                COND      X(14000000)                             CF083480
                                        *                                                        083490
                                        *                    DOT PRODUCT                        *H083500
                                        *                                                       *H083510
                                        * THIS ROUTINE FORMS THE DOT PRODUCT OF THE TWO VECTORS U AND V *H083520
                                        *                                                       *H083530
                                        *   DOT PRODUCT: U.V IN R0,1.   10 REGISTERS PRUNED      DP083540
                                        *       U  IN R0 TO R5                                   DP083550
                                        *       V  IN R6 TO R11                                  DP083560
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5112                                  REGISTER_DOT;                                                  DP083570
5112      16R      1728  68A4                  MPYD      10,4      "U . V = SUM U(I)*V(I), I=1 TO 3   083580
5113      32       1729  6882                  MPYD      8,2       22                                 DP083590
5114      48       172A  6860                  MPYD      6,0       11                                 DP083600
5115      52       172B  BCA8                  ADDD      10,8      33+22                              DP083610
5116      56       172C  BCA6                  ADDD      10,6      33+22+11                           DP083620
5117      86       172D  D590                  BBK       9         PRUNE 10                           DP083630
                                      *                                                                083640
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                                        **                                                                    EX083650
                                        *          OMEGA TASK                                                 *H083660
                                        *                                                                     *H083670
                                        *  PIN ROUTINE TO SET UP THE ADDRESS AND TIME OF THE NEXT OMEGA TASK  EX083680
                                        *          THE ROUTINE NUMBER MUST BE IN REGISTER 0                   EX083690
                                        *          THE CURRENT TIME SHOULD BE IN REGISTERS 1 AND 2            EX083700
                                        *          ALL THREE REGISTERS ARE PRUNED OFF WITH THE BBK            EX083710
                                        * THIS PIN ROUTINE SELECTS THE NEXT OMEGA                             *H083720
                                        * TASK FROM A TABLE AND COMPUTES THE TIME                             *H083730
                                        * OF THE NEXT OMEGA TASK FROM THE TIME                                *H083740
                                        * INCREMENT IN THE TABLE                                              *H083750
                                        * THE ARGUMENTS CONSIST OF A POINTER TO                               *H083760
                                        * THE TABLE AND THE CURRENT REAL TIME                                 *H083770
                                        *                                                                     EX083780
5118                                    OMEGA_TASK_PIN;                                                       EX083790
5118      2R      172E  B400                    ADD       0,0            "READ THE TASK AND TIME INTERVAL EX083800
5119      16      172F  F90C02BF                FETD      X0,,OMEGA_TASK_TABLE "FROM THE TASK TABLE      EX083810
5120      24      1731  7019   (0099)           STA       0,,OMEGA_TASK  "SAVE THE ADDRESS OF THE NEXT   EX083820
                                        *                                "OMEGA TASK FOR THE 5 MILLISEC  EX083830
                                        *                                "INTERRUPT PROGRAM              EX083840
5121      26      1732  9C00                    CLAM      0,,0           "ADD TIME TO THE TIME INCREMENT %S083850
5122      30      1733  BC03                    ADDD      0,3            "TO GET THE TIME OF THE NEXT    EX083860
5123      40      1734  7817   (0097)           STAD      0,,OMEGA_TIME  "OMEGA TASK AND SAVE FOR THE 5  EX083870
                                        *                                "MSEC INTERRUPT PROGRAM         EX083880
5124      44      1735  FC194000                CLAM      1,,X(4000)     "USE PROGRAM FLAG C TO DEFINE   %S083890
                                        *                                "RHO-RHO (C FALSE) OR PHASE     EX083900
                                        *                                "DIFFERENCE (C TRUE) NAVIGATION EX083910
                                        *                                "                               EX083920
                                        *                                "--SUBMARINE ALWAYS OPERATES IN--EX083930
                                        *                                "--PHASE DIFFERENCE NAVIGATION-- EX083940
                                        *                                "                               EX083950
                                        *                                "A MODE CHANGE CAN ONLY OCCUR   EX083960
                                        *                                "FROM THE PROGRAM MONITOR UNIT  EX083970
                                        *                                "                               EX083980
5125      50      1737  9E4A   (00CA)           CLA       0,,MODE        "SET UP MASK TO MAKE FLAG C FALSEEX083990
5126      54      1738  D011   (173A)           BNE       $1             "IS THE MODE SET FOR RHO-RHO?   EX084000
5127      2R      1739  A401                    CLA       0,1            *PHASE DIFFERENCE"              EX084010
                                        *                                "SET UP MASK TO MAKE FLAG C TRUE EX084020
5128      12R     173A  E1E10000        $1      MRG       X14,1,0        "SET SELECTED STATE OF FLAG C IN EX084030
                                        *                                "THE APPROPIATE BIT IN THE      EX084040
                                        *                                "INDICATOR WORD OF THE R14      EX084050
                                        *                                "SUBROUTINE RETURN PUSHDOWN STACKEX084060
                                        *                                "AFTER EXITING THIS PIN ROUTINE EX084070
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                                        *                                    "WITH A BRANCH BACK FLAG C WILL  EX084080
                                        *                                    "HAVE THE PROPER STATE           EX084090
5129      32        173C  D540                  BBK       4                                                EX084100
                                        *                                                                     EX084110
5130                173D  0F00          HX0F00    CON       X(0F00)                                          084120
                                        *                                                                     084130
                                        *                      POSITION VECTOR                               *H084140
                                        *                                                                     *H084150
                                        * THIS ROUTINE COMPUTES A 3 ELEMENT POSITION VECTOR FROM LATITUDE AND  *H084160
                                        * LONGITUDE ARGUMENTS                                                 *H084170
                                        *                                                                     *H084180
                                        *   GENERATE POSITION VECTOR FROM DESTINATION NUMBER (0 TO 9) IN R0    CI084190
                                        *        REGISTERS MADE: SIN LAT, COS LAT.COS LONG, COS LAT.SIN LONG   CI084200
5131                                    MAKE_DESTINATION_VECTOR,;                                             CI084210
5131      14R       173E  F90C1FC4      PLOT1     2FETD     X0,,DESTINATION_LONGITUDE                        084220
5132      448       1740  1400                    SINCOS    0,0                                             CI084230
5133      14R       1741  F94C1FDE      PLOT6     2FETD     X4,,DESTINATION_LATITUDE                        % 084240
5134      448       1743  1400                    SINCOS    0,0          "R1 = SIN(LAT)                 B1    084250
5135      452       1744  BC00                    ADDD      0,0          "R2 = COS(LAT) * COS(LONG)     B1    084260
5136      468       1745  6860                    MPYD      6,0          "R3 = COS(LAT) * SIN(LONG)     B1    084270
5137      484       1746  6840                    MPYD      4,0                                             CI084280
5138      498       1747  D510                    BBK       1                                               CI084290
                                        *                                                                     084300
                                        *SUN CONSTANTS CALCULATED FOR JULIAN DAY NUMBER  2,44/,317.5          084310
                                        *   JANUARY 1.0, 1972 @ 0000 HOURS GMT                                084320
                                        * K2 IS LONGITUDE OF MEAN SUN  =       279.75764 DEGREES*PI/180       084330
5139                1748  C6F0          SUN_CONS  CON       F(((-2.)*3.14159+4.882691926)/3.14159)  K2      084340
                                        *K1=2PI/NUMBER OF DAYS IN TROPICAL YEAR = 365.2421943 DAYS            084350
5140                1749  59B73F77                COND      F((.0172027915)/3.14159265B-7)          K1      084360
                                        *K3=2PI/NUMBER OF DAYS IN ANOMALISTIC YEAR  = 365.2596435 DAYS        084370
5141                174B  59B62696                COND      F((.0172019697)/3.14159265B-7)          K3      084380
                                        * K5 =SIN(E)  E = OBLIQUITY OF ECLIPTIC = 23.44292452 DEGREES         084390
5142                174D  32EC                    CON       F(0.397835337)                          K5      084400
                                        *K4= MEAN ANOMALY = 357.29877 DEGREES*PI/180                          084410
5143                174E  FE14                    CON       F(((-2.)*3.14159+6.236039952)/3.14159)  K4      084420
                                        *K6 =ECCENTRICITY OF ORBIT   0.01672087925*2                          084430
5144                174F  02BA                    CON       F((0.0334417585)/3.14159B-1)            K6      084440
                                        *K7 = TAN**2(E/2) *(-1)                                               084450
5145                1750  FC7E                    CON       F((-.0430482519)/3.14159B-1)            -K7     084460
                                        *                                                                     084470
                                        *                                                                     084480
                                        *                      VELOCITY MAGNITUDE                            *H084490
                                        *                                                                     *H084500
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                                    * THIS ROUTINE COMPUTES THE MAGNITUDE OF THE TWO ELEMENT VELOCITY      *H084510
                                    * VECTOR ARGUMENTS                                                     *H084520
                                    *                                                                      *H084530
5146                                MAKE_VELOCITY;                                                         CI084540
5146      8R      1751  C012                FET       1,2          V2 IN R2  V3 IN R0                     CI084550
5147      10      1752  B011                SUB       1,1          " V (MAG) = (V2**2 + V3**2)**.5         084560
5148      12      1753  B033                SUB       3,3                                                 DP084570
5149      28      1754  6822                MPYD      2,2                                                 CI084580
5150      44      1755  6800                MPYD      0,0                                                 CI084590
5151      48      1756  BC02                ADDD      0,2                                                 CI084600
5152     494      1757  1000                SQRT      0,0                                                 CI084610
5153     498      1758  AC20                CLAD      2,0                                                 CI084620
5154     512      1759  D510                BBK       1                                                   CI084630
                                    *                                                                       084640
                                    *                                                                       084650
5155                                STATION_BURST_TIMES;                                                   SB084660
5155              175A  008C                CON       140          .7 SEC                                 SB084670
5156              175B  00A0                CON       160          .8 SEC                                 SB084680
5157              175C  00B4                CON       180          .9 SEC                                 SB084690
5158              175D  00C8                CON       200          1  SEC                                 SB084700
5159              175E  00B4                CON       180          .9 SEC                                 SB084710
5160              175F  008C                CON       140          .7 SEC                                 SB084720
5161              1760  00C8                CON       200          1  SEC                                 SB084730
5162              1761  00A0                CON       160          .8 SEC                                 SB084740
                                    *                                                                       084750
                                    *                                THETA BR IS THE CCW ANGLE FROM        ES084760
                                    *                                +A TO THE STATION                     ES084770
                                    *                                +A IS 135 DEG CCW FROM KEEL LINE      ES084780
                                    *                                +B IS 270 DEG CCW FROM +A             ES084790
5163                                ANTENNA_SELECT_TABLE;            BEARING LIMITS FOR THETA BR           ES084800
5163              1762  0001                CON       X(1)         +A                                     ES084810
5164              1763  0004                CON       X(4)         +B                                     ES084820
5165              1764  8001                CON       X(8001)      -A                                     ES084830
5166              1765  8004                CON       X(8004)      -B                                     ES084840
                                    *                                                                      ES084850
5167                                FLOATER_SELECT_TABLE;                                                  ES084860
5167              1766  0001                CON       X(0001)      A                                      ES084870
5168              1767  8001                CON       X(8001)      -A                                     ES084880
                                    *                                                                       084890
5169                                TF_LAMBDA_CONSTANT_TABLE;                                              TF084900
5169              1768  60000000            COND      F(.75)       10.2KC                                 TF084910
5170              176A  7FFFFFFF            COND      X(7FFFFFFF)  13.6KC                                 TF084920
5171              176C  6AAAAAAA            COND      F(.833333333) 11.3KC                                TF084930
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                                        *                                                                                  084940
5172          176E  0007                HX0007      CON         X(0007)                                                  084950
                                        *                                                                                  084960
5173          176F  0004AC6A            DCAY_ONE    COND        F(((((207D-8)*.9974)*217.021)*1)/3.141593) 10.2 PP084970
5174          1771  0004AA7D                        COND        F(((((((155D-8)*.9974)*217.021)*4)/3)/3.141593) 1PP084980
5175          1773  0004A411                        COND        F(((((((185D-8)*.9974)*217.021)*10)/9)/3.141593) PP084990
                                        *                                                                                  085000
5176          1775  001F                HX001F      CON         X(001F)                                                  085010
                                        *                                                                                  085020
5177                                    POS_NOISE_TABLE;                                                               DP085030
5177          1776  0000084A                        COND          F(.5*.5*6076*6076/2.095D+7/2.095D+78-6)  A     DP085040
5178          1778  000468F5                        COND          F(5*5*6076*6076/2.095D+7/2.095D+78-6)    B     DP085050
5179          177A  00468F4F                        COND          F(20*20*6076*6076/2.095D+7/2.095D+78-6)  C     DP085060
                                        *   NOISE = 64*(NMI/R)**2                                                      DP085070
5180          177C  03C0                HD03C0      CON         X(03C0)        FOLLOW BY X(000F) MASK FOR LOP      085080
5181          177D  000F                HX000F      CON         X(000F)                                                  085090
5182          177E  6000                HX6000      CON         X(6000)                                                 HH085100
5183          177F  0FFF                HX0FFF      CON         X(0FFF)                                                 HH085110
5184          1780  2010                HX2010      CON         X(2010)        FOR OSC TEST                             HH085120
                                        *                                                                                  085130
5185                                    CALIBRATE_DATA_ADDRESSES;                                                      ES085140
5185          1781  1EF6                            CON         CALIBRATE_DATA          C3 DATA                    ES085150
5186          1782  1EFC                            CON         CALIBRATE_DATA+6        C2 DATA                    ES085160
5187          1783  1F02                            CON         CALIBRATE_DATA+12       C1 DATA                    ES085170
5188          1784  1F08                            CON         CALIBRATE_DATA+18       C4 DATA                    ES085180
                                        *                                                                                  085190
5189                                    LEAP_SECOND;                                                                  11   085200
5189          1785  00000320                        LITD        800         JAN 1 1975 VALUE ( 4 SECONDS)             01   085210
                                        *                                                                                  085220
5190                                    BURST_ADDRESSES;                                                               EB085230
5190          1787  0032                            CON         Q_SUB_T                                                EB085240
5191          1788  1EF3                            CON         PHI_ZERO                                               EB085250
5192          1789  0024                            CON         SIGMA_SQUARED_PHI_SUB_M                                EB085260
5193          178A  1EED                            CON         PHI_SUB_M                                              EB085270
                                        *                                                                                  085280
5194          178B  F000                HXF000      CON         X(F000)                                                  085290
5195          178C  DFFF                HXDFFF      CON         X(DFFF)                                                  085300
                                        *                                                                                  085310
5196                                    ANTENNA_NOISE_AND_CALIBRATE_CODES;                                             EB085320
5196          178D  0010                            CON         X(0010)                                                EB085330
5197          178E  0001                            CON         X(0001)        LOOP A                                  EB085340
5198          178F  0060                            CON         X(0060)                                                EB085350
5199          1790  0001                            CON         X(0001)        LOOP A                                  EB085360
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5200   1791  0020                  CON     X(0020)                                  EB085370
5201   1792  0004                  CON     X(0004)        LOOP B                    EB085380
5202   1793  0050                  CON     X(0050)                                  EB085390
5203   1794  0004                  CON     X(0004)        LOOP B                    EB085400
                          *                                                          085410
5204   1795  00023C8F    CAY_ONE   COND    F(((323D-6)*.9974)*217.021B-10)      10.2  PP085420
5205   1797  00023C28              COND    F(((((242D-6)*.9974)*217.021B-10)*4)/3)  13.6  PP085430
5206   1799  00023D57              COND    F(((((291D-6)*.9974)*217.021B-10)*10)/9) 11.3  PP085440
                          *                                                          085450
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                                                                                                                    SV085460
                **                                                                                                  
                *  OMEGA TRANSMITTER COORDINATES ARE REFERENCED TO THE MERCURY DATUM                                 085470
                *  ON THE FISHER 1960 ELLIPSOID(F = 1/298.3, REQ = 6378166. METERS                                   085480
                *  GEOCENTRIC DIRECTION COSINES AND GEODETIC LAT/LONG                                                085490
                *                                                                                                    085500
5207            STATION_VECTOR_TABLE;                                                                               085510
5207    179B    752F840D        COND        F(+.91551829)  NORWAY                =STATION A                         085520
5208    179D    3223FD8B        COND        F(+.39172334)  LAT  = N  66 25 15.00                                    085530
5209    179F    08B77EC7        COND        F(+.09153733)  LONG = E  13 09 10.00                                    085540
5210    17A1    179D8D80        COND        F(+.18449565)  TRINIDAD              =STATION B                         085550
5211    17A3    38C26F26        COND        F(+.46687116)  LAT  = N  10 42 06.20                                    085560
5212    17A5    914C14AC        COND        F(-.86486570)  LONG = W  61 38 20.30                                    085570
5213    17A7    2E714E36        COND        F(+.36283281)  HAWAII                =STATION C                         085580
5214    17A9    918A3DF1        COND        F(-.86296869)  LAT  = N  21 24 16.90                                    085590
5215    17AB    D2FE1498        COND        F(-.35162108)  LONG = W 157 49 52.70                                    085600
5216    17AD    5C5837FA        COND        F(+.72144222)  NORTH DAKOTA          =STATION D                         085610
5217    17AF    F326652F        COND        F(-.10039077)  LAT  = N  46 21 57.20                                    085620
5218    17B1    A84C85E6        COND        F(-.68515898)  LONG = W  98 20 08.77                                    085630
5219    17B3    D27368C3        COND        F(-.35585299)  ILE DE LA REUNION     =STATION E                         085640
5220    17B5    441D7343        COND        F(+.53214875)  LAT  = S  20 58 26.47                                    085650
5221    17B7    625B8D91        COND        F(+.76823587)  LONG = E  55 17 24.25                                    085660
5222    17B9    A8EE3E21        COND        F(-.68022941)  ARGENTINA             =STATION F                         085670
5223    17BB    275E3392        COND        F(+.30756230)  LAT  = S  43 03 12.53                                    085680
5224    17BD    AAD5BE4E        COND        F(-.66535207)  LONG = W  65 11 27.69                                    085690
                * NEW YORK IS INTERMITTENTLY RADIATING IN THE G SLOT                                                 085700
5225    17BF    57B52B3C        COND        F(+.68521633)  NEW YORK              =STATION G                         085710
5226    17C1    17FE6764        COND        F(+.18745129)  LAT  = N  43 26 40.92                                    085720
5227    17C3    A5E98D08        COND        F(-.70380437)  LONG = W  75 05 09.80                                    085730
5228    17C5    4861680F        COND        F(+.56547261)  TSUSHIMA ISLAND       =STATION H                         085740
5229    17C7    BCEA4FEA        COND        F(-.52409936)  LAT  = N  34 36 53.26                                    085750
5230    17C9    5183DAD6        COND        F(+.63683639)  LONG = E 129 27 12.49                                    085760
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                                  **                                                                  085770
5231        17CB  028F            PHI_ZERO_0   CON        F((1.0)/50)    10.2   RECEIVER INPUT       ES085780
5232        17CC  03D7                         CON        F((1.5)/50)    13.6   PHASE                ES085790
5233        17CD  03D7                         CON        F((1.5)/50)    11.3   SHIFT                ES085800
5234                              PHI_ZERO_FLOATER;                                                   ES085810
5234        17CE  E664                         CON        X(E664)        90 CEC'S                    ES085820
5235        17CF  2E15                         CON        X(2E15)        18 CEC'S                    ES085830
5236        17D0  051F                         CON        X(051F)        02 CEC'S                    ES085840
                                  *                                                                   ES085850
5237                              PHI_ZERO_LOOP;                                                      ES085860
5237        17D1  D26F                         CON        F((-17.8)/50)                              ES085870
5238        17D2  1917                         CON        F((9.8)/50)                                ES085880
5239        17D3  F168                         CON        F((-5.7)/50)                               ES085890
5240        17D4  0000            OVERLAY      CON        0              ECS WORD FOR OVERLAYS         085900
5241        17D5  0021            ASCII        CON        X(0021)        A                             085910
5242        17D6  0022                         CON        X(0022)        B                             085920
5243        17D7  0023                         CON        X(0023)        C                             085930
5244        17D8  0024                         CON        X(0024)        D                             085940
5245        17D9  0025                         CON        X(0025)        E                             085950
5246        17DA  0026                         CON        X(0026)        F                             085960
5247        17DB  0027                         CON        X(0027)        G                             085970
5248        17DC  0028                         CON        X(0028)        H                             085980
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                                **                                                    085990
                                *          VARIABLE STORAGE NOT CLEARED AT TURN ON    086000
                                *                                                    086010
5249          183C              ROLL       BSS        0                              086020
5250          183C              ROLL_15    BSS        175                            086030
5251          18EB              ROLL_14    BSSD       12                             086040
5252          1C03              ROLL_END   BSS        0                              086050
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                    **                                                                  086060
                    HEADING_GROUP;                                                      086070
1C03                          BSS       1                                               086080
1C04                TYPE_OUT  BSS       1                                               086090
                    DB_CKSUM_IGNORE;                                                    086100
1C05                          BSS       1                                               086110
1C06                KAL_TEMP  BSS       18                                             HH086120
                    CALIBRATE_FAIL_COUNT;                                              HH086130
1C18                          BSS       6                                              HH086140
1C1E                XXX       BSS       9          AVE ESTIMATE VECTOR                 CF086150
1C1E                SYNC_DATA EQU       XXX                                            SY086160
1DAE                SYNC_C    EQU       SYNC_DATA+400                                  SY086170
1E78                SYNC_COUNT EQU      SYNC_C+202                                      086180
1E7A                SYNC_BASE EQU       SYNC_COUNT+2                                    086190
                    SYNC_DATA_COUNTER;                                                  086200
1E7D                          EQU       SYNC_BASE+3                                     086210
1C27                X         BSS       120                                             086220
                    PROP_PRED_RESULTS;                                                  086230
1C63                          EQU       X+60                                            086240
1C80                AUR_SAVE  EQU       X+89                                            086250
                    SEASON_INDEX_NORTH;                                                 086260
1C9F                          BSS       1                                               086270
                    SEASON_INDEX_SOUTH;                                                 086280
1CA0                          BSS       1                                               086290
1CA1                PROP_C    BSS       OS*3                                            086300
1CB9                PP_THETA3 BSS       OS*3                                            086310
1CD1                ERROR_NORTH BSSD    2                                               086320
1CD3                ERROR_EAST EQU      ERROR_NORTH+2                                   086330
1CD5                BI        BSS       19         WEIGHTING_MATRIX + CODE             CF086340
1CE8                XXXX      BSS       5          SAVE AVERAGE P1,P2,P3,V2,V3         CF086350
1CED                XX        BSS       9            WORKING STORAGE                   CF086360
1CF6                X2XX      BSS       9                                              CF086370
1CFF                MISFIRE_CNT BSS     1                                              CF086380
                    SIGMA_SQ_KICK;                                                     CF086390
1D00                          BSSD      1                                              CF086400
1D02                RES3      BSSD      1                                               086410
1D04                RES2      BSSD      1                                               086420
                    P44_INC_RATE;                                                       086430
1D06                          BSS       1                                               086440
1D07                DF_COUNTER BSS      OS                                              086450
1D0F                PP_THETA2 BSS       OS                                              086460
1D17                P_MATRIX  BSSD      81         COVARIANCE_MATRIX                   CF086470
1D17                P11       EQU       P_MATRIX                                       CF086480
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5286  1D19  P12  EQU  P_MATRIX+2   CF086490
5287  1D1B  P13  EQU  P_MATRIX+4   CF086500
5288  1D1D  P14  EQU  P_MATRIX+6   CF086510
5289  1D1F  P15  EQU  P_MATRIX+8   CF086520
5290  1D21  P16  EQU  P_MATRIX+10  CF086530
5291  1D23  P17  EQU  P_MATRIX+12  CF086540
5292  1D25  P18  EQU  P_MATRIX+14  CF086550
5293  1D27  P19  EQU  P_MATRIX+16  CF086560
5294  1D29  P21  EQU  P_MATRIX+18  CF086570
5295  1D2B  P22  EQU  P_MATRIX+20  CF086580
5296  1D2D  P23  EQU  P_MATRIX+22  CF086590
5297  1D2F  P24  EQU  P_MATRIX+24  CF086600
5298  1D31  P25  EQU  P_MATRIX+26  CF086610
5299  1D33  P26  EQU  P_MATRIX+28  CF086620
5300  1D35  P27  EQU  P_MATRIX+30  CF086630
5301  1D37  P28  EQU  P_MATRIX+32  CF086640
5302  1D39  P29  EQU  P_MATRIX+34  CF086650
5303  1D3B  P31  EQU  P_MATRIX+36  CF086660
5304  1D3D  P32  EQU  P_MATRIX+38  CF086670
5305  1D3F  P33  EQU  P_MATRIX+40  CF086680
5306  1D41  P34  EQU  P_MATRIX+42  CF086690
5307  1D43  P35  EQU  P_MATRIX+44  CF086700
5308  1D45  P36  EQU  P_MATRIX+46  CF086710
5309  1D47  P37  EQU  P_MATRIX+48  CF086720
5310  1D49  P38  EQU  P_MATRIX+50  CF086730
5311  1D4B  P39  EQU  P_MATRIX+52  CF086740
5312  1D4D  P41  EQU  P_MATRIX+54  CF086750
5313  1D4F  P42  EQU  P_MATRIX+56  CF086760
5314  1D51  P43  EQU  P_MATRIX+58  CF086770
5315  1D53  P44  EQU  P_MATRIX+60  CF086780
5316  1D55  P45  EQU  P_MATRIX+62  CF086790
5317  1D57  P46  EQU  P_MATRIX+64  CF086800
5318  1D59  P47  EQU  P_MATRIX+66  CF086810
5319  1D5B  P48  EQU  P_MATRIX+68  CF086820
5320  1D5D  P49  EQU  P_MATRIX+70  CF086830
5321  1D5F  P51  EQU  P_MATRIX+72  CF086840
5322  1D61  P52  EQU  P_MATRIX+74  CF086850
5323  1D63  P53  EQU  P_MATRIX+76  CF086860
5324  1D65  P54  EQU  P_MATRIX+78  CF086870
5325  1D67  P55  EQU  P_MATRIX+80  CF086880
5326  1D69  P56  EQU  P_MATRIX+82  CF086890
5327  1D6B  P57  EQU  P_MATRIX+84  CF086900
5328  1D6D  P58  EQU  P_MATRIX+86  CF086910
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5329    1D6F    P59          EQU     P_MATRIX+88                    CF086920
5330    1D71    P61          EQU     P_MATRIX+90                    CF086930
5331    1D73    P62          EQU     P_MATRIX+92                    CF086940
5332    1D75    P63          EQU     P_MATRIX+94                    CF086950
5333    1D77    P64          EQU     P_MATRIX+96                    CF086960
5334    1D79    P65          EQU     P_MATRIX+98                    CF086970
5335    1D7B    P66          EQU     P_MATRIX+100                   CF086980
5336    1D7D    P67          EQU     P_MATRIX+102                   CF086990
5337    1D7F    P68          EQU     P_MATRIX+104                   CF087000
5338    1D81    P69          EQU     P_MATRIX+106                   CF087010
5339    1D83    P71          EQU     P_MATRIX+108                   CF087020
5340    1D85    P72          EQU     P_MATRIX+110                   CF087030
5341    1D87    P73          EQU     P_MATRIX+112                   CF087040
5342    1D89    P74          EQU     P_MATRIX+114                   CF087050
5343    1D8B    P75          EQU     P_MATRIX+116                   CF087060
5344    1D8D    P76          EQU     P_MATRIX+118                   CF087070
5345    1D8F    P77          EQU     P_MATRIX+120                   CF087080
5346    1D91    P78          EQU     P_MATRIX+122                   CF087090
5347    1D93    P79          EQU     P_MATRIX+124                   CF087100
5348    1D95    P81          EQU     P_MATRIX+126                   CF087110
5349    1D97    P82          EQU     P_MATRIX+128                   CF087120
5350    1D99    P83          EQU     P_MATRIX+130                   CF087130
5351    1D9B    P84          EQU     P_MATRIX+132                   CF087140
5352    1D9D    P85          EQU     P_MATRIX+134                   CF087150
5353    1D9F    P86          EQU     P_MATRIX+136                   CF087160
5354    1DA1    P87          EQU     P_MATRIX+138                   CF087170
5355    1DA3    P88          EQU     P_MATRIX+140                   CF087180
5356    1DA5    P89          EQU     P_MATRIX+142                   CF087190
5357    1DA7    P91          EQU     P_MATRIX+144                   CF087200
5358    1DA9    P92          EQU     P_MATRIX+146                   CF087210
5359    1DAB    P93          EQU     P_MATRIX+148                   CF087220
5360    1DAD    P94          EQU     P_MATRIX+150                   CF087230
5361    1DAF    P95          EQU     P_MATRIX+152                   CF087240
5362    1DB1    P96          EQU     P_MATRIX+154                   CF087250
5363    1DB3    P97          EQU     P_MATRIX+156                   CF087260
5364    1DB5    P98          EQU     P_MATRIX+158                   CF087270
5365    1DB7    P99          EQU     P_MATRIX+160                   CF087280
                *                                                   CF087290
                *                                                     087300
                *                                                     087310
5366    1DB9    N_CTR_SAVE   BSSD    1                          11    087320
5367            SIGMA_SQ_N_COUNTER;                                   087330
5367    1DBB                 BSS     OS*3                             087340
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5368                        SIGMA_SQ_PHI_DOT_PHI_DOT;                    087350
5368  1DD3                        BSSD        OS*3                       087360
5369                        SIGMA_SQ_PHI_PHI_DOT;                        087370
5369  1E03                        BSSD        OS*3                       087380
5370                        SIGMA_SQ_PHI_PHI;                            087390
5370  1E33                        BSSD        OS*3                       087400
5371  1E63                  PHI_DOT_DR  BSSD        OS                   087410
5372                        PHI_DOT_ESTIMATE;                            087420
5372  1E73                        BSSD        OS*3                       087430
5373                        PHI_ESTIMATE;                                087440
5373  1EA3                        BSSD        OS*3                       087450
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                                **                                                                  TF087460
5374    1ED3                    Q_STORAGE   BSS         24                                          087470
5375    1EE8                    AVIONICS    BSSD        1                                           MT087480
5376    1EED                    PHI_SUB_M   BSSD        3                                           087490
5377    1EF3                    PHI_ZERO    BSS         3                                           087500
5378                            CALIBRATE_DATA:                                                     087510
5378    1EF6                                BSS         24                                          087520
5379    1F08                    NOISE_DATA  EQU         CALIBRATE_DATA+18                           087530
5380                            END_OF_BURST_DATA:                                                  087540
5380    1F08                                EQU         CALIBRATE_DATA+18                           087550
5381                            PHI_DOT_OR_BASE:                                                    087560
5381    1F0E                                BSS         9                                           087570
5382    1F17                    BURST_TIME  BSSD        1                                           087580
5383                            SS_PHI_M_BASE:                                                      087590
5383    1F19                                BSSD        3                                           087600
5384    1F1F                    PHI_M_BASE  BSSD        3                                           087610
5385    1F25                    RAW_M       BSSD        3                                           087620
5386                            DELTA_THETA_2:                                                      RU087630
5386    1F28                                BSSD        2                                           RU087640
5387                            DELTA_THETA_3:                                                      RU087650
5387    1F2D                                EQU         DELTA_THETA_2+2                             RU087660
5388    1F2F                    MODE_CHANGE BSS         1                                           087670
5389                            BEARING_TEMPS:                                                      087680
5389    1F30                                BSSD        6                                           087690
5390    1F3C                    PHI_OFFSET  BSS         1                                           **087700
5391    1F3D                    IMAGE11     BSS         2                                           CI087710
5392    1F3E                    IMAGE12     EQU         IMAGE11+1                                   CI087720
5393    1F3F                    IMAGE13     BSS         1                                           CI087730
                                *                                                                   087740
                                *   CONTROL AND INDICATOR VARIABLES                                 087750
                                *       ORDER CRITICAL - DO NOT DISTURB                             CI087760
5394    1F40                    CALLWORD    BSS         1                                           CI087770
5395    1F41                    ARGWORD1    BSS         1                                           CI087780
5396    1F42                    ARGWORD2    BSS         1                                           CI087790
5397    1F43                    LINKWORD    BSS         1                                           CI087800
5398    1F44                    PROCWORD    BSS         1                                           CI087810
5399    1F45                    PANELTIME   BSSD        1                                           CI087820
5400    1F47                    PANELMODE   BSS         4                                           CI087830
                                *       END OF ORDERED VARIABLES                                    CI087840
                                *                                                                   087850
                                *                       START - CRITICALLY ORDERED STORAGE          087860
                                *                                                                   087870
5401    1F48                    V_TAS_STAR  BSS         1                                           087880
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5402    1F4C    TIME_STAR   BSSD    1                                   087890
5403    1F4E    VC2_STAR    BSS     2                                   087900
5404    1F50    THA_P_STAR  BSSD    1                                   087910
5405    1F52    PSI_A_STAR  BSS     1                                   087920
5406            PANEL_BUFFER;                                           087930
5406    1F53                BSS     0                                   087940
5407            SMOOTH_DATA_STAR;                                       087950
5407    1F53                BSS     2                                   087960
5408    1F55    RIJ_STAR    BSSD    9                                   087970
5409    1F67    PANEL_DATA  BSS     0                                   087980
5410    1F67    SMOOTH_DATA BSS     2                                   087990
5411    1F69    RIJ         BSSD    9                                   088000
5412    1F69    R11         EQU     RIJ+00                              088010
5413    1F6B    R12         EQU     RIJ+02                              088020
5414    1F6D    R13         EQU     RIJ+04                              088030
5415    1F6F    R21         EQU     RIJ+06                              088040
5416    1F71    R22         EQU     RIJ+08                              088050
5417    1F73    R23         EQU     RIJ+10                              088060
5418    1F75    R31         EQU     RIJ+12                              088070
5419    1F77    R32         EQU     RIJ+14                              088080
5420    1F79    R33         EQU     RIJ+16                              088090
5421    1F7B    PANEL_BOUND BSS     0                                   088100
                *                                                       088110
                *           END STORAGE NOT CLEARED AT TURN ON          088120
                *                                                       088130
                *                       END - CRITICALLY ORDERED STORAGE 088140
                *                                                       088150
                *                                                       088160
5422    1F7B    H_BURST     BSSD    OS                                  088170
5423    1F8B    PSI_INSERT  BSS     1                                   088180
5424    1F8C    FLOATER     BSS     1                                  HH088190
5425            HEADING_MODE;                                           088200
5425    1F8D                BSS     2                                   088210
5426    1F8E    NAV_MODE    EQU     HEADING_MODE+1                      088220
5427            CHANNEL_FAIL;                                           088230
5427    1F8F                BSS     3                                   088240
5428    1F92    COS_THETA_P BSSD    2                                   088250
5429    1F94    SIN_THETA_P EQU     COS_THETA_P+2                       088260
5430            SAVE_POSITION_VARIANCES;                               CF088270
5430    1F96                BSSD    2                                  CF088280
5431            CALIBRATE_RESULTS;                                     HH088290
5431    1F9A                BSS     12                                 HH088300
                * YPA,YPA,YPA,XPA,XPA,XPA,YPB,YPB,YPB,XPB,XPB,XPB    12 SINGLE WORDS 088310
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1FA6          Y_P          BSS     12                                  088320
1FB2          RZ_C         BSSD    3                                   088330
1FB8          RZ_PCS       BSSD    3                                   088340
1FBE          RZ_BETA      BSSD    3                                   088350
              DESTINATION_LONGITUDE;                                   088360
1FC4                       BSSD    26                                  088370
              DESTINATION_LATITUDE;                                    088380
1FDE                       EQU     DESTINATION_LONGITUDE+26            088390
              INTERCEPT_LAT;                                           088400
1FF6                       EQU     DESTINATION_LATITUDE+24             088410
              INTERCEPT_LONG;                                          088420
1FDC                       EQU     DESTINATION_LONGITUDE+24            088430
1FD8          RZ_TIME      EQU     DESTINATION_LONGITUDE+20            088440
1FF2          RZ_RATE      EQU     DESTINATION_LATITUDE+20             088450
1FDA          RZ_ALPHA     EQU     RZ_TIME+2                           088460
1FDB          RZ_VEL       EQU     RZ_ALPHA+1                          088470
1FF4          V_INSERT     EQU     RZ_RATE+2                           088480
1FF8          DB_WAT       BSS     8                                   088490
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                                 **                                                    088500
                                 *                                                    CT088510
                                 *          CONDUCTIVITY TABLE                        CT088520
                                 *                                                    CT088530
5446   17DD  FFFFFFFF   LAT_N85_N90 COND   X(FFFFFFFF)                                CT088540
5447   17DF  F700                   CON    X(F700)                                    CT088550
5448   17E0  FFFFFF9C   LAT_N80_N85 COND   X(FFFFFF9C)                                CT088560
5449   17E2  BAA78B98               COND   X(BAA78B98)                                CT088570
5450   17E4  776579F7               COND   X(776579F7)                                CT088580
5451   17E6  DF5ECCF2   LAT_N75_N80 COND   X(DF5ECCF2)                                CT088590
5452   17E8  D7BABDFF               COND   X(D7BABDFF)                                CT088600
5453   17EA  F7CCBBBC               COND   X(F7CCBBBC)                                CT088610
5454   17EC  ABABD832               COND   X(ABABD832)                                CT088620
5455   17EE  0000002F               COND   X(0000002F)                                CT088630
5456   17F0  5CE0                   CON    X(5CE0)                                    CT088640
5457   17F1  EEF3CCF0   LAT_N70_N75 COND   X(EEF3CCF0)                                CT088650
5458   17F3  DDB97774               COND   X(DDB97774)                                CT088660
5459   17F5  6589BDCA               COND   X(6589BDCA)                                CT088670
5460   17F7  BDDF7EEF               COND   X(BDDF7EEF)                                CT088680
5461   17F9  499A9CCC               COND   X(499A9CCC)                                CT088690
5462   17FB  877BF260               COND   X(877BF260)                                CT088700
5463   17FD  0002EF70               COND   X(0002EF70)                                CT088710
5464   17FF  9B9BDCBB   LAT_N65_N70 COND   X(9B9BDCBB)                                CT088720
5465   1801  97A88865               COND   X(97A88865)                                CT088730
5466   1803  65557777               COND   X(65557777)                                CT088740
5467   1805  77778767               COND   X(77778767)                                CT088750
5468   1807  BCF09778               COND   X(BCF09778)                                CT088760
5469   1809  89999756               COND   X(89999756)                                CT088770
5470   180B  6669BE87               COND   X(6669BE87)                                CT088780
5471   180D  CF0E003A               COND   X(CF0E003A)                                CT088790
5472   180F  BDDF4D90               COND   X(BDDF4D90)                                CT088800
5473   1811  A99ABAA8   LAT_N60_N65 COND   X(A99ABAA8)                                CT088810
5474   1813  9A999987               COND   X(9A999987)                                CT088820
5475   1815  67777777               COND   X(67777777)                                CT088830
5476   1817  677A89AC               COND   X(677A89AC)                                CT088840
5477   1819  F1EB9999               COND   X(F1EB9999)                                CT088850
5478   181B  99998777               COND   X(99998777)                                CT088860
5479   181D  49DDDBBF               COND   X(49DDDBBF)                                CT088870
5480   181F  256F2EDF               COND   X(256F2EDF)                                CT088880
5481   1821  3C8B                   CON    X(3C8B)                                    CT088890
5482   1822  C9ABAAA9   LAT_N55_N60 COND   X(C9ABAAA9)                                CT088900
5483   1824  9AAAAA88               COND   X(9AAAAA88)                                CT088910
5484   1826  88645559               COND   X(88645559)                                CT088920
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5485  1828  DEEBCF5E              COND  X(DEEBCF5E)  CT088930
5486  182A  CDF1D899              COND  X(CDF1D899)  CT088940
5487  182C  9865BDCF              COND  X(9865BDCF)  CT088950
5488  182E  0857AFAA              COND  X(0857AFAA)  CT088960
5489  1830  F0D8D000              COND  X(F0D8D000)  CT088970
5490  1832  AAA8AAA9  LAT_N50_N55 COND  X(AAA8AAA9)  CT088980
5491  1834  9AAAAA76              COND  X(9AAAAA76)  CT088990
5492  1836  7755566A              COND  X(7755566A)  CT089000
5493  1838  EF1CFCE8              COND  X(EF1CFCE8)  CT089010
5494  183A  99AAA977              COND  X(99AAA977)  CT089020
5495  183C  B97878F8              COND  X(B97878F8)  CT089030
5496  183E  DDE8A800              COND  X(DDE8A800)  CT089040
5497  1840  AA88A88A  LAT_N45_N50 COND  X(AA88A88A)  CT089050
5498  1842  BAAAA977              COND  X(BAAAA977)  CT089060
5499  1844  6689789C              COND  X(6689789C)  CT089070
5500  1846  EFFF188A              COND  X(EFFF188A)  CT089080
5501  1848  AA989877              COND  X(AA989877)  CT089090
5502  184A  7E9CF8CA              COND  X(7E9CF8CA)  CT089100
5503  184C  A9A0                  CON   X(A9A0)      CT089110
5504  184D  98DDACD8  LAT_N40_N45 COND  X(98DDACD8)  CT089120
5505  184F  BAA9AAAA              COND  X(BAA9AAAA)  CT089130
5506  1851  AAA8A7DF              COND  X(AAA8A7DF)  CT089140
5507  1853  0DFFF198              COND  X(0DFFF198)  CT089150
5508  1855  A98AAA6A              COND  X(A98AAA6A)  CT089160
5509  1857  AFBCBCDC              COND  X(AFBCBCDC)  CT089170
5510  1859  8000                  CON   X(8000)      CT089180
5511  185A  ECB999A9  LAT_N35_N40 COND  X(ECB999A9)  CT089190
5512  185C  A9789999              COND  X(A9789999)  CT089200
5513  185E  AAABF0BF              COND  X(AAABF0BF)  CT089210
5514  1860  0DEFFF1D              COND  X(0DEFFF1D)  CT089220
5515  1862  A6ABAAC9              COND  X(A6ABAAC9)  CT089230
5516  1864  CFCCCEDF              COND  X(CFCCCEDF)  CT089240
5517  1866  1000                  CON   X(1000)      CT089250
5518  1867  DEEAA99A  LAT_N30_N35 COND  X(DEEAA99A)  CT089260
5519  1869  AAA89999              COND  X(AAA89999)  CT089270
5520  186B  AAAAEF0E              COND  X(AAAAEF0E)  CT089280
5521  186D  FFF488AA              COND  X(FFF488AA)  CT089290
5522  186F  A8A8EFC8              COND  X(A8A8EFC8)  CT089300
5523  1871  AAADE000              COND  X(AAADE000)  CT089310
5524  1873  AA8B98DB  LAT_N25_N30 COND  X(AA8B98DB)  CT089320
5525  1875  AAAA9999              COND  X(AAAA9999)  CT089330
5526  1877  9A99EFFF              COND  X(9A99EFFF)  CT089340
5527  1879  7CAADF1C              COND  X(7CAADF1C)  CT089350
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187B  FCC9AAAA                  COND   X(FCC9AAAA)   CT089360
187D  A000                      CON    X(A000)       CT089370
187E  AA9C7AAC      LAT_N20_N25 COND   X(AA9C7AAC)   CT089380
1880  F0EA99BC                  COND   X(F0EA99BC)   CT089390
1882  A9BCDFFF                  COND   X(A9BCDFFF)   CT089400
1884  8EC9CF0E                  COND   X(8EC9CF0E)   CT089410
1886  FCEA9A89                  COND   X(FCEA9A89)   CT089420
1888  A900                      CON    X(A900)       CT089430
1889  998ABACE      LAT_N15_N20 COND   X(998ABACE)   CT089440
188B  F1C9CF0E                  COND   X(F1C9CF0E)   CT089450
188D  8ACF1EFF                  COND   X(8ACF1EFF)   CT089460
188F  F9CCCDFC                  COND   X(F9CCCDFC)   CT089470
1891  EAAA9BAA                  COND   X(EAAA9BAA)   CT089480
1893  7998ADF4      LAT_N10_N15 COND   X(7998ADF4)   CT089490
1895  9F2ECBF1                  COND   X(9F2ECBF1)   CT089500
1897  EFFFBEDD                  COND   X(EFFFBEDD)   CT089510
1899  F0DEEF7C                  COND   X(F0DEEF7C)   CT089520
189B  99899AA0                  COND   X(99899AA0)   CT089530
189D  88A89BF4      LAT_N05_N10 COND   X(88A89BF4)   CT089540
189F  EEF2EF1E                  COND   X(EEF2EF1E)   CT089550
18A1  EFFFDEC9                  COND   X(EFFFDEC9)   CT089560
18A3  98CF7C77                  COND   X(98CF7C77)   CT089570
18A5  A879                      CON    X(A879)       CT089580
18A6  8778AEF8      LAT_N00_N05 COND   X(8778AEF8)   CT089590
18A8  EDF0CDFF                  COND   X(EDF0CDFF)   CT089600
18AA  FFCA8779                  COND   X(FFCA8779)   CT089610
18AC  FAE78000                  COND   X(FAE78000)   CT089620
18AE  9878EFAB      LAT_S05_S00 COND   X(9878EFAB)   CT089630
18B0  F0CEEF0E                  COND   X(F0CEEF0E)   CT089640
18B2  CEFFF9EA                  COND   X(CEFFF9EA)   CT089650
18B4  A9999B8E                  COND   X(A9999B8E)   CT089660
18B6  F889                      CON    X(F889)       CT089670
18B7  9978FCEE      LAT_S10_S05 COND   X(9978FCEE)   CT089680
18B9  F3ECDFFF                  COND   X(F3ECDFFF)   CT089690
18BB  9AAA9979                  COND   X(9AAA9979)   CT089700
18BD  98F8B900                  COND   X(98F8B900)   CT089710
18BF  A877F0DF      LAT_S15_S10 COND   X(A877F0DF)   CT089720
18C1  EEADDFFF                  COND   X(EEADDFFF)   CT089730
18C3  AC9A99A8                  COND   X(AC9A99A8)   CT089740
18C5  8EF8C900                  COND   X(8EF8C900)   CT089750
18C7  A98BF09F      LAT_S20_S15 COND   X(A98BF09F)   CT089760
18C9  DC89AAEF                  COND   X(DC89AAEF)   CT089770
18CB  FFAC89AA                  COND   X(FFAC89AA)   CT089780
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18CD  98EF8AA0                  COND   X(98EF8AA0)   CT089790
18CF  A8AF0EAF     LAT_S25_S20  COND   X(A8AF0EAF)   CT089800
18D1  BE88AAAA                  COND   X(BE88AAAA)   CT089810
18D3  BEFFF9E8                  COND   X(BEFFF9E8)   CT089820
18D5  AAA9AF9D                  COND   X(AAA9AF9D)   CT089830
18D7  9000                      CON    X(9000)       CT089840
18D8  99CFEE87     LAT_S30_S25  COND   X(99CFEE87)   CT089850
18DA  AAAAACFF                  COND   X(AAAAACFF)   CT089860
18DC  F9E7AAAD                  COND   X(F9E7AAAD)   CT089870
18DE  FBA0                      CON    X(FBA0)       CT089880
18DF  ACFFF08A     LAT_S35_S30  COND   X(ACFFF08A)   CT089890
18E1  DDAA9DFF                  COND   X(DDAA9DFF)   CT089900
18E3  FAC9AABF                  COND   X(FAC9AABF)   CT089910
18E5  8D00                      CON    X(8D00)       CT089920
18E6  FFF7CBF3     LAT_S40_S35  COND   X(FFF7CBF3)   CT089930
18E8  EEFFF5BA                  COND   X(EEFFF5BA)   CT089940
18EA  8DFD                      CON    X(8DFD)       CT089950
18EB  FFF8EF3D     LAT_S45_S40  COND   X(FFF8EF3D)   CT089960
18ED  FFF6BAFF                  COND   X(FFF6BAFF)   CT089970
18EF  FFFCEFFF     LAT_S50_S45  COND   X(FFFCEFFF)   CT089980
18F1  79DFF000                  COND   X(79DFF000)   CT089990
18F3  FFFFFFF5     LAT_S55_S50  COND   X(FFFFFFF5)   CT090000
18F5  BEFF                      CON    X(BEFF)       CT090010
18F6  FFFFF300     LAT_S60_S55  COND   X(FFFFF300)   CT090020
18F8  FFFFF300     LAT_S65_S60  COND   X(FFFFF300)   CT090030
18FA  F1A89D76     LAT_S70_S65  COND   X(F1A89D76)   CT090040
18FC  4566ADFC                  COND   X(4566ADFC)   CT090050
18FE  8F70                      CON    X(8F70)       CT090060
18FF  32213310     LAT_S75_S70  COND   X(32213310)   CT090070
1901  0000226F                  COND   X(0000226F)   CT090080
1903  5DED9994                  COND   X(5DED9994)   CT090090
1905  F3943300                  COND   X(F3943300)   CT090100
1907  00002210     LAT_S80_S75  COND   X(00002210)   CT090110
1909  00001398                  COND   X(00001398)   CT090120
190B  CCA52211                  COND   X(CCA52211)   CT090130
190D  12348A95                  COND   X(12348A95)   CT090140
190F  2200                      CON    X(2200)       CT090150
1910  00000000     LAT_S85_S80  COND   X(00000000)   CT090160
1912  00123445                  COND   X(00123445)   CT090170
1914  55532211                  COND   X(55532211)   CT090180
1916  12233333                  COND   X(12233333)   CT090190
1918  2200                      CON    X(2200)       CT090200
1919  00000000     LAT_S90_S85  COND   X(00000000)   CT090210
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5614    191B  00223333          COND    X(00223333)   CT090220
5615    191D  33322222          COND    X(33322222)   CT090230
5616    191F  22222222          COND    X(22222222)   CT090240
5617    1921  2100              CON     X(2100)       CT090250
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                                                                    090260
                **                                                  090270
                *                                                   CT090280
5618  1922 1919 COND_TABLE  CON   LAT_S90_S85                       CT090290
5619  1923 1910             CON   LAT_S85_S80                       CT090300
5620  1924 1907             CON   LAT_S80_S75                       CT090310
5621  1925 18FF             CON   LAT_S75_S70                       CT090320
5622  1926 18FA             CON   LAT_S70_S65                       CT090330
5623  1927 18F8             CON   LAT_S65_S60                       CT090340
5624  1928 18F6             CON   LAT_S60_S55                       CT090350
5625  1929 18F3             CON   LAT_S55_S50                       CT090360
5626  192A 18EF             CON   LAT_S50_S45                       CT090370
5627  192B 18EB             CON   LAT_S45_S40                       CT090380
5628  192C 18E6             CON   LAT_S40_S35                       CT090390
5629  192D 18DF             CON   LAT_S35_S30                       CT090400
5630  192E 18D8             CON   LAT_S30_S25                       CT090410
5631  192F 18CF             CON   LAT_S25_S20                       CT090420
5632  1930 18C7             CON   LAT_S20_S15                       CT090430
5633  1931 18BF             CON   LAT_S15_S10                       CT090440
5634  1932 18B7             CON   LAT_S10_S05                       CT090450
5635  1933 18AE             CON   LAT_S05_S00                       CT090460
5636  1934 18A6             CON   LAT_N00_N05                       CT090470
5637  1935 189D             CON   LAT_N05_N10                       CT090480
5638  1936 1893             CON   LAT_N10_N15                       CT090490
5639  1937 1889             CON   LAT_N15_N20                       CT090500
5640  1938 187E             CON   LAT_N20_N25                       CT090510
5641  1939 1873             CON   LAT_N25_N30                       CT090520
5642  193A 1867             CON   LAT_N30_N35                       CT090530
5643  193B 185A             CON   LAT_N35_N40                       CT090540
5644  193C 184D             CON   LAT_N40_N45                       CT090550
5645  193D 1840             CON   LAT_N45_N50                       CT090560
5646  193E 1832             CON   LAT_N50_N55                       CT090570
5647  193F 1822             CON   LAT_N55_N60                       CT090580
5648  1940 1811             CON   LAT_N60_N65                       CT090590
5649  1941 17FF             CON   LAT_N65_N70                       CT090600
5650  1942 17F1             CON   LAT_N70_N75                       CT090610
5651  1943 17E6             CON   LAT_N75_N80                       CT090620
5652  1944 17E0             CON   LAT_N80_N85                       CT090630
5653  1945 170D END_COND_T  CON   LAT_N85_N90                       CT090640
5654  1946 C72C END_CKSUM   ECS                                     0090640
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                                                                                                                  1090650
                                                  TAPE          4,X(73)                                          090660
                                                  TAPE          3,12                                             090670
                                                  TAPE          4,X(F1)                                          090680
                                                  TAPE        1                                                  090690
                1947                              SCS                                                            090700
                015F                  HOT         EQU         OMEGA_TASK_TABLE/2                                 090710
                0156                              ORG         PROG_ID_DB                                         090720
                0156  0100                        CON         X(0100)        DISPLAY 01 FOR DEBUG ON C_I         090730
                1947                              ORG         END_CKSUM+1                                        090740
                                      OMEGA_DEBUG ;                                                              090750
      4R        1947  D009   (1951)               1BUC        OMEGA_DEBUG_ENTRY                                  090760
      4R        1948  D00F   (1958)   $2          1BUC        OMEGA_DEBUG_ENTRY$2                               1090770
     14R        1949  D510            AD_IO_TEST  2BBK        1                                                 2090780
      4R        194A  D000                        FILL
     14R        194B  D510            GP_TEST     2BBK        1                                                 3090790
      4R        194C  D000                        FILL
     14R        194D  D510            OSC_TEST    2BBK        1                                                  090800
      4R        194E  D000                        FILL
     70R        194F  0800                        OMEGA       SYNC1/2-HOT                                       5090810
     78         1950  D5F0                        BBK         15                                                6090820
```

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                                                  **
                                                  *   DEBUG PROGRAM
                                                  *   INCLUDE THE FOLLOWING CONSTANTS
                                                  *       HX1000, HX001F, HX007E, HX000F, HX0007
                                                  *   HAVE FOLLOWING LABELS:
                                                  *   1   ROLL          FIRST BSS
                                                  *   2   START_CKSUM   START OF CHECKSUM AREA
                                                  *   3   END_CKSUM     CHECKSUM AT END OF CHECKSUM AREA
                                                  *   DEBUG USES THE SPACE BETWEEN 1 AND 3
                                                  *      REGISTERS USED
                                                  *         0   SCRATCH
                                                  *         1   CURRENT ADDRESS
                                                  *         2   DATA 1
                                                  *         3   DATA 2
                                                  *         4   HEX-KEY
                                                  *         5   UPDATE INDEX
                                                  *         6   DISPLAY MODE
                                                  *         7   HOLD MARKER
                                                  *         8   PATCH ADDRESS
                                                  *         9   CORR. ADDRESS
5671                                              OMEGA_DEBUG_ENTRY;
5671      10R      1951  FC0A014D                        CLAD      0,,DB_PCHAD
5672      38R      1953  FC7C0C78                $1      FET       7,,DB_MODE
5673      46       1955  F40F8E10                        SNS       0,,PMU_KEYBOARD_REQUEST
5674      50       1957  D258   (1980)                   BRL       DB_UPDATE      NO KEY
5675       8R      1958  F80FCE0B                $2      IOC       0,,READ_PMU_KEYBOARD
5676      18       195A  F40D00D0                        PIP       0,,PMU_INPUT
5677      24       195C  9E50   (00D0)                   CLA       0,,PMU_INPUT
5678      28       195D  F809FFFF                        COMM      0,,X(FFFF)
5679      32       195F  D014   (1964)                   BNE       DB_DECODE
5680       2R      1960  9C00                            CLAM      0,,0           NO PMU
5681      10       1961  7050   (00D0)                   STA       0,,PMU_INPUT
5682      16       1962  040019B9                        BUC       DB_PNBWE$4
                                                  *   DECODE KEYBOARD INPUT
5683       8R      1964  E47000E1                DB_DECODE EXT       7,0,HX1000     BIT 13
5684      16       1966  E4001775                        EXT       0,0,HX001F     BITS 1 THROUGH 5
5685      20       1968  F809001B                        COMM      0,,27
5686      24       196A  D125   (1980)                   BGE       DB_UPDATE
5687       2R      196B  980F                            COMM      0,,15
5688      12       196C  C7031A40                        BRG       IX0,,DB_JUMP_TABLE-16
                                                  *   HEXADECIMAL CHARACTER RECEIVED
5689       2R      196E  9840                            COMM      4,,0           TEST HEX_KEY
5690       8       196F  040519CB                        BRL       DB_HEX         DISPLAY SELECT
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5691   4R   1971 D036   (1978)                BRG     $2              NEW ADDRESS                  DB091260
5692   2R   1972 9C10                         CLAM    1,,0                                         DB091270
5693   4    1973 9C41                         CLAM    4,,1                                         DB091280
5694   4R   1974 F4140010          $1         LSA     1,,4            CONTINUE ADDRESS             DB091290
5695   6    1976 B410                         ADD     1,0                                          DB091300
5696  10    1977 D008   (1980)                BUC     DB_UPDATE                                    DB091310
5697   2R   1978 9842              $2         COMM    4,,2                                         DB091320
5698   6    1979 D856   (1974)                BRL     $1                                           DB091330
5699   4R   197A D032   (197D)                BRG     $3                                           DB091340
5700   4R   197B B822                         SUBD    2,2             NEW DATA                     DB091350
5701   6    197C 9C43                         CLAM    4,,3                                         DB091360
5702   6R   197D FC240010          $3         LSAD    2,,4            CONTINUE DATA                DB091370
5703   8    197F B430                         ADD     3,0                                          DB091380
                                  *   UPDATE DISPLAY                                               DB091390
5704   8R   1980 F40F8E30          DB_UPDATE  SNS     PMU_DISPLAY_BUSY                             DB091400
5705  12    1982 D22F   (19B2)                BGE     DB_PNBWE$2                                   DB091410
5706   2R   1983 9451                         ADDM    5,1                                          DB091420
5707  10    1984 E455176E                     EXT     5,5,HX0007                                   DB091430
5708  14    1986 D217   (19AE)                BNE     DB_PNBWE$1                                   DB091440
                                  *   FILL DISPLAY BUFFER                                          DB091450
5709  10R   1987 8427                         FETM    2,,7                                         DB091460
5710  12    1988 9C0C                         CLAM    0,,ALPHA+BETA   MASK FOR MRG                 DB091470
5711  14    1989 9890                         COMM    9,,0            TEST MODE                    DB091480
5712  18    198A D026   (1991)                BGE     DB_SPECIALS$4                                DB091490
5713   8R   198B F51A1FF8          DB_SPECIALS CLA    X1,,DB_WAT                                   DB091500
5714  18    198D F11700AA                     STA     X1,,DB_BUFFER                                DB091510
5715  26    198F C415   (1988)                BXU     1,,DB_SPECIALS                               DB091520
5716   4R   1990 D10C   (19AD)                BUC     DB_PNBWE                                     DB091530
5717  12R   1991 E09000A1          $4         MRG     9,0,PMU_INDICATOR_WORD                       DB091540
5718  16    1993 D06A   (199E)                BRE     $1              SKIP UNLESS WRITE OR PATCH MODE DB091550
5719   2R   1994 9C23                         CLAM    2,,3                                         DB091560
5720  14    1995 F85700AE                     STAD    5,,DB_BUFFER+4                               DB091570
5721  16    1997 9898                         COMM    9,,ALPHA                                     DB091580
5722  20    1998 D06A   (19A3)                BRE     $2              SKIP IF WRITE MODE           DB091590
5723  10R   1999 F0B700B0                     STA     11,,DB_BUFFER+6 SHOW NEXT PATCH ADDRESS      DB091600
5724  16    199B A5B0                         CLA     X11,,0          AND CONTENTS                 DB091610
5725  24    199C 7031   (00B1)                STA     0,,DB_BUFFER+7                               DB091620
5726  28    199D D00F   (19AD)                BUC     DB_PNBWE                                     DB091630
5727   8R   199E F40A1FFE          $1         CLA     0,,DB_WAT+6     TEST FOR (CA) DISPLAY        DB091640
5728  14    19A0 9A7C   (00FC)                COM     0,,DB_M1_ADD    IN DISPLAY MODE              DB091650
5729  18    19A1 D011   (19A3)                BNE     $2                                           DB091660
5730   2R   19A2 9C25                         CLAM    2,,5            BLOCK CA OVERWRITE           DB091670
5731  10R   19A3 F04700B0          $2         STA     4,,DB_BUFFER+6 PREPARE TO SHOW CA, (CA)      DB091680
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5732    16    19A5  A540                      CLA     X4,,0                                  DB091690
5733    24    19A6  7031   (00B1)             STA     0,,DB_BUFFER+7                         DB091700
5734     8R   19A7  F51A1FF8           $3     CLA     X1,,DB_WAT                             DB091710
5735    14    19A9  A500                      CLA     X0,,0                                  DB091720
5736    24    19AA  F11700AA                  STA     X1,,DB_BUFFER                          DB091730
5737    32    19AC  C416   (19A7)             BXU     1,,$3                                  DB091740
                         *   POP NEXT BUFFER WORD AND EXIT                                   DB091750
5738    12R   19AD  D720              DB_PNBWE  PRN     2                                      DB091760
5739    10R   19AE  F95FDE00          $1        IOC     X5,,LOAD_PMU_REGISTER                  DB091770
5740    20    19B0  FD5D00AA                    POP     X5,,DB_BUFFER                          DB091780
5741     6R   19B2  9E21   (00A1)     $2        CLA     0,,PMU_INDICATOR_WORD                  DB091790
5742    16    19B3  F10F8E10                    SET     X0,,PMU_INDICATORS                     DB091800
5743    18    19B5  9870                        COMM    7,,0            TEST HOLD MARKER       DB091810
5744    22    19B6  D015   (19BC)             BNE     $5              HOLD MODE              DB091820
5745     2R   19B7  9C00          $3          CLAM    0,,0            SET ZERO INDICATOR     DB091830
5746     4    19B8  DF10                      LGC     1,,0            ENABLE INTERRUPTS      DB091840
5747    38R   19B9  F4770078      $4          PTR     7,,DB_MODE                             DB091850
5748    52    19BB  D510                      BBK     1                                      DB091860
5749     2R   19BC  DF00          $5          LGC     0,,0            INHIBIT INTERRUPTS     DB091870
5750    40    19BD  F4770078                  PTR     7,,DB_MODE                             DB091880
5751    46    19BF  04001951                  BUC     OMEGA_DEBUG_ENTRY     LOOP WITHIN DEBUG 091890
                         *   ACTION ROUTINES FOR NON-HEX CHARACTERS                          DB091900
5752     2R   19C1  8C41          DB_DISPLAY CLSM    4,,1            SET HEX-KEY _VE FOR DISPLAY DB091910
5753     8    19C2  04001980                  BUC     DB_UPDATE                              DB091920
5754     2R   19C4  9C42          DB_DATA    CLAM    4,,2            SET HEX-KEY FOR DATA   DB091930
5755     4    19C5  9E6C                      COMM    6,,ALPHA+BETA   TEST FOR PATCH MODE     DB091940
5756    10    19C6  04061980                  BRE     DB_UPDATE                              DB091950
5757     2R   19C8  9C68                      CLAM    6,,ALPHA        SET WRITE MODE         DB091960
5758     8    19C9  04001980                  BUC     DB_UPDATE                              DB091970
                         *   DISPLAY SELECT                                                  DB091980
5759     2R   19CB  9809          DB_HEX     COMM    0,,9                                   DB091990
5760     6    19CC  D168   (19E5)             BRE     $10             SPECIAL                DB092000
5761     4R   19CD  D038   (19D6)             BRG     $7              A TO F                 DB092010
5762     2R   19CE  9800                      COMM    0,,0                                   DB092020
5763     6    19CF  D161   (19E1)             BRE     $9                                     DB092030
5764     4R   19D0  F4091FF7                  ADDM    0,,DB_WAT-1     1 TO 8                 DB092040
5765     8R   19D2  7210          $8         STA     I1,0            STORE IN WAT           DB092050
5766     2R   19D3  9C40          $6         CLAM    4,,0            RESET HEX-KEY TO NEW ADDRESS DB092060
5767     8    19D4  04001980                  BUC     DB_UPDATE                              DB092070
5768     2R   19D6  8400          $7         ADD     0,0                                    DB092080
5769     6    19D7  F809001C                  COMM    0,,28                                  DB092090
5770    10    19D9  D827   (19D3)             BGE     $6              E OR F                 DB092100
5771     4R   19DA  F4091FE5                  ADDM    0,,DB_WAT-19    DOUBLE                 DB092110
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5772    6        19DC  9411                    ADDM    1,,1                                    DB092120
5773    14       19DD  7210                    STA     I1,0                                    DB092130
5774    16       19DE  9011                    SUBM    1,,1                                    DB092140
5775    18       19DF  9001                    SUBM    0,,1                                    DB092150
5776    22       19E0  D80F   (19D2)           BUC     $8                                      DB092160
5777    6R       19E1  9E7C   (00FC)  $9       CLA     0,,DB_M1_ADD    CURRENT ADDRESS         DB092170
5778    16       19E2  F0071FFE                STA     0,,DB_WAT+6                             DB092180
5779    20       19E4  D902   (19D3)           BUC     $6                                      DB092190
5780    2R       19E5  9860           $10      COMM    6,,0            WAT DISPLAY - IGNORE IF DB092200
5781    6        19E6  D934   (19D3)           BRC     $6              WRITE ENABLED           DB092210
5782    2R       19E7  8C61                    CLSM    6,,1                                    DB092220
5783    6        19E8  D906   (19D3)           BUC     $6                                      DB092230
5784    2R       19E9  9411           DB_INCR  ADDM    1,,1            ADVANCE CRNT ADDRESS    DB092240
5785    4        19EA  9868                    COMM    6,,ALPHA        TEST FOR WRITE MODE     DB092250
5786    8        19EB  D100   (19FC)           BUC     DB_WRITE1$2                             DB092260
5787    2R       19EC  986C           DB_CLEAR COMM    6,,ALPHA+BETA   TEST FOR PATCH MODE     DB092270
5788    8        19ED  04061980                BRE     DB_UPDATE                               DB092280
5789    2R       19EF  9C60                    CLAM    6,,0                                    DB092290
5790    6        19F0  D90E   (19D3)           BUC     DB_HEX$6                                DB092300
5791    2R       19F1  A402           DB_WRITE2 CLA    0,2             WRITE LEFT HALF         DB092310
5792    10  *    19F2  F80D1A28                BSV     DB_WRITE                                DB092320
5793    12       19F4  9411                    ADDM    1,,1            ADVANCE CURRENT ADDRESS DB092330
5794    20  *    19F5  F80D1A2A                BSV     WRITE_DATA      RIGHT HALF              DB092340
5795    22       19F7  9011                    SUBM    1,,1                                    DB092350
5796    26       19F8  D002   (19FB)           BUC     DB_WRITE1$1                             DB092360
5797    8R  *    19F9  F80D1A2A       DB_WRITE1 BSV    WRITE_DATA      RIGHT HALF              DB092370
5798    2R       19FB  986C           $1       COMM    6,,ALPHA+BETA   TEST FOR PATCH MODE     DB092380
5799    4R       19FC  DA5A   (19D3)  $2       BRL     DB_HEX$6                                DB092390
5800    2R       19FD  9C42           $3       CLAM    4,,2            SET HEX-KEY FOR DATA    DB092400
5801    8        19FE  04001980                BUC     DB_UPDATE                               DB092410
5802    2R       1A00  9868           DB_PATCH COMM    6,,ALPHA        TEST FOR WRITE MODE     DB092420
5803    6        1A01  DA1F   (19D3)           BNE     DB_HEX$6        IGNORE IF NOT           DB092430
5804    10R      1A02  F01700A0                STA     1,,DB_SAVE      SAVE CA FOR CLEAR AND RETURN BUC DB092440
5805    22       1A04  C211                    FET     I1,1            SAVE LONG INSTRUCTION   DB092450
5806    36       1A05  F41700AA                PTR     1,,DB_BUFFER    IN DISPLAY BUFFER       DB092460
5807    46       1A07  FC87C031                STA     8,,DB_SAVEPATCHSTART                    DB092470
5808    48       1A09  9C6C                    CLAM    6,,ALPHA+BETA   SET PATCH MODE          DB092480
5809    54       1A0A  9E2A   (00AA)           CLA     0,,DB_BUFFER    TRANSPLANT SAVED INSTRUCTION DB092490
5810    62  *    1A0B  F80D1A28                BSV     DB_WRITE                                DB092500
5811    68       1A0D  9E28   (00A8)           CLA     0,,DB_BUFFER+1                          DB092510
5812    76  *    1A0E  F80D1A28                BSV     DB_WRITE                                DB092520
5813    80       1A10  D904   (19FD)           BUC     DB_WRITE1$3                             DB092530
5814    2R       1A11  986C           DB_RETURN COMM   6,,ALPHA+BETA   TEST FOR PATCH MODE     DB092540
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5815      6        1A12  D113   (1A26)                BNE     DB_END_PCH$2   IF NOT, IGNORE                 DB092550
5816      8R *     1A13  F80D1A28                      BSV     WRITE_LBUC     BUILD RETURN BUC               DB092560
5817     14        1A15  9E20   (00A0)                CLA     0,,DB_SAVE                                    DB092570
5818     16        1A16  9402                          ADDM    0,,2                                          DB092580
5819     24 *      1A17  F80D1A2B                      BSV     DB_WRITE                                      DB092590
5820      2R       1A19  986C            DB_END_PCH    COMM    6,,ALPHA+BETA  TEST FOR PATCH MODE            DB092600
5821      6        1A1A  D01A   (1A25)                BNE     $1             DECREMENT CA IF DISPLAY OR WRITE DB092610
5822      2R       1A1B  9C68                          CLAM    6,,ALPHA       FORCE FROM PATCH TO WRITE      DB092620
5823     10        1A1C  F41A00A0                      CLA     1,,DB_SAVE     RESTORE CA                     DB092630
5824     18 *      1A1E  F80D1A28                      BSV     WRITE_LBUC     BUILD AND PLANT LBUC TO PATCH  DB092640
5825     20        1A20  9411                          ADDM    1,,1                                          DB092650
5826     28        1A21  F40A0031                      CLA     0,,DB_SAVEPATCHSTART LSH OF LBUC              DB092660
5827     36 *      1A23  F80D1A2B                      BSV     DB_WRITE                                      DB092670
5828      2R       1A25  9011            $1            SUBM    1,,1           RESTORE OR DECRMNT, MODE DEPNDNT DB092680
5829      6R       1A26  040019D3        $2            BUC     DB_HEX$6                                      DB092690
5830      6R       1A28  9E5F   (00DF)   WRITE_LBUC    CLA     0,,HX0400                                     DB092700
5831     10        1A29  D001   (1A2B)                BUC     DB_WRITE                                      DB092710
5832      2R       1A2A  A403            WRITE_DATA    CLA     0,3                                           DB092720
5833      2R       1A2B  9868            DB_WRITE      COMM    6,,ALPHA       TEST MODE                      DB092730
5834      6        1A2C  D250   (1A4D)                BRL     $7             NO WRITE ENABLE                DB092740
5835      4R       1A2D  D064   (1A32)                BRE     $1                                            DB092750
5836      6R       1A2E  C008                          FET     0,8            PATCH MODE                     DB092760
5837     16        1A2F  782C   (00AC)                STAD    0,,DB_BUFFER+2 DISPLAY                        DB092770
5838     18        1A30  9491                          ADDM    9,,1           ADVANCE PATCH ADDRESS          DB092780
5839     22        1A31  D001   (1A33)                BUC     $2                                            DB092790
5840      6R       1A32  C001            $1            FET     0,1            CHANGE MODE                    DB092800
5841      8R       1A33  C100            $2            FET     X0,,0          OLD DATA                       DB092810
5842     16        1A34  F00F8E20                      SET     DISABLE_MEMORY_PROTECT                        DB092820
5843     24        1A36  7221                          STA     I2,1           NEW DATA                       DB092830
5844     26        1A37  B002                          SUB     0,2            OLD - NEW FOR CHECKSUM         DB092840
                                        *   COMPARE WITH CHECKSUM LIMITS (32K ONLY)                           DB092850
5845     30        1A38  F81900D5                      COMM    1,,START_CKSUM                                DB092860
5846     34        1A3A  D05F   (1A4A)                BRL     $6                                            DB092870
5847      4R       1A3B  F8191B3C                      COMM    1,,ROLL                                       DB092880
5848      8        1A3D  D02C   (1A4A)                BGE     $6                                            DB092890
5849      8R       1A3E  F40B0158                      ADD     0,,DB_CKSUM                                   DB092900
5850     10        1A40  9888                          COMM    8,,ALPHA                                      DB092910
5851     14        1A41  D063   (1A45)                BRE     $8             CHANGE MODE                    DB092920
5852      2R       1A42  9001            $5            SUBM    0,,1           ALLOW FOR INCREMENT OF PATCH ADD DB092930
5853     12        1A43  F0A7014D                      STA     10,,DB_PCHAD                                  DB092940
5854     10R       1A45  F0070158        $8            STA     0,,DB_CKSUM                                   DB092950
5855     12        1A47  9C01                          CLAM    0,,1                                          DB092960
5856     22        1A48  F0071C05                      STA     0,,DB_CKSUM_IGNORE MRKR FOR PRESENT CKSUM PASS DB092970
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5857        8R      1A4A  F00F8E21      $6          SET     ENABLE_MEMORY_PROTECT      D8092980
5858        22      1A4C  0510                      BBK     1                          D8092990
5859        2R      1A4D  94E2          $7          ADDM    14,,2                      D8093000
5860        8       1A4E  04001903                  BUC     DB_HEX$6                   D8093010
```

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                                 **                                                  DB093020
                                 *          KEYBOARD CODING AND LAYOUT               DB093030
                                 *                                                  DB093040
                                 *   -------              ---------------           DB093050
                                 *   |21     |            |22     |25     |          DB093060
                                 *   |       |            | WRITE | WRITE |          DB093070
                                 *   |       |            |   1   |   2   |          DB093080
                                 *   | CLEAR |            |-------|-------|          DB093090
                                 *   |       |            |17     |26     |          DB093100
                                 *   |       |            | PATCH |       |          DB093110
                                 *   |       |     HEX    |       |       |          DB093120
                                 *   |-------|            |-------|  INC  |          DB093130
                                 *   |20     |     KEYS   |18     |       |          DB093140
                                 *   |       |            |RETURN |       |          DB093150
                                 *   |       |            |       |       |          DB093160
                                 *   | DISP  |            |-------|-------|          DB093170
                                 *   |       |            |19     |24     |          DB093180
                                 *   |       |            |END PCH| DATA  |          DB093190
                                 *   |       |            |       |       |          D3093200
                                 *   -------              ---------------           DB093210
                                 *                                                  DB093220
                                 *   JUMP TABLE FOR ACTION KEYS                     DB093230
5861                             DB_JUMP_TABLE:                                     DB093240
5861          1A50  1980                   CON        DB_UPDATE                    DB093250
5862          1A51  1A00                   CON        DB_PATCH                     DB093260
5863          1A52  1A11                   CON        DB_RETURN                    DB093270
5864          1A53  1A19                   CON        DB_END_PCH                   DB093280
5865          1A54  19C1                   CON        DB_DISPLAY                   DB093290
5866          1A55  19EC                   CON        DB_CLEAR                     DB093300
5867          1A56  19F9                   CON        DB_WRITE1                    DB093310
5868          1A57  1980                   CON        DB_UPDATE                    DB093320
5869          1A58  19C4                   CON        DB_DATA                      DB093330
5870          1A59  19F1                   CON        DB_WRITE2                    DB093340
5871          1A5A  19E9                   CON        DB_INCR                      DB093350
5872          1A5B  C8F6                   ECS                                       093360
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                                                                                  093370
                                                  TAPE        4,X(73)                 093380
                                                  TAPE        3,12                    093390
                                                  TAPE        4,X(71)                 093400
                                                  TAPE        1                       093410
                1A5C                              SCS                                 093420
                0156                              ORG         PROG_ID_DB              093430
                0156  0000                        CON         0           DISPLAY 00 FOR BIT ON C_I   093440
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                                                                                                                    093450
                                                                                                                    093460
                    *    PRE-FLIGHT RUNNING TESTS                                                                  TS093470
                    *        THIS IS THE FIRST OMEGA TASK                                                          TS093480
                    *        R0,1 = TIME                                                                           TS093490
5880        1947                    ORG         END_CKSUM+1                                                         093500
5881   14R  1947  D510              BBK         1                       OMEGA_DEBUG ENTRY                           093510
5882   30R  1948  D590              BBK         9                         '     '  $2 ENTRY                       093520
5883    6R  1949  04001984          2BUC        AD_IO_TEST_ENTRY                                                    093530
5884    6R  194B  04001A31          2BUC        GP_TEST_ENTRY                                                       093540
5885    6R  194D  04001A63          2BUC        OSC_TEST_ENTRY                                                      093550
5886                    PREFLIGHT_TEST,;                                                                            TS093560
5886   70R  194F  0809              PREAMP_TEST OMEGA       TEST2/2-HOT     "NEXT TST AFTER A 1 SEC DELAY       TS093570
                    *                                                       "INITIALIZE PREC. FREQUENCY         *I093580
5887   78   1950  030A                        SET         RESET_PFG_COUNTDOWN  "GENERATOR IN RCVR                TS093590
                    *                                                       "RESET ALL TEST SIGNALS IN          *I093600
5888  124   1951  3000                        SIGNAL      0               "TEST SIGNAL OUTPUT WORD            TS093610
5889  132   1952  8655   (00D5)               FET         0,,HX0001       "OUTPUT SIGNALS TO                  TS093620
5890    8R  1953  C010            $11         FET         1,0             "ANTENNA SWITCHING MATRICES         TS093630
5891   26   1954  F427002C                    PTR         2,,ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2             TS093640
5892   34   1956  8410                        FETM        1,,0            "CLEAR SIN/COS REGISTERS            TS093650
5893   48   1957  F4170011                    PTR         1,,COS_10_2     "TO START DATA COLLECTION           TS093660
                    *                                                       "                                   TS093670
5894   56   1959  D5F0                        BBK         15              "RETURN TO $1 AFTER 1 SEC           TS093680
                    *                                                                                           TS093690
                    *                                                       "SET NEXT OMEGA TASK = $2           *I093700
5895   70R  195A  080A            $1          OMEGA       TEST3/2-HOT     "TO OCCUR AFTER 1 SEC DELAY         TS093710
5896   78   1958  8410                        FETM        1,,0            "COMPUTE ANGLE FOR LOOP A           TS093720
5897   92   195C  F01C0011                    FET         1,,COS_10_2                                         TS093730
5898   94   195E  A421                        CLA         2,1                                                 TS093740
5899   96   195F  B011                        SUB         1,1                                                 TS093750
5900  634   1960  1800                        ATAN        0               "COMPUTE ANGLE FOR LOOP A.          TS093760
5901  648   1961  F4171F30                    PTR         1,,BEARING_TEMPS  SAVE FOR TEST                      TS093770
5902  656   1963  8657   (00D7)               FET         0,,HX0004       "SELECT LOOP B SIGNAL               TS093780
5903  660   1964  D902   (1953)               BUC         $11                                                 TS093790
                    *                                                                                           TS093800
5904    8R  1965  8410            $2          FETM        1,,0                                                TS093810
5905   22   1966  F01C0011                    FET         1,,COS_10_2                                          093820
5906   24   1968  A421                        CLA         2,1                                                  093830
5907   26   1969  B011                        SUB         1,1                                                  093840
5908  564   196A  1800                        ATAN        0               "COMPUTE ANGLE LOOP B               TS093850
5909  572   196B  F00B1F30                    SUB         0,,BEARING_TEMPS                                     093860
5910  576   196D  D021   (196F)               BGE         $4                                                   093870
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5911      2R      196E  A000                      CLS     0,0                                                  093880
5912      4R      196F  F8090580          $4      COMM    0,,PREAMP_TEST_ANGLE_LIMIT                           093890
5913      12      1971  8410                      FETM    1,0                                                  TS093900
5914      16      1972  D034   (1977)             BRG     $12                                                  TS093910
                        *       TEST PASS                                                                      *H093920
                        *                                                 FALL THROUGH                         093930
5915      14R     1973  D730              $21     PRN     3                                                    093940
5916      86      1974  F8000013                  OMEGA   TEST12/2-HOT    "SET NEXT OMEGA TASK RF TEST         093950
5917      94      1976  D5F0                      BBK     15                                                   093960
                        *         TEST  FAIL                                                                   TS093970
                        *                                                 "TEST FAIL-TURN ON MALF LAMP         *I093980
5918      18R *   1977  2EDC   (00DC)      $12     FAILD   I0,,HX0080     "                                    093990
                        *                                                 "POST ERROR TYPE IN FAIL WORD        *I094000
5919      30  *   1978  340F                      MARK    0,,15           "PREAMP - BIT 16                     TS094010
5920      34      1979  D807   (1973)             BUC     $21                                                  TS094020
5921      70R     197A  C808              RF_TEST OMEGA   TEST4/2-HOT    "TO OCCUR AFTER A 1 SEC DELAY        TS094030
5922      78      197B  8659   (00D9)             FET     0,,HX0010       "SELECT TEST+90 DEG SIGNAL           TS094040
5923      8R      197C  C010              $11     FET     1,0             "OUTPUT SELECTED SIGNAL TO ALL 3     TS094050
                        *                                                 "ANTENNA SWITCHING MATRICIES         TS094060
5924      26      197D  F427002C                  PTR     2,,ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2              TS094070
5925      16R     197F  8450              $9      FETM    5,,0            "CLEAR SIN/COS REGISTERS FOR ALL     TS094080
5926      46      1980  F4570011                  PTR     5,,COS_10_2     "3 FREQ TO START DATA COLLECTION     TS094090
                        *                                                 "                                    TS094100
5927      54      1982  D5F0                      BBK     15              "RETURN TO $1 OR $2 AFTER 1 SEC      TS094110
                        *                                                                                      TS094120
                        *                                                 "SET NEXT OMEGA TASK = RF TEST $2    *I094130
5928      70R     1983  C80D              $1      OMEGA   TEST6/2-HOT     "TO OCCUR AFTER A 1 SECOND DELAY     TS094140
5929      100     1984  F05C0011                  FET     5,,COS_10_2     "READ SIN/COS DATA COLLECTED WITH    TS094150
                        *                                                 "TEST + 90 SIGNAL                    TS094160
5930      130     1986  F4571F30                  PTR     5,,BEARING_TEMPS                                     TS094170
5931      138     1988  865A   (00DA)             FET     0,,HX0020       "SELECT TEST SIGNAL                  *S094180
5932      142     1989  D80E   (197C)             BUC     $11                                                  TS094190
                        *                                                                                      TS094200
5933      10R     198A  8424              $2      FETM    2,,4            "SET UP 3 COUNTER TO CYCLE THE       TS094210
                        *                                                 "3 FREQ IF PREFLIGHT ENTRY           TS094220
5934      6R      198B  8400              $4      FETM    0,,0            "READ SIN/COS FOR THIS FREQ FROM     TS094230
5935      16      198C  F12C0012                  FET     X2,,SIN_10_2    "SIN/COS REGISTERS.  THIS DATA       TS094240
5936      22      198E  8400                      FETM    0,,0            "WAS COLLECTED WITH TEST SIGNAL      TS094250
5937      32      198F  F14C0011                  FET     X4,,COS_10_2    "                                    TS094260
5938      570     1991  1800                      ATAN    0               "FORM ALPHA(T) = ATAN SIN/COS        TS094270
5939      576     1992  8400                      FETM    0,,0            "READ SAVED SIN/COS FOR TEST +90     *S094280
5940      586     1993  F14C1F31                  FET     X4,,BEARING_TEMPS+1                                  TS094290
5941      592     1995  8400                      FETM    0,,0            "                                    TS094300
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5942    602     1996  F16C1F30                FET     X6,,BEARING_TEMPS                    TS09431
5943   1140     1998  1800                    ATAN    0          "FORM ALPHA(T+90) = ATAN SIN/COS TS09432
5944   1142     1999  B002                    SUB     0,2                                     TS09433
5945   1146     199A  F8095000                COMM    0,,RF_HI_LIM                            TS09434
                                        *                          "IS ALPHA(T+90)              *209435
5946   1150     199C  D02A    (19A7)          BGE     $5         "- ALPHA(T) GREATER THAN"    TS09436
                                        *                          "112.5 DEG?                 TS09437
5947     4R     199D  F8093000                COMM    0,,RF_LO_LIM                            % 09438
                                        *                          "IS ALPHA(T+90)              *209439
5948      8     199F  D047    (19A7)          BLE     $5         "- ALPHA(T) LESS THAN"       TS09440
                                        *                          "67.5 DEG?                  TS09441
                                        *       TEST PASS                                       *H09442
5949     14R    19A0  D730            $6      PRN     3          "ADJUST R15 ROLL             TS09443
5950     16     19A1  9401                    ADDM    0,,1                                    TS09444
                                        *                          "DOES THE COUNTER            *209445
5951     24     19A2  CD18    (198B)          BXUD    1,,$4      "INDICATE THAT THERE ARE MORE TS09446
                                        *                          "FREQ TO PROCESS?           TS09447
5952     12R    19A3  D720                    PRN     2                                       % 09448
                                        *                          "SET PHASE TO DIGITAL TEST AS THE*I09449
5953     84     19A4  F8000012                OMEGA   TEST11/2-HOT "NEXT OMEGA TASK IN .02 SEC  TS09450
5954     92     19A6  D5F0                    BBK     15         "NEXT TASK = PHASE TO DIGITAL TS09451
                                        *   TEST FAIL                                           TS09452
                                        *                          "TEST FAIL - TURN ON MALF LAMP *I09453
5955     18R *  19A7  2EDC    (00DC)   $5      FAILD   IO,,HX0080 "                            TS09454
                                        *                          "POST ERROR TYPE IN FAILURE WORD *I09455
5956     44  *  19A8  3551                    MARK    X5,,1      "RF = BITS 2, 4 OR 6         TS09456
5957     48     19A9  D80A    (19A0)          BUC     $6         "CONTINUE RF TEST            TS09457
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                                                                                                                  TS094580
                                                                                                                  *H094590
                                                                                                                  *H094600
                                                                                                                  *H094610
                                                                                                                  *H094620
                                                                                                                  *H094630
                                                                                                                  *H094640
                                                                                                                  *H094650
                                                                                                                  *H094660
                                                                                                                  *H094670
                                                                                                                  *H094680
5958        8R        19AA  F40874FF        SIGNAL_PIN  FETM        0,,X(74FF)     "GET MASK TO SAVE BITS 9, 10, 12 TS094690
5959        20        19AC  E0100023                    MRG         1,0,OUTPUT_TEST_AND_MISCELLANEOUS_SIGNALS       TS094700
                                                                                    "AND MERGE ARGUMENT INTO TEST    TS094710
                                                                                    "SIGNAL SELECT WORD              TS094720
5960        34        19AE  D510                        BBK         1                                               TS094730
```

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                                                                                                                    TS094740
                                **                                                                                  TS094740
                                *                          AVIONICS TEST                                            #H094750
                                *                                                                                   #H094760
                                * THIS TEST IS EXECUTED EVERY .1 SECOND DURING SYSTEM OPERATION.                    #H094770
                                * IT EXAMINES THE A/D TEST WORD AND INDICATES A FAILURE WHEN IT                     #H094780
                                * IS OUT OF LIMITS AN EXCESSIVE NUMBER OF TIMES.  THE TEST IS                       #H094790
                                * DIVIDED UP INTO SETS OF 12 SAMPLES.  A FAILURE CONSISTS OF 3                      #H094800
                                * OR MORE BAD READINGS IN 5 CONSECUTIVE SETS.                                       #H094810
                                * SPECIAL CONTROL PROGRAM TO ENTER                                                  #H094820
                                * THE AVIONICS TEST EVERY 40 MSEC                                                   #H094830
                                * AS AN OMEGA TASK                                                                  #H094840
5961    10R   19AF  8420        AD_TEST     FETM    2,,0          "CLEAR AVIONICS TEST SCRATCH                     TS094850
5962    28    1980  F4270028              PTR     2,,AD_DATA    "STORAGE                                         TS094860
                                *                                 "SET UP NEXT OMEGA TASK TO RETURN                #I094870
5963    70R   1982  080C        $1          OMEGA   TEST5/2-HOT   "HERE IN 40 MILLISECONDS                        TS094880
                                * THE EXECUTIVE WILL START THIS                                                     #H094890
                                * OMEGA TASK EVERY 40 MSEC WHICH                                                    #H094900
                                * WILL CAUSE THE AVIONICS TEST                                                      #H094910
                                * TO BE CYCLED ONCE.  THIS PROCESS                                                  #H094920
                                * WILL CONTINUE UNTIL THE TEST                                                      #H094930
                                * GIVES A PASS OR FAIL INDICATION.                                                  #H094940
5964    78    1983  C011                  FET     1,1           "ADJUST R15 ROLL                                 TS094950
                                *                                                                                   TS094960
                                *                                                                                   TS094970
                                *                                                                                   TS094980
                                * START AVIONICS TEST - A NON                                                       #H094990
                                * OMEGA TASK                                                                        #H095000
                                *   AVIONICS TEST - PERIODIC VERSION                                                TS095010
5965                            AD_IC_TEST_ENTRY;                                                                   TS095020
5965    22R   1984  F03C002B        FET     3,,AD_DATA    "READ AD TEST PARAMETERS                                 TS095030
5966    24    1986  9C3B            CLAM    3,,11         " 1. SET COUNTER (0 TO 11)                               TS095040
                                *                           " 2. NUMBER FAILURES IN THIS SET                         TS095050
                                *                           " 3. NUMBER OF CONSECUTIVE SETS                          TS095060
                                *                           "       WITH 3 OR MORE FAILURES                          TS095070
5967    34    1987  F00C001C        FET     0,,A_TO_D_CONVERTER_TEST_LOCATION "                                     TS095080
                                *                           "THE EXPECTED VALUE IS 486 COUNTS                        TS095090
                                *                           "IN THE 10 MAGNITUDE BITS                                TS095100
5968    38    1989  F8094FF0        COMM    0,,AD_HI_LIM                                                            TS095110
                                *                           "DOES THE TEST                                           #2095120
5969    42    198B  D023  (198F)      BGE     $1            "WORD EXCEED THE EXPECTED VALUE                          TS095130
                                *                           "BY 24 COUNTS?                                           TS095140
5970    4R    198C  F8094D10        COMM    0,,AD_LO_LIM                                                            % 095150
                                *                           "IS THE TEST WORD                                        #2095160
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5971    8       19BE  D031   (19C0)          BRG     $2          "LESS THAN THE EXPECTED VALUE     %R095170
                                      *                          "BY 24 COUNTS?                    TS095180
5972    2R      19BF  9421            $1      ADDM    2,,1        "FAILURE"                         TS095190
                                      *                          "INCREMENT THE NUMBER OF FAILURESTS095200
                                      *                          "IN THIS SET BY 1                 TS095210
                                      *                          "HAVE 12 SAMPLES                  *2095220
5973    10R     19C0  F43C19CB        $2      BXU     3,,$3       "BEEN TESTED TO COMPLETE"         %R095230
                                      *                          "THIS SET?                        TS095240
5974    2R      19C2  9823                    COMM    2,,AD_SMALL                                   % 095250
                                      *                           "WERE THERE"                     *1095260
5975    6       19C3  D055   (19C9)           BRL     $4           "3 OR MORE FAILURES IN THIS SET?%R095270
5976    2R      19C4  9411                    ADDM    1,,1         "BAD SET"                        TS095280
                                      *                           "INCREMENT THE NUMBER OF SETS    TS095290
                                      *                           "THAT HAVE FAILED IN A ROW       TS095300
5977    4       19C5  9815                    COMM    1,,AD_BIG                                     TS095310
5978    8       19C6  D053   (19CA)           BRL     $5           "HAVE 5 CONSECUTIVE SETS FAILED?%R095320
                                      *                           "TEST FAIL - TURN ON MALF LAMP   *I095330
5979    18R *   19C7  2EDC   (00DC)           FAILD   I0,,HX0080                                    TS095340
                                      *                          "POST ERROR TYPE IN FAILURE WORD *I095350
5980    30  *   19C8  3407                    MARK    0,,7        "AVIONICS = BIT 8                 TS095360
5981    2R      19C9  B011            $4      SUB     1,1         "RESET COUNT OF CONSECUTIVE TESTSTS095370
                                      *                          "THAT HAVE FAILED                 TS095380
5982    2R      19CA  B022            $5      SUB     2,2         "RESET NUMBER OF FAILURES IN THISTS095390
                                      *                          "SET                              TS095400
5983    8R      19CB  D700            $3      PRN     0                                             TS095410
5984    26      19CC  F427002B                PTR     2,,AD_DATA  "SAVE AD TEST PARAMETERS          TS095420
5985    28      19CE  9C00                    CLAM    0,,0        "SET TEST WORD TO ZERO SO THAT    %S095430
                                      *                          "TEST WILL FAIL IF THERE IS NO    TS095440
                                      *                          "INPUT FROM A/D                   TS095450
5986    38      19CF  F007001C                STA     0,,A_TO_D_CONVERTER_TEST_LOCATION               TS095460
5987    46      19D1  0230                    SNS     HEADING_EXITATION_A                               095470
5988    50      19D2  D017   (19DA)           BNE     $12                                               095480
5989    6R      19D3  8401                    FETM    0,,1        POST BIT 1                            095490
5990    14      19D4  0240                    SNS     SPEED_EXITATION_B                                 095500
5991    18      19D5  D011   (19D7)           BNE     $11                                               095510
5992    2R      19D6  9402                    ADDM    0,,2                                              095520
5993    8R *    19D7  F80D0262        $11     BSV     FAIL_EXTERNAL  POST BITS IN R0                    095530
5994    12      19D9  D004   (19DE)           BUC     $13                                               095540
5995    8R      19DA  0240            $12     SNS     SPEED_EXITATION_B                                 095550
5996    12      19DB  D012   (19DE)           BNE     $13                                               095560
5997    6R      19DC  8402                    FETM    0,,2        POST BIT 2                            095570
5998    10      19DD  D807   (19D7)           BUC     $11                                               095580
5999    8R      19DE  F80FCE0B        $13     IOC     0,,READ_PMU_KEYBOARD                              095590
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6000    18    19E0  F40D00D0                PIP     0,,PMU_INPUT   "SET INPUT FOR LAB VELOCITY   095600
6001    24    19E2  9E50   (00D0)           CLA     0,,PMU_INPUT                                 095610
6002    28    19E3  F809FFFF                COMM    0,,X(FFFF)                                   095620
6003    32    19E5  D012   (19E8)           BNE     $6             " PMU CONNECTED               095630
6004     2R   19E6  9C00                    CLAM    0,,0                                         095640
6005    10    19E7  7050   (00D0)           STA     0,,PMU_INPUT                                 095650
6006    16R   19E8  D520            $6      BBK     2                                            095660
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AD-A050 501 NORTHROP CORP HAWTHORNE CALIF ELECTRONICS DIV F/G 17/7
AN/BRN-7 COMPUTER PROGRAM SPECIFICATION. VOLUME XIII. APPENDIX.(U)
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UNCLASSIFIED NORT-73-48 NL

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                                                                                                                    TS095670
                                **                                                                                  TS095670
                                *                    PHASE TO DIGITAL TEST                                          *H095680
                                *                                                                                   *H095690
                                * THIS TEST COMMANDS THE CONVERSION OF A FIXED SIGNAL AND CHECKS THE                *H095700
                                * RESULTING INPUT.  IT IS AN OMEGA TASK EXECUTED AFTER THE RF TEST AND             *H095710
                                * IT THEN SEQUENCES TO THE PC TEST IF IN PREFLIGHT.                                 *H095720
                                *                                                                                   *H095730
                                *                                                                                   *I095740
 6007      70R      19E9  080E  PD_TEST   OMEGA     TEST7/2-HOT   "SET NEXT OMEGA TASK = PD TEST $1               TS095750
                                *                                  "TO OCCUR AFTER A 1 SECOND DELAY               *I095760
 6008      116      19EA  3004            SIGNAL    4             "SET PHASE TO DIGITAL TEST SELECT              TS095770
                                *                                  "IN THE TEST SIGNAL OUTPUT WORD                TS095780
                                *                                  "USE COMMON PART OF RF TEST PRO-               TS095790
                                *                                  "GRAM TO CLEAR THE SIN/COS REGIS-              TS095800
                                *                                  "TERS AND EXIT UNTIL THE 1 SECOND              TS095810
 6009      122      19EB  0400197F          BUC       RF_TEST$9     "DELAY HAS ELAPSED AND PROGRAM                 TS095820
                                *                                  "RETURNS TO $1                                 TS095830
 6010      14R      19ED  8444  $1        FETM      4,,4          "SET UP 3 COUNTER TO CYCLE THE                 TS095840
                                *                                  "3 FREQ IF PREFLIGHT ENTRY                     TS095850
 6011      10R      19EE  FD3A0011 $10     CLAD      X3,,COS_10_2  "READ SIN/COS FOR THIS FREQUENCY               TS095860
 6012      12       19F0  9834            COMM      3,,4          "FROM THE SIN/COS REGISTERS                    TS095870
 6013      16       19F1  D022  (19F4)    BGE       $40           "IS THIS FREQUENCY 13.6?                       TS095880
 6014      2R       19F2  A000            CLS       0,0           "10.2 OR 11.3"                                 TS095890
                                *                                  "COMPLIMENT THE SIN AND COS SO                 TS095900
                                *                                  "THAT ALL 3 FREQ CAN BE PROCESSED              TS095910
 6015      4        19F3  A011            CLS       1,1           "IN THE SAME LOOP                              TS095920
 6016      4R       19F4  F8090640 $40     COMM      0,,PD_HI_LIM  "EXAMINE TEST INPUT                            TS095930
 6017      8        19F6  D029  (1A00)    BGE       $2            "DOES THE COS EXCEED 1600 COUNTS?              TS095940
 6018      4R       19F7  F8090200        COMM      0,,PD_LO_LIM                                                 % 095950
 6019      8        19F9  D046  (1A00)    BLE       $2            "IS THE COS LESS THAN 512 COUNTS?              TS095960
 6020      4R       19FA  F8190640        COMM      1,,PD_HI_LIM                                                 % 095970
 6021      8        19FC  D023  (1A00)    BGE       $2            "DOES THE SIN EXCEED 1600 COUNTS?              TS095980
 6022      4R       19FD  F8190200        COMM      1,,PD_LO_LIM                                                 % 095990
 6023      8        19FF  D032  (1A02)    BRG       $3            "IS THE SIN LESS THAN 512 COUNTS?              %R096000
                                *                                  "TEST FAIL - TURN ON MALF LAMP                 *I096010
 6024      18R *    1A00  2EDC  (00DC)    $2        FAILD     IO,,HX0080  "                                      TS096020
                                *                                  "POST ERROR TYPE IN FAILURE WORD               *I096030
 6025      40 *     1A01  3532            MARK      X3,,2         "PD = BITS 3, 5 OR 7                           TS096040
                                *                                  "DOES THE COUNTER                              *2096050
 6026      8R       1A02  CD35  (19EE)    $3        BXUD      3,,$10  "INDICATE THAT THERE ARE MORE              TS096060
                                *                                  "FREQ TO PROCESS?                              TS096070
 6027      16R      1A03  D740            PRN       4             "CONTINUE TO PC TEST                           TS096080
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                                                                                                                    TS096090
                                **                                                                                  TS096090
                                *                          PHASE COUNTER TEST                                       *H096100
                                *                                                                                   *H096110
                                * THIS TEST COMMANDS THE PHASE COUNTER TO COUNT UP AND DOWN IN THE TEST             *H096120
                                * LOCATION AND CHECKS THE RESULT.  IT IS AN OMEGA TASK THAT IS EXECUTED             *H096130
                                * AFTER THE PD TEST DURING PREFLIGHT.  IT THEN SEQUENCES TO THE DMA TEST           *H096140
                                *                                                                                   *H096150
                                *   PHASE COUNTER IO TEST                                                           TS096160
                                *                                                    "SET NEXT OMEGA TASK = PC TEST $1  *I096170
6028    70R     1A04  080F      PC_TEST     OMEGA       TEST8/2-HOT                 "TO OCCUR AFTER A 1 SECOND DELAY   TS096180
6029    76      1A05  8400                  FETM        0,,0                        "SET PHASE COUNTER TEST LOCATION   TS096190
                                *                                                   "TO ZERO TO START DATA COLLECTION  TS096200
6030    86      1A06  F4070010              PTR         0,,PHASE_COUNTER_TEST_LOCATION                                 TS096210
                                *                                                   "SET PHASE COUNTER 'UP' TEST       *I096220
6031    132     1A08  3008                  SIGNAL      8                           "IN THE TEST SIGNAL OUTPUT WORD    TS096230
6032    140     1A09  D5F0                  BBK         15                          "RETURN TO $1 AFTER 1 SECOND       TS096240
                                *                                                                                   TS096250
                                * THE UP TEST IS COMPLETE NOW                                                       *H096260
                                * AND THE RESULTS ARE IN THE                                                        *H096270
                                * PHASE COUNTER TEST LOCATION                                                       *H096280
                                *                                                    "SET NEXT OMEGA TASK = PC TEST $2  *I096290
6033    72R     1A0A  F800001C  $1          OMEGA       TEST9/2-HOT                 "TO OCCUR AFTER A 1 SECOND DELAY   TS096300
                                *                                                   "SET PHASE COUNTER 'DOWN' TEST     *I096310
6034    118     1A0C  3000                  SIGNAL      0                           "IN THE TEST SIGNAL OUTPUT WORD    TS096320
6035    128     1A0D  F00C0010              FET         0,,PHASE_COUNTER_TEST_LOCATION                                 TS096330
6036    132     1A0F  F809C190              COMM        0,,PC_PLUS_LIM              "READ THE 'UP' TEST RESULTS        TS096340
                                *                                                   "DOES THE 'UP'                     *I096350
6037    136     1A11  D032    (1A14)        BRG         $3                          "COUNT EXCEED 400 COUNTS?          TS096360
                                *                                                   "TEST FAIL - TURN ON MALF LAMP     *I096370
6038    18R *   1A12  2EDC    (00DC)        FAILD       IO,,HX0080                                                     TS096380
                                *                                                   "POST ERROR TYPE IN FAILURE WORD   *I096390
6039    30  *   1A13  3408                  MARK        8                           "PC 'UP' = BIT 9                   TS096400
6040    12R     1A14  D5C0    $3            BBK         0                           "RETURN TO $2 AFTER 1 SECOND       TS096410
                                *                                                                                   TS096420
                                * THE DOWN TEST IS COMPLETE NOW                                                     *H096430
                                * AND THE RESULTS ARE IN THE                                                        *H096440
                                * PHASE COUNTER TEST LOCATION                                                       *H096450
6041    10R     1A15  F00C0010  $2          FET         0,,PHASE_COUNTER_TEST_LOCATION                                 TS096460
6042    12      1A17  980F                  COMM        0,,PC_END_HI_LIM            "READ THE 'DOWN' TEST RESULTS      TS096470
                                *                                                   "WHICH IS THE SUM OF THE 'UP'      TS096480
                                *                                                   "AND 'DOWN' COUNTS OVER THE TWO    TS096490
                                *                                                   "1 SECOND TEST PERIODS             TS096500
6043    16      1A18  D033    (1A1C)        BRG         $4                                                             % 096510
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6044      4R      1A19  F809FFF1                  COMM     0,,PC_END_LO_LIM                    TS096520
                                          *                                  "IS THE UP - DOWN          *2096530
6045      8       1A1B  D022    (1A1E)            BGE      $5                 "TOTAL OUTSIDE THE RANGE OF + 15 %R096540
                                          *                                  "TO - 15 COUNTS?           TS096550
                                          *                                  "TEST FAIL - TURN ON MALF LAMP *I096560
6046     18R *    1A1C  2EDC    (00DC)    $4       FAILD    IO,,HX0080                          TS096570
                                          *                                  "POST ERROR TYPE IN FAILURE WORD *I096580
6047     30  *    1A1D  3409                      MARK     9                  "PC 'DOWN' = BIT 10        TS096590
6048      8R      1A1E  D700              $5       PRN      0                  "SEQUENCE ON TO DMA TEST   TS096600
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                                                                                                                    TS096610
                                                **                                                                  *H096620
                                                *                  DIRECT MEMORY ACCESS TEST                        *H096630
                                                *                                                                   *H096640
                                                * THIS TEST COMMANDS THE DIRECT MEMORY ACCESS TO GO TO THE TEST MODE AND*H096650
                                                * DECREMENT THE DMA TEST LOCATION WORD FOR EACH DMA INPUT (A TOTAL OF 7 *H096660
                                                * EVERY 5 MILLISEC) AND THEN CHECKS THE RESULTS.  IT IS AN OMEGA TASK   *H096670
                                                * THAT IS EXECUTED AFTER THE PC TEST  DURING PREFLIGHT.  IT IS THE LAST *H096680
                                                * PREFLIGHT TEST AND IT SEQUENCES TO THE SYNCHRONIZATION PROCESS.       *H096690
                                                *                                                                   TS096700
                                                *   IC DMA TEST                                                     *H096710
                                                *                                                                   TS096720
6049    72R     1A1F  F8000011                  DMA_TEST    OMEGA       TEST10/2-HOT    "SET NEXT OMEGA TASK = DMA TEST$1"TO OCCUR AFTER A 5 MILLISEC WAIT"SET DMA TEST BIT (13) IN THE  *I096730
                                                *                                                                   TS096740
6050    120     1A21  F0031000                              SIGNAL      X(1000)         "TEST SIGNAL OUTPUT WORD            TS096750
6051    126     1A23  8400                                  FETM        0,,0            "SET THE DMA TEST LOCATION WORD     TS096760
                                                *                                       "TO ZERO TO START DATA COLLECTION   096770
6052    136     1A24  F0070017                              STA         0,,DIRECT_MEMORY_ACCESS_TEST_LOCATION               TS096780
6053    148     1A26  D500                                  BBK         0               "RETURN TO $1 AFTER 5 MILLISEC      TS096790
                                                *                                                                   *H096800
                                                * DMA TEST IS COMPLETE NOW                                          *H096810
                                                * RESULTS ARE IN THE DMA                                            *H096820
                                                * TEST LOCATION                                                     *I096830
                                                *                                       "SET NEXT OMEGA TASK = SYNC TO      TS096840
6054    70R     1A27  0800                      $1          OMEGA       SYNC1/2-HOT     "OCCUR AFTER A 200 MILLISEC DELAY% 096850
6055    80      1A28  F00C0017                              FET         0,,DIRECT_MEMORY_ACCESS_TEST_LOCATION               % 096860
6056    84      1A2A  F809FFF9                              COMM        0,,1(-7)                                            *I096870
                                                *                                       "ARE THE DMA TEST                   TS096880
6057    88      1A2C  D062    (1A2F)                        BRE         $2              "RESULTS EQUAL TO - 7 COUNTS?       *I096890
                                                *                                       "TEST FAIL - TURN ON MALF LAMP      TS096900
6058    18R *   1A2D  2EDC    (00DC)                        FAILD       IO,,HX0080      "                                   *I096910
                                                *                                       "POST ERROR TYPE IN FAILURE WORD    TS096920
6059    30  *   1A2E  340A                                  MARK        10              "DMA TEST = BIT 11                  *I096930
                                                *                                       "TURN OFF ALL TEST SELECT BITS      TS096940
6060    46R     1A2F  3000                      $2          SIGNAL      0               "IN THE TEST SELECT OUT WORD        TS096950
6061    58      1A30  D500                                  BBK         0               "EXIT - NEXT TASK IS SYNC
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                                        **                                                                  TS096960
                                        *                        1070 A/C TEST                              *H096970
                                        *                                                                   *H096980
                                        * THIS TEST EXERCISES VARIOUS INSTRUCTIONS IN THE 1070 REPERTOIRE AND *H096990
                                        * CHECKS THE RESULTS.  IT IS A SLOW NON OMEGA TASK (ONCE PER SECOND) *H097000
                                        *                                                                   *H097010
6062                                    GP_TEST_ENTRY;                                                      TS097020
6062    20R     1A31  F468F0F0                  FETM    6,,X(F0F0)      "USE FETM AND FET TO LOAD REGIS-    TS097030
6063    58      1A33  F07C0159                  FET     7,,AUG_MEM_TEST "TERS WITH KNOWN VALUES             TS097040
6064    62      1A35  BC06                      ADDD    0,6             "EXERCISE ADDD AND COMM             TS097050
6065    66      1A36  F809FF22                  COMM    0,,X(FF22)                                          TS097060
                                        *                               "                                   *2097070
6066    70      1A38  D01B    (1A44)            BNE     $1              "ARE THE RESULTS IN ERROR?          TS097080
                                        *                               "(BNE)"                             TS097090
6067     2R     1A39  B035                      SUB     3,5             "EXERCISE SUB                       TS097100
                                        *                               "IS THE SIGN OF                     *2097110
6068     6      1A3A  D029    (1A44)            BGE     $1              "THE RESULT IN ERROR?               TS097120
                                        *                               "(BGE)"                             TS097130
6069     4R     1A3B  F839E5E0                  COMM    3,,X(E5E0)      "EXERCISE COMM                      TS097140
                                        *                               "ARE THE RESULTS                    *2097150
6070     8      1A3D  D046    (1A44)            BLE     $1              "OF THE SUB OR COMM IN ERROR?       TS097160
                                        *                               "(BLE)                              TS097170
6071     2R     1A3E  B424                      ADD     2,4             "EXERCISE ADD TO GET AN OVERFLOW    TS097180
                                        *                               "DID THE ATTEMPT                    *2097190
6072     6      1A3F  D074    (1A44)            BNO     $1              "TO GET AN OVERFLOW FAIL?           TS097200
                                        *                               "(BNO)                              TS097210
6073     6R     1A40  A5F0                      CLA     X15,0           "EXERCISE CLA(X) FROM R15 STACK     TS097220
6074    10      1A41  F809F0F0                  COMM    0,,X(F0F0)                                          TS097230
                                        *                               "DID THE INDEXING                   *2097240
6075    14      1A43  D064    (1A48)            BRE     $2              "AND ROLL WORK CORRECTLY?           TS097250
                                        *                               "(BRE)                              TS097260
6076    22R     1A44  D770              $1      PRN     7               "FAILURE - ADJUST R15 STACK         TS097270
                                        *                               "TEST FAIL - TURN ON MALF LAMP      *I097280
6077    18R *   1A45  2EDC    (00DC)    $10     FAILD   10,,HX0080      "                                   TS097290
                                        *                               "POST ERROR TYPE IN FAILURE WORD    *I097300
6078    30  *   1A46  340B                      MARK    11              "GP TEST = BIT 12                   TS097310
6079    58      1A47  D580                      BBK     8               "EXIT"                              TS097320
6080    22R     1A48  D770              $2      PRN     7               "ADJUST ROLL WITH PRN               TS097330
6081    26      1A49  F869F0F0                  COMM    6,,X(F0F0)                                          TS097340
                                        *                               "DID THE PUSHDOWN                   *2097350
6082    30      1A4B  D817    (1A45)            BNE     $10             "STACK ROLL THE REGISTERS WRONG?    TS097360
                                        *                               "(BNE)"                             TS097370
6083    10R     1A4C  FC0A1A5B                  CLAD    0,,$3                 SIN ARGUMENT                  TS097380
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6084    24    1A4E  F80C1A5D                  FETD    0,,$4      COS ARGUMENT                  TS097390
6085   562    1A50  1800                      ATAN    0,0        "EXERCISE THE ARCTANGENT ROUTINE TS097400
6086   572    1A51  F8081A5F                  COMD    0,,$5                                    TS097410
                                    *                            "DID THE ARCTAN               *1097420
6087   576    1A53  D81F   (1A45)             BNE     $10        "GIVE THE WRONG ANSWER?       TS097430
6088    10R   1A54  FC0A1A5B                  CLAD    0,,$3      SQUARE ROOT ARGUMENT          TS097440
6089   456    1A56  1000                      SQRT    0,0        "EXERCISE THE SQUARE ROOT ROUTINETS097450
6090   466    1A57  F8081A61                  COMD    0,,$6                                    TS097460
                                    *                            "DID THE SQUARE               *1097470
6091   470    1A59  D915   (1A45)             BNE     $10        "ROOT GIVE THE WRONG ANSWER?  TS097480
                                    * THE TEST HAS PASSED                                       *H097490
6092    28R   1A5A  D580                      BBK     8          "EXIT"                        TS097500
6093          1A5B  01237654        $3        COND    X(01237654) SIN/SQRT ARG                 TS097510
6094          1A5D  89ABFEDC        $4        COND    X(89ABFEDC) COS ARG                      TS097520
6095          1A5F  7F9BA533        $5        COND    X(7F9BA533) ATAN RESULT                  TS097530
6096          1A61  0C1268F6        $6        COND    X(0C1268F6) SQRT RESULT                  TS097540
```

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                                        **
                                        *  OSCILATOR FREQUENCY STABILITY TEST
6097                                    OSC_TEST_ENTRY;
6097      14R      1A63  F01C0009                  FET     1,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES
6098      22       1A65  E4001780                  EXT     0,0,HX2010      TEST FOR SYNC AND POS UNC
6099      26       1A67  D061    (1A69)            BRE     $1              BRANCH IF NO
6100      18R      1A68  D530                      BBK     3
6101      10R      1A69  FC0A1D53          $1      CLAD    0,,P44          GET VAR OF T_O_DOT
6102      20       1A6B  F8081AE0                  COMD    0,,=DF((.05)*.25D-128+36) VAR LIMIT
6103      24       1A6D  D02A    (1A78)            BGE     $23
6104      10R      1A6E  FC0A1C21                  CLAD    0,,XXX+3        GET T_O_DOT
6105      14       1A70  D021    (1A72)            BGE     $11
6106       4R      1A71  A800                      CLSD    0,0
6107      10R      1A72  F8081AE2          $11     COMD    0,,=DF(2.5D-6B+18)  3.8 USEC IS FULL SCALE
6108      14       1A74  D053    (1A78)            BRL     $23             PASS IF LESS
                                        *   FAILED THE TEST
6109       6R      1A75  8404                      FETM    0,,4
6110      14  *    1A76  F80D0262                  BSV     FAIL_EXTERNAL
6111      18R      1A78  D530              $23     BBK     3
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                                  **                                                                  TS097740
                                  *   TOLERANCE LIMITS FOR TEST ROUTINES                              TS097750
6112          5000                RF_HI_LIM   EQU        X(5000)                                      TS097760
6113          3000                RF_LO_LIM   EQU        X(3000)                                      TS097770
6114                              PREAMP_TEST_MAGNITUDE_LIMIT;                                        TS097780
6114          0000                            EQU        0                                            TS097790
6115                              PREAMP_TEST_ANGLE_LIMIT;                                            TS097800
6115          05B0                            EQU        X(05B0)        APPROX 8 DEGREES SCALED PI     097810
                                  *       ANALOG TO DIGITAL CONVERTER       RATIO                     TS097820
6116          4FF0                AD_HI_LIM   EQU        X(4FF0)                                      HH097830
6117          4D10                AD_LO_LIM   EQU        X(4D10)                                      HH097840
6118          0003                AD_SMALL    EQU        3                                            TS097850
6119          0005                AD_BIG      EQU        5                                            TS097860
6120          0640                PD_HI_LIM   EQU        X(0640)                                      HH097870
6121          0200                PD_LO_LIM   EQU        X(0200)                                      HH097880
6122          0190                PC_PLUS_LIM EQU        400                                          TS097890
6123                              PC_END_HI_LIM;                                                      TS097900
6123          000F                            EQU        15                                           TS097910
6124                              PC_END_LO_LIM;                                                      TS097920
6124          FFF1                            EQU        I(-15)                                       TS097930
                                  *                                                                     097940
                                  *                                                                     097950
6125          1A79  94C2          END_TEST    ECS                                                       097960
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                                **                                                                                  097970
                                *                                                                                   097980
6126                                        TAPE        4,X(73)                                                     097990
6127                                        TAPE        3,12                                                        098000
6128                                        TAPE        4,X(F1)                                                     098010
6129                                        TAPE        1                                                           098020
6130                1A7A                    SCS                                                                     098030
6131                0157                    ORG         PROG_ID_OVL                                                 098040
6132                0157  F000              CON         X(F000)         DISPLAY ILLEGAL DIGIT (BLANK)               098050
                                *                                                                                   098060
                                *                                                                                   098070
6133                0542                    ORG         PLOT16                                                      098080
6134          6R    0542  040018AE          BUC         MAG_TAPE                                                    098090
                                *                                                                                   098100
                                *                                                                                   098110
6135                18AE                    ORG         LAT_S05_S00                                                 098120
                                *                                                                                   MT098130
                                * MAG TAPE OUTPUT PROGRAM                                                          MT098140
                                *       ENTERED BY BUC AT BEGINNING OF RECORD                                       MT098150
                                *       ENTERED BY INTERRUPT DURING RECORD OUTPUT                                   MT098160
                                *                                                                                   MT098170
6136          2R    18AE  DF00  MAG_TAPE  LGC         INTERRUPT_INHIBIT                                           MT098180
6137          20    18AF  F02C0047        FET         2,,MAG_TAPE_DATA+7                                          MT098190
6138          26    18B1  040218EF        BGE         $50                                                         MT098200
6139           8R   18B3  F80F9800        IOC         RESET_RECORDER_INTERRUPT                                    MT098210
6140          16    18B5  F80FB800        IOC         ENABLE_RECORDER_INTERRUPT                                   MT098220
6141          24    18B7  F80FC800        IOC         LOAD_RECORDER                                               MT098230
6142          34    18B9  FD1D0040        POP         X1,,MAG_TAPE_DATA                                           MT098240
6143          60    18BB  F04C0042        FET         4,,MAG_TAPE_DATA+2                                          MT098250
6144          68    18BD  F16B0040        SUB         X6,,MAG_TAPE_DATA CHECKSUM                                  MT098260
6145          78    18BF  F46C18C8        BXU         6,,$99                                                      MT098270
                                *                                                                                   MT098280
6146          10R   18C1  F41C18D0  $1    BXU         1,,$2                                                       MT098290
6147           4R   18C3  F859FFFF        COMM        5,,X(FFFF)                                                  MT098300
6148           8    18C5  D014   (18CA)   BNE         $32                                                         MT098310
6149           4R   18C6  FC290060        CLAM        2,,96           MAX MPX WORDS PER FRAME COUNT               MT098320
6150           6    18C8  9051            SUBM        5,,1            START MKR FFFE FOR MPX MODE                 MT098330
6151          10    18C9  D0C6   (18D0)   BUC         $2                                                          MT098340
6152           2R   18CA  9C51  $32       CLAM        5,,1            START MKR + FOR END OF FRAME                MT098350
                                *                                                                                   MT098360
6153          38R   18CB  F4770042  $99   PTR         7,,MAG_TAPE_DATA+2                                          MT098370
6154           6R   18CD  8400    $90    FETM        0,,0                                                        MT098380
6155           8    18CE  DF10            LGC         INTERRUPT_INHIBIT+NE                                        MT098390
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6156    20      18CF  D500                    BBK     0                                                MT098400
                                              *                                                        MT098410
6157     8R     18D0  C010              $2    FET     1,0             SET UP TO OUTPUT                 MT098420
6158    12      18D1  F879FFFF                COMM    7,,X(FFFF)                                       MT098430
6159    16      18D3  D06A    (18DE)           BRE     $3              NOT MPX MODE                     MT098440
6160     8R     18D4  F55A1929                CLA     X5,,MPX_ADD     READ MPX START ADDRESSES         MT098450
6161    12      18D6  9733                    ADDM    IX3,3           ADD 2 TIMES WORD COUNT = DATA ADDMT098460
6162    16      18D7  F8390060                COMM    3,,96           CHECKSUM IF LAST WORD            MT098470
6163    20      18D9  D019    (18E3)           BNE     $10                                              MT098480
6164     2R     18DA  9C81                    CLAM    8,,1            DOUBLE MKR = 1                   MT098490
6165    46R     18DB  F4970040          $98   PTR     9,,MAG_TAPE_DATA                                 MT098500
6166    50      18DD  D901    (18CD)           BUC     $90                                              MT098510
                                              *                                                        MT098520
6167     8R     18DE  F53A1904          $3    CLA     X3,,MAG_TABLE                                    MT098530
6168    12      18E0  D022    (18E3)           BGE     $10             NOT MPX                          MT098540
6169     6R     18E1  9664    (00E4)           ADD     0,,HX8000       CLEAR MPX BIT                    MT098550
6170    12      18E2  A750                    CLA     IX5,0           READ ADDRESS                     MT098560
6171     8R     18E3  AEC0              $10   CLAD    I0,0            READ DATA                        MT098570
6172    10      18E4  9830                    COMM    3,,0            OUTPUT WORD NOW IF               MT098580
6173    14      18E5  D81B    (18D8)           BNE     $98              THIS IS FIRST WORD              MT098590
6174     2R     18E6  9850                    COMM    5,,0             OF FRAMES 2 TO 8                MT098600
6175     6      18E7  D86D    (18DB)           BRE     $98                                              MT098610
6176     4R     18E8  F879FFFF                COMM    7,,I(-1)                                         MT098620
6177     8      18EA  D910    (18DB)           BNE     $98                                              MT098630
6178    46R     18EB  F4970040                PTR     9,,MAG_TAPE_DATA                                 MT098640
6179    52      18ED  040018AE                BUC     MAG_TAPE                                         MT098650
                                              *                                                        MT098660
6180     4R     18EF  D062    (18F2)   $50    BRE     $60             START FRAME  IF 0                MT098670
6181    12R     18F0  D720                    PRN     2                                                098680
6182    16      18F1  DA05    (18CD)           BUC     $90                                              MT098690
                                              *                                                        MT098700
6183    18R     18F2  F02C0044          $60   FET     2,,MAG_TAPE_DATA+4                               MT098710
6184    26      18F4  F41A0085                CLA     1,,STATION_COUNTER                               MT098720
6185    30      18F6  D016    (18FD)           BNE     $61                                              MT098730
6186     8R     18F7  F8CF9800                IOC     RESET_RECORDER_INTERRUPT                         MT098740
6187    16      18F9  F00F8801                SET     INTER_RECORD_GAP                                 MT098750
6188    24      18F8  F80F8800                IOC     ENABLE_RECORDER_INTERRUPT                        MT098760
6189     2R     18FD  8C31              $61   CLSM    3,,1            START MKR -                      MT098770
6190     6      18FE  FC09001C                CLAM    0,,28           MAX WORD CT-1 (NOT MPX)          MT098780
6191     8      1900  9C51                    CLAM    5,,1            MAX DOUBLE COUNT                 MT098790
6192    10      1901  9C40                    CLAM    4,,0            FIRST DOUBLE COUNT               MT098800
6193    22      1902  8430                    FETM    3,,0                                             MT098810
6194    26      1903  DA06    (18DE)           BUC     $3                                               MT098820
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                                 *                                                                  MT098830
                                 *                                                                  MT098840
                                 * MAG TAPE DATA +9 = DOUBLE COUNT MAX                              MT098850
                                 * MAG TAPE DATA +8 = DOUBLE COUNT                                  MT098860
                                 * MAG TAPE DATA +7 = START MARKER                                  MT098870
                                 *                                                                  MT098880
                                 * MAG TAPE DATA +5 = FRAME COUNT                                   MT098890
                                 * MAG TAPE DATA +4 = WORD COUNT MAX                                MT098900
                                 * MAG TAPE DATA +3 = WORD COUNT                                    MT098910
                                 * MAG TAPE DATA +2 = CHECKSUM                                      MT098920
                                 * MAG TAPE DATA +1 = DATA (LSB)                                    MT098930
                                 * MAG TAPE DATA +0 = DATA (MSB)                                    MT098940
                                 *                                                                  MT098950
                                 *                                                                  MT098960
                                 *                                                                  MT098970
                                 *                                                                  MT098980
                                 *                                                                  MT098990
                1904  00C6       MAG_TABLE   CON        GMT                                         MT099000
                1905  1F08                   CON        END_OF_BURST_DATA       10.2 BURST          MT099010
                1906  1F0A                   CON        END_OF_BURST_DATA+2     13.6 BURST          MT099020
                1907  1F0C                   CON        END_OF_BURST_DATA+4     11.3 BURST          MT099030
                1908  1EED                   CON        PHI_SUB_M                                   MT099040
                1909  1EEF                   CON        PHI_SUB_M+2                                 MT099050
                190A  1EF1                   CON        PHI_SUB_M+4                                 MT099060
                190B  0024                   CON        SIGMA_SQUARED_PHI_SUB_M                     MT099070
                190C  0026                   CON        SIGMA_SQUARED_PHI_SUB_M+2                   MT099080
                190D  0028                   CON        SIGMA_SQUARED_PHI_SUB_M+4                   MT099090
                190E  1F69                   CON        R11                                         MT099100
                190F  1F6B                   CON        R12                                         MT099110
                1910  1F6D                   CON        R13                                         MT099120
                1911  1F6F                   CON        R21                                         MT099130
                1912  1F71                   CON        R22                                         MT099140
                1913  1F73                   CON        R23                                         MT099150
                1914  1F75                   CON        R31                                         MT099160
                1915  1F77                   CON        R32                                         MT099170
                1916  1F79                   CON        R33                                         MT099180
                1917  00C2                   CON        PSI_A                                       MT099190
                1918  0032                   CON        Q_SUB_T                                     MT099200
                1919  0034                   CON        Q_SUB_T+2                                   MT099210
                191A  1F08                   CON        END_OF_BURST_DATA       10.2 SLOT           MT099220
                191B  1F0A                   CON        END_OF_BURST_DATA+2     13.6 SLOT           MT099230
                191C  1F0C                   CON        END_OF_BURST_DATA+4     11.3 SLOT           MT099240
                191D  00BC                   CON        TIME                                        MT099250
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191E  00A2                  CON     V2                                  MT099260
191F  00BE                  CON     VC2                                 MT099270
1920  9921                  CON       MPX_SP_ADD+X(8000)                MT099280
                  *                                                     MT099290
1921  014F        MPX_SP_ADD CON     PROGRAM_ID                          MT099300
1922  0151                  CON     TAPE_ID                             MT099310
1923  0009                  CON     X(0009)                             MT099320
1924  00E5                  CON     STATIONS_IN_USE                     MT099330
1925  0000                  CON     0                                   MT099340
1926  0000                  CON     0                                   MT099350
1927  0000                  CON     0                                   MT099360
1928  0000                  CON     0                                   MT099370
                  *                                                     MT099380
1929  1F40        MPX_ADD   CON     X(1F40)                             MT099390
192A  1DBB                  CON     SIGMA_SQ_N_COUNTER                  MT099400
192B  1E7B                  CON     SIGMA_SQ_N_COUNTER+192              MT099410
192C  0022                  CON     X(0022)                             MT099420
192D  1C03                  CON     ROLL_END                              099430
192E  1CE8                  CON     XXXX                                  099440
192F  1D17                  CON     P_MATRIX                            MT099450
1930  0000                  CON     0                                   MT099460
1931  89D8                  ECS                                         MT099470
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                                                **                                                                  099480
                                                * PLOT                                                              099490
6241                                                    TAPE    4,X(73)                                             099500
6242                                                    TAPE    3,12                                                099510
6243                                                    TAPE    4,X(F1)                                             099520
6244                                                    TAPE    1                                                   099530
6245                1932                                SCS                                                         099540
6246                0157                                ORG     PROG_ID_OVL                                         099550
6247                0157  F000                          CON     X(F000)         DISPLAY ILLEGAL DIGIT (BLANK)       099560
                                                *                                                                   099570
                                                *                                                                   099580
6248                18AE                                ORG     LAT_S05_S00                                         PT099590
6249          8R    18AE  F40F8F10            PT_TYPE     SNS     PUNCH_OR_PRINTER_BUSY                               PT099600
6250          12    18B0  D025    (18B6)                BGE     $20                                                 PT099610
6251          38R   18B1  F07C1FC1                      FET     7,,PT_IMAGE-3                                       PT099620
6252          40    18B3  9840                          COMM    4,0                                                 PT099630
6253          44    18B4  D023    (18B8)                BGE     $1                                                  PT099640
6254          22R   18B5  D770                          PRN     7                                                   PT099650
6255          6R    18B6  C4000285            $20         BUC     EXEC                                                PT099660
6256          4R    18B8  D038    (18C4)      $1          BRG     $2                                                  PT099670
6257          4R    18B9  FC390084                      CLAM    3,,X(0084)      CARRIAGE RETURN                     PT099680
6258          2R    18BB  9041                $3          SUBM    4,1                                                 PT099690
6259          12R   18BC  D720                $4          PRN     2                                                   PT099700
6260          38    18BD  F4471FC4                      PTR     4,,PT_IMAGE                                         PT099710
6261          46    18BF  F80FDF01                      IOC     LOAD_PRINTER                                        PT099720
6262          56    18C1  FC0D1FC4                      POP     0,,PT_IMAGE                                         PT099730
6263          60    18C3  D80E    (18B6)                BUC     $20                                                 PT099740
6264          4R    18C4  FC390081            $2          CLAM    3,,X(0081)      SPACE                               PT099750
6265          6     18C6  8064                          COM     6,4                                                 PT099760
6266          10    18C7  D058    (18D0)                BRL     $5                                                  PT099770
6267          4R    18C8  D036    (18CF)                BRG     $6                                                  PT099780
6268          4R    18C9  FC390040                      CLAM    3,,X(0040)                                          PT099790
6269          8     18CB  F869001A                      COMM    6,,26                                               PT099800
6270          12    18CD  D011    (18CF)                BNE     $6                                                  PT099810
6271          2R    18CE  9038                          SUBM    3,,8                                                PT099820
6272          2R    18CF  9065                $6          SUBM    6,5                                                 PT099830
6273          4R    18D0  FC291FC9            $5          CLAM    2,,PT_IMAGE+5                                       PT099840
6274          2R    18D2  8027                $7          COM     2,7                                                 PT099850
6275          6     18D3  D939    (18BB)                BRG     $3                                                  PT099860
6276          6R    18D4  A602                          CLA     I0,2                                                PT099870
6277          14    18D5  E41001 0F                     EXT     1,0,HX00FF                                          PT099880
6278          22    18D7  525C    (00DC)                MPLM    I0,,HX0080                                          PT099890
6279          26    18D8  D065    (18DE)                BRE     $10                                                 PT099900
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6280    2R    18D9  8014                    COM     1,4                          PT099910
6281    6     18DA  D011   (18DC)           BNE     $14                          PT099920
6282    2R    18DB  A430                    CLA     3,0                          PT099930
6283    2R    18DC  9424           $14      ADDM    2,4                          PT099940
6284    6     18DD  D80C   (18D2)           BUC     $7                           PT099950
6285    2R    18DE  8014           $10      COM     1,4                          PT099960
6286    6     18DF  D062   (18E2)           BRE     $11                          PT099970
6287    2R    18E0  9423                    ADDM    2,3                          PT099980
6288    6     18E1  D900   (18D2)           BUC     $7                           PT099990
6289    2R    18E2  9850           $11      COMM    5,0                          PT100000
6290    6     18E3  D011   (18E5)           BNE     $12                          PT100010
6291    2R    18E4  9C54                    CLAM    5,4                          PT100020
6292    6R    18E5  A522           $12      CLA     X2,2                         PT100030
6293   14     18E6  5659   (00D9)           MIEM    I0,,HX0010                   PT100040
6294   22     18E7  7122                    STA     X2,2                         PT100050
6295   30     18E8  5664   (00E4)           MIEM    I0,,HX8000                   PT100060
6296   32     18E9  DE50                    FLG     A+L                          PT100070
6297   40     18EA  E400176E                EXT     0,0,HX0007                   PT100080
6298   48     18EC  F50A18F5                CLA     X0,,$16                      PT100090
6299   52     18EE  D081   (18F0)           BAT     $13                          PT100100
6300    8R    18EF  525C   (00DC)           MPLM    I0,,HX0080                   PT100110
6301    2R    18F0  9051           $13      SUBM    5,1                          PT100120
6302    6     18F1  D011   (18F3)           BNE     $15                          PT100130
6303    2R    18F2  9044                    SUBM    4,4                          PT100140
6304    2R    18F3  A430           $15      CLA     3,0                          PT100150
6305    6     18F4  DB09   (18BC)           BUC     $4                           PT100160
6306          18F5  387F           $16      CON     X(387F)        0,1           PT100170
6307          18F6  763E                    CON     X(763E)        2,3           PT100180
6308          18F7  753D                    CON     X(753D)       4,5            PT100190
6309          18F8  347C                    CON     X(347C)        6,7           PT100200
6310          18F9  7931                    CON     X(7931)        8,9           PT100210
6311          18FA  4F46                    CON     X(4F46)        A,B           PT100220
6312          18FB  0E45                    CON     X(0E45)        C,D           PT100230
6313          18FC  0D04                    CON     X(0D04)        E,F           PT100240
                                   *                                             PT100250
                                   *                                             PT100260
6314                               PT_TYPE_SETUP;                                PT100270
6314    8R    18FD  8635   (00B5)           FET     0,,STATION_COUNTER           PT100280
6315   10     18FE  9807                    COMM    0,7                          PT100290
6316   14     18FF  D061   (1901)           BRE     $40                          PT100300
6317   12R    1900  D500                    BBK     0                            PT100310
6318    4R    1901  FC091FC4       $40      CLAM    0,,PT_IMAGE                  PT100320
6319   28     1903  C240                    FET     I4,0                         PT100330
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6320    32    1904  9D55                  CLAM   X5,5                PT100340
6321    34    1905  8040                  COM    4,0                 PT100350
6322    38    1906  D052   (1909)         BRL    $1                  PT100360
6323     2R   1907  9810                  COMM   1,,0                PT100370
6324     6    1908  D051   (190A)         BRL    $2                  PT100380
6325    22R   1909  D550          $1      BBK    5                   PT100390
6326     6R   190A  A610          $2      CLA    I1,0                PT100400
6327    20R   190B  C230          $3      FET    I3,0                PT100410
6328    28    190C  525C   (00DC)         MPLM   I0,,HX0080          PT100420
6329    32    190D  D019   (1917)         BNE    $4                  PT100430
6330     6R   190E  A510                  CLA    X1,0                PT100440
6331    14    190F  7142                  STA    X4,2                PT100450
6332    28    1910  D730                  PRN    3                   PT100460
6333    30    1911  9403                  ADDM   0,3                 PT100470
6334    32    1912  8004                  COM    0,4                 PT100480
6335    36    1913  D849   (1908)         BLE    $3                  PT100490
6336     4R   1914  B822                  SUBD   2,2                 PT100500
6337    20R   1915  7635          $5      PTR    I3,5                PT100510
6338    34    1916  D510                  BBK    1                   PT100520
6339     2R   1917  DE8C          $4      FLG    A+EOR+AT            PT100530
6340    10    1918  AE61                  CLAD   I6,1                PT100540
6341     4R   1919  8862          $6      COMD   6,2                 PT100550
6342     8    191A  D053   (191E)         BRL    $7                  PT100560
6343     4R   191B  B862                  SUBD   6,2                 PT100570
6344     8    191C  B862                  SUBD   6,2                 PT100580
6345    12    191D  D805   (1919)         BUC    $6                  PT100590
6346     4R   191E  D083   (1922)  $7     BAT    $8                  PT100600
6347     2R   191F  DE00                  FLG    A                   PT100610
6348     6    1920  A866                  CLSD   6,6                 PT100620
6349    10    1921  D809   (1919)         BUC    $6                  PT100630
6350   126R   1922  DC62          $8      DIVD   6,2                 PT100640
6351   132    1923  465D   (00DD)         MPI    0,,HX0100           PT100650
6352   142    1924  F0661932              MPY    6,,$10              PT100660
6353   148    1926  F569001A              ADDM   X6,,26              PT100670
6354   168    1928  7634                  PTR    I3,4                PT100680
6355   170    1929  9404                  ADDM   0,4                 PT100690
6356   172    192A  8004                  COM    0,4                 PT100700
6357   176    192B  DA41   (1908)         BLE    $3                  PT100710
6358     4R   192C  FC190050              CLAM   1,,80               PT100720
6359     8    192E  FC390033              CLAM   3,,51               PT100730
6360    10    1930  9C20                  CLAM   2,0                 PT100740
6361    14    1931  D90D   (1915)         BUC    $5                  PT100750
6362          1932  0019          $10     CON    25                  PT100760
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                                        *                                                    PT100770
                                        *                                                     100780
6363                1FE4                PT_DEST_LNG EQU      DESTINATION_LONGITUDE+32        PT100790
6364                1FE8                PT_DEST_LAT EQU      PT_DEST_LNG+4                   PT100800
6365                1FC4                PT_IMAGE    EQU      DESTINATION_LONGITUDE           PT100810
6366                173E                            ORG      PLOT1                           PT100820
6367      14R       173E  F90C1FE4                 2FETD    X0,,PT_DEST_LNG                 PT100830
6368                1273                            ORG      PLOT2                           PT100840
6369      28        1273  F91C1FE4                 2FETD    X1,,PT_DEST_LNG                 PT100850
6370                0F81                            ORG      PLOT3                           PT100860
6371      42        0F81  FD771FE8                 2PTRD    X7,,PT_DEST_LAT                 PT100870
6372                0F83                            ORG      PLOT4                           PT100880
6373      54        0F83  F9571FE4                 2STAD    X5,,PT_DEST_LNG                 PT100890
6374                1276                            ORG      PLOT5                           PT100900
6375      68        1276  F94C1FE8                 2FETD    X4,,PT_DEST_LAT                 PT100910
6376                1741                            ORG      PLOT6                           PT100920
6377      82        1741  F94C1FE8                 2FETD    X4,,PT_DEST_LAT                 PT100930
6378                113F                            ORG      PLOT11                          PT100940
6379      86        113F  FC490003                 2CLAM    4,,X(0003)      0,1             PT100950
6380                0146                            ORG      PLOT15                          PT100960
6381      94  *     0146  F80D18AE                 2BSV     PT_TYPE                         PT100970
6382                0542                            ORG      PLOT16                          PT100980
6383     100        0542  040018FD                 2BUC     PT_TYPE_SETUP                   PT100990
                                        *                                                    PT101000
6384                1933                            ORG      PT_TYPE_SETUP$10+1              PT101010
6385                1933  43D2                      ECS                                      PT101020
```

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                                        **                                                                  101030
                                        *                                                                   101040
                                        * DECIMAL PRINT ROUTINES                                            101050
                                        *                                                                   101060
6386                                                TAPE        4,X(73)                                     101070
6387                                                TAPE        3,12                                        101080
6388                                                TAPE        4,X(F1)                                     101090
6389                                                TAPE        1                                           101100
                                        *                                                                   101110
                                        *                                                                   101120
6390                1934                            SCS                                                     101130
6391                0157                            ORG         PROG_ID_OVL                                 101140
6392                0157  F000                      CON         X(F000)                                     101150
                                        *                                                                  AT101160
6393                1893                            ORG         LAT_N10_N15                                 101170
                                        *                                                                  OM101180
                                        * HIGH SPEED PRINTER  -  OUTPUT SUBROUTINES  -  DECIMAL OR HEXADECIMAL OM101190
                                        *                                                  REGS PRUNED:     OM101200
                                        *  HSP        PRINT BITS 1-4 OF R0 AS 1 HEX CHARACTER                1 OM101210
                                        *  HSP_OUT    PRINT CHARACTER IN R0                                  1 OM101220
                                        *  HSP_16H    PRINT R0 AS 4 HEX CHARACTERS                           1 OM101230
                                        *  HSP_32H    PRINT R0,1 AS 8 HEX CHARACTERS                         2 OM101240
                                        *  HSP_LINE   LINE ADVANCE                                           0 OM101250
                                        *  HSP_D      PRINT R1,2 AS N DEC CHARACTERS (N-1 IN R0)             4 OM101260
                                        *                                                                  OM101270
                                        *                                   OUTPUT 1 CHARACTER             OM101280
6394        8R      1893  E400177D      HSP         EXT         0,0,HX000F                                  OM101290
6395       16       1895  F50A18CB                  CLA         X0,,TYPE_TABLE                              OM101300
                                        *                                                                  OM101310
6396        8R      1897  8663   (00E3) HSP_OUT     FET         0,,HX4000                                   OM101320
6397        2R      1898  9001          $1          SUBM        0,,1            OF 18 MICROSEC EACH = 540   OM101330
6398        6       1899  D069   (18A3)             BRE         $2                                          OM101340
6399        8R      189A  F40F8F10                  SNS         PUNCH_OR_PRINTER_BUSY                       OM101350
6400       12       189C  D825   (1898)             BGE         $1                                          OM101360
6401       10R      189D  F0171C04                  STA         1,,TYPE_OUT                                 OM101370
6402       18       189F  F80FDF01                  IOC         0,,LOAD_PRINTER                             OM101380
6403       28       18A1  FC0D1C04                  POP         0,,TYPE_OUT                                 OM101390
6404       14R      18A3  D510          $2          BBK         1                                           OM101400
                                        *                                                                  OM101410
                                        *                                   OUTPUT 8 CHARACTERS            OM101420
6405        8R *    18A4  F80D18A6      HSP_32H     BSV         HSP_16H                                     OM101430
                                        *                                                                  OM101440
                                        *                                   OUTPUT 4 CHARACTERS            OM101450
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6406        8R      18A6  8413          HSP_16H     FETM    1,,3                                                    0M101460
6407        6R      18A7  F425001C      $2          LSE     2,,4                                                    0M101470
6408       12       18A9  C002                      FET     0,2                                                     0M101480
6409       20  *    18AA  F8CD1893                  BSV     HSP                                                     0M101490
6410       28       18AC  C406   (18A7)             BXU     0,,$2                                                   0M101500
6411       16R      18AD  D520                      BBK     2                                                       0M101510
                                                    *                                                               0M101520
                                                    *                                   LINE ADVANCE AND DELAY      0M101530
6412       14R  *   18AE  F0020084      HSP_LINE_D  PLINE   0,,X(0084)                                              0M101540
6413        2R      18B0  9001          $1          SUBM    0,,1                                                    0M101550
6414        6       18B1  0812   (18B0)             BNE     $1                                                      0M101560
6415       12R      18B2  D500                      BBK     0                                                       0M101570
                                                    *                                                               0M101580
                                                    *                                   OUTPUT N DECIMAL CHARACTERS 0M101590
6416        8R      18B3  F4080081      HSP_D       FETM    0,,X(0081)  SPACE IN CASE DATA IS +                     0M101600
6417       10       18B5  9820                      COMM    2,,0                                                    0M101610
6418       14       18B6  0023   (18BA)             BGE     $1          PLUS                                        0M101620
6419        4R      18B7  FC090057                  CLAM    0,,X(0057)  -                                           0M101630
6420        8       18B9  A822                      CLSD    2,2                                                     0M101640
6421        8R  *   18BA  F8CD1897      $1          BSV     HSP_OUT                                                 0M101650
6422       14       18BC  8400                      FETM    0,,0        INDEX TO GO WITH NO CHAR IN R0              0M101660
6423        2R      18BD  8040          $2          COM     4,0         =0 IF NO CHAR TO LEFT OF DEC .              0M101670
6424        6       18BE  D012   (18C1)             BNE     $3                                                      0M101680
6425       14R  *   18BF  F0020040                  PLINE   0,,X(0040)  DECIMAL POINT                               0M101690
6426        6R      18C1  C002          $3          FET     0,2         GET NEXT CHAR FROM BITS 12-15 OF            0M101700
6427       12       18C2  F0040010                  RSA     0,,11       MOST SIG HALF OF DATA = BCD CHAR            0M101710
6428       20  *    18C4  F8CD1893                  BSV     HSP                                                     0M101720
6429       30       18C6  EC221AE4                  EXTD    2,2,=DX(07FFFFFF) GET RID OF LAST CHAR OUTPUT           0M101730
6430       36       18C8  4C2A                      MPIDM   2,,10       GET NEXT CHAR                               0M101740
6431       44       18C9  C40D   (18BD)             BXU     0,,$2                                                   0M101750
6432       20R      18CA  D540                      BBK     4                                                       0M101760
                                                    *                                                               0M101770
                                                    *                                                               0M101780
6433                18CB  0038          TYPE_TABLE  CON     X(0038)                                                 0M101790
6434                18CC  007F                      CON     X(007F)                                                 0M101800
6435                18CD  0076                      CON     X(0076)                                                 0M101810
6436                18CE  003E                      CON     X(003E)                                                 0M101820
6437                18CF  0075                      CON     X(0075)                                                 0M101830
6438                18D0  003D                      CON     X(003D)                                                 0M101840
6439                18D1  0034                      CON     X(0034)                                                 0M101850
6440                18D2  007C                      CON     X(007C)                                                 0M101860
6441                18D3  0079                      CON     X(0079)                                                 0M101870
6442                18D4  0031                      CON     X(0031)                                                 0M101880
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6443    18D5  004F                  CON     X(004F)                OM101890
6444    18D6  0046                  CON     X(0046)                OM101900
6445    18D7  000E                  CON     X(000E)                OM101910
6446    18D8  0045                  CON     X(0045)                OM101920
6447    18D9  000D                  CON     X(000D)                OM101930
6448    18DA  0004                  CON     X(0004)                OM101940
                          *                                        OM101950
                          *                                        AT101960
                          *                                        AT101970
6449    18DB  4BCC                  ECS                            101980
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                                                  **                                                                  101990
                                                  *  THIS BLOCK FOR PI AND PCI TESTS WHICH REQUIRE INHIBITING THE USE  102000
                                                  *  OF PROP PRED CORRECTION, ANTENNA SWITCHING ALL +, AND PROGRMR      102010
                                                  *  CONTROLLER FAILURE DISPLAY                                         102020
6450                                                        TAPE      4,X(73)                                          102030
6451                                                        TAPE      3,12                                             102040
6452                                                        TAPE      4,X(F1)                                          102050
6453                                                        TAPE      I                                                102060
6454                  18DC                                  SCS                                                        102070
6455                  0157                                  ORG       PROG_ID_OVL                                      102080
6456                  0157  2000                            CON       X(2000)        DISPLAY DIGIT FOR C_I             102090
6457                  0E0E                                  ORG       PLOT17                                           102100
6458          4R      0E0E  B800                           2SUBD      0,0            CAUSES PP_THETA3=0 IF SIMLTR      102110
6458          8       0E0F  D000                            FILL
6459                  1764                                  ORG       ANTENNA_SELECT_TABLE+2                           102120
6460                  1764  0001                            CON       X(1)           +A                                102130
6461                  1765  0004                            CON       X(4)           +B                                102140
6462                  17CE                                  ORG       PHI_ZERO_FLOATER  AND PHI_ZERO_LOOP              102150
6463                  17CE  00000000                       COND       0              SET TO ZERO, CAUSES DISABLED      102160
6464                  17D0  00000000                       COND       0              PHASE SHIFT FOR RHO-RHO           102170
6465                  17D2  00000000                       COND       0              OPERATION                         102180
6466                  17D4  57FB                            ECS                                                        102190
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                                                  **
                                                  *  THIS BLOCK IS FOR PRODUCTION INSP. I/O TEST OF UNUSED I/O.
                                                  *  REQUIRES SIS TO GENERATE INTERRUPT TO
                                                          TAPE      4,X(73)
                                                          TAPE      3,12
                                                          TAPE      4,X(F1)
                                                          TAPE      1
                    17D5                                  SCS
                    0157                                  ORG       PROG_ID_OVL
                    0157  4000                            CON       X(4000)        C_I DISPLAY DIGIT
                    039C                                  ORG       END_OF_BURST$66
                    039C  D001                            CON       X(D001)        PREVENT STORE IN Q_M=38
                    014A                                  ORG       PLOT20
          8R *      014A  F80D1893                        BSV       IOTEST
                    06B8                                  ORG       VELOCITY_PROCESSING$3
                    06B8  D000                            CON       X(D000)        NOOP FOR 0-40 KNOTS RANGE
                    1893                                  ORG       LAT_N10_N15
         14R        1893  F80C18F0          IOTEST        FETD      0,,HX10100     INIT RIGHT LEFT MRG BITS
         28         1895  8446                            FETM      4,,6           LOAD LIMIT WITH NO. OF DISC'S
                                                  *  REG USE: 0- I FOR SNS, 1 AND 2- ACCUMULATED BIT PATTERN,
                                                  *                 3 AND 4- BXU COUNTS, 5 AND 6- RIGHT AND LEFT
                                                  *                 SIDE MERGE BITS.
         10R        1896  F50F0000          $1            SNS       X0,DOPPLER_IN_MEMORY
         14         1898  DC12    (189B)                  BNE       $2             BRANCH IF HI
          2R        1899  B415                            ADD       1,5            WAS LO SO ADD R BIT TO ACUM.
          6         189A  D001    (189C)                  BUC       $3
          2R        189B  B416              $2            ADD       1,6            WAS HI SO ADD L BIT TO ACUM.
          6R        189C  4C52              $3            LSAD      5,,1           MOVE L AND R BITS FOR NEXT I
         10         189D  F4090010                        ADDM      0,,16          I+1 TO I AT B11 FOR SNS CMND
         14         189F  F8090050                        COMM      0,,80          IS IT  HEX 50 SPECIAL CASE
         18         18A1  D066    (18A8)                  BRE       $100           IF SO MAKE IT 70
          4R        18A2  F8090080                        COMM      0,,128         IS IT HEX 80 RSLT OF SP CASE
          8         18A4  D015    (18AA)                  BNE       $101           JMP IF NOT 80
          4R        18A5  FC090060                        CLAM      0,,96          MAKE IT HEX 60 FOR CH 6
          8         18A7  D002    (18AA)                  BUC       $101
          4R        18A8  FC090070          $100          CLAM      0,,112         MAKE IT HEX 70 FOR CH 5
          8R        18AA  C535    (1896)    $101          BXU       3,,$1
         10R        18AB  F017003A                        STA       1,,DMAX1       SAVE IN DMA WD FOR DISPLAY
         20         18AD  F8150010                        RSLD      1,,11          STRIP BITS 12,13, KEEP BITS.
         26         18AF  F0152000                        RSL       1,,2           15,14,11,10,9 AND RIGHT ADJ
         32         18B1  4C18                            LSAD      1,,3           DISPLAY NO. IN R1.
         34         18B2  9813                            COMM      1,,3
         38         18B3  D240    (18D4)                  BLE       $20            GO DO SYNCHRO DISPLAY.
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6504    2R    18B4  981A                  COMM   1,,10                                  102630
6505    6     18B5  D141   (18C7)         BLE    $10          GO DO LO DISPLAY.         102640
6506    4R    18B6  F8190011              COMM   1,,17                                  102650
6507    8     18B8  D231   (18DA)         BRG    $99                                    102660
6508    8R    18B9  F51A18D8              CLA    X1,,IOTAB1-4  START HI DISPLAY        102670
6509    10    18BB  981E                  COMM   1,,14                                  102680
6510    14    18BC  D045   (18C2)         BLE    $4                                     102690
6511    10R   18BD  F007003C              STA    0,DMAX3                                102700
6512    16 *  18BF  F11D18DE              XEQ    X1,,IOTAB3-15                          102710
6513    20    18C1  D108   (18DA)         BUC    $99                                    102720
6514    10R   18C2  F007003B      $4      STA    0,,DMAX2                               102730
6515    22    18C4  E0000023              MRG    0,0,DMAX23                             102740
6516    26    18C6  D103   (18DA)         BUC    $99                                    102750
6517    8R    18C7  F51A18D8      $10     CLA    X1,,IOTAB1-4  START LO DISPLAY        102760
6518    18    18C9  F007003C              STA    0,,DMAX3                               102770
6519    20    18CB  9817                  COMM   1,,7                                   102780
6520    24    18CC  D043   (18D0)         BLE    $57                                    102790
6521    6R *  18CD  F11D18E2              XEQ    X1,,IOTAB2-8                           102800
6522    10    18CF  D00A   (18DA)         BUC    $99                                    102810
6523    2R    18D0  B022          $57     SUB    2,2                                    102820
6524    14    18D1  E0200023              MRG    2,0,DMAX23                             102830
6525    18    18D3  D006   (18DA)         BUC    $99                                    102840
6526    2R    18D4  B411          $20     ADD    1,1          SYNCHRO DISPLAY           102850
6527    4     18D5  A421                  CLA    2,1                                    102860
6528    14    18D6  FD2A0018              CLAD   X2,,CHO                                102870
6529    26    18D8  F8070038              STAD   0,,DMAX4                               102880
6530    20R   18DA  D760          $99     PRN    6                                      102890
6531    8R    18DB  D5F0          $90     BBK    15           EXIT UNTILL NEXT INTERRUPT 102900
6532          18DC  8000          IOTAB1  CON    X(8000)                                102910
6533          18DD  4000                  CON    X(4000)                                102920
6534          18DE  2000                  CON    X(2000)                                102930
6535          18DF  0400                  CON    X(0400)                                102940
6536          18E0  0008                  CON    X(0008)                                102950
6537          18E1  0010                  CON    X(0010)                                102960
6538          18E2  0020                  CON    X(0020)                                102970
6539          18E3  8000                  CON    X(8000)                                102980
6540          18E4  4000                  CON    X(4000)                                102990
6541          18E5  2000                  CON    X(2000)                                103000
6542          18E6  0400                  CON    X(0400)                                103010
6543          18E7  0001                  CON    X(0001)                                103020
6544          18E8  0002                  CON    X(0002)                                103030
6545          18E9  0004                  CON    X(0004)                                103040
6546    8R    18EA  0300          IOTAB2  SET    0            DC LO 4                   103050
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6547    16    18EB  0304                  SET     4           DC LO 5     103060
6548    24    18EC  0306                  SET     6           DC LO 6     103070
6549     8R   18ED  0302        IOTAB3    SET     2           DC HI 4     103080
6550    16    18EE  0304                  SET     4           DC HI 5     103090
6551    24    18EF  0306                  SET     6           DC HI 6     103100
6552          18F0  00010100    HX10100   COND    X(00010100) MASK        103110
6553          003A              DMAX1     EQU     X(003A)                 103120
6554          003B              DMAX2     EQU     X(003B)                 103130
6555          003C              DMAX3     EQU     X(003C)                 103140
6556          0038              DMAX4     EQU     X(0038)                 103150
6557          0023              DMAX23    EQU     X(0023)                 103160
6558          18F2  DFE4                  ECS                             103170
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                                                  **
                                                  *  THIS BLOCK IS THE PCI NAVIGATION PERFORMANCE 24 HOUR TEST,
                                                  *  IT ALSO IS USED FOR PCI TIMMING TEST. NO RZ CALCULATIONS ARE
                                                  *  ALLOWED BECAUSE RZ UPDATES ARE DELETED.
                                                          TAPE      4,X(73)
                                                          TAPE      3,12
                                                          TAPE      4,X(F1)
                                                          TAPE      1
                    18F3                                  SCS
                    00E5                                  ORG       STATIONS_IN_USE
                    00E5  040E                            CON       X(040E)
                    00E6  FBF2                            CON       X(FBF2)
                    0157                                  ORG       PROG_ID_OVL
                    0157  6000                            CON       X(6000)
                    02B6                                  ORG       ONE_SEC$101
                    02B6  0297                            CON       END_EXEC
                    02B7  0297                            CON       END_EXEC
                    02BC                                  ORG       ONE_SEC$103
                    02BC  1815                            CON       TYPE_NAV_PERF_OUTPUT
                    02BD  1873                            CON       NAV_PERF_DATA
                    0240                                  ORG       MAIN_PROGRAM
          6R        0240  040017EA                        BUC       PCI_INIT          INITIALIZE PARAMETERS
                    17DD                                  ORG       LAT_N85_N90
          8R *      17DD  F80D142D          POP_12_SUB    BSV       POP12             GET COUNT
         16         17DF  E400010E                        EXT       0,0,HXFF00        PUT CCCCCCFF, COUNTS AND
         22         17E1  F0150080                        RSL       1,,8              2 BLANKS IN REGS 0 AND 1
         24         17E3  8401                            ADD       0,1               FOLLOWED BY R2-R3 BOTH
         26         17E4  A413                            CLA       1,3
         30         17E5  F4140100                        LSA       1,,8
         34         17E7  F41900FF                        ADDM      1,,X(00FF)
         42         17E9  D5F0                            BBK       15                EXIT
         32R        17EA  F4C80040          PCI_INIT      FETM      12,,I(64)         SET NUM CHARS TO TYPE OUT
         34         17EC  A4AC                            CLA       10,12             SET CHAR POINTER
         36         17ED  94A1                            ADDM      10,,1             BY ONE TO INHBT IMMED. T/O
         38         17EE  A4BC                            CLA       11,12
         48         17EF  FC6A1811                        CLAD      6,,TIME_INC2      SET NEXT T/O TO OCCUR IN 15M
        106         17F1  F4C71FE0                        PTR       12,,SXSQ          LEAVE REST ZERO
        128         17F3  8480                            FETM      8,,0
        170         17F4  F4871FB2                        PTR       8,,N6_15_COUNT    ZERO GOOD RECEPTION COUNTERS
          8R *      17F6  F80D0243          $1            BSV       MP_CKSUM          ALL ZERO.
         12         17F8  D803    (17F6)                  BUC       $1
                                                  *ACCUMULATE MEAN  (SUMMATION X**2/N) AND (SUMMATION X/N)**2 TERMS
                                                  *FOR COMPUTATION OF STANDARD DEVIATION. ENTER ONCE FOR EACH X
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                                        *WITH  R0 = SXSQ  2 WORDS  SUM X**2/N
                                        *      R2 = SX    2 WORSS  MEAN TERM
                                        *      R4 = N SCALED
                                        *      R5 = N
                                        *      R6-R8 SCRATCH
                                        *      R9 NEW VALUE TO BE AVERAGED 2 WORDS
6596    42R    17F9  F08C1FE0   ACCUMULATE  FET     8,,SXSQ
6597    52     17FB  FC4B1813               ADDD    4,,N_INC      INCREMENT COUNT N
6598    54     17FD  9890                   COMM    9,,0
6599    58     17FE  D021   (1800)          BGE     $1
6600     4R    17FF  A899                   CLSD    9,9
6601     4R    1800  AC79       $1          CLAD    7,9
6602     8     1801  B892                   SUBD    9,2           NEWX-SX
6603   134     1802  DC94                   DIVD    9,4           (NEWSX-SX)/N RESULT B7 OFF
6604   144     1803  F8940100               RSAD    9,,7          SCALE SAME AS SX
6605   148     1805  BC29                   ADDD    2,9           (NEWX-SX)/N + SX TO SX
6606   154     1806  FC740040               LSAD    7,,6
6607   170     1808  6877                   MPYD    7,7           NEWX**2
6608   174     1809  B870                   SUBD    7,0
6609   300     180A  DC74                   DIVD    7,4
6610   310     180B  F8740100               RSAD    7,,7
6611   314     180D  BC07                   ADDD    0,7           (NEWX**2 - SXSQ)/N + SXSQ
6612   344     180E  F4571FE0               PTR     5,,SXSQ
6613   364     1810  D540                   BBK     4
6614           1811  00000384   TIME_INC2   COND    X(00000384)   I(900) SEC = 15 MIN
6615           1813  01000001   N_INC       COND    X(01000001)
6616                            TYPE_NAV_PERF_OUTPUT;
6616    10R    1815  F00C0009               FET     0,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES
6617    18     1817  E40000E2               EXT     0,0,HX2000    TEST FOR TRYING TO SYNC
6618    22     1819  D061   (181B)          BRE     $10
6619    16R    181A  D520                   BBK     2             YES, SO EXIT.
6620     8R    181B  F40A1FEA   $10         CLA     0,,CHAR_POINTER
6621    20     181D  8430                   FETM    3,0
6622    28     181E  F0481FEB               COM     4,,MAX_COUNT
6623    32     1820  D051   (1822)          BRL     $2
6624    24R    1821  D560       $1          BBK     6             EXIT IF NO TYPE OUT
6625     8R    1822  F40F8F10   $2          SNS     PUNCH_OR_PRINTER_BUSY
6626    12     1824  D824   (1821)          BGE     $1
6627    10R    1825  F8452000               RSLD    4,,2
6628    16     1827  5052                   RSL     5,,14
6629    18     1828  A435                   CLA     3,5
6630    26     1829  F54A1FC6               CLA     X4,,T_O_BUFFER
6631     6R    182B  F405C010   $3          LSE     0,,4
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6632   14   182D  C423   (182B)                BXU   2,,$3                                  104040
6633    8R  182E  E400177D                     EXT   0,0,HX000F                             104050
6634   16   1830  F50A183E                     CLA   X0,,T_O_TABLE                          104060
6635   26   1832  F0071C04                     STA   0,,TYPE_OUT                            104070
6636   34   1834  F80FDF01                     IOC   0,,LOAD_PRINTER                        104080
6637   44   1836  FC0D1C04                     POP   0,,TYPE_OUT                            104090
6638   52   1838  F41A1FEA                     CLA   1,,CHAR_POINTER                        104100
6639   54   183A  9411                         ADDM  1,,1                                   104110
6640   64   183B  F0171FEA                     STA   1,,CHAR_POINTER                        104120
6641   88   183D  D560                         BBK   6              EXIT AFTER 1CHAR TYPEOUT.  104130
6642        183E  0038            T_O_TABLE    CON   X(0038)        0                       104140
6643        183F  007F                         CON   X(007F)        1                       104150
6644        1840  0076                         CON   X(0076)        2                       104160
6645        1841  003E                         CON   X(003E)        3                       104170
6646        1842  0075                         CON   X(0075)        4                       104180
6647        1843  003D                         CON   X(003D)        5                       104190
6648        1844  0034                         CON   X(0034)        6                       104200
6649        1845  007C                         CON   X(007C)        7                       104210
6650        1846  0079                         CON   X(0079)        8                       104220
6651        1847  0031                         CON   X(0031)        9                       104230
6652        1848  004F                         CON   X(004F)        A                       104240
6653        1849  0015                         CON   X(0015)        B=M                     104250
6654        184A  0070                         CON   X(0070)        C=#                     104260
6655        184B  0045                         CON   X(0045)        D                       104270
6656        184C  0084                         CON   X(0084)        CR                      104280
6657        184D  0081                         CON   X(0081)        SPACE                   104290
```

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                                **
                                                ORG         LAT_N25_N30                                                 104300
                                                ORG         LAT_N25_N30                                                 104310
                    NAVIGATION_PERFORMANCE_DATA_COLLECTION,NAV_PERF_DATA;                                               104320
6659      10R   1873  F00C0009                  FET         0,,C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES                  104330
6660      18    1875  E40000E2                  EXT         0,0,HX2000      TEST FOR TRYING TO SYNC                     104340
6661      22    1877  D061   (1879)             BRE         $99             BRANCH IF NO                                104350
6662      16R   1878  D520                      BBK         2               YES SO EXIT                                 104360
6663      50R   1879  F0AC1FE0          $99      FET         10,,SXSQ        GET DATA.                                   104370
6664      60    187B  FC8B00EB                  ADDD        8,,=DX(00000001)  INCR SECOND COUNTER                       104380
6665      72    187D  F8871FE8                  STAD        8,,T_0_SEC_COUNT                                            104390
6666      82    187F  F8881921                  COMD        8,,ONE_DAY      IS ONE DAY UP                               104400
6667      86    1881  D063   (1885)             BRE         $1                                                          104410
6668       4R   1882  8868                      COMD        6,8             IS IT TIME TO GET DATA RDY                  104420
6669       8    1883  D26C   (1880)             BRE         $2              YES.                                        104430
6670      38R   1884  D5D0                      BBK         13              NO.                                         104440
6671       8R   1885  8410              $1      FETM        1,,0            DO END OF DAY TYO                           104450
6672      10    1886  A407                      CLA         0,7             GET NO. OF GOODS                            104460
6673       2R   1887  980A              $10     COMM        0,,10           START CONV OF GOODS NO.                     104470
6674       6    1888  D054   (188D)             BRL         $11                                                         104480
6675       2R   1889  900A                      SUBM        0,,10                                                       104490
6676       6    188A  F4190010                  ADDM        1,,16                                                       104500
6677      10    188C  D806   (1887)             BUC         $10                                                         104510
6678       2R   188D  B401              $11     ADD         0,1             CONVERTED RESULT                            104520
6679       6    188E  F409EC00                  ADDM        0,,X(EC00)      CR # BEFORE FINAL T/O.                      104530
6680      16    1890  F0071FC6                  STA         0,,T_0_BUFFER                                               104540
6681      26    1892  FC0A1FE0                  CLAD        0,,SXSQ                                                     104550
6682      36    1894  4808                      RSAD        0,,12                                                       104560
6683      46    1895  FC2A1FE2                  CLAD        2,,SX                                                       104570
6684      62    1897  6822                      MPYD        2,2             10                                          104580
6685      64    1898  A400                      CLA         0,0             WAS SUBD 0,2                                104590
6686      68    1899  D021   (189B)             BGE         $13                                                         104600
6687       4R   189A  A800                      CLSD        0,0                                                         104610
6688     446R   189B  1000              $13     SQRT        0                                                           104620
6689    1022    189C  0C04                      GEN         RANGE_DISPLAY                                               104630
6690    1026    189D  F41900FF                  ADDM        1,,X(00FF)                                                  104640
6691    1030    189F  FC09FFBF                  CLAM        0,,X(FFBF)                                                  104650
6692    1044    18A1  FC071FC7                  PTRD        0,,T_0_BUFFER+1                                             104660
6693    1048    18A3  FC09EEEE                  CLAM        0,,X(EEEE)      PUT 4 CRS IN LAST WORD                      104670
6694    1058    18A5  F0071FC9                  STA         0,,T_0_BUFFER+3                                             104680
6695    1072    18A7  F4380010                  FETM        3,,16           COUNT = 16                                  104690
6696    1094    18A9  F4371FE8                  PTR         3,,T_0_SEC_COUNT 0 TO CHAR POINTE                           104700
6697    1104    18AB  FC7A1813                  CLAD        7,,N_INC        MAKE NEXT T/O LONG TIME                     104710
6698    1116    18AD  F8771FE6                  STAD        7,,T_0_TIME                                                 104720
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                                                  **                                                                  104740
                                                  *  PREPARE DATA FOR T_O_BUFFER                                      104750
6700      2R        18B0  9C11          $2              CLAM     1,,1            STATION B COUNTS                   104760
6701     10  *      18B1  F80D17DD                      BSV      POP_12_SUB                                         104770
6702     32         18B3  F4371FCF                      PTR      3,,T_O_BUFFER+9                                    104780
6703     34         18B5  9C12                          CLAM     1,,2            STATION C  COUNTS                  104790
6704     42  *      18B6  F80D17DD                      BSV      POP_12_SUB                                         104800
6705     64         18B8  F4371FD1                      PTR      3,,T_O_BUFFER+11                                   104810
6706     66         18BA  9C13                          CLAM     1,,3            STATION D  COUNTS                  104820
6707     74  *      18BB  F80D17DD                      BSV      POP_12_SUB                                         104830
6708     78         18BD  FC29FFEE                      CLAM     2,,X(FFEE)      PUT CRS IN LAST WORD               104840
6709     96         18BF  F4271FD3                      PTR      2,,T_O_BUFFER+13                                   104850
6710    132         18C1  D7E0                          PRN      14              START TIME CALCULATION             104860
6711    140  *      18C2  F80D1386                      BSV      POP9                                               104870
6712    148         18C4  E444010E                      EXT      4,4,HXFF00                                         104880
6713    156         18C6  F448C10F                      ADD      4,,HX00FF                                          104890
6714    168         18C8  D720                          PRN      2                                                  104900
6715    186         18C9  F4271FC6                      PTR      2,,T_O_BUFFER                                      104910
6716    188         18CB  9C1B                          CLAM     1,,11           GET LAT/LONG FOR SHIP              104920
6717    196  *      18CC  F80D1270                      BSV      POP1                                               104930
6718    204         18CE  E411010E                      EXT      1,1,HXFF00                                         104940
6719    212         18D0  F418010F                      ADD      1,,HX00FF                                          104950
6720    220         18D2  E444010E                      EXT      4,4,HXFF00                                         104960
6721    228         18D4  F448010F                      ADD      4,,HX00FF                                          104970
6722    246         18D6  F4271FC8                      PTR      2,,T_O_BUFFER+2                                    104980
6723    264         18D8  F4271FCA                      PTR      2,,T_O_BUFFER+4                                    104990
6724    272  *      18DA  F80D12C2                      BSV      POP4            GET VAR                            105000
6725    274         18DC  A424                          CLA      2,4             REPOSITION                         105010
6726    280         18DD  FC141000                      LSAD     1,,12                                              105020
6727    282         18DF  941F                          ADDM     1,,15           PUT BLANK ON RIGHT                 105030
6728    290         18E0  D700                          PRN      0               FOR STORE.                         105040
6729    300         18E1  F4071FCD                      PTR      0,,T_O_BUFFER+7 END OF VAR                         105050
6730    310         18E3  FC0A1C21                      CLAD     0,,XXX+3        START T_3_DOT                      105060
6731    886         18E5  0C0A                          GEN      T_O_DOT_CVT                                        105070
6732    892         18E6  FC041000                      LSAD     0,,12                                              105080
6733    894         18E8  940F                          ADDM     0,,15           PUT BLANK ON RIGHR                 105090
6734    904         18E9  F4071FCE                      PTR      0,,T_O_BUFFER+8                                    105100
6735    918         18EB  8448                          FETM     4,,8                                               105110
6736    928         18EC  F0071FEC                      STA      0,,GOOD_BAD_FL  CLEAR THE FLAG                     105120
6737    938         18EE  FC0A1FE6                      CLAD     0,,T_O_TIME     INNC TO NEXT T/O TIME              105130
6738    948         18F0  FC0B1811                      ADDD     0,,TIME_INC2    BY 15 MIN                          105140
6739    960         18F2  F8071FE6                      STAD     0,,T_O_TIME                                        105150
6740      8R        18F4  F53A1DBE      $100            CLA      X3,,SIGMA_SQ_N_COUNTER+3                           105160
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6741    10          18F6  A410                      CLA     1,0             TO UPDATE  LATER                    105170
6742    18          18F7  F13B1FB2                  SUB     X3,,N6_15_COUNT  N TIMES UPDATED IN 15 MIN        105180
6743    20          18F9  A420                      CLA     2,0             SAVE IT                             105190
6744    22          18FA  A401                      CLA     0,1             REPLACE FOR NEXT TIME               105200
6745    32          18FB  F1371FB2                  STA     X3,,N6_15_COUNT                                     105210
6746    38          18FD  F0240080                  RSA     2,,8            RIGHT ADJUST                        105220
6747    40          18FF  9820                      COMM    2,,0            MAKE IT MOD 100                     105230
6748    44          1900  D022   (1903)             BGE     $20             IF NEGATIVE                         105240
6749     4R         1901  F4290064                  ADDM    2,,X(0064)      ADD 100                             105250
6750     2R         1903  9826            $20       COMM    2,,6            NEED 6 IN 15 MIN                    105260
6751     6          1904  D022   (1907)             BGE     $3              IF GOOD JUMP                        105270
6752    10R         1905  F0471FEC                  STA     4,,GOOD_BAD_FL   ELSE SET FLAG NON ZERO             105280
6753     8R         1907  C534   (18F4)    $3       BXU     3,,$100         TEST FOR 9 TIMES                    105290
6754    10R         1908  F0371FEA                  STA     3,,CHAR_POINTER                                     105300
6755    18          190A  F40A1FEC                  CLA     0,,GOOD_BAD_FL   TEST FLAG                          105310
6756    22          190C  D065   (1912)             BRE     $4              JUMP IF ALL GOOD                    105320
6757     8R         190D  F40A178C                  CLA     0,,HXDFFF       ELSE STORE D AND BLANKS             105330
6758    18          190F  F0071FCC                  STA     0,,T_O_BUFFER+6                                     105340
6759    58          1911  D5E0                      BBK     14              RETURN TO EXEC                      105350
6760    24R         1912  D780            $4        PRN     8                                                   105360
6761    26          1913  9C18                      CLAM    1,,11           SHIP TO                             105370
6762    28          1914  9C20                      CLAM    2,,0            FOR WAYPT NO. 1                     105380
6763    36  *       1915  F80D1483                  BSV     MAKE_RANGE_AND_BEARING                              105390
6764    44          1917  8410                      FETM    1,,0            PRESERVE FOR LATER                  105400
6765    48          1918  AC02                      CLAD    0,2                                                 105410
6766    56  *       1919  F80D17F9                  BSV     ACCUMULATE                                          105420
6767   632          191B  0C04                      GEN     RANGE_DISPLAY   RANGE IN R0,1.                       105430
6768   642          191C  F8040080                  RSAD    0,,8            POSITION RESULT                     105440
6769   652          191E  F0171FCC                  STA     1,,T_O_BUFFER+6                                     105450
6770   686          1920  D580                      BBK     11                                                  105460
6771                1921  000151C1        ONE_DAY   COND    1(86465)        ONE DAY + 65 SEC IN SECS            105470
6772                1FE0                  SXSQ      EQU     DESTINATION_LATITUDE+2  2 WORDS SQUARED TERM        105480
6773                1FE2                  SX        EQU     DESTINATION_LATITUDE+4  2 WORDS MEAN                105490
6774                                      N_GOODS_SCALED;                                                     105500
6774                1FE4                            EQU     DESTINATION_LATITUDE+6  1 WORD                      105510
6775                1FE5                  NO_GOODS  EQU     DESTINATION_LATITUDE+7  1 WORD                      105520
6776                1FE6                  T_O_TIME  EQU     DESTINATION_LATITUDE+8  2 WORDS                    105530
6777                                      T_O_SEC_COUNT;                                                      105540
6777                1FE8                            EQU     DESTINATION_LATITUDE+10 2 WORDS                    105550
6778                                      CHAR_POINTER;                                                       105560
6778                1FEA                            EQU     DESTINATION_LATITUDE+12 1 WORD                     105570
6779                1FEB                  MAX_COUNT EQU     DESTINATION_LATITUDE+13 1 WORD                     105580
6780                1FEC                  GOOD_BAD_FL EQU   DESTINATION_LATITUDE+14 1 WORD                     105590
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6781    1FB2                N6_15_CCUNT EQU     RZ_C                    9 WORD          105600
6782    1FC6                T_O_BUFFER  EQU     DESTINATION_LONGITUDE+2   16 WORDS        105610
6783    1923  94F5                      ECS                                               105620
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                    ** THIS BLOCK IS FOR PCI DYNAMIC RANGE AND RANDOM NOISE TEST                105630
                    *  IT RUNS VIA SIMULATOR, HENCE THAT BLOCK SHOULD ALSO BE LOADED            105640
6784                                        TAPE        4,X(73)                                 105650
6785                                        TAPE        3,12                                    105660
6786                                        TAPE        4,X(F1)                                 105670
6787                                        TAPE        1                                       105680
6788                1924                    SCS                                             105690
6789                00E5                    ORG         STATIONS_IN_USE                     105700
6790                00E5    040EF8F2        COND        X(040EF8F2)                         105710
6791                0146                    ORG         PLOT15                              105720
6792          8R *  0146    F80D0C4D        BSV         TYPE_DYN_RNG_DATA                   105730
6793                0157                    ORG         PROG_ID_OVL                         105740
6794                0157    9000            CON         X(9000)                             105750
6795                028C                    ORG         ONE_SEC$103                         105760
6796                028C    0297            CON         END_EXEC                            105770
6797                028D    0297            CON         END_EXEC                            105780
6798                0542                    ORG         PLOT16                              105790
6799          14    0542    040000C82       BUC         GET_DYN_RNG_DATA                    105800
6800                0683                    ORG         START_OF_BURST$77-3                 105810
6801          2R    0683    A400            CLA         0,0             NO OP               105820
6802                0767                    ORG         KALMAN_FILTER+2                     105830
6803          4     0767    A400            CLA         0,0                                 105840
6804                0240                    ORG         MAIN_PROGRAM                        105850
6805          10    0240    040017DD        BUC         DYN_RNG_INIT                        105860
6806                02B6                    ORG         ONE_SEC$101                         105870
6807                02B6    0297            CON         END_EXEC        DISABLE RZ          105880
6808                02B7    0297            CON         END_EXEC        UPDATES             105890
6809                0470                    ORG         MEASUREMENT_UPDATE$15               105900
6810          6R    0470    040017F5        BUC         SAVE_BP_DATA                        105910
6811                0686                    ORG         START_OF_BURST$77                   105920
6812          2R    0686    9C06            CLAM        0,,6            FORCE BASE STATION  105930
6813          4     0687    9C13            CLAM        1,,3            TO D                105940
6814                0C49                    ORG         PROPAGATION_PREDICTION              105950
6815          12    0C49    D5F0            BBK         15              STOP PROP           105960
6816                0380                    ORG         END_OF_BURST$8                      105970
6817                0380    D000            CON         X(D000)         STOP PHANTOM CORRECTION 105980
6818                155F                    ORG         CD13                                105990
6819                155F    CC51E000        COND        X(0051E000)     THIS GIVES XX.X IN CEC  106000
6820                1561    232E            CON         X(232E)         3 BLANKS            106010
6821                12F8                    ORG         POP8$1                              106020
6822          2R    12F8    B000            SUB         0,0                                 106030
6823                1306                    ORG         POP8$5-1                            106040
6824          4     1306    A400            CLA         0,0                                 106050
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                1763                          ORG     ANTENNA_SELECT_TABLE+1
                1763  0001                    CON     X(1)
                1764  0001                    CON     X(1)
                1765  0001                    CON     X(1)
                17DD                          ORG     LAT_N85_N90
                                DYN_RNG_INIT;
      28R       17DD  84B0                    FETM    11,,0
      82        17DE  F4B71FC6                PTR     11,,SXSQ2       CLEAR DATA COLLECTOR CELLS
      98        17E0  8450                    FETM    5,,0
     128        17E1  F4571FD2                PTR     5,,BPDATA2
     138        17E3  F00C112A                FET     0,,HXFEFF       GET CR AND BLANKS
     148        17E5  F0071FB2                STA     0,,T_O_BUFFER2
     158        17E7  F0071FB9                STA     0,,T_O_BUFFER2+7
     168        17E9  F4071FC0                PTR     0,,T_O_BUFFER2+14
     180        17EB  8430                    FETM    3,,0            ZEROES TO
     202        17EC  F4371FE0                PTR     3,,T_O_SEC_COUNT2  AND NN
     224        17EE  F03C0D43                FET     3,,FIVE_MIN     INITIALIZE
     246        17F0  F4371FE4                PTR     3,,T_O_TIME2    ,CHAR_POINT AND MAX COUNTER
       8R *     17F2  F80D0243        $1      BSV     MP_CKSUM
      12        17F4  D803    (17F2)          BUC     $1              END OF INITIALIZATION
                                SAVE_BP_DATA;
      10R       17F5  F99B1F1F                SUBD    X9,,PHI_M_BASE
      12        17F7  9862                    COMM    6,,2            TEST FOR STATION B
      18        17F8  0401183D                BNE     $1
       8R       17FA  C011                    FET     1,1
      14        17FB  C00B                    FET     0,11            FREQ INDEX                  D01
      18        17FC  D015    (1802)          BNE     $2              NOT 10.2
       8R       17FD  F0081CA1                COM     0,,SAMPLE_MKR
      12        17FF  D062    (1802)          BRE     $2              NOT SAMPLE TIME
       8R *     1800  F80D183F                BSV     ACCUMULATEX
       6R       1802  C000            $2      FET     0,0             FREQUENCY INDEX
      16        1803  F0071CB0                STA     0,,BPHISTORY+14
      20        1805  F4091FD2                ADDM    0,,BPDATA2
      38        1807  F6380D47                FETM    I3,,N_SMOOTHING D(0),D(N)
      42        1809  F4591CA2                ADDM    5,,BPHISTORY
      44        180B  9032                    SUBM    3,2             N-2
      46        180C  B433                    ADD     3,3             LIMIT=2N-4
      54        180D  C017                    FET     1,7
     488        180E  1400                    SINCOS  0
     498        180F  F00C1CB0                FET     0,,BPHISTORY+14
     504        1811  C000                    FET     0,0
     508        1812  440E                    MPIM    0,,14
     512        1813  F4091CC2                ADDM    0,,BPHISTORY+32                          01
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6866    524    1815  C035                    FET      3,5                                    106490
6867    534    1816  F8241000                RSAD     2,,3                                   106500
6868    544    1818  F8041000                RSAD     0,,3                                   106510
6869    554    181A  F418001A                FETM     1,,26                                  106520
6870    562    181C  C015                    FET      1,5                                    106530
6871     8R    181D  BF28          $4        ADDD    IX2,8                                   106540
6872     10    181E  9422                    ADDM     2,,2                                   106550
6873     18    181F  CC23   (181D)           BXUD     2,,$4                                  106560
6874     2R    1820  9082                    SUBM     8,,2                                   106570
6875     10    1821  C015                    FET      1,5                                    106580
6876     8R    1822  BF4A          $5        ADDD    IX4,10                                  106590
6877     10    1823  9442                    ADDM     4,,2                                   106600
6878     18    1824  CC43   (1822)           BXUD     4,,$5                                  106610
6879     6R    1825  C008                    FET      0,11                                   106620
6880     10    1826  4402                    MPIM     0,,2                                   106630
6881     14    1827  F4091D1F                ADDM     0,,BPDATA4                             106640
6882     26    1829  C034                    FET      3,4                                    106650
6883     46    182A  7634                    PTR     I3,4                                    106660
6884     54    182B  D700                    PRN      0                                      106670
6885    592    182C  1800                    ATAN     0                                      106680
6886    604    182D  F9971CA2                STAD    X9,,BPHISTORY                           106690
6887    610    182F  C008                    FET      0,8                                    106700
6888    612    1830  9404                    ADDM     0,,4                                   106710
6889    618    1831  8400                    FETM     0,,0                                   106720
6890    626    1832  F4080016                FETM     0,,22                                 01 106730
6891    12R    1834  CB08          $6        FETD    IX0,11                                  106740
6892     24    1835  7F24                    PTRD    IX2,4                                   106750
6893     32    1836  CC03   (1834)           BXUD     0,,$6                                 01 106760
6894    20R    1837  D760                    PRN      6                                      106770
6895     40    1838  7634                    PTR     I3,4                                    106780
6896     50    1839  D710                    PRN      1                                      106790
6897     52    183A  A412                    CLA      1,2                                    106800
6898     62    183B  7A08                    STAD    I0,8                                    106810
6899     92    183C  D7B0                    PRN      11                                     106820
6900     6R    183D  04000472      $1        BUC      MEASUREMENT_UPDATE$10                  106830
                                  * THIS ROUTINE KEEPS A RUNNING AVERAGE (SX = SUMMATION X/N) AND 106840
                                  * ALSO  SXSQ = SUMMATION X**2/N FOR THE 3 VALUES OF BP, ONE FOR 106850
                                  * EACH FREQUENCY. S.D.=ROOT(SXSQ-SX**2). RMS= ROOT(SXSQ).      106860
6901    18R    183F  F02C0D39      ACCUMULATEX FET  2,,MSXSQ2      GET ADDRESSES FOR DATA  106870
6902     32    1841  F01C0D3F                FET      1,,N_INC2                              106880
6903     42    1843  FC0B1FE2                ADDD     0,,NN          INCREMENT N             106890
6904     54    1845  F8071FE2                STAD     0,,NN                                  106900
6905     64    1847  F00C1FE2                FET      0,,NN                                  106910
```

```
6906    72    1849  841A                  FETM    1,,10
6907    14R   184A  F90C1D1F      $2       FETD    X0,,BPDATA4
6908    28    184C  F92C1D2F               FETD    X2,,BPDATA4+16
6909    32    184E  B820                   SUBD    2,0
6910    42    184F  F8240100               RSAD    2,,7
6911   168    1851  DC26                   DIVD    2,6
6912   172    1852  BC02                   ADDD    0,2
6913   186    1853  FD471D2F               PTRD    X4,,BPDATA4+16
6914   196    1855  D710                   PRN     1
6915   204    1856  CC0D   (184A)          BXUD    0,,$2
6916    12R   1857  D720                   PRN     2
6917    20    1858  8414                   FETM    1,,4          GET 3 DBL CNT AND INDEX REG.
6918    12R   1859  CB06          $1       FETD    IX0,6         GET LATEST BP THIS FREQ
6919    24    185A  CB27                   FETD    IX2,7
6920    32    185B  C014                   FET     1,4
6921    34    185C  B003                   SUB     0,3
6922    36    185D  B042                   SUB     4,2
6923    46    185E  F8040100               RSAD    0,,7
6924    56    1860  F8440100               RSAD    4,,7
6925   182    1862  DC08                   DIVD    0,8
6926   308    1863  DC48                   DIVD    4,8
6927   310    1864  B430                   ADD     3,0
6928   312    1865  B424                   ADD     2,4
6929   322    1866  D710                   PRN     1
6930   332    1867  7B49                   STAD    IX4,9
6931   340    1868  AF48                   CLAD    IX4,8
6932   354    1869  F94C1CA2               FETD    X4,,BPHISTORY
6933   366    186B  5A63   (00E3)          MPLDM   I0,,HX4000    RSLD 1                    01
6934   382    186C  6800                   MPYD    0,0           BP**2
6935   386    186D  B802                   SUBD    0,2                 - SXSQ
6936   396    186E  F8040100               RSAD    0,,7
6937   522    1870  DC08                   DIVD    0,8
6938   526    1871  BC02                   ADDD    0,2           (BP**2-SXSQ)/N + SXSQ
6939   536    1872  7B6A                   STAD    IX6,10        SAVE SXSQ
6940   554    1873  D750                   PRN     5
6941   562    1874  CD0C   (1859)          BXUD    0,,$1         DO IT 3 TIMES
6942    24R   1875  D560                   BBK     6             THEN EXIT
                                  *
6943          0C4D                         ORG     PROPAGATION_PREDICTION$10
6944                            TYPE_DYN_RNG_DATA;
6944    8R    0C4D  F40F8F10               SNS     PUNCH_OR_PRINTER_BUSY
6945    12    0C4F  D027   (0C57)          BGE     $21
6946    18R   0C50  F02C1FE6               FET     2,,CHAR_POINT
```

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30      0C52  8430                  FETM   3,,0                                  107350
38      0C53  F0481FE7              COM    4,,MAX_COUNTER                        107360
42      0C55  D053   (0C59)         BRL    $20                                   107370
20R     0C56  D760          $19     PRN    6                                     107380
 6R     0C57  04000285      $21     BUC    EXEC                                  107390
10R     0C59  F8452000      $20     RSLD   4,,2                                  107400
16      0C5B  5052                  RSL    5,,14                                 107410
18      0C5C  A435                  CLA    3,5                                   107420
26      0C5D  F54A1FB2              CLA    X4,,T_O_BUFFER2                       107430
 6R     0C5F  F4050010      $3      LSE    0,,4                                  107440
14      0C61  C423   (0C5F)         BXU    2,,$3                                 107450
 8R     0C62  E400177D              EXT    0,0,HX000F                            107460
16      0C64  F50A0C72              CLA    X0,,T_O_TABLES                        107470
26      0C66  F0071C04              STA    0,,TYPE_OUT                           107480
34      0C68  F80FDF01              IOC    0,,LOAD_PRINTER                       107490
44      0C6A  FC0D1C04              POP    0,,TYPE_OUT                           107500
52      0C6C  F41A1FE6              CLA    1,,CHAR_POINT                         107510
54      0C6E  9411                  ADDM   1,,1                                  107520
64      0C6F  F0171FE6              STA    1,,CHAR_POINT                         107530
68      0C71  D90C   (0C56)         BUC    $19                                   107540
        0C72  0038          T_O_TABLES CON X(0038)        0                      107550
        0C73  007F                  CON    X(007F)        1                      107560
        0C74  0076                  CON    X(0076)        2                      107570
        0C75  003E                  CON    X(003E)        3                      107580
        0C76  0075                  CON    X(0075)        4                      107590
        0C77  003D                  CON    X(003D)        5                      107600
        0C78  0034                  CON    X(0034)        6                      107610
        0C79  007C                  CON    X(007C)        7                      107620
        0C7A  0079                  CON    X(0079)        8                      107630
        0C7B  0031                  CON    X(0031)        9                      107640
        0C7C  0057                  CON    X(0057)        -                      107650
        0C7D  0015                  CON    X(0015)        M                      107660
        0C7E  0026                  CON    X(0026)        S                      107670
        0C7F  0045                  CON    X(0045)        D                      107680
        0C80  0084                  CON    X(0084)        CR                     107690
        0C81  0081                  CON    X(0081)        SPACE                  107700
                            GET_DYN_RNG_DATA;                                    107710
14R     0C82  F01C00B5              FET    1,,STATION_COUNTER                    107720
18      0C84  D061   (0C86)         BRE    $99                                   107730
14R     0C85  D510                  BBK    1              RETURN IF NOT BURST 0  01 107740
10R     0C86  FC0A1FE0      $99     CLAD   0,,T_O_SEC_COUNT2                     107750
18      0C88  96EB   (00EB)         ADDD   0,,=DX(00000001) INCR 1 SEC           107760
30      0C89  F8071FE0              STAD   0,,T_O_SEC_COUNT2                     107770
```

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6989    40    0C8B  F8080D3D                COMD   0,,TEN_MIN                                  107780
6990    44    0C8D  D065   (0C93)           BRE    $1            END OF TEST                   107790
6991    10R   0C8E  F8081FE4                COMD   0,,T_O_TIME2                                107800
6992    16    0C90  04060D1C                BRE    G_O_R_D                                     107810
6993    14R   0C92  D510                    BBK    1             RETURN TO EXEC                107820
6994    22R   0C93  F03C0D39        $1      FET    3,,MSXSQ2     END OF TEST TYPE OUT          107830
6995    24    0C95  9435                    ADDM   3,,5                                        107840
6996    32    0C96  8414                    FETM   1,,4          GET 3 DOUBLE COUNTER          107850
6997     8R   0C97  C010            $10     FET    1,0                                         107860
6998    12    0C98  4402                    MPIM   0,,2                                        107870
6999    16    0C99  F4091D2F                ADDM   0,,BPDATA4+16                               107880
7000    36    0C9B  C230                    FET    I3,0                                        107890
7001   574    0C9C  1800                    ATAN   0                                           107900
7002   578    0C9D  AC20                    CLAD   2,0                                         107910
7003   588    0C9E  D710                    PRN    1                                           107920
7004   598    0C9F  F8054000                RSLD   0,,1                                   01    107930
7005   610    0CA1  CB24                    FETD   IX2,4         GET SXSQ                      107940
7006   626    0CA2  6822                    MPYD   2,2           SX**2                         107950
7007   630    0CA3  B802                    SUBD   0,2           SXSQ-SX**2                D01 107960
7008   634    0CA4  D021   (0CA6)           BGE    $11                                         107970
7009     4R   0CA5  A800                    CLSD   0,0                                         107980
7010   446R   0CA6  1000            $11     SQRT   0             S. D.                         107990
7011   458    0CA7  7F49                    PTRD   IX4,9         STORE IN T_O_BUFFER+6         108000
7012   466    0CA8  AF25                    CLAD   IX2,5         GET SX                        108010
7013   474    0CA9  C011                    FET    1,1                                         108020
7014   476    0CAA  A421                    CLA    2,1                                         108030
7015   478    0CAB  B011                    SUB    1,1                                         108040
7016   480    0CAC  B033                    SUB    3,3                                         108050
7017  1018    0CAD  1800                    ATAN   0                                           108060
7018  1028    0CAE  F8054000                RSLD   0,,1                                        108070
7019  1032    0CB0  D031   (0CB2)           BRG    $12                                         108080
7020     4R   0CB1  A800                    CLSD   0,0           MAKE IT PLUS                  108090
7021     2R   0CB2  A487            $12     CLA    8,7           COMPUTE                       108100
7022     4    0CB3  9486                    ADDM   8,,6          STORE ADDRESS                 108110
7023    14    0CB4  7B28                    STAD   IX2,8         THEN STORE IT                 108120
7024    24    0CB5  D710                    PRN    1                                           108130
7025    32    0CB6  CE00   (0C97)           BXUD   0,,$10                                      108140
7026    10R   0CB7  F4180018                FETM   1,,24         NO. OF CHARS TO TYPE AND 0.   108150
7027    24    0CB9  F4171FE6                PTR    1,,CHAR_POINT ZERO CHAR POINT               108160
7028    34    0CBB  F00C0D3F                FET    0,,N_INC2                                   108170
7029    44    0CBD  F0171CA1                STA    1,,SAMPLE_MKR ZERO                          108180
7030    62    0CBF  D750                    PRN    5                                           108190
7031   116    0CC0  F0BC1FB8                FET    11,,T_O_BUFFER2+6  START SD COMPUTATION     108200
```

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7032    136    0CC2  F8060D10                MPYD    0,,THIRD                                  108210
7033    156    0CC4  F8260D18                MPYD    2,,FIFTYB1                                108220
7034    176    0CC6  F8460D1A                MPYD    4,,SIXTYB1                                108230
7035    180    0CC8  BC02                    ADDD    0,2                                       108240
7036    184    0CC9  BC04                    ADDD    0,4                                       108250
7037    194    0CCA  FC2A0D10                CLAD    2,,THIRD                                  108260
7038    770    0CCC  0C08                    GEN     BASE_DISPLAY                              108270
7039    774    0CCD  F41900FF                ADDM    1,,X(00FF)                                108280
7040    778    0CCF  FC29FEFF                CLAM    2,,X(FEFF)                                108290
7041    796    0CD1  F4271FB5                PTR     2,,T_O_BUFFER2+3                          108300
7042    806    0CD3  F84B0D16                SUBD    4,,FRTYFIV                                108310
7043    816    0CD5  F86B0D14                SUBD    6,,SIXTY                                  108320
7044    826    0CD7  F88B0D12                SUBD    8,,FIFTY                                  108330
7045    846    0CD9  F8460D10                MPYD    4,,THIRD                                  108340
7046    866    0CDB  F8660D18                MPYD    6,,FIFTYB1                                108350
7047    886    0CDD  F8860D1A                MPYD    8,,SIXTYB1                                108360
7048    890    0CDF  BC46                    ADDD    4,6                                       108370
7049    894    0CE0  BC48                    ADDD    4,8                                       108380
7050    904    0CE1  FC2A0D10                CLAD    2,,THIRD                                  108390
7051    934    0CE3  F05C1EB5                FET     5,,PHI_ESTIMATE+18      "D"               108400
7052    940    0CE5  FC040800                LSAD    0,,11                                     108410
7053    946    0CE7  FC240800                LSAD    2,,11                                     108420
7054    952    0CE9  FC440800                LSAD    4,,11                                     108430
7055    972    0CEB  F8060D10                MPYD    0,,THIRD                                  108440
7056    992    0CED  F8260D18                MPYD    2,,FIFTYB1                                108450
7057   1012    0CEF  F8460D1A                MPYD    4,,SIXTYB1                                108460
7058   1016    0CF1  BC02                    ADDD    0,2                                       108470
7059   1020    0CF2  BC04                    ADDD    0,4                                       108480
7060   1030    0CF3  F8045D70                MPYDM   0,,X(5D70)                                108490
7061   1040    0CF5  F8054000                RSLD    0,,1                                  01  108500
7062   1044    0CF7  F8094000                COMM    0,,X(4000)                                108510
7063   1048    0CF9  D041    (0CFB)          BLE     $14                                       108520
7064     8R    0CFA  92F3    (00F3)          SUBD    0,,=DI(1B31-1)                            108530
7065     4R    0CFB  B8A0            $14     SUBD    10,0                                      108540
7066     22    0CFC  D750                    PRN     5                                         108550
7067     24    0CFD  9C60                    CLAM    6,,0                                      108560
7068     28    0CFE  AC04                    CLAD    0,4                                       108570
7069     32    0CFF  D022    (0D02)          BGE     $13                                       108580
7070     4R    0D00  A800                    CLSD    0,0                                       108590
7071      6    0D01  9465                    ADDM    6,,5                                      108600
7072    576R   0D02  0C08            $13     GEN     BASE_DISPLAY                              108610
7073    580    0D03  F41900FF                ADDM    1,,X(00FF)                                108620
7074    590    0D05  F00C0D0F                FET     0,,CMFO                                   108630
```

```
7075    592     0D07  BC08                    SUB     0,8                                                  108640
7076    610     0D08  F4271FB2                PTR     2,,T_O_BUFFER2                                       108650
7077    636     0D0A  D790                    PRN     9                                                    108660
7078    650     0D0B  0510                    BBK     1                                                    108670
7079            0D0C  00000018        DINC    COND    X(00000018)                                          108680
7080            0D0E  FCDF          BSDB    CON     X(FCDF)         .SD.                                 108690
7081            0D0F  EE8F          CMFO    CON     X(EE8F)                                          01  108700
7082            0D10  2AAAAAAB        THIRD   COND    X(2AAAAAAB)                                          108710
7083            0D12  40000000C     FIFTY   COND    X(40000000)                                          108720
7084            0D14  4CCCCCCC      SIXTY   COND    X(4CCCCCCC)                                          108730
7085            0D16  39999999      FRTYFIV COND    X(39999999)                                          108740
7086            0D18  20000000C     FIFTY81 COND    X(20000000)                                      01  108750
7087            0D1A  26666666      SIXTY81 COND    X(26666666)                                      01  108760
7088     14R    0D1C  F01C0D38      G_D_R_D FET     1,,MBPDATA                                           108770
7089     22     0D1E  8414                    FETM    1,,4            3 COUNTER                            108780
7090     12R    0D1F  CB02          $20     FETD    IX0,2           GET 1ST VALUE                        108790
7091     20     0D20  C011                    FET     1,1                                                  108800
7092     22     0D21  A421                    CLA     2,1                                                  108810
7093     24     0D22  B033                    SUB     3,3                                                  108820
7094    562     0D23  1800                    ATAN    0                                                    108830
7095    572     0D24  F8C54000                RSLD    0,,I                                                 108840
7096   1148     0D26  0C08                    GEN     BASE_DISPLAY                                         108850
7097   1152     0D27  F41900FF                ADDM    1,,X(00FF)                                           108860
7098   1164     0D29  7F36                    PTRD    IX3,6           STORE RESULT IN T_O_BUFFER           108870
7099   1172     0D2A  D7C0                    PRN     0                                                    108880
7100   1180     0D2B  CC0D    (001F)          BXUD    0,,$20          DO IT 3 TIMES                        108890
7101     10R    0D2C  F0E71CA1                STA     14,,SAMPLE_MKR  NON-ZERO                            108900
7102     20     0D2E  F418001C                FETM    1,,28           SET POINT 0 AND MAX CNT 28           108910
7103     34     0D30  F4171FE6                PTR     1,,CHAR_POINT                                        108920
7104     48     0D32  F80C1FE4                FETD    0,,T_O_TIME2    INCR NEXT T_O_TIME                   108930
7105     58     0D34  FC080D41                ADDD    0,,TIME_INC3                                         108940
7106     72     0D36  FCC71FE4                PTRD    0,,T_O_TIME2                                         108950
7107     94     0D38  D550                    BBK     5                                                    108960
                                *  CONSTANTS USED FOR PCI DYN RANGE ONLY                                  108970
7108            0D39  1FC6          MSXSQ2  CON     SXSQ2                                                108980
7109            0D3A  1FCC          MSX2    CON     SX2                                                  108990
7110            0D3B  1FD2          MBPDATA CON     BPDATA2                                              109000
7111            0D3C  1FB3          MT_O_BUFFER CON T_O_BUFFER2+1                                        109010
7112            0D3D  0000005A      TEN_MIN COND    I(90)                                                109020
7113            0D3F  01000000      N_IN52  COND    X(01000000)     NN COUNT INCREMENT  187              109030
7114            0D41  00000001      TIME_INC3 COND  I(1)                                                 109040
7115            0D43  0000000C      FIVE_MIN COND   I(12)                                                109050
7116            0D45  0021                    CON     X(0021)         INITIAL CHAR_POINT = 33              109060
```

```
0046  0020                    CON      X(0020)          INITIAL MAX_COUNT = 32
0047  0008        N_SMOOTHING CON      I(8)             RANGE IS 2 TO 8
1CA1              SAMPLE_MKR  EQU      PROP_C                      1 S WDS
1CA2              BPHISTORY   EQU      PROP_C+1                   21 D WDS
                  * VARIABLE STORAGE FOR PCI DYN RANGE TEST
1FC6              SXSQ2       EQU      DESTINATION_LONGITUDE+2     3 D WDS
1FCC              SX2         EQU      DESTINATION_LONGITUDE+8     3 D WDS
1FD2              BPDATA2     EQU      DESTINATION_LONGITUDE+14    3 D WDS
1FB2              T_O_BUFFER2 EQU      RZ_C             15 WORDS
                  T_O_SEC_COUNT2;
1FE0                          EQU      DESTINATION_LATITUDE+2      1 D WDS
1FE2              NN          EQU      DESTINATION_LATITUDE+4      1 D WDS
1FE4              T_O_TIME2   EQU      DESTINATION_LATITUDE+6      1 D WDS
1FE6              CHAR_POINT  EQU      DESTINATION_LATITUDE+8      1 S WDS
1FE7              MAX_COUNTER EQU      DESTINATION_LATITUDE+9      1 S WDS
1D1F              BPDATA4     EQU      P15
0048  E10B                    ECS
```

```
                                                  **
                                                  *                  SRN - 17  OPERATIONAL PROGRAM OVERLAY
                                                  *                    MODIFIES ANTENNA SELECTION FOR
                                                  *                      USE WITH WHIP ANTENNA
                                                  *                    MODIFIES SCALEING ON LOG INPUT
                                                  *
                                                          TAPE      4,X(73)
                                                          TAPE      3,12
                                                          TAPE      4,X(F1)
                                                          TAPE      1
                        0D49                              SCS
                        02EC                              ORG       SYNC$81
                2R      02EC   9C01                       CLAM      0,,1
                        06B3                              ORG       VELOCITY_PROCESSING$81
                8       06B3   F0040A8C                   MPYM      0,,F(6076*100/3600B11) 100 KNOTS PER 360 DEG
                12      06B5   F8090A05                   COMM      0,,F(6076*95/3600B11)
                        1762                              ORG       ANTENNA_SELECT_TABLE
                        1762   00010001                   COND      X(00010001)
                        1764   00010001                   COND      X(00010001)
                        1766   00010001                   COND      X(00010001)
                        17D4                              ORG       OVERLAY
                        17D4   6758                       ECS
```

```
                                                                                  109460
                                                TAPE        4,X(73)               109470
                                                TAPE        3,12                  109480
                                                TAPE        4,X(F1)               109490
                                                TAPE      1                       109500
                  17D5                          SCS                               109510
                  1A7A                          ORG       ENO_TEST+1              109520
                  1A7A  C0000000                LITERAL
                  1A7C  26666666                LITERAL
                  1A7E  00206666                LITERAL
                  1A80  01FFFFFF                LITERAL
                  1A82  00000098                LITERAL
                  1A84  000007D0                LITERAL
                  1A86  00000004                LITERAL
                  1A88  00000010                LITERAL
                  1A8A  01900000                LITERAL
                  1A8C  033EC5EC                LITERAL
                  1A8E  0005D23C                LITERAL
                  1A90  517CC1B9                LITERAL
                  1A92  00000006                LITERAL
                  1A94  65DBF227                LITERAL
                  1A96  08A87495                LITERAL
                  1A98  506CBDD9                LITERAL
                  1A9A  40000000                LITERAL
                  1A9C  001D7DBF                LITERAL
                  1A9E  00008620                LITERAL
                  1AA0  06666666                LITERAL
                  1AA2  000290C9                LITERAL
                  1AA4  006DDE18                LITERAL
                  1AA6  0011A3D4                LITERAL
                  1AA8  0B115555                LITERAL
                  1AAA  04010D47                LITERAL
                  1AAC  0A000000                LITERAL
                  1AAE  01F40000                LITERAL
                  1AB0  0E49D201                LITERAL
                  1AB2  000B4A21                LITERAL
                  1AB4  00000FEA                LITERAL
                  1AB6  08000000                LITERAL
                  1AB8  80000001                LITERAL
                  1ABA  0CCCCCCD                LITERAL
                  1ABC  00000D18                LITERAL
                  1ABE  000084A2                LITERAL
                  1AC0  04000000                LITERAL
```

```
7154  1AC2  00008852          LITERAL
7154  1AC4  6487ED4F          LITERAL
7154  1AC6  7F24AB82          LITERAL
7154  1AC8  00684DC5          LITERAL
7154  1ACA  00028F20          LITERAL
7154  1ACC  000174D4          LITERAL
7154  1ACE  0517CC1C          LITERAL
7154  1AD0  0001A5E0          LITERAL
7154  1AD2  0092174F          LITERAL
7154  1AD4  FFFEA070          LITERAL
7154  1AD6  27E9F880          LITERAL
7154  1AD8  2CC327EA          LITERAL
7154  1ADA  59864FD4          LITERAL
7154  1ADC  0000A2FA          LITERAL
7154  1ADE  0010624E          LITERAL
7154  1AE0  001C25C2          LITERAL
7154  1AE2  53E2D624          LITERAL
7154  1AE4  07FFFFFF          LITERAL
7154  1AE6  6622      LAST_WORD  END                                    EX109530
```

NUMBER OF ERRORS = 0

THE COUNT OF UNUSED STORAGE IS 85

ROLL	USED/TOTAL	= PERCENT
0	12237/ 40800	= 29.99
4	11232/ 33600	= 33.43
8	512/ 2400	= 21.33
12	0/ 800	= 0.0
16	0/ 8192	= 0.0
20	0/ 48	= 0.0
24	0/ 80	= 0.0
28	180/ 192	= 93.75
32	0/ 0	= 0.0
36	0/ 0	= 0.0
40	0/ 0	= 0.0
44	0/ 0	= 0.0
48	0/ 0	= 0.0
52	0/ 0	= 0.0
56	0/ 0	= 0.0
60	0/ 0	= 0.0
64	0/ 0	= 0.0
68	0/ 0	= 0.0
72	3744/ 3744	= 100.00
76	9324/ 39872	= 23.38
----	37229/129728	= 28.70

ADDR	LITERAL	USE
00E7	07C46929	5
00E9	0AAAAAA8	2
00EB	00000001	10
00ED	00000014	2
00EF	1999999A	2
00F1	00008000	3
00F3	7FFFFFFF	8
00F5	20000000	4
00F7	008CBCCC	2
1A7A	C0000000	1
1A7C	26666666	1
1A7E	00206666	1
1A80	01FFFFFF	1
1A82	0000009B	1
1A84	000007D0	1
1A86	00000004	1
1A88	00000010	1
1A8A	01900000	1
1A8C	033E05EC	1
1A8E	0005D23C	2
1A90	517CC1B9	1
1A92	00000006	2
1A94	65DBF227	1
1A96	08A87495	1
1A98	506CBDD9	2
1A9A	40000000	1
1A9C	001D7D8F	1
1A9E	00008620	1
1AA0	06666666	1
1AA2	000290C9	2
1AA4	006DDE18	3
1AA6	0011A304	1
1AA8	0B115555	1
1AAA	04010D47	1
1AAC	0A000000	1
1AAE	01F40000	1
1AB0	0E49D201	2
1AB2	00084A21	2
1AB4	00000FEA	1
1AB6	08000000	2
1AB8	80000001	1
1ABA	0CCCCCCD	2

ADDR	LITERAL	USE
1ABC	00000D18	1
1ABE	000084A2	1
1AC0	04000000	1
1AC2	00008852	1
1AC4	6487ED4F	2
1AC6	7F24A882	1
1AC8	00684DC5	1
1ACA	0002BF20	2
1ACC	000174D4	1
1ACE	0517CC1C	1
1AD0	0001A5E0	1
1AD2	0092174F	1
1AD4	FFF6A070	2
1AD6	27E9FB80	2
1AD8	2CC327EA	1
1ADA	59864FD4	1
1ADC	0000A2FA	1
1ADE	0010624E	1
1785	00000320	0
1AE0	001C25C2	1
1AE2	53E2D624	1
1AE4	07FFFFFF	1

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
497 / 1F5F	_BLOCK_NO	109 168 190 200 231 471 473 498
495 / 1F5D	_BLOCKS	116 191 202 232 496
501 / 1F6C	_BUFFER	417 454 503
502 / 005C	_BUFFER_LIM	407 421 456 460 503
498 / 1F61	_CHECK_SUM	193 197 238 251 499
135 / 1041	_COMPARE	120
91 / 2000	_CORE_SIZE	92 223
493 / 1F58	_END_CKSUM	96
496 / 1F5E	_END_TAPE	198 483 497
499 / 1F62	_FILL_COMP	118 187 211 235 500
266 / 1E0F	_PPDATA	264
359 / 1EA0	_PPLEADER	145 155 222
380 / 1EC7	_PPTABLE	319
494 / 1F5C	_PPTEMP	106 113 114 286 289 290 295 296 300 321 325 495
321 / 1E66	_PRINT	310 334
304 / 1E4A	_PRINT_WORD	277 337 340
284 / 1E29	_PUNCH	154 157 218 220 279 282 355 361
140 / 104A	_PUNCH_TAPE	122
332 / 1E78	_PUNCHBCD	150 152
348 / 1E8F	_PUNCHVIS	342 343 345
396 / 1ED7	_READ_DATA	167
503 / 1FC8	_ROLL	504
505 / 1FFA	_ROLL_END	93
504 / 1FE6	_ROLL_14	95 505
158 / 1068	_START	129 134
150 / 1058	_START_READ	139
500 / 1F63	_TAPE_DATA	396 428 429 441 501
426 / 1EFD	_TAPE_INPUT	160
93 / 1000	_VERIFY	97 127 130 506
364 / 1EA7	_VISTABLE	351
492 / 1F5A	_XOFFF	115
488 / 1F56	_XOOOF	318 348
489 / 1F57	_XOO3F	354
491 / 1F59	_XOO7F	430
490 / 1F58	_XOO70	437
74 / 0000	A	1856 2207 3881 4821 4843 6296 6339 6347
539 / 001C	A_TO_D_CONVERTER_TEST_LOCATION	5967 5986
4115 / 0004	ACCEPT_GROUP	4076
548 / 002A	ACCEPT_OLD	3510 3598 3896
6596 / 17F9	ACCUMULATE	6766
6901 / 183F	ACCUMULATEX	6852
6119 / 0005	AD_BIG	5977
549 / 0028	AD_DATA	5962 5965 5984

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
6116 / 4FF0	AD_HI_LIM	5968
5666 / 1949	AD_IO_TEST	1039
5965 / 19B4	AD_IO_TEST_ENTRY	5883
6117 / 4D10	AD_LO_LIM	5970
6118 / 0003	AD_SMALL	5974
5961 / 19AF	AD_TEST	1082
67 / 0090	AF	
4458 / 13EE	ALLSTATIONS	4456
43 / 0008	ALPHA	5710 5721 5755 5757 5785 5787 5798 5802 5808 5814 5820 5822 5833 5850
5006 / 16AF	ALPHA_0	3195 3202
83 / 0008	AND	
5196 / 178D	ANTENNA_NOISE_AND_CALIBRATE_CODES	1186
353 / 0035	ANTENNA_SELECT_SAVE	1199 1225 1608
5163 / 1762	ANTENNA_SELECT_TABLE	1602 6459 6825 7142
543 / 0020	ANTENNA_SWITCHING_MATRIX_OUTPUT_10_2	1104 1188 1607 5891 5924
545 / 0022	ANTENNA_SWITCHING_MATRIX_OUTPUT_11_33	
544 / 0021	ANTENNA_SWITCHING_MATRIX_OUTPUT_13_6	
5012 / 1688	ARCSIN	3076 3135
4973 / 1689	ARCTAN	5019
4070 / 120D	ARGINPUT	4112
4128 / 000C	ARGUMENT	3855 3858 3924 3966
5395 / 1F41	ARGWORD1	3878 3903 3971 4072 4274 4298
5396 / 1F42	ARGWORD2	3862 3873 3916 3930 4027 4032
5241 / 17D5	ASCII	4040
2803 / 08A0	ASSEMBLE_XX	2091 2569 2586
66 / 0080	AT	4843 6339
4972 / 1688	ATAN_ENTRY	684
5033 / 16CE	ATC	4977 4978 4990
5039 / 16DA	ATC1	4978
5040 / 16DC	ATC2	4990
771 / 0159	AUG_MEM_TEST	6063
615 / 0088	AUGMENTER_KEY	
3419 / 0E90	AUR_DATA	3079
3395 / 0E78	AUR_LIMITS	3081
5266 / 1C80	AUR_SAVE	3127
2711 / 0830	AVERAGE_X	2100 2648
5375 / 1EE8	AVIONICS	3442 3445
75 / 0001	B	2201 2226 2981 3003 4253 4255 4477 4481 4655 4658
629 / 00C8	BASE	1345 1353 1391 1414 1794 1815 1817 1827 2324 2412 2685 2883 3284 3324 4256 4299 4478 4483 4557
4739 / 0008	BASE_DISPLAY	4371 7038 7072 7096
4747 / 1564	BCDTOBIN	3455 3457

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
4870 / 1605	BEARING	1594
4714 / 0000	BEARING_DISPLAY	4545 4571 4578 4584 4631
5389 / 1F30	BEARING_TEMPS	4609 4621 4622 4626 4632 4633 4641 4642 5901 5909 5930 5940
	5942	
785 / 0166	BEGIN	754 1123
44 / 0004	BETA	5710 5755 5787 5798 5808 5814 5820
2910 / 0C26	BETA_LOG	
2909 / 0C24	BETA_NRA	2055
2911 / 0C28	BETA_PSEUDO	
69 / 0080	BF	
5273 / 1CD5	BI	2039 2041 2118 2325 2538 2541 2591 2593 2771 2772
4229 / 128F	BLANKS_GEN	4190 4236
7123 / 1FD2	BPDATA2	6833 6855 7110
7130 / 1D1F	BPDATA4	6881 6907 6908 6913 6999
7120 / 1CA2	BPHISTORY	6854 6857 6862 6865 6886 6932
7080 / 0D0E	BSDB	
68 / 00A0	BT	2201 3003 4255 4477 4655
5190 / 1787	BURST_ADDRESSES	1222
5382 / 1F17	BURST_TIME	1195 1767
76 / 0002	C	1858 2209 2222 3467 4141
512 / 0002	C_I_INPUT_KEYBOARD_SWITCHES	3775
511 / 0001	C_I_INPUT_MISCELLANEOUS_SWITCHES	3760 3767 3768 3771 3773
513 / 0003	C_I_LEFT_DISPLAY	821 3456 3521 3732 4091 4095 4143
515 / 0004	C_I_LEFT_DISPLAY_DIGITS_2_TO_1	
514 / 0003	C_I_LEFT_DISPLAY_DIGITS_6_TO_3	
519 / 0007	C_I_LEFT_DISPLAY_LEGEND_AND_PUNCTUATION	3746 3766 3808 4457 4750
525 / 000D	C_I_LOWER_KEYBOARD_LAMPS	
521 / 0009	C_I_OUTPUT_LAMPS_MISCELLANEOUS_SWITCHES	806 3512 3562 3565 3593 3725 3758 4136 6097 6616 6659
522 / 0009	C_I_OUTPUT_MALFUNCTION_STATUS_INDICATORS	3484 3558
516 / 0005	C_I_RIGHT_DISPLAY	3454 3541 4025 4066 4096
518 / 0006	C_I_RIGHT_DISPLAY_DIGITS_2_TO_1	
517 / 0005	C_I_RIGHT_DISPLAY_DIGITS_6_TO_3	
520 / 0008	C_I_RIGHT_DISPLAY_LEGEND_AND_PUNCTUATION	4455
595 / 009F	C_I_STATUS_IMAGE	1112 1174 1397 2269 3465
523 / 0008	C_I_UPPER_LEFT_KEYBOARD_LAMPS	4187 4560
524 / 000C	C_I_UPPER_RIGHT_KEYBOARD_LAMPS	
667 / 00F8	CAL_R_ADD	1192 1622 1715
4884 / 1613	CALC_TIME_CORRECTION	1178 3560
590 / 009A	CALIBRATE_COMPUTED_MARKER	1699 1709 4196
5378 / 1EF6	CALIBRATE_DATA	1616 1617 1618 1620 5185 5186 5187 5188 5379 5380
5185 / 1781	CALIBRATE_DATA_ADDRESSES	1625
5257 / 1C18	CALIBRATE_FAIL_COUNT	1661 1669
5431 / 1F9A	CALIBRATE_RESULTS	667

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5394 / 1F40	CALLWORD	3451 3835 3915
5204 / 1795	CAY_ONE	3305
3399 / 0E7C	CAY_TABLE	3214
3346 / 0E47	CAY1_TABLE	3224
4715 / 0715	CDD	4718 4721 4724 4727 4730 4733 4736 4739 4742 4745
4737 / 1559	CD11	4739
4740 / 155C	CD12	4742
4743 / 155F	CD13	4745 6818
4716 / 1544	CD2	4718
4719 / 1547	CD3	4721
4722 / 154A	CD4	4724
4725 / 1540	CD5	4727
4728 / 1550	CD7	4730
4731 / 1553	CD8	4733
4734 / 1556	CD9	4736
71 / 00D0	CF	2222
5427 / 1F8F	CHANNEL_FAIL	1704 1705
7128 / 1FE6	CHAR_POINT	6946 6963 6965 7027 7103
6778 / 1FEA	CHAR_POINTER	6620 6638 6640 6754
535 / 0018	CH0	6528
536 / 0019	CH1	
540 / 001D	CH5	
541 / 001E	CH6	
542 / 001F	CH7	
3394 / 0E77	CI_TABLE	3241
765 / 0153	CKSUM_LINK	953
4116 / 0000	CLEAR_PANEL	3813 3832 3912
7081 / 0D0F	CMFO	7074
614 / 00B7	COLD_START_MKR	2018 2037 3517 3595 3606
2516 / 0A2F	COMPUTE_BI	2540
2502 / 0A1E	COMPUTE_BI_AND_C	2223 2450
2042 / 079E	COMPUTE_PHI	
2752 / 0862	COMPUTE_THETA1	1800 2332 2942 3285 4302 4307
5618 / 1922	COND_TABLE	3148
562 / 0070	CONNIE	2554 2575 2672 2674 2675
624 / 00C3	CONNIE_LIMIT	2387 2445 2446 2492 2547
4712 / 1541	CONVERSION_DATA	4659 4715
760 / 014C	CORR_CKSUM	137 140 143 216
4933 / 1655	COS	3637 4829 4834
5428 / 1F92	COS_THETA_P	1972 2211 5429
528 / 0011	COS_10_2	1110 1127 1130 1141 1183 1571 1580 1773 5893 5897 5905 5926 5929 5937 6011
532 / 0015	COS_11_33	

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
530 / 0013	COS_13_6	
2010 / 0769	COVARIANCE_INITIALIZATION	2008
1322 / 0407	CP	1317
70 / 00C0	CT	2209
77 / 0003	D	2356 2360 4401 4419
2883 / 0C05	D_PHI_KI	2749 4276 4487 4500 4503
2926 / 0C3D	DATA_TABLE	2175
627 / 00C8	DAY	3530 3538
625 / 00C4	DAY_SINCE_JAN1_1972	793 794 2978 3556 4386 4897 4898
5020 / 16C1	DAYS_BY_MONTH	3536 4426 4429
605 / 00AA	DB_BUFFER	5714 5720 5723 5725 5731 5733 5736 5740 5806 5809 5811 5837
770 / 0158	DB_CKSUM	5849 5854
5255 / 1C05	DB_CKSUM_IGNORE	958 961 5856
5787 / 19EC	DB_CLEAR	5866
5754 / 19C4	DB_DATA	5869
5683 / 1964	DB_DECODE	5679
5752 / 19C1	DB_DISPLAY	5865
5820 / 1A19	DB_END_PCH	5815 5864
5759 / 19CB	DB_HEX	5690 5790 5799 5803 5829 5860
5784 / 19E9	DB_INCR	5871
5861 / 1A50	DB_JUMP_TABLE	5688
566 / 0078	DB_MODE	668 789 5672 5747 5750
668 / 00FC	DB_M1_ADD	5728 5777
5802 / 1A00	DB_PATCH	5862
761 / 014D	DB_PCHAD	788 5671 5853
5738 / 19AD	DB_PNBWE	5682 5705 5708 5716 5726
5814 / 1A11	DB_RETURN	5863
596 / 00A0	DB_SAVE	5804 5817 5823
551 / 0031	DB_SAVEPATCHSTART	5807 5826
5713 / 1988	DB_SPECIALS	5712 5715
5704 / 1980	DB_UPDATE	5674 5686 5696 5753 5756 5758 5767 5788 5801 5861 5868
5445 / 1FF8	DB_WAT	5713 5727 5734 5764 5771 5778
5833 / 1A28	DB_WRITE	5792 5810 5812 5819 5827 5831
5797 / 19F9	DB_WRITE1	5786 5796 5813 5867
5791 / 19F1	DB_WRITE2	5870
5173 / 176F	DCAY_ONE	3302
3404 / 0E81	DCAY_TABLE	3217
705 / 0110	DCAY1_TABLE	3228
5386 / 1F28	DELTA_THETA_2	1960 1962 2117 5387
5387 / 1F2D	DELTA_THETA_3	1959
616 / 0089	DELTA_V2	1892 1893 2135 2144 2158 3516
617 / 008A	DELTA_V3	2140 2145

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5437 / 1FDE	DESTINATION_LATITUDE	3588 4168 4619 5133 5438 5441 6772 6773 6774 6775 6776 6777 6778 6779 6780 7125 7126 7127 7128 7129
5436 / 1FC4	DESTINATION_LONGITUDE	3589 4166 4618 5131 5437 5439 5440 6363 6365 6782 7121 7122 7123
73 / 00F0	DF	
5282 / 1D07	DF_COUNTER	2282 2287 2705
561 / 006F	DF_MKR	2237 2251 2279 2353 2435 2463 2467 2483 2702
7079 / 0C0C	DINC	
534 / 0017	DIRECT_MEMORY_ACCESS_TEST_LOCATION	6052 6055
40 / 8E20	DISABLE_MEMORY_PROTECT	94 3506 5842
4084 / 1221	DISCLEAR	3800
3886 / 1108	DISFINAL	3814 3838 3840 3843 3845 3847 3856 3864 3880 3904 3911
3832 / 10C5	DISTART	3789
5057 / 16EE	DIURNAL_CONSTANT_TABLE	3179
560 / 005C	DIVERGENCE_CONTROL	2205 2221 2425 2428 2434 2517 2784
79 / 0001	DMA_INHIBIT	829
6049 / 1A1F	DMA_TEST	1092
6553 / 003A	DMAX1	6498
6554 / 0038	DMAX2	6514
6557 / 0023	DMAX23	6515 6524
6555 / 003C	DMAX3	6511 6518
6556 / 0038	DMAX4	6529
1022 / 0298	DO_NON_OMEGA_TASK	1020
19 / 0000	DOPPLER_IN_MEMORY	6483
72 / 00E0	DT	2356 4401
6830 / 17DD	DYN_RNG_INIT	6805
64 / 0060	E	163 829 830 3467 4141 4419
4125 / 0009	EAST_OR_WEST	3942
7 / 8F00	ENABLE_CMP_INTERRUPT	110 415
41 / 8E21	ENABLE_MEMORY_PROTECT	787 3508 5857
55 / 0000	ENABLE_READ	158
16 / 8800	ENABLE_RECORDER_INTERRUPT	6140 6188
1072 / 02CD	END_BURST	2006
5654 / 1946	END_CKSUM	172 194 195 5663 5880
5653 / 1945	END_COND_T	
1021 / 0297	END_EXEC	1048 1051 1054 1056 1057 6570 6571 6796 6797 6807 6808
1181 / 0357	END_OF_BURST	1072 6474 6816
5380 / 1F08	END_OF_BURST_DATA	1182 6196 6197 6198 6217 6218 6219
1574 / 0544	END_OF_SLOT	1066
1066 / 02C7	END_SLOT	1566
1042 / 02AE	END_TASK	1023
6125 / 1A79	END_TEST	7153
4060 / 11FE	ENTEREW	4109

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
84 / 000C	EOR	2201 2209 2356 3003 4255 4401 4477 4655 4843 6339
46 / 0001	ERROR	965
5272 / 1CD3	ERROR_EAST	
5271 / 1CD1	ERROR_NORTH	2210 3653 5272
4733 / 0006	ETE_DISPLAY	4251
1006 / 0285	EXEC	757 6255 6951
976 / 0262	FAIL_EXTERNAL	5993 6110
970 / 0258	FAIL_PIN	696
7083 / 0D12	FIFTY	7044
7086 / 0D18	FIFTY81	7033 7046 7056
4123 / 0007	FIVE_DIGITS	3941
7115 / 0D43	FIVE_MIN	6840
3826 / 1080	FLOAT_LOOP	3791
5424 / 1F8C	FLOATER	1100 1598 1689 3479 3826 3830
85 / 0010	FLOATER_ANTENNA	
5167 / 1766	FLOATER_SELECT_TABLE	1606
57 / 0002	FORCE	
48 / 0001	FORWARD	164 204 412 462 477
4129 / 000D	FOUR_DIGITS	3988
3343 / 0E41	FREQ_TABLE	3329
7085 / 0D16	FRTYFIV	7042
61 / 0030	G	
7088 / 0D1C	G_D_R_D	6992
45 / 0002	GAMMA	
60 / 0020	GE	
4654 / 14FA	GEN_PIN	678
6983 / 0C82	GET_DYN_RNG_DATA	6799
626 / 00C6	GMT	1014 1016 3551 4884 4894 4895 6195
6780 / 1FEC	GOOD_BAD_FL	6736 6752 6755
5667 / 1948	GP_TEST	1052
6062 / 1A31	GP_TEST_ENTRY	5884
5422 / 1F7B	H_BURST	1398 1400 1401 1789
3817 / 10AF	HCONTROL	3784
5180 / 177C	HD03C0	4460
665 / 00F9	HD200	984 991 1136 1138
22 / 0030	HEADING_EXITATION_A	5987
5253 / 1C03	HEADING_GROUP	3968 4013 4018 4099
5425 / 1F8D	HEADING_MODE	1888 1900 5426
31 / 8000	HIGH_SPEED_PRINTER_BUSY	
37 / 8000	HIGH_SPEED_PRINTER_OUTPUT	
5660 / 015F	HOT	5669 5886 5895 5916 5921 5928 5953 5963 6007 6028 6033 6049 6054
6394 / 1893	HSP	6409 6428

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
6416 / 18B3	HSP_D	694
6412 / 18AE	HSP_LINE_D	692
6396 / 1897	HSP_OUT	690 6421
6406 / 18A6	HSP_16H	6405
6405 / 18A4	HSP_32H	
5195 / 178C	HXDFFF	6757
3908 / 1120	HXE000	3776
3905 / 112A	HXFEFF	3891 6834
3906 / 1128	HXFFF0	4709
702 / 010E	HXFF00	1531 2291 2472 6579 6712 6718 6720
3909 / 112E	HXF0FF	4084
5194 / 178B	HXF000	3806 4691
666 / 00FA	HX0800	3751 3752 3759
5183 / 177F	HX0FFF	1842
5130 / 173D	HX0F00	4669
672 / 0100	HX00ED	
703 / 010F	HX00FF	1276 2262 2304 4552 6277 6713 6719 6721
5181 / 177D	HX000F	3706 3708 4393 4523 4757 6394 6633 6958
638 / 00D5	HX0001	1612 5889
639 / 00D6	HX0002	
640 / 00D7	HX0004	5902
5172 / 176E	HX0007	5707 6297
641 / 00D8	HX0008	1527 1843
5176 / 1775	HX001F	5684
642 / 00D9	HX0010	2110 3477 5922 6293
643 / 00DA	HX0020	2418 5931
644 / 00DB	HX0040	3464 4054
645 / 00DC	HX0080	820 963 1396 1884 5918 5955 5979 6024 6038 6046 6058 6077 6278 6300 6328
646 / 00DD	HX0100	976 1664 1707 2473 3097 3440 3724 6351
647 / 00DE	HX0200	1144 3104 3500 4555
648 / 00DF	HX0400	3910 4554 5830
649 / 00E0	HX0800	967 968 1446 4699
650 / 00E1	HX1000	1838 1847 5683
6552 / 18F0	HX10100	6481
3907 / 112C	HX17FF	3860
673 / 0101	HX1800	
651 / 00E2	HX2000	1111 1604 3107 3557 5015 6617 6660
5184 / 1780	HX2010	6098
652 / 00E3	HX4000	1861 3112 3143 3561 3611 3615 3921 3954 4058 4059 4548 4914 4917 4933 6396 6933
5182 / 177E	HX6000	1839
653 / 00E4	HX8000	1226 1261 2311 3931 4370 6169 6295

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5391 / 1F3D	IMAGE11	3499 3863 3879 3887 3980 3985 4071 4089 5392
5392 / 1F3E	IMAGE12	3901
5393 / 1F3F	IMAGE13	3836 3883 3888 3917 4090
594 / 009E	IMAGE9	595 3726 3757
20 / 0010	INERTIAL_SYSTEM_NO_GO	85
1 / 8000	INHIBIT_BOTH_CSE_INTERRUPTS	
6 / AF00	INHIBIT_CMP_INTERRUPT	208 405 484
56 / 0001	INHIBIT_READ	111 209 485
15 / A800	INHIBIT_RECORDER_INTERRUPT	
3813 / 10AA	INPUTERROR	3769 3772 3782 3893 4035
3910 / 112F	INSACC	3788 3987
3995 / 11A2	INSFIVE	4107
3993 / 11A0	INSFOUR	4113
3997 / 11A4	INSSIX	3962 3990 3992 3994 3996 4108
3991 / 119E	INSTHREE	4106
3989 / 119C	INSTWO	4105
581 / 008D	INTEGRATION_COUNTER	2943 3248 3250 3281
38 / 8801	INTER_RECORD_GAP	6187
5438 / 1FF6	INTERCEPT_LAT	4866
5439 / 1FDC	INTERCEPT_LONG	4867
78 / 0000	INTERRUPT_INHIBIT	163 780 830 1122 2155 2160 6136 6155
6532 / 19DC	IOTAB1	6508 6517
6546 / 19EA	IOTAB2	6521
6549 / 19ED	IOTAB3	6512
6481 / 1893	IOTEST	6477
2495 / 0A15	K_EXIT	2016 2233 2276 2347 2488
1070 / 02C8	K_FILTER	1776
584 / 0090	KAL_STA_FLG	1176 2014 2498
5256 / 1C06	KAL_TEMP	2440 2444 2490 2493 2811 2877
2006 / 0765	KALMAN_FILTER	1070 1171 6802
63 / 0050	L	1856 1858 2360 3881 6296
1539 / 0518	L_ALPHA	1454 1486
5009 / 1682	LAMBDA_TABLE	2367 2734 4310
7154 / 1AE6	LAST_WORD	174 761
3712 / 101A	LAT_LONG_SCALING	3583
5551 / 18A6	LAT_N00_N05	5636
5546 / 1890	LAT_N05_N10	5637
5541 / 1893	LAT_N10_N15	5638 6393 6480
5536 / 1889	LAT_N15_N20	5639
5530 / 187E	LAT_N20_N25	5640
5524 / 1873	LAT_N25_N30	5641 6658
5518 / 1867	LAT_N30_N35	5642
5511 / 185A	LAT_N35_N40	5643

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5504 / 184D	LAT_N40_N45	5644
5497 / 1840	LAT_N45_N50	5645
5490 / 1832	LAT_N50_N55	5646
5482 / 1822	LAT_N55_N60	5647
5473 / 1811	LAT_N60_N65	5648
5464 / 17FF	LAT_N65_N70	5649
5457 / 17F1	LAT_N70_N75	5650
5451 / 17E6	LAT_N75_N80	5651
5448 / 17E0	LAT_N80_N85	5652
5446 / 17DD	LAT_N85_N90	5653 6577 6829
5555 / 18AE	LAT_S05_S00	5635 6135 6248
5560 / 18B7	LAT_S10_S05	5634
5564 / 18BF	LAT_S15_S10	5633
5568 / 18C7	LAT_S20_S15	5632
5572 / 18CF	LAT_S25_S20	5631
5577 / 18D8	LAT_S30_S25	5630
5581 / 18DF	LAT_S35_S30	5629
5585 / 18E6	LAT_S40_S35	5628
5588 / 18EB	LAT_S45_S40	5627
5590 / 18EF	LAT_S50_S45	5626
5592 / 18F3	LAT_S55_S50	5625
5594 / 18F6	LAT_S60_S55	5624
5595 / 18F8	LAT_S65_S60	5623
5596 / 18FA	LAT_S70_S65	5622
5599 / 18FF	LAT_S75_S70	5621
5603 / 1907	LAT_S80_S75	5620
5608 / 1910	LAT_S85_S80	5619
5613 / 1919	LAT_S90_S85	5618
4718 / 0001	LATITUDE_DISPLAY	4169 4177
62 / 0040	LE	
5189 / 1785	LEAP_SECOND	4887
4126 / 000A	LEFT_STATION_PAIR	3865
5397 / 1F43	LINKWORD	3801 3960 4026 4051 4069 4073 4078
10 / DE00	LOAD_PMU_REGISTER	5739
11 / DE0A	LOAD_PMU_TIMER	
2 / DF01	LOAD_PRINTER	324 6261 6402 6636 6961
3 / DF02	LOAD_PUNCH	299
17 / C800	LOAD_RECORDER	6141
4721 / 0002	LONGITUDE_DISPLAY	4167 4175
4724 / 0003	LOP_DISPLAY	4452
4119 / 0003	LOWER_KEY	3834 3872 3892 3914
557 / 004A	M_MATRIX	558 2203 2217 2352 2870 2878
2929 / 0C43	M_4_TABLE	2399

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
6195 / 1904	MAG_TABLE	6167
6136 / 18AE	MAG_TAPE	756 6134 6179
556 / 0040	MAG_TAPE_DATA	1572 6137 6142 6143 6144 6153 6165 6178 6183
951 / 0240	MAIN_PROGRAM	952 6575 6804
5131 / 173E	MAKE_DESTINATION_VECTOR	4608
4595 / 14A7	MAKE_LAT_LONG	3634 4172 4865
4607 / 1483	MAKE_RANGE_AND_BEARING	4237 4242 6763
3705 / 100F	MAKE_TWO_BINARY	3522 3529 3537 3542 3545 3548
5146 / 1751	MAKE_VELOCITY	4244 4580 4804
972 / 025B	MARK_PIN	700
5082 / 1707	MATRIX_3D	1329 2330
6779 / 1FEB	MAX_COUNT	6622
7129 / 1FE7	MAX_COUNTER	6948
7110 / 0D38	MBPDATA	7088
564 / 0074	MEASUREMENT	2216 2419 2448 2874
565 / 0076	MEASUREMENT_RESIDUAL	2572 2583 2875
1378 / 0448	MEASUREMENT_UPDATE	1533 6809 6900
2770 / 0879	MEASUREMENT_UPDATE_P	2657
2558 / 0A64	MEASUREMENT_UPDATE_X	2224 2451 2677
563 / 0072	MEASUREMENT_VARIANCE	2220 2395 2421 2429 2447 2449 2491 2515
36 / 0008	MEMORY_AUGMENTER_GO	
5277 / 1CFF	MISFIRE_CNT	2688 2689
628 / 00CA	MODE	3466 4140 5125
5388 / 1F2F	MODE_CHANGE	
953 / 0243	MP_CKSUM	835 951 6594 6842
6232 / 1929	MPX_ADD	6160
6224 / 1921	MPX_SP_ADD	6223
7108 / 0D39	MSXSQ2	6901 6994
7109 / 0D3A	MSX2	
7111 / 0D3C	MT_0_BUFFER	
571 / 0084	N	2017 2021 2083 2559 2633 2659 2663 3462
5366 / 1089	N_CTR_SAVE	2470 2471 2485
6774 / 1FE4	N_GOODS_SCALED	
6615 / 1813	N_INC	6597 6697
7113 / 0D3F	N_INC2	6902 7028
7118 / 0D47	N_SMOOTHING	6856
21 / 0020	NAV_INERTIAL_DOPPLER_MODE	
5426 / 1F8E	NAV_MODE	1284 2044 2130 2156
6659 / 1873	NAV_PERF_DATA	6574
6659 / 1873	NAVIGATION_PERFORMANCE_DATA_COLLECTION	
4522 / 1444	NCT	4511 4512 4515 4518
3899 / 1121	NCT_DISPLAY	3841 3850 3885
59 / 0010	NE	2160 2207 6155

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
630 / 00CD	NEED_BASE	1778 1796 1812 1832
7126 / 1FE2	NN	6903 6904 6905
65 / 0070	NO	
6775 / 1FE5	NO_GOODS	
2924 / 0C39	NOISE	2030 2690
591 / 0098	NOISE_COMPUTED_MARKER	1189 1744 1761
5379 / 1F08	NOISE_DATA	1712
585 / 0091	NON_OMEGA_TASK_INDEX	1022 1029
1031 / 02A3	NON_OMEGA_TASK_TABLE	1023 1030
586 / 0093	NON_OMEGA_TIME	1019 1028
5003 / 16AC	NORTH_MAGNETIC_POLE_VECTOR	2970 3067
1709 / 05EF	NOT_CALIB	1613
1701 / 05E4	NOT_FOURTH_ITERATION	1621
6781 / 1FB2	N6_15_COUNT	6593 6742 6745
780 / 0161	OFF	755
631 / 00CE	OFF_COUNT	781 783
587 / 0095	OLD_NON_OMEGA_TASK_TIME	1025 1027 1170
5664 / 1947	OMEGA_DEBUG	790 1031 1033 1035 1036 1038 1040
5671 / 1951	OMEGA_DEBUG_ENTRY	5664 5665 5751
589 / 0099	OMEGA_TASK	1018 1172 5120
5118 / 172E	OMEGA_TASK_PIN	676
1058 / 028F	OMEGA_TASK_TABLE	826 1098 1108 1116 1181 1566 1579 1776 2006 5119 5660
588 / 0097	OMEGA_TIME	945 1017 1165 5123
25 / 0060	OMNI_ANTENNA_AVAILABLE	
6771 / 1921	ONE_DAY	6666
1048 / 0285	ONE_SEC	1047 6569 6572 6795 6806
3437 / 0EA2	OPER_P_C	1055
82 / 0004	OR	
509 / 0008	OS	1271 1275 1283 1326 1386 1787 1814 2234 2496 5269 5270 5282
	5283 5367 5368 5369 5370	5371 5372 5373 5422
5668 / 1940	OSC_TEST	1053
6097 / 1A63	OSC_TEST_ENTRY	5885
510 / 01FE	OSHEX	3899 4039
546 / 0023	OUTPUT_TEST_AND_MISCELLANEOUS_SIGNALS	831 970 5959
3795 / 108F	OUTWAL	4104
5240 / 17D4	OVERLAY	7146
5284 / 1D17	P_MATRIX	2011 2073 2079 2080 2807 2849 2879 5285 5286 5287 5288 5289
	5290 5291 5292 5293 5294	5295 5296 5297 5298 5299 5300 5301 5302 5303 5304 5305 5306
	5307 5308 5309 5310 5311	5312 5313 5314 5315 5316 5317 5318 5319 5320 5321 5322 5323
	5324 5325 5326 5327 5328	5329 5330 5331 5332 5333 5334 5335 5336 5337 5338 5339 5340
	5341 5342 5343 5344 5345	5346 5347 5348 5349 5350 5351 5352 5353 5354 5355 5356 5357
	5358 5359 5360 5361 5362	5363 5364 5365 6238
2849 / 0B06	P_SYM	2071 2801

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5421 / 1F7B	PANEL_BOUND	4647
5406 / 1F53	PANEL_BUFFER	4649
555 / 003E	PANEL_COUNT	2013 4130 4133
5409 / 1F67	PANEL_DATA	800 4647 4648
3763 / 1060	PANEL_INPUT	758
3447 / 0EB2	PANEL_MAIN	1037 3605 3703 3704 4135 4620
4074 / 1214	PANEL_PIN	687
4101 / 1238	PANEL_PIN_TABLE	4114
3722 / 1027	PANEL_TEST	3449
5400 / 1F47	PANELMODE	807 3448 3460 3762 3764 3809
4130 / 1248	PANELOUTPUT	3453 4562
5399 / 1F45	PANELTIME	3735 3737
3802 / 109C	PANOUT	3765 3812 3816 3822 3825 3831 4101 4102 4103
3815 / 10AD	PANTEST	3790
593 / 009D	PAST_NAV_MODE	1280 1285 1287
6123 / 000F	PC_END_HI_LIM	6042
6124 / FFF1	PC_END_LO_LIM	6044
602 / 00A6	PC_INSERT	2206 2232 3654
6122 / 0190	PC_PLUS_LIM	6036
6028 / 1AD4	PC_TEST	1088 1090
6586 / 17EA	PCI_INIT	6576
6120 / 0640	PD_HI_LIM	6016 6020
6121 / 0200	PD_LO_LIM	6018 6022
6007 / 19E9	PD_TEST	1086 1094
632 / 00CF	PFG_COUNT	1119 1121
24 / 0050	PFG_COUNTDOWN_NO_GOOD	1117 1567
527 / 0010	PHASE_COUNTER_TEST_LOCATION	6030 6035 6041
2915 / 0C30	PHI_CODE	2816
5371 / 1E63	PHI_DOT_DR	5079
5381 / 1F0E	PHI_DOT_DR_BASE	1347 1349 1359 2401
5372 / 1E73	PHI_DOT_ESTIMATE	5080
5373 / 1EA3	PHI_ESTIMATE	2296 2906 3334 3339 4263 4361 4489 4493 4494 5081 7051
5384 / 1F1F	PHI_M_BASE	1405 1417 6844
559 / 005C	PHI_MATRIX	560 561 562 563 564 565 2042 2046 2137 2141 2812
5390 / 1F3C	PHI_OFFSET	4446 4473 4497
2807 / 08A6	PHI_P_PHIT	2067 2070 2094
5376 / 1EE0	PHI_SUB_M	1448 5193 6199 6200 6201
5377 / 1EF3	PHI_ZERO	946 1695 5191
5234 / 17CE	PHI_ZERO_FLOATER	1692 6462
5237 / 17D1	PHI_ZERO_LOOP	1694
5231 / 17C8	PHI_ZERO_0	1688
80 / 0002	PIN_MODE	
5131 / 173E	PLOT1	6366

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
3987 / 113F	PLOT11	3974 6378
757 / 0146	PLOT15	6380 6791
1573 / 0542	PLOT16	6133 6382 6798
3307 / 0E0E	PLOT17	6457
4179 / 1273	PLOT2	6368
759 / 014A	PLOT20	6476
3703 / 0F81	PLOT3	6370
3704 / 0F83	PLOT4	6372
4180 / 1276	PLOT5	6374
5133 / 1741	PLOT6	6376
30 / 8E30	PMU_DISPLAY_BUSY	5704
597 / 00A1	PMU_INDICATOR_WORD	966 5717 5741
42 / 8E10	PMU_INDICATORS	5742
633 / 00D0	PMU_INPUT	1883 5676 5677 5681 6000 6001 6005
28 / 8E10	PMU_KEYBOARD_REQUEST	5673
29 / 8E20	PMU_TIMER_OVERFLOW	
6578 / 17D0	POP_12_SUB	6701 6704 6707
4163 / 1270	POP1	4161 4179 4180 6717
4542 / 145F	POP10	4158
4551 / 146A	POP11	4150
4506 / 1420	POP12	4153 6578
4563 / 147C	POP13	4543
4574 / 1488	POP14	4157
4583 / 1498	POP15	4159 4573
4191 / 1293	POP2	4151
4232 / 12C2	POP4	4152 6724
4445 / 13D9	POP5	4156
4237 / 12C9	POP6	4160
4240 / 12CE	POP7	4154
4255 / 12E2	POP8	4162 4254 6821 6823
4384 / 1386	POP9	4155 4540 6711
5177 / 1776	POS_NOISE_TABLE	3518 3592
2209 / 0892	POSITION_MEASUREMENT	2227 2229
569 / 0081	POSITION_NOISE	2218 3655
638 / 00D5	POWERS_OF_TWO	858 972 1791 2259 4558 4922
611 / 0084	PP_STATION	2495 2499
5283 / 1D0F	PP_THETA2	2740 3319 4313 4315
5270 / 1CB9	PP_THETA3	2742 3308 4264 4265
4114 / 123A	PPT	4080 4115 4117 4118 4119 4120 4121 4122 4123 4124 4125 4126
	4127 4128 4129	
5886 / 194F	PREAMP_TEST	1076 1078
6115 / 05B0	PREAMP_TEST_ANGLE_LIMIT	5912
6114 / 0000	PREAMP_TEST_MAGNITUDE_LIMIT	

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5886 / 194F	PREFLIGHT_TEST	1074
4457 / 13EC	PROCESS_LEFT_PAIR	4449
4455 / 13E9	PROCESS_RIGHT_PAIR	4447
5398 / 1F44	PROCWORD	3780 3783 4079
768 / 0156	PROG_ID_DB	808 5661 5878
769 / 0157	PROG_ID_OVL	6131 6246 6391 6455 6472 6567 6793
763 / 014F	PROGRAM_ID	809 834 6224
35 / 000C	PROGRAM_SEQUENCING	832 1013 1177
18 / 8CC3	PROGRAMMER_CONTROLLER_GO_LIGHT	833
5269 / 1CA1	PROP_C	2390 2392 3313 7119 7120
5265 / 1C63	PROP_PRED_RESULTS	2932 3318
2932 / 0C49	PROPAGATION_PREDICTION	2500 3341 6814 6943
623 / 00C2	PSI_A	1596 1899 2131 6214
582 / 008F	PSI_A_SAVE	583 2132 2133
5405 / 1F52	PSI_A_STAR	
5423 / 1F88	PSI_INSERT	1878 3581 4544
6364 / 1FE8	PT_DEST_LAT	6371 6375 6377
6363 / 1FE4	PT_DEST_LNG	6364 6367 6369 6373
6365 / 1FC4	PT_IMAGE	6251 6260 6262 6273 6318
6249 / 18AE	PT_TYPE	6381
6314 / 18FD	PT_TYPE_SETUP	6383 6384
4101 / 123B	PT1	4117
4110 / 1244	PT10	4126
4111 / 1245	PT11	4127
4112 / 1246	PT12	4128
4113 / 1247	PT13	4129
4102 / 123C	PT2	4118
4103 / 123D	PT3	4119
4104 / 123E	PT4	4120
4105 / 123F	PT5	4121
4106 / 1240	PT6	4122
4107 / 1241	PT7	4123
4108 / 1242	PT8	4124
4109 / 1243	PT9	4125
26 / 8F10	PUNCH_OR_PRINTER_BUSY	297 322 6249 6399 6625 6944
5285 / 1017	P11	2035 2170 2243 2693 2695
5286 / 1019	P12	
5287 / 1018	P13	
5288 / 101D	P14	
5289 / 101F	P15	7130
5290 / 1021	P16	
5291 / 1023	P17	
5292 / 1025	P18	

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5293 / 1027	P19	
5294 / 1029	P21	
5295 / 1028	P22	2036 2246 2696 2698
5296 / 102D	P23	
5297 / 102F	P24	
5298 / 1031	P25	
5299 / 1033	P26	
5300 / 1035	P27	
5301 / 1037	P28	
5302 / 1039	P29	
5303 / 1038	P31	
5304 / 103D	P32	
5305 / 103F	P33	2031 2239 2700 3471
5306 / 1041	P34	
5307 / 1043	P35	
5308 / 1045	P36	
5309 / 1047	P37	
5310 / 1049	P38	
5311 / 1048	P39	
5312 / 104D	P41	
5313 / 104F	P42	
5314 / 1051	P43	
5315 / 1053	P44	2029 2168 2169 2640 6101
5281 / 1006	P44_INC_RATE	2163 2165
5316 / 1055	P45	
5317 / 1057	P46	
5318 / 1059	P47	
5319 / 1058	P48	
5320 / 105D	P49	
5321 / 105F	P51	
5322 / 1061	P52	
5323 / 1063	P53	
5324 / 1065	P54	
5325 / 1067	P55	
5326 / 1069	P56	
5327 / 106B	P57	
5328 / 106D	P58	
5329 / 106F	P59	
5330 / 1071	P61	
5331 / 1073	P62	
5332 / 1075	P63	
5333 / 1077	P64	
5334 / 1079	P65	

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5335 / 1078	P66	
5336 / 1C7D	P67	
5337 / 107F	P68	
5338 / 1C81	P69	
5339 / 1083	P71	
5340 / 1085	P72	
5341 / 1D87	P73	
5342 / 1089	P74	
5343 / 1D88	P75	
5344 / 1D8D	P76	
5345 / 1D8F	P77	
5346 / 1D91	P78	
5347 / 1D93	P79	
5348 / 1D95	P81	
5349 / 1D97	P82	
5350 / 1D99	P83	
5351 / 1D9B	P84	
5352 / 1D9D	P85	
5353 / 1D9F	P86	
5354 / 1DA1	P87	
5355 / 1DA3	P88	
5356 / 1DA5	P89	
5357 / 1DA7	P91	
5358 / 1DA9	P92	
5359 / 1DAB	P93	
5360 / 1DAD	P94	
5361 / 1DAF	P95	
5362 / 1DB1	P96	
5363 / 1DB3	P97	
5364 / 1DB5	P98	
5365 / 1DB7	P99	
554 / 0038	Q_M	1238
5374 / 1ED3	Q_STORAGE	900 901 908 921 933 1246 4195 4203
552 / 0032	Q_SUB_T	1746 1759 5190 6215 6216
558 / 004A	R_MATRIX	2043 2062 2064 2074
4727 / 0004	RANGE_DISPLAY	4238 6689 6767
5106 / 171F	RAT_TABLE	3226 3230
5385 / 1F25	RAW_H	1247 1248 1390 1534 1536
12 / CE0B	READ_PMU_KEYBOARD	5675 5999
8 / CF02	READ_START_ADDRESS	112
9 / CF03	READ_STOP_ADDRESS	
4 / CF01	READ_TAPE	427
1702 / 05E5	REC_ERROR	1641 1665

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
2877 / 08FB	REG_SETUP	2502 2770
5095 / 1714	REGISTER_CROSS	2759 2946 4634 4776
5112 / 1728	REGISTER_DOT	2761 2766 4623 4627 4643 4790 4794
5 / 9F00	RESET_CMP_INTERRUPT	426
34 / 000A	RESET_PFG_COUNTDOWN	827 5887
13 / 9E00	RESET_PMU_INTERRUPT	
14 / 9800	RESET_RECORDER_INTERRUPT	6139 6186
568 / 0080	RESET_TF	1268 1281 1830 3610
1902 / 06E3	RESOLVE	1882 2151
5280 / 1004	RES2	2138 2139
5279 / 1002	RES3	2142 2143
52 / 0000	REVERSE	210 486
6112 / 5000	RF_HI_LIM	5945
6113 / 3000	RF_LO_LIM	5947
5921 / 197A	RF_TEST	1080 1084 1096 6009
4127 / 0008	RIGHT_STATION_PAIR	3866
5411 / 1F69	RIJ	669 762 2038 2040 3607 4788 4792 5078 5412 5413 5414 5415
	5416 5417 5418 5419 5420	
669 / 00FD	RIJ_ADD	1798 1964 2940 3283 3633
5408 / 1F55	RIJ_STAR	4171 4301 4306 4613 4614
1927 / 0701	RIJ_UPDATE	1034
5249 / 183C	ROLL	181 397 799 5847
5252 / 1C03	ROLL_END	786 6236
5251 / 18E8	ROLL_14	785
5250 / 183C	ROLL_15	766
766 / 0154	ROLLADDRESS	
1974 / 0743	ROTATE_RIJS	1966 2120
4746 / 1562	ROUND_FOR_H	4673
49 / 0002	RUN	164 204 210 412 486
5442 / 1FDA	RZ_ALPHA	3667 3679 5443
5435 / 1FBE	RZ_BETA	3701 4563 4775
5433 / 1FB2	RZ_C	4778 4789 4854 6781 7124
5434 / 1FB8	RZ_POS	3665 3681 4564 4565 4767 4774 4782 4786 4793 4858
5441 / 1FF2	RZ_RATE	4772 4810 5444
5440 / 1FD8	RZ_TIME	4847 5442
4788 / 1598	RZ_TIME_UPDATE.	1050
4765 / 1579	RZ_UPDATE	1049
5443 / 1FDB	RZ_VEL	3677 4572 4766
5412 / 1F69	R11	1932 2945 4805 6205
5413 / 1F68	R12	227 6206
5414 / 1F6D	R13	6207
5415 / 1F6F	R21	228 1593 1936 1967 6208
5416 / 1F71	R22	6209

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
5417 / 1F73	R23	6210
5418 / 1F75	R31	1939 1968 6211
5419 / 1F77	R32	6212
5420 / 1F79	R33	229 3608 6213
7119 / 1CA1	SAMPLE_NKR	6850 7029 7101
6844 / 17F5	SAVE_BP_DATA	6810
5430 / 1F96	SAVE_POSITION_VARIANCES	2032 2081 3468 3520 3604 4232 4233
2038 / 0796	SAVE_RIJ	2019
4928 / 164F	SC_ENTRY	682
5267 / 1C9F	SEASON_INDEX_NORTH	3001 3131
5268 / 1CA0	SEASON_INDEX_SOUTH	3005 3133
2201 / 0888	SELECT_MEASUREMENT	
51 / 0008	SELFTEST_ON	
538 / 0018	SHIP_SPEED_INPUT	
4736 / 0007	SIG_DISPLAY	4235
2913 / 0C2C	SIGMA_LOG	
2912 / 0C2A	SIGMA_NRA	2058
2914 / 0C2E	SIGMA_PSUDO	
5278 / 1D00	SIGMA_SQ_KICK	2034 2692
5367 / 1D88	SIGMA_SQ_N_COUNTER	1277 2257 2344 2469 2477 2486 4510 5075 6233 6234 6740
5368 / 1DD3	SIGMA_SQ_PHI_DOT_PHI_DOT	2307 2462 5072
5370 / 1E33	SIGMA_SQ_PHI_PHI	1273 2299 2460 4526 5074
5369 / 1E03	SIGMA_SQ_PHI_PHI_DOT	1493 2458 5073
547 / 0024	SIGMA_SQUARED_PHI_SUB_M	5192 6202 6203 6204
5958 / 19AA	SIGNAL_PIN	698
4934 / 1656	SIN	2334 3016 3020 3030 4930
4929 / 1650	SIN_COS	
5429 / 1F94	SIN_THETA_P	
529 / 0012	SIN_10_2	5935
533 / 0016	SIN_11_33	
531 / 0014	SIN_13_6	
4124 / 0008	SIX_DIGITS	3944 3963 3964 3969
7084 / 0D14	SIXTY	7043
7087 / 0D1A	SIXTYB1	7034 7047 7057
1043 / 02AF	SLOW	1041
600 / 00A4	SLOW_RATE	1043 1046
1913 / 06EE	SMOOTH	1852
5410 / 1F67	SMOOTH_DATA	1913 1923 1925
5407 / 1F53	SMOOTH_DATA_STAR	4583
4730 / 0005	SPEED_DISPLAY	4549 4581 4587
23 / 0040	SPEED_EXITATION_B	5990 5995
4900 / 1629	SQUARE_ROOT	680
5383 / 1F19	SS_PHI_M_BASE	1412 1416

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
4036 / 11DD	STAPAIR	4110 4111
4104 / 123E	START_ACCEPT_GROUP	4115
1068 / 02C9	START_BURST	1579
636 / 0005	START_CKSUM	165 765 5845
609 / 0082	START_CNT	1423 1425 1777 1788
610 / 0083	START_MKR	1426 1785 1831
1763 / 0635	START_OF_BURST	1068 6800 6811
1566 / 0538	START_OF_SLOT	1064
1156 / 0334	START_OMEGA	1042
592 / 009C	START_OMEGA_NOW	950 1156 1175
1064 / 02C5	START_SLOT	1181
580 / 0088	START_SYNC_TIME	942 943 1107 1158 4886
5155 / 175A	STATION_BURST_TIMES	1766 2897
612 / 0085	STATION_COUNTER	1185 1240 1378 1582 1611 1614 1728 1763 1771 2007 4270 6184 6314 6983
603 / 00A7	STATION_INDEX	
613 / 0086	STATION_NUMBER	2235 2273 2278 2407 2684
5207 / 1798	STATION_VECTOR_TABLE	670 2753 5077
654 / 00E5	STATIONS_IN_USE	859 1792 1854 2258 3507 4551 6227 6564 6789
4253 / 12E0	STATUS_CCOH	4194
4181 / 1284	STATUS_FAIL	4192
3881 / 1105	STATUS_INPUTS	3875 3877
53 / 0000	STOP	102 125 136 141 462 477
526 / 000E	SUM_T_ZERO_DOT	2194 2195
5139 / 1748	SUN_CONS	3006
670 / 00FE	SV_ADD	1592 2328 2939
4589 / 14A1	SWAP	4239 4252 4550 4582 4588
6773 / 1FE2	SX	6683
6772 / 1FE0	SXSQ	6591 6596 6612 6663 6681
7121 / 1FC6	SXSQ2	6831 7108
7122 / 1FCC	SX2	7109
1098 / 02E7	SYNC	1012 1058 1060 1062 1569 7137
5262 / 1E7A	SYNC_BASE	1114 1124 1142 5263
5260 / 1DAE	SYNC_C	845 5261
838 / 01B4	SYNC_CALC	
5261 / 1E78	SYNC_COUNT	5262
5259 / 1C1E	SYNC_DATA	946 947 1113 1134 5260
577 / 0087	SYNC_DATA_ADDRESS	986
576 / 0087	SYNC_DATA_ADDRESS_AND_FREQUENCY	1133
5263 / 1E7D	SYNC_DATA_COUNTER	1154
578 / 0088	SYNC_FREQUENCY	854
5041 / 16DE	SYNC_LIMIT_TABLE	861
583 / 008F	SYNC_N	1143 1147

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
980 / 0268	SYNC_SUMMATION_SUBROUTINE	862 867
575 / 0085	SYNC_10VERN	875 897 1150
1058 / 02BF	SYNC1	5669 6054
1060 / 02C1	SYNC2	1098
1062 / 02C3	SYNC3	1108 1116
6782 / 1FC6	T_0_BUFFER	6630 6680 6692 6694 6702 6705 6709 6715 6722 6723 6729 6734 6758 6769
7124 / 1FB2	T_0_BUFFER2	6835 6836 6837 6955 7031 7041 7076 7111
4742 / 0009	T_0_PEAVG	
6777 / 1FE8	T_0_SEC_COUNT	6665 6696
7125 / 1FE0	T_0_SEC_COUNT2	6839 6986 6988
6642 / 183E	T_0_TABLE	6634
6967 / 0C72	T_0_TABLES	6959
6776 / 1FE6	T_0_TIME	6698 6737 6739
7127 / 1FE4	T_0_TIME2	6841 6991 7104 7106
4745 / 000A	T_0_DOT_CVT	6731
47 / 8F10	TAPE_CONTROL	102 125 136 141 164 204 210 412 462 477 486
54 / 8F20	TAPE_FILL	111 158 209 485
764 / 0151	TAPE_ID	6225
27 / 8F20	TAPE_READER_DATA_READY	
32 / 8801	TAPE_RECORDER_BUSY	
33 / 8802	TAPE_RECORDER_INTERRUPT	
7112 / 0030	TEN_MIN	6989
579 / 0089	TEN_SECOND_SYNC_PERIOD_COMPLETE_MARKER	836 839 1152
634 / 00D1	TEST_FAIL	973 977
550 / 002E	TEST_FAIL_TEMP	974 978 3438 3756 4181
835 / 0180	TEST_SYNC	837 904 918 931 934
1074 / 02CF	TEST1	826
1092 / 02E1	TEST10	6049
1094 / 02E3	TEST11	5953
1096 / 02E5	TEST12	5916
1076 / 02D1	TEST2	5886
1078 / 02D3	TEST3	5895
1080 / 02D5	TEST4	5921
1082 / 02D7	TEST5	5963
1084 / 02D9	TEST6	5928
1086 / 02DB	TEST7	6007
1088 / 02DD	TEST8	6028
1090 / 02DF	TEST9	6033
5169 / 1768	TF_LAMBDA_CONSTANT_TABLE	1362 1440 2403 2741 4316
5076 / 1701	TF_PHI_DATA_ADDRESSES	1325 1438
5072 / 16FD	TF_SIGMA_SQ_DATA_ADDRESSES	1282
572 / 0085	TF_TEMP	575 576 577 578 579 1451 1468 1484 1494 5076

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
1293 / 03E5	TF_TIME_UPDATE	1286 1323
5404 / 1F50	THA_P_STAR	4577
2733 / 0847	THETA_C	2408 2413 3320 3325
622 / 00C0	THETA_P	1595 1902 1970 4612
7082 / 0D10	THIRD	7032 7037 7045 7050 7055
4122 / 0006	THREE_DIGITS	3975
619 / 008C	TIME	791 796 1006 1008 1159 1576 2976 3552 4885 6220
604 / 00A8	TIME_INC	1574 1578 2199
6614 / 1811	TIME_INC2	6590 6738
7114 / 0041	TIME_INC3	7105
5402 / 1F4C	TIME_STAR	4387
2065 / 07C1	TIME_UPDATE_P	
2082 / 07DE	TIME_UPDATE_X	
779 / 0080	TITLE	767
767 / 0155	TITLE_LINK	
1268 / 03C1	TRACKING_FILTER	
2234 / 08B5	TRACKING_FILTER_MEASUREMENT	2208 2679 2706
538 / 0018	TRUE_AIR_SPEED_INPUT	
537 / 001A	TRUE_HEADING_INPUT	1834
4121 / 0005	TWO_DIGITS	
6944 / 0C4D	TYPE_DYN_RNG_DATA	6792
6616 / 1815	TYPE_NAV_PERF_OUTPUT	6573
5254 / 1C04	TYPE_OUT	6401 6403 6635 6637 6960 6962
6433 / 18C8	TYPE_TABLE	6395
58 / 0000	UC	2226
81 / 0000	UCO	2207 2222 2226
4117 / 0001	UPPER_LEFT_KEY	3797 3861 3868 3900 3981 4000 4070
4118 / 0002	UPPER_RIGHT_KEY	3936 4030 4041 4045 4061
5444 / 1FF4	V_INSERT	1879 3576 4546
5109 / 1722	V_LAMBDA	2386 2430 4284
618 / 0088	V_TAS	1866 4651
5401 / 1F4B	V_TAS_STAR	4585 4652
4647 / 14EE	VARSAVE	3819 4139
620 / 00BE	VC2	621 1897 1929 4803 6222
5403 / 1F4E	VC2_STAR	4243 4574 4579
621 / 00BF	VC3	1928
1834 / 0690	VELOCITY_PROCESSING	1032 6478 7139
50 / 0004	VERIFY_ON	
598 / 00A2	V2	599 1337 1898 6221
599 / 00A3	V3	1336
601 / 00A5	WINDOWAD	4001 4012 4022 4024 4067 4092
4120 / 0004	WITH_ACCEPT_LIGHT	3934 3958 4034
5832 / 1A2A	WRITE_DATA	5794 5797

STMT# / ADDR	LABEL	STMT# WHERE REFERENCED
39 / 8802	WRITE_FILE_GAP	
5830 / 1A28	WRITE_LBUC	5816 5824
5264 / 1C27	X	2022 2087 2121 2558 2634 2638 4268 4271 5265 5266
5275 / 1CED	XX	2086 2092 2570 2601 2602 2608 2619 2645 2805
5258 / 1C1E	XXX	671 2085 2104 2123 2126 2146 2147 2161 2192 2565 2661 3328
		5259 6104 6730
671 / 00FF	XXX_ADD	2096 2644 2711
5274 / 1CE8	XXXX	2023 2162 2662 2803 6237
5276 / 1CF6	X2XX	2108 2635 2716
2867 / 0BED	Y_MINUS_MX	2571
5432 / 1FA6	Y_P	1201 1727