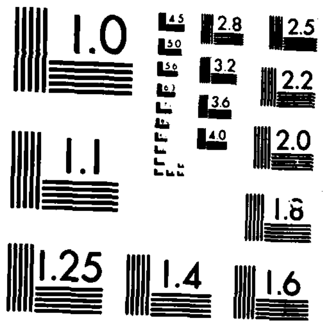
AD-A164 042 DEVELOPMENT AND IMPLEMENTATION OF THE X25 PROTOCOL FOR THE UNIVERSAL NETW..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. M W WEBER 1/3

UNCLASSIFIED DEC 85 AFIT/GE/ENG/85D-52-VOL-2 F/G 17/2 NL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DEVELOPMENT AND IMPLEMENTATION OF THE X.25 PROTOCOL FOR THE UNIVERSAL NETWORK INTERFACE DEVICE (UNID) II

VOL II OF II

THESIS

[illegible] Mark W. Weber
Captain USAF

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/GE/ENG/85D-52

1

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THESIS

Presented to the Faculty of the School of Engineering

of the Air Force Institute of Technology

Air University

in Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Electrical Engineering

Mark W. Weber, BS EE

Captain, USAF

December 1985

APPENDIX J

ISIS HOST SOFTWARE

ISHOST.SRC may be linked with the I/O modules HOST2.SRC, or HOST3.SRC. The program is derived from Childress' host program CPMTMP.SRC (15). The software operatates on the Intel 230 or Intel 210 under the ISIS operation system.

```
$TITLE('LOCAL NETWORK TEST PROG FOR ISIS SYSTEM III, 15 AUG 1985')

/*****************************************************************************/
MAIN: DO;

/****************************************************************************/
/*                                                                          */
/*  DATE:              15 AUG 85                                            */
/*  VERSION:           1.1                                                  */
/*  TITLE:             ISIS HOST SOFTWARE                                   */
/*  FILENAME:          ISHOST.SRC                                           */
/*  OWNER:             Capt Mark Weber                                      */
/*  OPERATING SYSTEM:  ISIS                                                 */
/*  LANGUAGE:          INTEL PL/M 80                                        */
/*  USE:  Link with the assemble driver HOST2.ASM or the PL/M driver       */
/*        HOST3.SRC and the PLM80.LIB file and the SYSTEM.LIB files.       */
/*        The submit file LNK4.CSD may be used to link and locate these    */
/*        four files for use on the intel 230.  The files must be located  */
/*        at or above 04100 h to function properly.                        */
/*  CONTENTS:                                                               */
/*               DELAAY - time delay procedure                              */
/*               HEX$ASC - changes hex numbers to ascii characters          */
/*               ASC$HEX - changes ascii characters to hex numbers          */
/*               VALID$HEX - checks for true hex number                     */
/*               INIT - initialization routine for variable and channel    */
/*               ERR$CHK - checks status of ISIS called routines           */
/*               SNDSEQ - writes to the console                             */
/*               READ$CON - reads the system console                        */
/*               RCV$1 - sets channel one up as a monitor for the SBC 54   */
/*               TRANS$1 - sets channel one up to transmit data to the     */
/*                          channel one monitor                             */
/*               LD$TAB$HSKP - house keeps the specified table              */
/*               SRVC$TAB$HSKP - services table when packet is removed     */
/*               CHK$RXTA - checks the netos receive acknolwedge           */
/*               CHK$TXTR - checks for the transmit request character      */
/*               READ$TXTAB - reads the transmit tables                     */
/*               READ$RXTAB - reads the receive tables                      */
/*               LOAD - places a message in the TX01TB  table               */
/*               READ$LINE - Reads a line of data from the host system     */
/*               LOOP2 - loops data back to the system console through     */
/*                                 channel one                              */
/*                                                                          */
/*               HISTORY:                                                   */
/*                         1.1 - Capt Mark Weber - abopted to ISI           */
/*                             systems with X.25 protocol specifications   */
/*                         1.0 - Capt Creed T. Childress - origanal         */
/*                             CPM version                                  */
/****************************************************************************/
/****************** EXTERNAL PROCEDURE DECLARATIONS ******************/
```

```
SINIT: PROCEDURE EXTERNAL;         /*assembly initialization of ch 1 TTY port */
END SINIT;

SCLRCM: PROCEDURE EXTERNAL;    /*clears the port for valid data transfer  */
END SCLRCM;                     /* (assembly)                 */

SCMCHK: PROCEDURE BYTE EXTERNAL; /*checks the comm channel (assembly)   */
END SCMCHK;

SCMIN: PROCEDURE BYTE EXTERNAL;  /* serical data in driver (assembly)   */
END SCMIN;

SCMOUT: PROCEDURE(CHAROUT) EXTERNAL;   /*serical data out driver    */
   DECLARE CHAROUT BYTE;            /* (assembly)          */
END SCMOUT;

READ:  PROCEDURE(AFTN, BUFFER, COUNT, ACTUAL, STATUS) EXTERNAL;
       DECLARE(AFTN, BUFFER, COUNT, ACTUAL, STATUS) ADDRESS;
END READ;
       /* reads data from console device (system lib)          */

WRITE: PROCEDURE(AFTN, BUFFER, COUNT, STATUS) EXTERNAL;
       DECLARE(AFTN, BUFFER, COUNT, STATUS) ADDRESS;
END WRITE;
       /* writes data to the console device (system lib)       */

ERROR: PROCEDURE (ERRNUM) EXTERNAL;    /* system error check procedure */
       DECLARE ERRNUM ADDRESS;
END ERROR;

EXIT: PROCEDURE EXTERNAL;  /* system exit from ISIS                 */
END EXIT;


DECLARE BUFFER(128) BYTE;
DECLARE CRLF(*) BYTE DATA(0DH,0AH);
DECLARE     MESSAGE(*) BYTE DATA(0DH, 0AH,
'THIS IS THE TEST MESSAGE                   THIS IS THE TEST MESSAGE!!!!!');
DECLARE        ASCII(*) BYTE DATA('0123456789ABCDEF');
DECLARE    (CHAN$NUM, DEST$NET$CODE, DEST$HOST$CODE) BYTE;
DECLARE (ACT$COUNT, STATUS) ADDRESS;

DECLARE    DATA$GRAM$SIZE  LITERALLY '128',    /* NUMBER OF BYTES FROM HOST */
             PACKETS$IN$TABLE LITERALLY '10',
             DATA$TABLE$SIZE LITERALLY '1280',   /* DATAGRAM * NBR OF DATAGRAMS */
                         TCP$DATA$SIZE        LITERALLY '72',              /* TCP DATA SIZE
*/
                        MAX$RXTA$TRIES  LITERALLY '3',              /* MAX NUMBER OF TA WAIT
TRIES */
```

```
                 /* FOLLOWING ARE NETWORK DEFINED VARIABLES */
                 /* NOTES:1. THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
                          2. THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH
                             THIS UNID IS LOCATED.
                          3. MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
                             ARE CURRENTLY OPERATIONAL. CC=0000 IS RESERVED FOR
                             THE DELNET MONITOR.
                          4. MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
                             CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
                          5. FOR DETAILED INFORMATION ON THE ABOVE REFER TO
                             PHISTER'S THESIS, APPENDIX D.  */

              THIS$UNID$NBR     LITERALLY '2',  /* UNIQUE ADDRESS FOR THIS UNID */
              THIS$COUNTRY$CODE LITERALLY '9',  /* CC WHERE THIS UNID RESIDES */
              MAX$COUNTRY$CODE  LITERALLY '9',  /* INDICATES COUNTRY$CODES IN USE */
              MAX$NETWORK$CODE  LITERALLY '3';  /* INDICATES UNIDS OPERATIONAL IN NET */

/*****************************************************************************/
/*   ADDITIONAL GENERAL DECLARES NEEDED FOR THIS PROGRAM                     */
/*****************************************************************************/

DECLARE
                    CHAN$PTR     ADDRESS,
             RXTA$TRIES  BYTE,
             TEMP1(*) BYTE INITIAL('XXEMPTY EMPTY0XX'),
             TEMP2(*) BYTE INITIAL('XXEMPTY EMPTY0XX'),
             (TRTA, TXTR, TXTA, RXTR, RXTA, CHAR) BYTE,
                        FOREVER    BYTE,
             TRANS$1$RDY  BYTE,
             BYTES$SENT$1 BYTE,
             BYTES$RECV$1 BYTE,
             MSGNUM          BYTE,

/****************************************************************************/
/*    DATA TABLES USED IN THIS PROGRAM                                      */
/****************************************************************************/

             RX01TB (DATA$TABLE$SIZE) BYTE,
              RX01NS ADDRESS,
              RX01NE ADDRESS,
              RX01SZ ADDRESS,

              TX01TB(DATA$TABLE$SIZE) BYTE,
             TX01NS ADDRESS,
             TX01NE ADDRESS,
             TX01SZ ADDRESS,

         DESTINATI
             DESTI
         SOURCE$ADD
```

```
            /*  MISCELLANEOUS DECLARATIONS  */

DECLARE
            TR       LITERALLY          '42H',         /* TR, TA FOLLOWS NETOS */
            TA       LITERALLY          '41H',         /* CONVENTION           */
            BUSY         LITERALLY    'OFFH',
            TRUE         LITERALLY    'OFFH',
            FALSE        LITERALLY    '00H',
            NMBR$MSK     LITERALLY    '07H',
            CR           LITERALLY    '0DH',
            LF           LITERALLY    '0AH',
            SOURCE       LITERALLY    '12',
            DESTIN       LITERALLY    '16',
            ESC          LITERALLY    '1BH',
            RCV$STATE    LITERALLY '00010110B', /* MODE INSTRUCTION FOR  */
                                                /* 8251 USART RCV INT    */
            TRANS$STATE LITERALLY '00110111B'; /* MODE INSTRUCTION FOR  */
                                                /* 8251 RCV & XMIT INT  */

DECLARE               STARTUP$HDR(*) BYTE DATA(CR,LF,
'                        UNID II #2 LOCAL OS',CR,LF,
'                       SUPPORTING S/W ON ISIS',CR,LF,
'                        VERS 1.1, 25 SEP 85',CR,LF,
'                           EXECUTING ',CR,LF);

DECLARE     INIT$MSG(*) BYTE DATA(CR,LF,
'            CONFIGURED for the ISIS SYSTEM II at 1.18 Mhz',CR,LF,
'            timing to the I/O port.',CR,LF,LF,
'           Operating with the UNID II iSBC TCP/IP protocol',CR,LF,
'            to simulate a host system',CR,LF);

      /* THE FOLLOWING TEST POINTS ARE USED TO FOLLOW THE DATA WITHIN THE UNID */

DECLARE TP$50(*) BYTE DATA(CR,LF,
'TP$50               Channel Number = ');
DECLARE TP$51A(*) BYTE DATA(CR,LF,
'TP$51A              Destination Network = ');
DECLARE TP$52A(*) BYTE DATA(CR,LF,
'TP$52A              Destination Host = ');
DECLARE TP$54(*) BYTE DATA(CR,LF,
'TP$54               Loaded test datagram in TX01TB');
DECLARE TP$55A(*) BYTE DATA(CR,LF,
'TP$55A              Reading test datagram from TX01TB');
DECLARE TP$56A(*) BYTE DATA(CR,LF,
'TP$56A              Reading test datagram from RX01TB');
DECLARE TP$57(*) BYTE DATA(CR,LF,
'TP$57               Sent TR');
DECLARE TP$58(*) BYTE DATA(CR,LF,
'TP$58               Sent TA');
DECLARE TP$59(*) BYTE DATA(CR,LF,
'TP$59               Received TR');
DECLARE TP$60(*) BYTE DATA(CR,LF,
'TP$60               Received TA');

DECLARE        MSG1(*)        BYTE DATA(CR,LF,
'Do you want to load the test message (Y/N) [N] ? ');
DECLARE MSG1A(*) BYTE DATA(CR,LF,
'Do you want TR/TA handshake (Y/N) [N] ? ');
DECLARE MSG2(*) BYTE DATA(CR,LF,
'Do you want to stop the test (Y/N) [N] ? ');
DECLARE MSG3(*) BYTE DATA(CR,LF,
'Load into which host channel (1,2,3,4)? ');
DECLARE MSG4(*) BYTE DATA(CR,LF,
'How many datagrams (0 - 9)? ');
DECLARE MSG5(*) BYTE DATA(CR,LF,
'Destination network code (1,2,3) = ');
DECLARE MSG6(*) BYTE DATA(CR,LF,
'Destination host code (0 - FFH) = ');
DECLARE MSG7(*) BYTE DATA(CR,LF,
'Finished simulation, rebooting to ISIS',CR,LF);
DECLARE MSG8(*) BYTE DATA(CR,LF,
'Timeout on receive datagram from UNID');
DECLARE MSG9(*) BYTE DATA(CR,LF,
'Timeout on receive TA from UNID');
DECLARE MSG10(*) BYTE DATA(CR,LF,
'Timeout on receive TR from UNID');

/*********************************************************************
*  DATE:                 25 SEP 84                                   *
*  VERSION:              1.0                                         *
*  NAME:                 DELAY                                       *
*  MODULE NUMBER:         Not yet implemented                        *
*  FUNCTION:              The purpose of this procedure is to add  a *
*               delay to parts of the initialization prodedure that  *
*               are time dependent.  Delay is approzimately in       *
*               milliseconds.                                        *
*  INPUTS:               MILLISEC (approximate)                      *
*  OUTPUTS:              None                                        *
*  GLOBAL VARIBLES USED:        None                                 *
*  GLOBAL VARIBLES CHANGED:     None                                 *
*  MODULES CALLED:              TIME (PLM80.LIB)                     *
*  CALLING MODULES:             None yet                             *
*  AUTHOR:  Capt C. T. Childress                                     *
*  HISTORY:                                                          *
*               1.0 - Capt C. T. Childress -25 SEP 85 configured for *
*                     CP/M                                           *
*********************************************************************/
DELAY: PROCEDURE(MILLISEC);
       DECLARE (I, MILLISEC) BYTE;
```

```
    DO I=1 TO MILLISEC;
       CALL TIME(25); /* TIME IS A BUILT IN FUNCTION OF PLM80 WHICH CAUSES */
                      /* A DELAY BASED ON THE NUMBER IN PARENS             */
    END;
END DELAY;

/*************************************************************************
        PROCEDURES TO CONVERT HEX TO ASCII FOR USE WITH DISPLAYING A FRAME
*************************************************************************/
********************************************************************
/*******************************************************************
*  DATE:                  25 SEP 84                                *
*  VERSION:               1.0                                      *
*  NAME:                  HEX$ASC                                  *
*  MODULE NUMBER:         4.1                                      *
*  FUNCTION:              Converts a HEX number into its ascii characters *
*               for printing to console                            *
*  INPUTS:                VAL - a hex number                       *
*  OUTPUTS:               HEX$ASC                                  *
*  GLOBAL VARIBLES USED:          ASCII - array of leagal hex characters *
*                                 I - position in string           *
*  GLOBAL VARIBLES CHANGED:       TEMP1 - ASCII output array       *
*  MODULES CALLED:                None                             *
*  CALLING MODULES:               SNDSEQ, READ$TX$TAB              *
*  AUTHOR:  Capt C.T. Childress                                    *
*  HISTORY:                                                        *
*               1.0 - Capt C. T. Childress -25 SEP 84              *
*******************************************************************/
HEX$ASC: PROCEDURE(VAL, I);
   DECLARE (VAL, I) BYTE;

   TEMP1(I) = ASCII(SHR(VAL,4) AND 0FH);
   TEMP1(I+1) = ASCII(VAL AND 0FH);

END HEX$ASC;

/*******************************************************************
*  DATE:                25 SEP 84                                  *
*  VERSION:             1.0                                        *
*  NAME:                ASC$HEX                                    *
*  MODULE NUMBER:       3.3                                        *
*  FUNCTION:            Converts ASCII characters to their HEX equi- *
               vallent number.                                     *
*  INPUTS:              C - the character                          *
*  OUTPUTS:             ASC$HEX                                    *
*  GLOBAL VARIBLES USED:        None                               *
*  GLOBAL VARIBLES CHANGED:     None                               *
*  MODULES CALLED:              None                               *
*  CALLING MODULES:             READLINE                           *
*  AUTHOR:  Capt C.T. Childress                                    *
*  HISTORY:
```

```
*               1.0 - Capt C. T. Childress -25 SEP 84                   *
************************************************************************/
ASC$HEX: PROCEDURE(C) BYTE;
   DECLARE C BYTE;

   IF (C >= '0' AND C <= '9') THEN
       RETURN (C-30H);
   ELSE
       IF (C >= 'A' AND C <= 'F') THEN
           RETURN (C-37H);
       ELSE
           IF (C >= 'a' AND C <= 'f') THEN
               RETURN (C-57H);


   RETURN C;

END ASC$HEX;

/***********************************************************************
*  DATE:                25 SEP 84                                       *
*  VERSION:             1.0                                             *
*  NAME:                VALID$HEX                                       *
*  MODULE NUMBER:       Not yet used                                    *
*  FUNCTION:            Validates a char to be changed to hex           *
*  INPUTS:              H - char                                        *
*  OUTPUTS:             VALIDHEX - boolean                              *
*  GLOBAL VARIBLES USED:         ASCII - array of valid ascii char      *
*  GLOBAL VARIBLES CHANGED:      None                                   *
*  MODULES CALLED:               None                                   *
*  CALLING MODULES:              None yet                               *
*  AUTHOR:  Capt C.T. Childress                                         *
*  HISTORY:                                                             *
*               1.0 - Capt C. T. Childress -25 SEP 84                   *
************************************************************************/
VALID$HEX: PROCEDURE(H) BYTE;
       DECLARE (H,I) BYTE;

   DO I = 0 TO LAST(ASCII);
       IF H = ASCII(I) THEN
           RETURN TRUE;
   END;
   RETURN FALSE;

END VALID$HEX;

/***********************************************************************
*  DATE:                24 SEP 84                                       *
*  VERSION:             1.0                                             *
*  NAME:               INIT                                               *
*  MODULE NUMBER:      1.0                                                *
*  FUNCTION:           Initializes the software including all global      *
*              varibles, tables, pointers and the communcations           *
*              channel.  This procedures writes the control words to      *
*              the PIC, PIT, PPI, and USARTs.                             *
*  INPUTS:             None                                               *
*  OUTPUTS:            None                                               *
*  GLOBAL VARIBLES USED:  MSGNUM, BYTES$SENT$1, BYTES$RECV$1, CHAN$NUM    *
*             DEST$NET$CODE, BUFFER, CHAR, TRANS$1$RDY, RXTA$TRIES        *
*             TRTA,TXTR,RXTR,RXTA, RX01NS, RX01NE, RX01SZ, TX01NS,        *
*             TX01NE, TX01SZ                                              *
*  GLOBAL VARIBLES CHANGED:        same as above                          *
*  MODULES CALLED:                 SINIT, SCLRCM                          *
*  CALLING MODULES:                main                                   *
*  AUTHOR:  Capt C.T. Childress                                           *
*  HISTORY:                                                               *
*             1.0 - Capt C. T. Childress -25 SEP 84                       *
*************************************************************************/
INIT: PROCEDURE;

     MSGNUM = 0;
   BYTES$SENT$1 = 0;
   BYTES$RECV$1 = 0;
   CHAN$NUM = 0;
   DEST$NET$CODE = 0;
   BUFFER(0) = 120;
   CHAR = ' ';
   TRANS$1$RDY = FALSE;
   RXTA$TRIES = 0;
   TRTA, TXTR, TXTA, RXTR, RXTA = FALSE;

/*****************************************************************************/
/*                                                                           */
/*          THIS PORTION   SETS THE LOCAL AND NETWORK TABLES TO THIER        */
/*        INITIAL VALUES PRIOR TO PROCESSING ANY MESSAGES.                   */
/*                                                                           */
/*****************************************************************************/

   RX01NS = 0;
   RX01NE = 0;
   RX01SZ = DATA$TABLE$SIZE;

   TX01NS = 0;
   TX01NE = 0;
   TX01SZ = DATA$TABLE$SIZE;


   CALL SINIT;
   CALL SCLRCM;
```

```
END INIT;

/**********************************************************************
*  DATE:                 15 AUG 85                                      *
*  VERSION:              1.1                                            *
*  NAME:                 ERR$CHK                                        *
*  MODULE NUMBER:        2.1                                            *
*  FUNCTION:             Checks the status of ISIS call procedures and  *
*                for an orderly exit incase of error                    *
*  INPUTS:               None                                           *
*  OUTPUTS:              None                                           *
*  GLOBAL VARIBLES USED:        STATUS                                  *
*  GLOBAL VARIBLES CHANGED:     None                                    *
*  MODULES CALLED:              ERROR, EXIT                             *
*  CALLING MODULES:             SNDSEQ, READ$CON                        *
*  AUTHOR:  Capt Mark Weber                                             *
*  HISTORY:                                                             *
*               1.1 - Capt Mark Weber -15 AUG 85 changed from CPM exit to*
*                     ISIS exit procedures                              *
*               1.0 - Capt C. T. Childress 25 SEP 84                    *
***********************************************************************/

ERR$CHK:  PROCEDURE;
       IF STATUS <> 0 THEN
              DO;
               CALL ERROR(STATUS);
       CALL EXIT;
         END;

END ERR$CHK;

/**********************************************************************
*  DATE:                 15 AUG 85                                      *
*  VERSION:              1.1                                            *
*  NAME:                 SNDSEQ                                         *
*  MODULE NUMBER:        2.0                                            *
*  FUNCTION:             Sends a message to the system console          *
*  INPUTS:               MSG - the message addess                       *
*                        TOTAL - the count of the char in the buffer    *
*  OUTPUTS:              None (Text to console output)                  *
*  GLOBAL VARIBLES USED:        STATUS                                  *
*  GLOBAL VARIBLES CHANGED:     STATUS                                  *
*  MODULES CALLED:              ERR$CHK, WRITE (ISIS call)              *
*  CALLING MODULES:             main, READ$LINE, LOAD, READ$RX$TAB,     *
*                        READ$TX$TAB, RCV$1                             *
*  AUTHOR:  Capt Mark Weber                                             *
*  HISTORY:                                                             *
*  HISTORY:                                                             *
*               1.1 - Capt Mark Weber -15 AUG 85 -configured for ISIS  *
*               1.0 - Capt C. T. Childress -25 SEP 84 configured for   *
*                         CP/M                                         *
**********************************************************************/
SNDSEQ: PROCEDURE(MSG, TOTAL) REENTRANT;
    DECLARE  MSG  ADDRESS,
             TOTAL ADDRESS;

       CALL WRITE(0, MSG, TOTAL, .STATUS);
       CALL ERR$CHK;

END SNDSEQ;

/*********************************************************************
*  DATE:                 15 AUG 85                                     *
*  VERSION:              2.0                                           *
*  NAME:                 READ$CON                                      *
*  MODULE NUMBER:        3.2                                           *
*  FUNCTION:             Reads a character from the system console     *
*  INPUTS:               None                                          *
*  OUTPUTS:              None                                          *
*  GLOBAL VARIBLES USED:        BUFFER, ACT$COUNT, STATUS              *
*  GLOBAL VARIBLES CHANGED:     BUFFER, ACT$COUNT, STATUS              *
*  MODULES CALLED:              ERR$CHK, READ (ISIS call), WRITE(ISIS) *
*  CALLING MODULES:             READ$LINE                              *
*  AUTHOR:  Capt Mark Weber                                            *
*  HISTORY:                                                            *
*               1.1 - Capt Mark Weber -15 AUG 85 -configured for ISIS  *
*               1.0 - Capt C. T. Childress -25 SEP 85 configured for   *
*                         CP/M                                         *
**********************************************************************/
READ$CON: PROCEDURE;

        CALL READ(1, .BUFFER, 128, .ACT$COUNT, .STATUS);
           CALL ERR$CHK;

       CALL WRITE(0, .BUFFER, ACT$COUNT, .STATUS);
       CALL ERR$CHK;

END READ$CON;

/*********************************************************************
*  DATE:                 24 SEP 84                                     *
*  VERSION:              1.0                                           *
*  NAME:                 RCV$1                                         *
*  MODULE NUMBER:        7.2                                           *
*  FUNCTION:             Receives data from channel one of SBC 544.    *
*               This procedure takes a characer at a time from the     *
*               receive port and puts it in the receive channel buffer *
*               The routine is interrupt driven and operates after        *
*               initialization.  Operates off of USART 0                  *
*  INPUTS:                None                                            *
*  OUTPUTS:               None                                            *
*  GLOBAL VARIBLES USED:       RXTR,TXTA,TXTR,RX01NE,RX01SZ               *
*                              BYTES$RCV$1, RX01TB                        *
*  GLOBAL VARIBLES CHANGED:    same as above                              *
*  MODULES CALLED:             SCMCHK, SNDSEQ                             *
*  CALLING MODULES:            LOOP2                                      *
*  AUTHOR:  Capt Mark Weber                                               *
*  HISTORY:                                                               *
*  HISTORY:                                                               *
*                 1.0 - Capt C. T. Childress -25 SEP 85 configured for    *
*                         CP/M                                            *
**************************************************************************/
/* USE THIS CODE FOR SELF TEST; CHAR BY CHAR RECEIVE */
/*
   RCV$1: PROCEDURE;

   RX01TB(RX01NE) = SCMIN;
   RX01NE = RX01NE + 1;
   IF(RX01NE >= RX01SZ) THEN
       RX01NE = 0;

END RCV$1;
*/
/* USE THE FOLLOWING FOR OPERATIONAL 544 S/W TEST */
/*     DATAGRAM BY DATAGRAM RECEIVE     */

RCV$1: PROCEDURE;
   DECLARE COUNT ADDRESS;

   COUNT = 30000;
   DO WHILE ((SCMCHK = 0) AND (COUNT <> 0));
       COUNT = COUNT - 1;
   END;
   IF COUNT = 0 THEN
       DO;
       CALL SNDSEQ(.MSG8, SIZE(MSG8));
       RXTR = FALSE;
       TXTA = FALSE;
       END;
   ELSE
       IF ((NOT TRTA) OR (RXTR AND TXTA AND
              (NOT TXTR) AND (NOT RXTA))) THEN
            DO;
            DO WHILE (BYTES$RECV$1 < DATA$GRAM$SIZE);
                RX01TB(RX01NE) = SCMIN;
                RX01NE = RX01NE + 1;
                BYTES$RECV$1 = BYTES$RECV$1 + 1;
```

```
          END;
          BYTES$RECV$1 = 0;
          IF (RX01NE >= RX01SZ) THEN
              RX01NE = 0;
          RXTR = FALSE;
          TXTA = FALSE;
          END;

END RCV$1;

/*********************************************************************
*  DATE:              25 SEP 84                                      *
*  VERSION:           1.0                                            *
*  NAME:              TRANS$1                                        *
*  MODULE NUMBER:     7.1                                            *
*  FUNCTION:          This procedure sends a datagram out local      *
*               channel 1.  Each byte of data generates an interrupt *
*               on USART 0.  When the message is complete the transmit *
*               interrupt is disabled and TRANS$1RDT is set true.    *
*  INPUTS:            None                                           *
*  OUTPUTS:           None                                           *
*  GLOBAL VARIBLES USED:     BYTES$SENT$1, DATA$GRAM$SIZE, TX01TB    *
*                            TX01NS$1$RDY, TX01SZ, TXTR,RXTA         *
*  GLOBAL VARIBLES CHANGED:  same as above                           *
*  MODULES CALLED:           SCMOUT                                  *
*  CALLING MODULES:          LOOP2                                   *
*  AUTHOR:  Capt Mark Weber                                          *
*  HISTORY:                                                          *
*  HISTORY:                                                          *
*                1.0 - Capt C. T. Childress -25 SEP 85 configured for *
*                      CP/M                                          *
*********************************************************************/
/* USE THIS CODE FOR SELF TEST; CHAR BY CHAR TRANSMIT */
/*
TRANS$1: PROCEDURE;

   IF(BYTES$SENT$1 < DATA$GRAM$SIZE) THEN
       DO;
       CALL SCMOUT(TX01TB(TX01NS));
       BYTES$SENT$1 = BYTES$SENT$1 + 1;
       TX01NS = TX01NS + 1;

       IF BYTES$SENT$1 >= DATA$GRAM$SIZE THEN
           DO;
           BYTES$SENT$1 = 0;
           IF TX01NS >= TX01SZ THEN
                TX01NS = 0;
           TRANS$1$RDY = FALSE;
           END;
       END;

END TRANS$1;
*/
/* USE THE FOLLOWING FOR OPERATIONAL 544 S/W TEST */
/*       DATAGRAM BY DATAGRAM TRANSMIT           */

TRANS$1: PROCEDURE;

   DO;
   DO WHILE (BYTES$SENT$1 < DATA$GRAM$SIZE);
       CALL SCMOUT(TX01TB(TX01NS));
       BYTES$SENT$1 = BYTES$SENT$1 + 1;
       TX01NS = TX01NS + 1;
   END;
   BYTES$SENT$1 = 0;
   IF TX01NS >= TX01SZ THEN
       TX01NS = 0;
   TRANS$1$RDY = FALSE;
   TXTR = FALSE;
   RXTA = FALSE;
   END;

END TRANS$1;

/************************************************************************
*  DATE:               25 SEP 84                                        *
*  VERSION:            1.0                                              *
*  NAME:               LD$TAB$HSKP                                      *
*  MODULE NUMBER:      3.5                                              *
*  FUNCTION:           This procedure housekeeps a specified buffer     *
*              after loading the user data from the host.  The pro-     *
*              cedure determines which table to process, and advances   *
*              the NEX$EMPTY$BYTE address by one PACKET$SIZE, and if    *
*              necessary wrapps the data araound to the begining of     *
*              the queue.                                               *
*  INPUTS:             TABLE - address of the table to process          *
*  OUTPUTS:            None                                             *
*  GLOBAL VARIBLES USED:        TX01NE, DATAGRAM$SIZE, TX01SZ           *
*  GLOBAL VARIBLES CHANGED:     TX01NE                                  *
*  MODULES CALLED:              NONE                                    *
*  CALLING MODULES:             READ$LINE                               *
*  AUTHOR:  Capt Mark Weber                                             *
*  HISTORY:                                                             *
*                 1.0 - Capt C. T. Childress -25 SEP 85 configured for  *
*                         CP/M                                          *
************************************************************************/
LD$TAB$HSKP: PROCEDURE(TABLE) ;
       DECLARE  TABLE ADDRESS;
```

```
      TXO1NE = TXO1NE + DATA$GRAM$SIZE;
      IF TXO1NE >= TXO1SZ THEN
          TXO1NE = 0;

END LD$TAB$HSKP;

/*********************************************** *********************
*  DATE:               25 SEP 84                                       *
*  VERSION:            1.0                                             *
*  NAME:               SRCV$TAB$HSKP                                   *
*  MODULE NUMBER:      4.3                                             *
*  FUNCTION:           This procedure housekeeps a specified table     *
*             after servicing removing a packet.  The procedure        *
*             determines which table to process, advances the next     *
*             byte to service pointer, and performs any necessary      *
*             wrap around requirements                                 *
*  INPUTS:             TAB - pointer to table to process               *
*  OUTPUTS:            None                                            *
*  GLOBAL VARIBLES USED:        RXO1NS, RXO1SZ, TXO1NS, TXO1SZ,        *
*                               DATA$GRAM$SIZE                         *
*  GLOBAL VARIBLES CHANGED:     RXO1NS, RXO1SZ, TXO1NS, TXO1SZ         *
*  MODULES CALLED:              None                                   *
*  CALLING MODULES:             READ$RX$TAB                            *
*  AUTHOR:  Capt Mark Weber                                            *
*  HISTORY:                                                            *
*                 1.0 - Capt C. T. Childress -25 SEP 85 configured for *
*                         CP/M                                         *
***********************************************************************/
SRVC$TAB$HSKP: PROCEDURE(TAB) ;
     DECLARE  TAB  ADDRESS;

   DO CASE TAB;
       ;

       DO;
       RXO1NS = RXO1NS + DATA$GRAM$SIZE;
       IF RXO1NS >= RXO1SZ THEN
           RXO1NS = 0;
       END;

       DO;
       TXO1NS = TXO1NS + DATA$GRAM$SIZE;
       IF TXO1NS >= TXO1SZ THEN
           TXO1NS = 0;
       END;

   END;

END SRVC$TAB$HSKP;
```

```
/*************************************************************************
*  DATE:                 15 AUG 85                                       *
*  VERSION:              1.0                                             *
*  NAME:                 CHK$RXTA                                        *
*  MODULE NUMBER:        9.0                                             *
*  FUNCTION:             Checks for RXTA from UNID                       *
*  INPUTS:               None                                            *
*  OUTPUTS:              None                                            *
*  GLOBAL VARIBLES USED:        TXTR,RXTA,RXTR,TXTA,RXTA$TRIES           *
*  GLOBAL VARIBLES CHANGED:     same as above                            *
*  MODULES CALLED:              SCMCHK, SNDSEQ, SCMIN, TRANS$1           *
*  CALLING MODULES:             none yet                                 *
*  AUTHOR:  Capt C.T. Childress                                          *
*  HISTORY:                                                              *
*               1.0 - Capt C. T. Childress                               *
*************************************************************************/
CHK$RXTA: PROCEDURE;
       DECLARE COUNT ADDRESS;

       IF (TXTR AND (NOT RXTA) AND (NOT RXTR) AND (NOT TXTA)) THEN
              COUNT = 30000;
              DO WHILE ((SCMCHK = 0) AND (COUNT <> 0));
                     COUNT = COUNT - 1;
       END;
       IF COUNT = 0 THEN
           DO;
           CALL SNDSEQ(.MSG9, SIZE(MSG9));
           TXTR = FALSE;
           END;
       ELSE
           DO;
           CHAR = SCMIN;
           IF CHAR = TA THEN
               DO;
               CALL SNDSEQ(.TP$60, SIZE(TP$60));
               RXTA = TRUE;
               RXTA$TRIES = 0;
               CALL TRANS$1;
               END;
           END;

END CHK$RXTA;

/*************************************************************************
*  DATE:                 25 SEP 84                                       *
*  VERSION:              1.0                                             *
*  NAME:                 CHK$RXTR                                        *
*  MODULE NUMBER:        10.0                                            *
*  FUNCTION:             Checks RXTR from the channel                    *
*  INPUTS:               None                                            *
*  OUTPUTS:                                                              *
*  GLOBAL VARIBLES USED:       RXTR,TXTA,TXTR,RXTA                       *
*  GLOBAL VARIBLES CHANGED:    same as above                             *
*  MODULES CALLED:             SCMCHK, SNDSEQ, SCMIN, SCMOUT, RCV$1      *
*  CALLING MODULES:            None yet                                  *
*  AUTHOR:  Capt C.T. Chrildress                                         *
*  HISTORY:                                                              *
*               1.0 - Capt C. T. Childress                               *
************************************************************************/
CHK$RXTR: PROCEDURE;
       DECLARE COUNT ADDRESS;

       IF ((NOT RXTR) AND (NOT TXTA) AND (NOT TXTR) AND (NOT RXTA)) THEN
              COUNT = 30000;
              DO WHILE ((SCMCHK = 0) AND (COUNT <> 0));
               COUNT = COUNT - 1;
       END;
       IF COUNT = 0 THEN
           CALL SNDSEQ(.MSG10, SIZE(MSG10));
       ELSE
           DO;
           CHAR = SCMIN;
           IF CHAR = TR THEN
               DO;
               CALL SNDSEQ(.TP$59, SIZE(TP$59));
               CALL SNDSEQ(.TP$58, SIZE(TP$58));
               RXTR = TRUE;
               TXTA = TRUE;
               CALL SCMOUT(TA);
               CALL RCV$1;
               END;
           END;

END CHK$RXTR;


/************************************************************************
*  DATE:               25 SEP 84                                         *
*  VERSION:            1.0                                               *
*  NAME:               READ$TX$TAB:                                      *
*  MODULE NUMBER:      5.0                                               *
*  FUNCTION:           Reads the local transmit table                    *
*  INPUTS:             None                                              *
*  OUTPUTS:            None                                              *
*  GLOBAL VARIBLES USED:       RXTA$TRIES, TXTR,RXTA,TXO1NE,TXO1SZ       *
*                      DATA$GRAM$SIZE, MAX$RXTA$TRIES                    *
*  GLOBAL VARIBLES CHANGED:    RXTA$TRIES, TXTR,TXO1NE,TXO1SZ, RXTA      *
*  MODULES CALLED:             SRVC$TAB$HSKP, HEX$ASC, SNDSEQ, SCMOUT    *
*  CALLING MODULES:            main                                      *
*  AUTHOR:  Capt C.T. Chrildress                                         *
*  HISTORY:                                                              *
*              1.0 - Capt C. T. Childress                                *
*************************************************************************/
READ$TXTAB:       PROCEDURE;
       DECLARE I BYTE;

       RXTA$TRIES = RXTA$TRIES + 1;
       IF RXTA$TRIES > MAX$RXTA$TRIES THEN
           DO;
       TXTR = FALSE;
       RXTA = FALSE;
       CALL SRVC$TAB$HSKP(2);
       RXTA$TRIES = 0;
       END;

   IF ((TX01NE - TX01NS) >= DATA$GRAM$SIZE) OR (TX01NS > TX01NE) THEN
       DO;
       I = 12;
       DO WHILE I <= 19;
           CALL HEX$ASC(TX01TB(TX01NS + I),(I-12)*2);
           I = I + 1;
       END;
       CALL SNDSEQ(.TP$55A, SIZE(TP$55A));
       CALL SNDSEQ(.CRLF, SIZE(CRLF));
       CALL SNDSEQ(.TEMP1, SIZE(TEMP1));
       CALL SNDSEQ(.TX01TB(TX01NS + 56), TCP$DATA$SIZE);
       IF (TRTA AND (NOT TXTR) AND (NOT RXTA) AND
               (NOT RXTR) AND (NOT TXTA)) THEN
           DO;
           TXTR = TRUE;
           CALL SNDSEQ(.TP$57, SIZE(TP$57));
           CALL SCMOUT(TR);
           END;
       IF (NOT TRTA) THEN
           TRANS$1$RDY = TRUE;
   END;

END    READ$TXTAB;

/************************************************************************
*  DATE:                 25 SEP 84                                      *
*  VERSION:              1.0                                            *
*  NAME:                 READ$RXTAB                                     *
*  MODULE NUMBER:        4.0                                            *
*  FUNCTION:             Reads the local receive tables                 *
*  INPUTS:               None                                           *
*  OUTPUTS:              None                                           *
*  GLOBAL VARIBLES USED:       RX01NE,RX01SZ,DATA$GRAM$SIZE,RX01TB      *
*                              RX01NS                                   *
*  GLOBAL VARIBLES CHANGED:    None                                     *
*  MODULES CALLED:          HEX$ASC, SNDSEQ, SRVC$TAB$HSKP                 *
*  CALLING MODULES:         main                                           *
*  AUTHOR:  Capt C.T. Childress                                            *
*  HISTORY:                                                                *
*              1.0 - Capt C. T. Childress                                  *
***************************************************************************/
READ$RXTAB:        PROCEDURE;
   DECLARE I BYTE;

   IF ((RX01NE - RX01NS) >= DATA$GRAM$SIZE) OR (RX01NS > RX01NE) THEN
      DO;
      I = 12;
      DO WHILE I <= 19;
          CALL HEX$ASC(RX01TB(RX01NS + I),(I-12)*2);
          I = I + 1;
      END;
      CALL SNDSEQ(.TP$56A, SIZE(TP$56A));
      CALL SNDSEQ(.CRLF, SIZE(CRLF));
      CALL SNDSEQ(.TEMP1, SIZE(TEMP1));
      CALL SNDSEQ(.RX01TB(RX01NS + 56), TCP$DATA$SIZE);
      CALL SRVC$TAB$HSKP(1);
   END;

END    READ$RXTAB;


/***************************************************************************
*  DATE:                15 AUG 85                                          *
*  VERSION:             1.1                                                *
*  NAME:                LOAD                                               *
*  MODULE NUMBER:       3.4                                                *
*  FUNCTION:            This procedure places a message in the TX01TB      *
*                       table                                              *
*  INPUTS:              TABLE$PTR, DEST$UNID, DEST$HOST                    *
*  OUTPUTS:             NONE                                               *
*  GLOBAL VARIBLES USED:        MSGUM,THIS$COUNTRY$CODE,THIS$UNID$NBR      *
*                       CHAN$NUM,COUNTRY$CODE                              *
*  GLOBAL VARIBLES CHANGED:     MSGNUM                                     *
*  MODULES CALLED:              SNDSEQ                                     *
*  CALLING MODULES:             READ$LINE                                  *
*  AUTHOR:  Capt Mark Weber                                                *
*  HISTORY:                                                                *
*                 1.1 - Capt Mark Weber -15 AUG 85 -configured for ISIS    *
*                 1.0 - Capt C. T. Childress -25 SEP 85 configured for     *
*                         CP/M                                             *
***************************************************************************/
LOAD: PROCEDURE(TABLE$PTR, DEST$UNID, DEST$HOST);

      DECLARE (INDEX, TABLE$PTR) ADDRESS;
   DECLARE (DEST$UNID, DEST$HOST) BYTE;
   DECLARE LCOXTB BASED TABLE$PTR (1) BYTE;

       DO INDEX = 0 TO (DATA$GRAM$SIZE - 1);
           LCOXTB(INDEX) = 0;
       END;

   /* VARIOUS CONSTANTS PER THE TCP/IP SPEC */
       LCOXTB(0) = 48H;
       LCOXTB(3) = 80H;
       LCOXTB(6) = 40H;
       LCOXTB(8) = 3CH;
       LCOXTB(9) = 6;
       LCOXTB(20) = 82H;
       LCOXTB(21) = 0BH;

   /* IP SOURCE HEADER */
       LCOXTB( 12) = THIS$COUNTRY$CODE AND 0FH;
                               /* CT    = 0, CC     = THIS$COUNTRY$CODE */
       LCOXTB( 13) = (ROL(THIS$UNID$NBR, 4) AND 0F0H) OR
                         (ROR(((CHAN$NUM*56) AND 0F0H), 4) AND 0FH);
                               /* NC     = THIS$UNID$NBR, HC(H) = CHAN$NUM * 56*/
       LCOXTB( 14) = 7H OR (ROL(((CHAN$NUM*56) AND 0FH), 4) AND 0F0H);
                               /* HC(L) = CHAN$NUM * 56, PC(2) = 7 */
       LCOXTB( 15) = 77H;  /* PC(1) = 7, PC(0) = 7 */

   /* IP DESTINATION HEADER */
       LCOXTB( 16) = THIS$COUNTRY$CODE AND 0FH;
                               /* CT    = 0, CC     = THIS$COUNTRY$CODE */
       LCOXTB( 17) = (ROL(DEST$UNID, 4) AND 0F0H) OR
                         (ROR((DEST$HOST AND 0F0H), 4) AND 0FH);
                               /* NC     = DEST$UNID, HC(H) = DEST$HOST */
       LCOXTB( 18) = 7H OR (ROL((DEST$HOST AND 0FH), 4) AND 0F0H);
                               /* HC(L) = DEST$HOST, PC(2) = 7 */
       LCOXTB( 19) = 77H;  /* PC(1) = 7, PC(0) = 7 */

       CALL MOVE(TCP$DATA$SIZE, .MESSAGE, .LCOXTB( 56));
       IF MSGNUM > 9 THEN
           MSGNUM = 0;
       LCOXTB( 86) = '0' + MSGNUM;
       MSGNUM = MSGNUM + 1;
       CALL SNDSEQ(.TP$54, SIZE(TP$54));

END    LOAD;

/*********************************************************************
*  DATE:                15 AUG 85                                    *
*  VERSION:             1.1                                          *
*  NAME:                READ$LINE                                    *
*  MODULE NUMBER:       3.0                                          *
*  FUNCTION:            Reads a line of data from the host console and    *
*              then loads the specified number of datagrams into the     *
*              transmit table according to the specified path            *
*  INPUTS:               None                                            *
*  OUTPUTS:              None                                            *
*  GLOBAL VARIBLES USED:         TRTA,BUFFER,TX01TB,TX01NE,DEST$HOST$CODE *
*                        CHAN$NUM,FOREVER,DEST$NET$CODE                  *
*  GLOBAL VARIBLES CHANGED:      BUFFER,TRTA,DEST$NET$CODE,DEST$HOST$CODE *
*  MODULES CALLED:               SNDSEQ, READ$CON, ASC$HEX, HEX$ASC      *
*  CALLING MODULES:              main                                    *
*  AUTHOR:  Capt Mark Weber                                              *
*  HISTORY:                                                              *
*              1.1 - Capt Mark Weber - adapted BUFFER to ISIS READ,      *
*                    WRITE calls                                         *
*              1.0 - Capt C. T. Childress                                *
*************************************************************************/
READ$LINE: PROCEDURE;

   DECLARE TABLE$PTR ADDRESS,
           (I, COUNT) BYTE;

   I = 0;

   CALL SNDSEQ(.MSG1, SIZE(MSG1));
   BUFFER(0) = 'N';
   CALL READ$CON;

   IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN
      DO;
      CALL SNDSEQ(.MSG1A, SIZE(MSG1A));
      BUFFER(0) = 'N';
      CALL READ$CON;
      IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN
         TRTA = TRUE;
      ELSE
         TRTA = FALSE;
      CALL SNDSEQ(.MSG3, SIZE(MSG3));
      CALL READ$CON;
      CHAN$NUM = ASC$HEX(BUFFER(0));
      IF (CHAN$NUM >= 1) AND (CHAN$NUM <= 4) THEN
         DO;
         TABLE$PTR = .TX01TB(TX01NE);
         CALL SNDSEQ(.MSG5, SIZE(MSG5));
         CALL READ$CON;
         DEST$NET$CODE = ASC$HEX(BUFFER(0));

         CALL SNDSEQ(.MSG6, SIZE(MSG6));
         CALL READ$CON;
         DEST$HOST$CODE = 0;
         COUNT = BUFFER(0);
         DO I = 0 TO 1;
```

```
              DEST$HOST$CODE = ROL(DEST$HOST$CODE, 4);
              DEST$HOST$CODE = DEST$HOST$CODE OR ASC$HEX(BUFFER(I));
          END;

          CALL SNDSEQ(.MSG4, SIZE(MSG4));
          CALL READ$CON;
          IF (BUFFER(0) >= '1') AND (BUFFER(0) <= '9') THEN
              DO I = 1 TO ASC$HEX(BUFFER(0));
                  CALL LOAD(TABLE$PTR, DEST$NET$CODE, DEST$HOST$CODE);
                  CALL LD$TAB$HSKP(2);
                  TABLE$PTR = .TX01TB(TX01NE);
              END;
      END;
   END;

   CALL SNDSEQ(.TP$50, SIZE(TP$50));
   CALL HEX$ASC(CHAN$NUM, 0);
   CALL SNDSEQ(.TEMP1, 2);
   CALL SNDSEQ(.TP$51A, SIZE(TP$51A));
   CALL HEX$ASC(DEST$NET$CODE, 0);
   CALL SNDSEQ(.TEMP1, 2);
   CALL SNDSEQ(.TP$52A, SIZE(TP$52A));
   CALL HEX$ASC(DEST$HOST$CODE, 0);
   CALL SNDSEQ(.TEMP1, 2);

   CALL SNDSEQ(.MSG2, SIZE(MSG2));
   BUFFER(0) = 'N';
   CALL READ$CON;

   IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN
       FOREVER = FALSE;
   ELSE
       FOREVER = TRUE;

END READ$LINE;

/*************************************************************************
*  DATE:               25 SEP 84                                          *
*  VERSION:            1.0                                                *
*  NAME:               LOOP2                                              *
*  MODULE NUMBER:      7.0                                                *
*  FUNCTION:           Loops the datalink transmit and receive packets    *
*              back to the network for validating iSBC 544 operation     *
*  INPUTS:             None                                               *
*  OUTPUTS:            None                                               *
*  GLOBAL VARIBLES USED:        None                                      *
*  GLOBAL VARIBLES CHANGED:     None                                      *
*  MODULES CALLED:              TRANS$1, RCV$1                            *
*  CALLING MODULES:             main                                      *
*  AUTHOR:  Capt C.T. Childress                                           *
*  HISTORY:                                                                 *
*               1.0 - Capt C. T. Childress                                  *
***************************************************************************/


LOOP2: PROCEDURE;

   CALL TRANS$1;
   CALL RCV$1;

END LOOP2;

/*****************************************************************************/
/*     THIS IS THE MAIN BODY OF THE PROGRAM                                  */
/*****************************************************************************/

BEGIN:

   CALL INIT;
   CALL SNDSEQ(.STARTUP$HDR, SIZE(STARTUP$HDR));
   CALL SNDSEQ(.INIT$MSG, SIZE(INIT$MSG));
   CALL SNDSEQ(.(CR,LF), 2);

   FOREVER = TRUE;
   CALL READ$LINE;
   CALL SCLRCM;
   DO WHILE FOREVER;
       CALL READ$TXTAB;
       IF TRTA THEN
           CALL CHK$RXTA;
       IF TRANS$1$RDY THEN
           CALL LOOP2;
       IF TRTA THEN
           CALL CHK$RXTR;
       CALL READ$RXTAB;
       IF SCMCHK <> 0 THEN
           CALL CHK$RXTR;
       CALL READ$LINE;
   END;
   CALL SNDSEQ(.MSG7, SIZE(MSG7));
   CALL EXIT;

END MAIN;

/****************************** THE END ******************************/
```

APPENDIX K

HOST I/O MODULES

1. Intel 210 CP/M I/O Module (assembly). K-2

2. Intel 230 ISIS I/O Module (assembly). K-11

3. Intel 230 ISIS I/O Modle (PL/M) K-15

1. Intel 210 CP/M O/P Module (assembly)

APPENDIX K

HOST I/O MODULES

1. Intel 210 CP/M I/O Module (assembly). K-2

2. Intel 230 ISIS I/O Module (assembly). K-11

3. Intel 230 ISIS I/O Modle (PL/M) K-16

```
;************************************************
;       LINK80 SUBROUTINES               *
;************************************************
;
; In directory as TSBS.ASM, SBS.ASM, or SBS.MOD
; Set up for California Computer System 2810 CPU
;     (at 4 MHz) which uses the WD or NS 8250 UART
; This software module was developed by Capt C. T.(Tom)
;     Childress on his own time and with his own resources
;     for use with his own CP/M system communications
;     program.  It is a proven module of software.  This
;     software and his system are used in his thesis as a
;     software validation tool for the SBC 544 board.
;     Any other use without prior written permission from
;     Capt Childress is strictly prohibited.
;
;Vers 1.0, 10 May 82
;Vers 1.1, 26 Sep 82
;Vers 1.2, 19 Oct 82
;Vers 1.3, 11 Feb 83, New video board driver, 19.2 & 38.4 kbps
;Vers 1.4, 24 Mar 83, Changed to 4MHz, ABCD drives
;Vers 1.5,  3 Jul 83, Added XON/XOFF toggle for Terminal transmit file
;              mode, Added Echo to remote for terminal mode
;Vers 1.6, 30 Jul 84, Deleted the XON/OFF and Echo for use with higher
;              speeds in the terminal mode file transfer mode
;Vers 1.7, 17 Aug 84, Modified to work with the UNID II iSBC 544 to
;              support the Internet Protocol (IP) datagram exchange
;              running on the iSBC 544.
;Vers 1.8, 20 Jul 85, Modified to work with the Intel system II/210
;               operation under CPM and with 8251 USART
;
; EQUATES
;
SDATA   EQU 0F4H    ;Serial data port
SCONT   EQU SDATA+1 ;Serial command port
SSTAT       EQU SDATA+1 ;Serial status port
;
;  8253 Counter ports and control mode
COUNTER     EQU 0F3H        ;Counter mode port
CNTBAUD EQU 0F0H        ;Counter 0 baud port
CNTMODE EQU 00110110B   ;Counter mode3, counter 0 command
;
RXRDY   EQU 00000010B   ;Rx data available
TXMTY   EQU 00000001B   ;Tx buffer empty
ERROR   EQU 00111000B   ;Error bit mask
DSRMSK EQU 10000000B    ;DSR bit mask
SYSNDET EQU 01000000B   ;Sync detect mask
RESET    EQU 01000000B  ;Software reset
;
BRFO    EQU 00000000B   ;Bit Rate Factor x 0 = synchronous
```

```
BRF1    EQU 00000001B   ;Bit Rate Factor x 1
BRF16    EQU 00000010B   ;Bit Rate Factor x 16
BRF64    EQU 00000011B  ;Bit Rate Factor x 64
;
commd    EQU 00110111B  ;tx, tr enabled
;
CR EQU 0DH
LF EQU 0AH
XON     EQU 11H
XOF     EQU 13H
bdos0  equ 5
wbvec  equ 0
;
   cseg         ;Relative assembly for ASM80
;
; Start of jump table is public
;
   public  sinit, sclrcm, scmchk, scmin, scmout
;
; Console, BDOS, and warm boot are public
;
   public  const, conin, conout, bdos, exit
;
; Jump table
;
START:
sinit: JMP INIT     ;Initialization
sclrcm:     JMP CLRCM    ;Clear comm channel
scmchk:     JMP CMCHK    ;Check channel
scmin: JMP CMIN     ;Input byte
scmout:     JMP CMOUT    ;Output byte
;
; CP/M BDOS and BIOS call vectored jumps
;
bdos:   jmp bdos0    ;Bdos call
exit:   jmp wbvec    ;Warm boot
;
const: lhld    const0  ;Bios console status
   pchl
conin: lhld    conin0  ;Bios console input
   pchl
conout: lhld   cnout0 ;Bios console output
   pchl
const0: dw 0   ;Bios console status vector
conin0: dw 0   ;Bios console input vector
cnout0: dw 0   ;Bios console output vector
;
;
; Menu initialization routines
;
```

```
INIT:
   lhld    wbvec + 1   ;Calculate the bios console
   lxi d,3      ; status, input, output vectors
   dad d
   shld    const0
   dad d
   shld    conin0
   dad d
   shld    cnout0
;
   LXI D,MSGS  ;CCS signon
   MVI C,9
   CALL    5
   MVI C,1 ;Get keystroke
   CALL    5
INITS: LXI D,CLEAR ;Clear screen
   MVI C,9
   CALL    5
   LXI D,MENU
   MVI C,9 ;Display menu selections
   CALL    5
   LXI D,INBUF  ;Get selection
   MVI C,10
   CALL    5
   LXI H,INBUF+1  ;Check for null select
   MOV A,M
   ORA A
   JZ  INIT1   ;No select, go initialize
   INX H   ;Get feature
   MOV A,M
   CALL    ULCAS   ;Make upper case
   CPI 'A' ;Data rate?
   LXI D,RATE  ;Get save addr
   JNZ INIT2   ;No
   JMP SAVIT   ;Save it
INIT2: CPI 'B' ;Data bits?
   LXI D,BITS1 ;Get save addr
   JNZ INIT3   ;No
   JMP SAVIT   ;Save it
INIT3: CPI 'C' ;Stop bits?
   LXI D,BITS2 ;Get save addr
   JNZ INIT4   ;No
   JMP SAVIT   ;Save it
INIT4: CPI 'D' ;Parity
   LXI D,PAR   ;Get save addr
   JNZ INITS   ;No
SAVIT: INX H   ;Go past delimiter
   INX H   ;Get selection
   MOV A,M
   CALL    VALNUM  ;Is it a valid number?
   JC  INITS   ;Repeat if not
   STAX    D   ;Save it
   JMP INITS   ;Another selection?
;
INIT1: LDA RATE    ;Get data rate
   SUI '0' ;Make binary
   CPI 10  ;Check for more than allowed
   JP  INITS   ;Repeat if so
   RLC      ;Double for two bytes/entry
   LXI H,BTBL  ;Get data rate table addr
   MVI D,0 ;Init D
   MOV E,A ;Put offset in E
   DAD D   ;Add to table addr  .
;  (hl) now has the pointer to the data rate divisor
;
   LDA BITS1   ;Get data bits
   CPI '1' ;Check for 7 bit
   JZ  BITS7   ;It's 7 bit
   CPI '2' ;Check for 8 bit
   JNZ INITS   ;Error,do again
   LDA BIT8    ;Get 8 bit mask
   JMP BITSA   ;Continue
BITS7: LDA BIT7    ;Get 7 bit mask
BITSA: MOV B,A ;Save it
;
   LDA BITS2   ;Get stop bits
   CPI '1' ;Check for 1 bit
   JZ  STPA    ;It's 1 bit
   CPI '2' ;Check for 2 bits
   JNZ INITS   ;Error, start over
   LDA STP2    ;Get 2 bit mask
   JMP STPB    ;Continue
STPA:  LDA STP1    ;Get 1 bit mask
STPB:  ORA B   ;Add 7/8 bit mask
   MOV B,A ;Resave it
;
   LDA PAR ;Get parity
   CPI '1' ;Check for none
   JZ  PARN    ;It's no parity
   CPI '2' ;Check for even
   JZ  PARE    ;It's even parity
   CPI '3' ;Check for odd
   JNZ INITS   ;Error, do again
   LDA ODPAR   ;Get odd par mask
   JMP PARX    ;Continue
PARN:  LDA NOPAR   ;Get no par mask
   JMP PARX    ;Continue
PARE:  LDA EVPAR   ;Get even par mask
PARX:  ORA B   ;Add in 7/8 and 1/2 bits
   MOV B,A ;Resave
```

```
;
   MVI A,BRF16 ;Add in the bit rate factor
   ORA B       ;to the rest of the mode byte
   MOV B,A     ;Resave the mode byte
;
; User provided initialization routine (Baud rate, etc.)
;****UART INITIALIZATION ROUTINE****
;For WD or NS 8250 UART: VR 1.7
;FOR           8251/A USART VR 1.8
;
;       RATE     CODE     MULTIPLIER
;       110      2BAH     0CEH
;       300      040H     0CFH
;       1200     010H     0CFH
;       2400     020H     0CEH
;       4800     010H     0CEH
;       9600     008H     0CEH
;                19200    004H     0CEH
;
   MVI A,RESET           ;reset the 8251 USART
   OUT SCONT             ;
   MVI A,CNTMODE         ;load the 8253 counter for mode 3
   OUT COUNTER           ;and lsb followed by msb
;          LOAD THE BAUD RATE INTO THE COUNTER!
   LXI H,008H            ;baud rate factor for 9600
   MOV A,L               ;lsb
   OUT CNTBAUD           ;
   MOV A,H               ;msb
   OUT CNTBAUD           ;
;          LOAD THE MULTIPLIER TO THE USART!
   MOV A,B               ;x 16 multipiler ( 0CEH DEFAULT )
   OUT SCONT             ;
   MVI A,commd           ;enable tx, rx, and set rts, dtr
   OUT SCONT
   RET
;
; Clear communications channel
; Do not output anything to the remote!!!!!!
;
CLRCM:  IN SDATA
   RET
;
; Check communications channel for anything
; Return with accumulator=0 if nothing ready,
; non-zero if a byte is waiting
;
CMCHK:
   IN  SSTAT
   ANI RXRDY
   RET
```

```
;
; Input byte from remote terminal
;
CMIN:
    IN  SSTAT    ;Added for speed
    ANI RXRDY   ;added for speed
    JZ  CMIN    ;added for speed
    IN  SDATA   ;Get good data
    RET
;
; Output byte to remote computer
;
CMOUT:
OTWT:
    IN  SSTAT   ;Get the transmit status
    ANI TXMTY
    JZ  OTWT    ;Not ready yet
    MOV A,C ;It is now, send the byte
    OUT SDATA
RETURN: RET            ;Default return
;
ULCAS: CPI 'a'    ;Less than lower case a?
    RM          ;Yes
    CPI 'z'+1   ;> lower case z?
    RP       ;Yes
    SUI ' ' ;No, clear lower case bit
    RET
;
VALNUM: CPI    '0' ;Less than 0?
    STC
    RM      ;Carry set; not valid number
    CPI ':' ;More than 9?
    STC
    RP      ;Carry set; not valid number
    CMC
    RET     ;Carry cleared; valid number
;
; NOTE: 1ah    is the clear screen code for the Soroc 120
;       1bh,1h                             for the H-19
;
MSGS:  DB      1BH,62H,'Configured for the CCS 2810 CPU (at 4 MHz), 20 Jul 85',CR,LF
    DB  'Working with the UNID II iSBC 544 Internet Protocol (IP)',CR,LF
    DB  '     to simulate an actual host system.',CR,LF
    DB  'Hit any key to continue $',CR,LF
;
MENU:
    DB  'Feature      Name    Choice          Option',CR,LF,LF
    DB  '   a       Data Rate     '
RATE:  DB  '7 '
    DB  '     0- 110, 1- 150, 2- 300',CR,LF
```

```
   DB  '                                3- 600, 4-1200, 5-2400',CR,LF
   DB  '                                6-4800, 7-9600, 8-19.2', CR,LF
   DB  '                                9-38.4 kbps',CR,LF,LF
;
   DB  '   b       Data Bits    '
BITS1: DB  '2 '
   DB  '    1-7 bit, 2-8 bit',CR,LF,LF
;
   DB  '   c       Stop Bits    '
BITS2: DB  '1 '
   DB  '    1-1 bit, 2-2 bits',CR,LF,LF
;
   DB  '   d       Parity       '
PAR:   DB  '1 '
   DB  '    1-None, 2-Even, 3-Odd',CR,LF,LF
;
CHOIC: DB  'Show choice by letter, space or comma, number, and CR',CR,LF
   DB  'Hit CR when menu selections complete: $'
;
;Rate table for 2.45 MHz xtal
;
BTBL:  DB  1396 MOD 256    ;110 bps
   DB  1396/256
   DB  1024 MOD 256    ;150
   DB  1024/256
   DB  512 MOD 256 ;300
   DB  512/256
   DB  256 MOD 256 ;600
   DB  256/256
   DB  128 MOD 256 ;1200
   DB  128/256
   DB  64 MOD 256  ;2400
   DB  64/256
   DB  32 MOD 256  ;4800
   DB  32/256
   DB  16 MOD 256  ;9600
   DB  16/256
   DB  8 MOD 256   ;19200
   DB  8/256
   DB  4 MOD 256   ;38400
   DB  4/256
;
BIT7:  DB  00001000B   ;7 bit mask
BIT8:  DB  00001100B   ;8 bit mask
STP1:  DB  01000000B   ;1 stop bit
STP2:  DB  11000000B   ;2 stop bits
NOPAR: DB  0        ;No parity
EVPAR: DB  00110000B   ;Even parity
ODPAR: DB  00010000B   ;Odd parity
;
```

```
CLEAR:  DB      1BH,62H,'$'       ;1AH:  String to clear screen (Soroc IQ 120)
;                                 ;1BH,2H                        (H-19)
;
INBUF:  DB 5   ;Input buffer, max # chars
   DB  0    ;# chars in buff
   DS  5    ;Storage for chars
;
   DB  'end SBS'
;
   END
;
```

2. Intel 230 ISIS I/O Module (assembly)

```
$TITLE('HOST2.ASM:  I/O MODULE FOR INTEL 230 UNDER ISIS')
;************************************************
;       LINK80 SUBROUTINES          *
;************************************************
;
; FILE NAME:  HOST2.ASM
; This software module was developed by Capt C. T.(Tom)
;    Childress and modified by Capt Mark Weber for operation
;    on the ISIS SERIES II/III systems.  The program
;    initializes 8251/8251A USARTS to 9600 baud, parity
;    disabled, 8 bit ASCII, Full Duplex. This was used as a
;    software validation tool for the SBC 544 board.
;
;Vers 1.0, 10 May 82
;Vers 1.1, 26 Sep 82
;Vers 1.2, 19 Oct 82
;Vers 1.3, 11 Feb 83, New video board driver, 19.2 & 38.4 kbps
;Vers 1.4, 24 Mar 83, Changed to 4MHz, ABCD drives
;Vers 1.5,  3 Jul 83, Added XON/XOFF toggle for Terminal transmit file
;            mode, Added Echo to remote for terminal mode
;Vers 1.6, 30 Jul 84, Deleted the XON/OFF and Echo for use with higher
;            speeds in the terminal mode file transfer mode
;Vers 1.7, 17 Aug 84, Modified to work with the UNID II iSBC 544 to
;            support the Internet Protocol (IP) datagram exchange
;            running on the iSBC 544.
;Vers 1.8, 20 Jul 85, Modified to support ISIS system, Filed under
;             HOST1.ASM.
;Vers 1.9, 21 Jul 85, Version 1.8 with CPM menu removed, Filed under
;             HOST2.ASM
;
; EQUATES
;
SDATA   EQU 0F4H    ;Serial data port
SCONT   EQU SDATA+1 ;Serial command port
SSTAT       EQU SDATA+1 ;Serial status port
;
;  8253 Counter ports and control mode
COUNTER     EQU 0F3H        ;Counter mode port
CNTBAUD EQU 0F0H        ;Counter 0 baud port
CNTMODE EQU 00110110B   ;Counter mode3, counter 0 command
;
RXRDY   EQU 00000010B   ;Rx data available
TXMTY   EQU 00000001B   ;Tx buffer empty
ERROR   EQU 00111000B   ;Error bit mask
DSRMSK  EQU 10000000B   ;DSR bit mask
SYSNDET EQU 01000000B   ;Sync detect mask
RESET    EQU 01000000B  ;Software reset
;
BRF0    EQU 00000000B   ;Bit Rate Factor x 0 = synchronous
BRF1    EQU 00000001B   ;Bit Rate Factor x 1
```

```
BRF16   EQU 00000010B   ;Bit Rate Factor x 16
BRF63   EQU 00000011B  ;Bit Rate Factor x 64
;
commd   EQU 00110111B  ;tx, tr enabled
;
CR EQU 0DH
LF EQU 0AH
XON    EQU 11H
XOF    EQU 13H
;
   cseg        ;Relative assembly for ASM80
;
; Start of jump table is public
;
   public  sinit, sclrcm, scmchk, scmin, scmout
;
; Jump table
;
START:
sinit: JMP INIT    ;Initialization
sclrcm:     JMP CLRCM   ;Clear comm channel
scmchk:     JMP CMCHK   ;Check channel
scmin: JMP CMIN    ;Input byte
scmout:     JMP CMOUT   ;Output byte
;
;
INIT:
;
;
; User provided initialization routine (Baud rate, etc.)
;****UART INITIALIZATION ROUTINE****
;For WD or NS 8250 UART: VR 1.7
;FOR          8251/A USART VR 1.8
;
;      RATE    CODE    MULTIPLIER
;      110     2BAH    0CEH
;      300     040H    0CFH
;      1200    010H    0CFH
;      2400    020H    0CEH
;      4800    010H    0CEH
;      9600    008H    0CEH
;              19200   004H    0CEH
;
   MVI A,RESET          ;reset the 8251 USART
   OUT SCONT            ;
   MVI A,CNTMODE        ;load the 8253 counter for mode 3
   OUT COUNTER          ;and lsb followed by msb
;          LOAD THE BAUD RATE INTO THE COUNTER!
   LXI H,008H           ;baud rate factor for 9600
   MOV A,L              ;lsb
   OUT CNTBAUD         ;
   MOV A,H             ;msb
   OUT CNTBAUD         ;
;          LOAD THE MULTIPLIER TO THE USART!
   MVI A,0CEH          ;x 16 multipiler
   OUT SCONT           ;
   MVI A,commd         ;enable tx, rx, and set rts, dtr
   OUT SCONT
   RET
;
; Clear communications channel
; Do not output anything to the remote!!!!!!
;
CLRCM:  IN SDATA
   RET
;
; Check communications channel for anything
; Return with accumulator=0 if nothing ready,
; non-zero if a byte is waiting
;
CMCHK:
   IN  SSTAT
   ANI RXRDY
   RET
;
; Input byte from remote terminal
;
CMIN:
   IN  SSTAT    ;Added for speed
   ANI RXRDY   ;added for speed
   JZ  CMIN    ;added for speed
   IN  SDATA   ;Get good data
   RET
;
; Output byte to remote computer
;
CMOUT:
OTWT:
   IN  SSTAT   ;Get the transmit status
   ANI TXMTY
   JZ  OTWT    ;Not ready yet
   MOV A,C ;It is now, send the byte
   OUT SDATA
RETURN: RET           ;Default return
;
;
   END
;
```

3. Intel 230 ISIS I/O Modle (PL/M)

```
$TITLE('PLM80 DRIVERS FOR HOST SYSTEM 220/230 UNDER ISIS, 18 SEP 85')
*  DATE:  18 SEP 85                                                      *
*  VERSION:  1.0                                                         *
*  TITLE:  PLM80 I/O driver software                                     *
*  FILENAME:  HOST3.SRC                                                  *
*  COORDINATOR:  Capt Mark W. Weber                                      *
*  PROJECT:  UNIT II                                                     *
*  OPERATING SYSTEM:  INTEL SYSTEM III/230 UNDER ISIS                    *
*  LANGUAGE:  PL/M 80                                                    *
*  USE:  This file must be linked with ISHOST to operate the channel 1   *
*        (TTY) input/ouput port on the Intel SYSTEM 220/230.  This module *
*        replaces the assembly module used with ISHOST (either HOST1.ASM, *
*        or HOST2.ASM)                                                   *
*  CONTENTS:                                                             *
*             SINIT - initializes the serial port                        *
*             SCLRCM - cleares the serial port                           *
*             SCMCHK - checks the status on the serioal port             *
*             SCMIN - input routine for the serial port                  *
*             SCMOUT - output routine for the serial port                *
*  FUNCTION:  This module operates the Intel SYSTEM 220/230 micro computer *
*             channel 1 (TTY) port.  The port uses an 8251A USART.  Changing *
*             the port addresses on this module may  allow other systems  *
*             to use these procedures if they also use an 8251/8251A USART. *
*  HISTORY:  1.0 Mark Weber - implemented X.25 datalink procedures       *
**************************************************************************/

HOST3: DO;

DECLARE SDATA LITERALLY 'OF4H';              /*  SERIAL PORT DATA ADDRESS        */
DECLARE SCONT LITERALLY 'OF5H';              /*  SERIAL PORT CONTROL ADDRESS     */
DECLARE SSTAT LITERALLY 'OF5H            /*  SERIAL PORT STATUS ADDRESS      */
DECLARE COUNTER LITERALLY 'OF3H';        /*  8255 COUNTER MODE ADDESS        */
DECLARE CNTBAUD LITERALLY 'OFOH';        /*  8255 COUNTER BAUD RATE ADDRESS  */
DECLARE CNTMODE LITERALLY '036H';        /*  8255 MODE COMMAND               */
DECLARE COMMAND LITERALLY '037H';        /*  8251A MODE COMMAND              */
DECLARE RXRDY  LITERALLY '02H',          /*  RX DATA READY                   */
        TXMTY  LITERALLY '01H',          /*  TX BUFFER EMPTYE                */
        ERROR      LITERALLY '038H',         /*  ERROR BIT MASK                  */
        DSRMAK     LITERALLY '080H',         /*  DSR BIT MASK                    */
        SYSNDET    LITERALLY '040H',         /*  SYNC DETECT BIT MASK            */
        RESET      LITERALLY '040H';         /*  SOFTWARE RESET                  */

DECLARE BRFO       LITERALLY '00H',          /*  BIT RATE FACTOR X 0 OR SYNC     */
        BRF1   LITERALLY '01H',          /*  BIT RATE FACTOR X 1             */
        BRF16  LITERALLY '02H',          /*  BIT RATE FACTOR X 16            */
        BRF64  LITERALLY '03H';          /*  BIT RATE FACTOR X 64            */

DECLARE FALSE   LITERALLY 'OH';
DECLARE TRUE    LITERALLY 'OFFH';
/*                          BAUD RATE TABLE                          */
```

```
/*********************************************************************
           RATE        CODE        MULTIBLIER
           110         2BAH        0CEH
           300         040H        0CFH
           1200        010H        0CFH
           2400        020H        0CEH
           4800        010H        0CEH
           9600        008H        0CEH
           19200       004H        0CEH
**********************************************************************/
/*******************************************************************
*  DATE:                          18 SEP 85                        *
*  VERSION:                       1.2                              *
*  NAME:                          SINIT                            *
*  MODULE NUMBER:                                                  *
*  DESCRIPTION:   This procedure initializes the communications    *
*             channel for full duplex operation.                   *
*  PASSED VARIABLES:              None                             *
*  RETURNS:                       None                             *
*  GLOBAL VARIBLES USED:          None                             *
*  GLOBAL VARIBLES CHANGED:       None                             *
*  MODULES CALLED:                None                             *
*  CALLING MODULES:               INIT$N$TAB                       *
*  AUTHOR:   Mark Weber                                            *
*  HISTORY:  1.2 Capt Mark Weber - original PL/M 80 version        *
*            1.1 Capt Mark Weber - system 230/220 verson           *
*            1.0 Capt C.T. Childress - original assembly version   *
*******************************************************************/
SINIT:  PROCEDURE PUBLIC;

   OUTPUT(SCONT)   = RESET;
   OUTPUT(COUNTER) = CNTMODE;
   OUTPUT(CNTBAUD)   = 08H;                 /* LOW BITS */
   OUTPUT(CNTBAUD)   = 00H;                 /* HIGH BITS */
   OUTPUT(SCONT)   = 0CEH;                  /* USART MULTIPLIER */
   OUTPUT(SCONT)   = COMMAND;               /* USART COMMAND BYTE */

END SINIT;

/*******************************************************************
*  DATE:                          18 SEP 85                        *
*  VERSION:                       1.2                              *
*  NAME:                          SCLRM                            *
*  MODULE NUMBER:                                                  *
*  DESCRIPTION:   This procedure clears the commounications channel. *
*  PASSED VARIABLES:              None                             *
*  RETURNS:                       INPUT$BYTE                       *
*  GLOBAL VARIBLES USED:          None                             *
*  GLOBAL VARIBLES CHANGED:       None                             *
*  MODULES CALLED:                None                             *
*  CALLING MODULES:                                                    *
*  AUTHOR:    Mark Weber                                               *
*  HISTORY:  1.2 Capt Mark Weber - original PL/M 80 version            *
*            1.1 Capt Mark Weber - system 230/220 verson               *
*            1.0 Capt C.T. Childress - original assembly version       *
***********************************************************************/
SCLRCM:  PROCEDURE BYTE PUBLIC;

   DECLARE INPUT$BYTE BYTE;

   INPUT$BYTE = INPUT(SDATA);
   RETURN INPUT$BYTE;

END SCLRCM;

/**********************************************************************
*  DATE:                         18 SEP 85                             *
*  VERSION:                      1.2                                   *
*  NAME:                         SCMCHK                                *
*  MODULE NUMBER:                                                      *
*  DESCRIPTION:   This procedure checks the status of the USART.       *
*  PASSED VARIABLES:             None                                  *
*  RETURNS:                      PORT$STATUS                           *
*  GLOBAL VARIBLES USED:         None                                  *
*  GLOBAL VARIBLES CHANGED:      None                                  *
*  MODULES CALLED:               None                                  *
*  CALLING MODULES:                                                    *
*  AUTHOR:    Mark Weber                                               *
*  HISTORY:  1.2 Capt Mark Weber - original PL/M 80 version            *
*            1.1 Capt Mark Weber - system 230/220 verson               *
*            1.0 Capt C.T. Childress - original assembly version       *
***********************************************************************/
SCMCHK:  PROCEDURE BYTE PUBLIC;

   DECLARE PORT$STATUS BYTE;

   PORT$STATUS = SHR((INPUT(SSTAT) AND RXRDY), 1);
   RETURN PORT$STATUS;

END SCMCHK;

/**********************************************************************
*  DATE:                         18 SEP 85                             *
*  VERSION:                      1.2                                   *
*  NAME:                         SCMIN                                 *
*  MODULE NUMBER:                                                      *
*  DESCRIPTION:   This procedure is the input routine for the channel. *
*  PASSED VARIABLES:             None                                  *
*  RETURNS:                      DATA$INPUT                            *
*  GLOBAL VARIBLES USED:        None                                   *
*  GLOBAL VARIBLES CHANGED:     None                                   *
*  MODULES CALLED:              None                                   *
*  CALLING MODULES:                                                    *
*  AUTHOR:    Mark Weber                                               *
*  HISTORY:   1.2 Capt Mark Weber - original PL/M 80 version           *
*             1.1 Capt Mark Weber - system 230/220 verson              *
*             1.0 Capt C.T. Childress - original assembly version      *
**********************************************************************/
SCMIN:  PROCEDURE BYTE PUBLIC;

   DECLARE (DATA$INPUT, READY) BYTE;

   READY = FALSE;
   DO WHILE NOT READY;
       READY = SHR((INPUT(SSTAT) AND RXRDY), 1);
   END;
   DATA$INPUT = INPUT(SDATA);
   RETURN DATA$INPUT;

END SCMIN;


/**********************************************************************
*  DATE:                        18 SEP 85                              *
*  VERSION:                     1.2                                    *
*  NAME:                        SCMOUT                                 *
*  MODULE NUMBER:                                                      *
*  DESCRIPTION:   This procedure clears the commounications channel.   *
*  PASSED VARIABLES:            None                                   *
*  RETURNS:                     None                                   *
*  GLOBAL VARIBLES USED:        None                                   *
*  GLOBAL VARIBLES CHANGED:     None                                   *
*  MODULES CALLED:              None                                   *
*  CALLING MODULES:                                                    *
*  AUTHOR:    Mark Weber                                               *
*  HISTORY:   1.2 Capt Mark Weber - original PL/M 80 version           *
*             1.1 Capt Mark Weber - system 230/220 verson              *
*             1.0 Capt C.T. Childress - original assembly version      *
**********************************************************************/
SCMOUT:  PROCEDURE (CHAR$OUT) PUBLIC;

   DECLARE (CHAR$OUT, READY) BYTE;

   READY = FALSE;
   DO WHILE NOT READY;
       READY = INPUT(SSTAT) AND TXMTY;
   END;
   OUTPUT(SDATA) = CHAR$OUT;
```

```
END SCMOUT;
END HOST3;
/*---------------------END MODULE HOST3.SRC-----------------------------*/
```

APPENDIX L

SBC 544 Simulation Software

SIM544.SRC contains the format modifications to the SBC 544 simulation software used to validate the frame and packet header formats made on the embedded SBC 544 software.

```
$TITLE('SBC 544 LOCAL NETWORK TEST SIMULATION, 30 SEP 1985')

/***********************************************************************
*  DATE:  20 SEP 85                                                    *
*  VERSION:  1.3                                                       *
*  TITLE:  ISO layer 3B SBC 544 SIMULATION WITH THE X.25 PACKET FORMAT *
*  FILENAME:  SIM544.SRC                                               *
*  COORDINATOR:  Capt Mark W. Weber                                    *
*  PROJECT:  UNID II                                                   *
*  OPERATING SYSTEM:  8080/8085 CPU (embedded software)                *
*  LANGUAGE:  PL/M 80                                                  *
*  USE:  This file requires no includes and is used to validate the    *
*        the upper network level functions performed by the SBC 544 via *
*        simulation.  This file has the X.25 packet format implemented. *
*        No other changes have been made between thies file and the file *
*        NEWLOD.LOC.  This file must be linked with PLM80.LIB and SYSTEM.LIB.*
*        The file may be linked using LNK544(SIM544, PLM80.LIB, SYSTEM.LIB). *
*  CONTENTS:  MAIN - main processing routine                           *
*             DELAY - causes a selectable delay                        *
*             HEX$ASC -  converts HEX to ASCII                         *
*             ASC$HEX - converts ASCII to HEX                          *
*             VALID$HEX - validates HEX numbers                        *
*             INVINT - intializes the necessary hardware               *
*             INIT$L$TAB - initializes the necessary tables and pointers *
*             TRNMIT$PKT - initilazes a data port for packet transmission *
*             ERR$CHK - processes system errors                        *
*             SNDSEQ - writes messages system console                  *
*             LD$TAB$HSKP  - updates the transmit tables               *
*             SRVC$TAB$HSKP - updates the receive tables               *
*             RXIN$1 - USART 0 (channel 1) monitor input routine       *
*             TXOUT$1 - USART 0 transmit monitor routine               *
*             BUILD$I$PACKET - formats a message into a data packet    *
*             DET$ADDR - procedufe determines the destionation of local data *
*             DET$ADDR$NL - determines the destionation of data from the *
*                           datalink layer                             *
*             MOVE$LL - moves a packet beween local host channels      *
*             MOVE$NL - moves a packet between the local and network channels*
*             SERVICE$LOOP - software loop to retuen packets to receive *
*                            channel                                   *
*             ROUTE$IN - processes incomming packets from the transport layer*
*             LOAD - places a tacket in transmit table LCOxTB          *
*             READ$TXTAB - reads the transmit tables for data to send  *
*             READ$LCTAB - reads the local table for message           *
*             UPDATE$LCPTR - updates the channel pointer within a table *
*             READ$LINE - reads user responces                         *
*             main - calls proceures to simulate operational SBC 544 in UNID *
*  FUNCTION:  Implements the simulation of the SBC 544 in the UNID II using *
*             the TCP/IP protocol as defined by Phister.  This SBC handles *
*             the functions of ISO layer 3B which processes the IP protocol *
*            and handles a multi-host requriements.                          *
*  HISTORY:  1.2 Mark Weber - implemented X.25 packet format                 *
*            1.1 C.T. Childress - 2 OCT 84 - original implementation         *
*            1.0 P. Philster - original                                      *
****************************************************************************/

/**************************************************************************/
MAIN: DO;

READ:    PROCEDURE (AFTN, BUFFER, COUNT, ACTUAL, STATUS) EXTERNAL;
       DECLARE (AFTN, BUFFER, COUNT, ACTUAL, STATUS) ADDRESS;
END READ;

WRITE:   PROCEDURE (AFTN, BUFFER, COUNT, STATUS) EXTERNAL;
       DECLARE (AFTN, BUFFER, COUNT, STATUS) ADDRESS;
END WRITE;

EXIT:    PROCEDURE EXTERNAL;
END EXIT;

ERROR: PROCEDURE (ERRNUM) EXTERNAL;
       DECLARE ERRNUM ADDRESS;
END ERROR;

DECLARE ACTUAL ADDRESS;
DECLARE STATUS ADDRESS;
DECLARE BUFFER (128) BYTE;
DECLARE R$CONN LITERALLY '1';
DECLARE W$CONN LITERALLY '0';
DECLARE ERRNUM ADDRESS;
DECLARE CRLF(*) BYTE DATA(0DH,0AH);
DECLARE      MESSAGE(*) BYTE DATA(0DH, 0AH,
'THIS IS THE TEST MESSAGE                    THIS IS THE TEST MESSAGE!!!!!');
DECLARE         ASCII(*) BYTE DATA('0123456789ABCDEF');
DECLARE     CHAN$NUM ADDRESS;


DECLARE
        L$RI$DEST$ERR   LITERALLY '000H',   /* LOCAL ROUTE$IN ERROR */
         L$RO$DEST$ERR   LITERALLY '01H';    /* LOCAL ROUTE$OUT ERROR */

                  /* THE FOLLOWING ARE UNID DEFINED VARIABLES */
                  /* NOTE: THESE VARIABLES MAY CHANGE DEPENDING ON THE
                           SOFTWARE CONFIGURATION USED WITHIN THE DELNET */

 DECLARE    DATA$GRAM$SIZE  LITERALLY '128',    /* NUMBER OF BYTES FROM HOST */
            PACKET$SIZE     LITERALLY '138',    /* DATA PACKET + HEADER */
            PACKETS$IN$TABLE LITERALLY '10',
            STAT$NBR        LITERALLY '20',     /* STATUS ENTRIES IN STATTB */
            DATA$TABLE$SIZE LITERALLY '1280',   /* DATAGRAM * NBR OF DATAGRAMS */
```

```
           PACKET$TABLE$SIZE LITERALLY '1380', /* PACKET * NBR OF PACKETS */
          TCP$DATA$SIZE  LITERALLY '72',      /* TCP DATA SIZE */

              /* FOLLOWING ARE NETWORK DEFINED VARIABLES */
              /* NOTES:1. THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
                       2. THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH
                          THIS UNID IS LOCATED.
                       3. MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
                          ARE CURRENTLY OPERATIONAL. CC=0000 IS RESERVED FOR
                          THE DELNET MONITOR.
                       4. MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
                          CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
                       5. FOR DETAILED INFORMATION ON THE ABOVE REFER TO
                          PHISTER'S THESIS, APPENDIX D.  */

          THIS$UNID$NBR    LITERALLY '02',  /* UNIQUE ADDRESS FOR THIS UNID */
          THIS$COUNTRY$CODE LITERALLY '01', /* CC WHERE THIS UNID RESIDES */
          MAX$COUNTRY$CODE LITERALLY '01',  /* INDICATES COUNTRY$CODES IN USE */
          MAX$NETWORK$CODE LITERALLY '03';  /* INDICATES UNIDS OPERATIONAL IN NET */

/***************************************************************************/
/*  DEFINITIONS FOR THE LOCAL SERIAL INPUT/OUTPUT CARD AND 86/12 PPI       */
/***************************************************************************/

   DECLARE   CNTRL$8255      LITERALLY '0CEH',  /* 8255 CONTROL PORT ON 86/12 */
             A$IN            LITERALLY '0C8H',  /* I/O INPUT PORT ADDRESS  */
             B$OUT           LITERALLY '0CAH',  /* I/O OUTPUT PORT ADDRESS */
             C$CNTRL         LITERALLY '0CCH',  /* I/O CONTROL PORT ADDRESS */
             ICW1$OR$OCW2    LITERALLY '0C0H',   /* PORT ADDRESS FOR PIC    */
             ICWS            LITERALLY '0C2H',   /* PORT ADDRESS FOR PIC MODE */
             RCV$STATE       LITERALLY '00010110B', /* MODE INSTRUCTION FOR  */
                                                   /* 8251 USART RCV INT    */
             TRANS$STATE     LITERALLY '00110111B', /* MODE INSTRUCTION FOR  */
                                                   /* 8251 RCV & XMIT INT  */
             ROTATE$PRIORITY$SET  LITERALLY '10100000B'; /* ROTATES PRIORITY */
                                                   /* FOR EQUAL PRIORITY TO  */
                                                   /* ALL I/O PORTS          */

/***************************************************************************/
/*   ADDITIONAL GENERAL DECLARES NEEDED FOR THIS PROGRAM                   */
/***************************************************************************/

DECLARE    BAUD$LSB        BYTE,
           BAUD$MSB        BYTE,
           NUM$BYTES$SENT ADDRESS,
           TRANS$1$RDY  BYTE,
           TRANS$2$RDY  BYTE,
           TRANS$3$RDY  BYTE,
           TRANS$4$RDY  BYTE,
          MSGNUM       BYTE;
```

```
DECLARE        TEMP1(*) BYTE INITIAL('0000000000000000'),
           TEMP2(*) BYTE INITIAL('0000000000000000');

DECLARE      BYTES$SENT$1 BYTE,
             BYTES$SENT$2 BYTE,
             BYTES$SENT$3 BYTE,
             BYTES$SENT$4 BYTE;

DECLARE      J            BYTE;

DECLARE  HSKP$ERR  ADDRESS;

/****************************************************************************/
/*    DATA TABLES USED IN THIS PROGRAM                                       */
/****************************************************************************/

DECLARE     LC01TB (DATA$TABLE$SIZE) BYTE,
            LC01NS ADDRESS,
            LC01NE ADDRESS,
            LC01SZ ADDRESS,

            LC02TB (DATA$TABLE$SIZE) BYTE,
            LC02NS ADDRESS,
            LC02NE ADDRESS,
            LC02SZ ADDRESS,

            LC03TB (DATA$TABLE$SIZE) BYTE,
            LC03NS ADDRESS,
            LC03NE ADDRESS,
            LC03SZ ADDRESS,

            LC04TB (DATA$TABLE$SIZE) BYTE,
            LC04NS ADDRESS,
            LC04NE ADDRESS,
            LC04SZ ADDRESS,

            TX01TB(DATA$TABLE$SIZE) BYTE,
           TX01NS ADDRESS,
           TX01NE ADDRESS,
           TX01SZ ADDRESS,

            TX02TB(DATA$TABLE$SIZE) BYTE,
           TX02NS ADDRESS,
           TX02NE ADDRESS,
           TX02SZ ADDRESS,

            TX03TB(DATA$TABLE$SIZE) BYTE,
           TX03NS ADDRESS,
           TX03NE ADDRESS,
                TX03SZ ADDRESS,

                 TX04TB(DATA$TABLE$SIZE) BYTE,
                TX04NS ADDRESS,
                TX04NE ADDRESS,
                TX04SZ ADDRESS,

                 LCNTNS ADDRESS,
                 LCNTNE ADDRESS,
                 LCNTSZ ADDRESS,

                 NTLCNS ADDRESS,
                 NTLCNE ADDRESS,
                 NTLCSZ ADDRESS,

                 STATTB (STAT$NBR) BYTE;

        /* DECLARATIONS FOR FLAGS AND TABLES IN SYSTEM MEMORY */

DECLARE
                INTERUPT    BYTE,                      /* 88/45 INTERRUPT BYTE */
                (SPARE1,SPARE2,SPARE3) BYTE,           /* SPARE LOCATIONS */
                (TO$HOST, TO$HOST$BUSY) BYTE,          /* BOOLEAN FLAGS */
                (TOHOSTNS, TOHOSTNE) ADDRESS,          /* TABLE ADDRESSS */
                 NTLCTB (PACKET$TABLE$SIZE)  BYTE,     /* TABLE OF 10 PACKETS */

                (TO$NET, TO$NET$BUSY) BYTE,            /* BOOLEAN FLAGS */
                (TONETNS, TONETNE) ADDRESS,            /* TABLE ADDRESSS */
                 LCNTTB (PACKET$TABLE$SIZE) BYTE;      /* TABLE OF 10 PACKETS */

                   /*  MISCELLANEOUS DECLARATIONS  */

DECLARE         FOREVER   BYTE;
DECLARE         BUSY        LITERALLY    'OFFH',
                TRUE          LITERALLY    'OFFH',
                FALSE         LITERALLY    '00H',
                NMBR$MSK      LITERALLY    '07H',
                CR            LITERALLY    '0DH',
                LF            LITERALLY    '0AH',
               SOURCE       LITERALLY    '12',
               DESTIN       LITERALLY    '16',
                ESC           LITERALLY    '1BH';

DECLARE         DESTINATION  ADDRESS,   /* DESTINATION OF THE PACKET  */
               DESTINATION$ADDRESS BYTE, /* DESTIN ADDR OF DATAGRAM */
               SOURCE$ADDRESS BYTE;      /* SOURCE ADDR OF DATAGRAM */

                  /*  INTERNAL VARIABLES USED IN THIS MODULE  */

DECLARE           STARTUP$HDR(*) BYTE DATA(CR,LF,
,                           UNID II #2 LOCAL OS',CR,LF,
,                           VERS 1.2,  30 SEP 85',CR,LF,
,                              EXECUTING ',CR,LF);

      /* THE FOLLOWING TEST POINTS ARE USED TO FOLLOW THE DATA WITHIN THE UNID */

DECLARE     TP$1(*) BYTE DATA(CR,LF,
'TP$1            ENTERING INIT$L$TAB PROCEDURE');
DECLARE     TP$2(*) BYTE DATA(CR,LF,
'TP$2            ENTERING INIT$U$SHTAB PROCEDURE');
DECLARE     TP$3(*) BYTE DATA(CR,LF,
'TP$3            ENTERING INVINT PROCEDURE');
DECLARE     TP$4(*) BYTE DATA(CR,LF,
'TP$4            STARTING ROUTE$IN-ROUTE$OUT LOOP' );
DECLARE     TP$5(*) BYTE DATA(CR,LF,
'TP$5            ENTERING ROUTE$IN PROCEDURE' );
DECLARE     TP$6(*) BYTE DATA(CR,LF,
'TP$6            DATA LOCATED IN LOCAL CHANNEL-1' );
DECLARE     TP$7(*) BYTE DATA(CR,LF,
'TP$7            DATA IS LC01TB TO TXOXTB TRANSFER' );
DECLARE     TP$8(*) BYTE DATA(CR,LF,
'TP$8            DATA IS LC01TB TO LCNTTB TRANSFER' );
DECLARE     TP$9(*) BYTE DATA(CR,LF,
'TP$9            ERROR OCCURED IN LOCAL CHANNEL-1 IN-PROCESING' );
DECLARE     TP$10(*) BYTE DATA(CR,LF,
'TP$10           DATA LOCATED IN LOCAL CHANNEL-2' );
DECLARE     TP$11(*) BYTE DATA(CR,LF,
'TP$11           DATA IS LC02TB TO TXOXTB TRANSFER' );
DECLARE     TP$12(*) BYTE DATA(CR,LF,
'TP$12           DATA IS LC02TB TO LCNTTB TRANSFER' );
DECLARE     TP$13(*) BYTE DATA(CR,LF,
'TP$13           ERROR OCCURED IN LOCAL CHANNEL-2 IN PROCESSING' );
DECLARE     TP$14(*) BYTE DATA(CR,LF,
'TP$14           DATA LOCATED IN LOCAL CHANNEL-3' );
DECLARE     TP$15(*) BYTE DATA(CR,LF,
'TP$15           DATA IS LC03TB TO TXOXTB TRANSFER' );
DECLARE     TP$16(*) BYTE DATA(CR,LF,
'TP$16           DATA IS LC03TB TO LCNTTB TRANSFER' );
DECLARE     TP$17(*) BYTE DATA(CR,LF,
'TP$17           ERROR OCCURED IN LOCAL CHANNEL-3 IN PROCESSING' );
DECLARE     TP$18(*) BYTE DATA(CR,LF,
'TP$18           DATA LOCATED IN LOCAL CHANNEL-4' );
DECLARE     TP$19(*) BYTE DATA(CR,LF,
'TP$19           DATA IS LC04TB TO TXOXTB TRANSFER' );
DECLARE     TP$20(*) BYTE DATA(CR,LF,
'TP$20           DATA IS LC04TB TO LCNTTB TRANSFER' );
DECLARE     TP$21(*) BYTE DATA(CR,LF,
'TP$21           ERROR OCCURED IN LOCAL CHANNEL-4 IN PROCESSING' );
DECLARE     TP$22(*) BYTE DATA(CR,LF,
'TP$22           ENTERING ROUTE$OUT PROCEDURE' );
```

```
DECLARE     TP$23(*) BYTE DATA(CR,LF,
'TP$23            OUTGOING DATA IS IS LCLCTB');
DECLARE     TP$24(*) BYTE DATA(CR,LF,
'TP$24            DATA IN LCOXTB DESTINED FOR LOCAL CHANNEL-1');
DECLARE     TP$25(*) BYTE DATA(CR,LF,
'TP$25            DATA IN LCOXTB DESTINED FOR LOCAL CHANNEL-2');
DECLARE     TP$26(*) BYTE DATA(CR,LF,
'TP$26            DATA IN LCOXTB DESTINED FOR LOCAL CHANNEL-3');
DECLARE     TP$27(*) BYTE DATA(CR,LF,
'TP$27            DATA IN LCOXTB DESTINED FOR LOCAL CHANNEL-4');
DECLARE     TP$28(*) BYTE DATA(CR,LF,
'TP$28            ERROR OCCURED IN LCOXTB OUT$PROCESSING');
DECLARE     TP$29(*) BYTE DATA(CR,LF,
'TP$29            OUTGOING DATA IS IN NTLCTB');
DECLARE     TP$30(*) BYTE DATA(CR,LF,
'TP$30            DATA IN NTLCTB DESTINED FOR LOCAL CHANNEL-1');
DECLARE     TP$31(*) BYTE DATA(CR,LF,
'TP$31            DATA IN NTLCTB DESTINED FOR LOCAL CHANNEL-2');
DECLARE     TP$32(*) BYTE DATA(CR,LF,
'TP$32            DATA IN NTLCTB DESTINED FOR LOCAL CHANNEL-3');
DECLARE     TP$33(*) BYTE DATA(CR,LF,
'TP$33            DATA IN NTLCTB DESTINED FOR LOCAL CHANNEL-4');
DECLARE     TP$34(*) BYTE DATA(CR,LF,
'TP$34            ERROR OCCURED IN NTLCTB TO TXOXTB OUT-PROCESSING');
DECLARE     TP$35(*) BYTE DATA(CR,LF,
'TP$35            END OF ROUTE$IN-ROUTE$OUT LOOP');
DECLARE     TP$36(*) BYTE DATA(CR,LF,
'TP$36      HAVE EXITED ROUTE$IN-ROUTE$OUT LOOP and returned to ISIS',CR,LF);

DECLARE TP$40(*) BYTE DATA(CR,LF,
'TP$40            Packet moved from LCNTTB to NTLCTB');
DECLARE TP$50(*) BYTE DATA(CR,LF,
'TP$50            Channel Number = ');
DECLARE TP$51(*) BYTE DATA(CR,LF,
'TP$51            Destination = ');
DECLARE TP$51A(*) BYTE DATA(CR,LF,
'TP$51A           Destination Network = ');
DECLARE TP$51B(*) BYTE DATA(CR,LF,
'TP$51B           Destination Control Code = ');
DECLARE TP$51C(*) BYTE DATA(CR,LF,
'TP$51C           Destination Country Code = ');
DECLARE TP$51D(*) BYTE DATA(CR,LF,
'TP$51D           Lobits = ');
DECLARE TP$51E(*) BYTE DATA(CR,LF,
'TP$51E           Hibits = ');
DECLARE TP$52(*) BYTE DATA(CR,LF,
'TP$52            Destination Address = ');
DECLARE TP$52B(*) BYTE DATA(CR,LF,
'TP$52b           Source Address = ');
DECLARE TP$52A(*) BYTE DATA(CR,LF,
'TP$52A          Destination Host = ');
DECLARE TP$53(*) BYTE DATA(CR,LF,
'TP$53           Source Address = ');
DECLARE TP$53A(*) BYTE DATA(CR,LF,
'TP$53A          Destination Network Code > Max Network');
DECLARE TP$53AA(*) BYTE DATA(CR,LF,
'TP$53AA         Source Network Code > Max Network');
DECLARE TP$53B(*) BYTE DATA(CR,LF,
'TP$53B          Country Code <> This Country - Sent to UNID 0');
DECLARE TP$53C(*) BYTE DATA(CR,LF,
'TP$53C          Control Code <> 0');
DECLARE TP$54(*) BYTE DATA(CR,LF,
'TP$54           Loaded test datagram in LCOXTB');
DECLARE TP$55A(*) BYTE DATA(CR,LF,
'TP$55A          Reading test datagram from TX01TB');
DECLARE TP$55B(*) BYTE DATA(CR,LF,
'TP$55B          Reading test datagram from TX02TB');
DECLARE TP$55C(*) BYTE DATA(CR,LF,
'TP$55C          Reading test datagram from TX03TB');
DECLARE TP$55D(*) BYTE DATA(CR,LF,
'TP$55D          Reading test datagram from TX04TB');
DECLARE TP$56A(*) BYTE DATA(CR,LF,
'TP$56A          Reading test datagram from LC01TB');
DECLARE TP$56B(*) BYTE DATA(CR,LF,
'TP$56B          Reading test datagram from LC02TB');
DECLARE TP$56C(*) BYTE DATA(CR,LF,
'TP$56C          Reading test datagram from LC03TB');
DECLARE TP$56D(*) BYTE DATA(CR,LF,
'TP$56D          Reading test datagram from LC04TB');

DECLARE    MSG1(*) BYTE DATA(CR,LF,
'Do you want to load the test message? ');
DECLARE MSG2(*) BYTE DATA(CR,LF,
'Do you want to stop the test? ');
DECLARE MSG3(*) BYTE DATA(CR,LF,
'Load into which host channel (1,2,3,4)? ');
DECLARE MSG4(*) BYTE DATA(CR,LF,
'How many datagrams (0 - 9)? ');
DECLARE MSG5(*) BYTE DATA(CR,LF,
'Destination network code (1,2,3) = ');
DECLARE MSG6(*) BYTE DATA(CR,LF,
'Destination host code (0 - FFH) = ');


/*************************************************************************
*  DATE:                 25 SEP 84                                        *
*  VERSION:              1.0                                              *
*  NAME:                 DELAY                                            *
*  MODULE NUMBER:         Not yet implemented                             *
*  FUNCTION:              The purpose of this procedure is to add  a      *
*               delay to parts of the initialization prodedure that   *
*               are time dependent.  Delay is approzimately in        *
*               milliseconds.                                          *
*  INPUTS:                 MILLISEC (approximate)                      *
*  OUTPUTS:                None                                        *
*  GLOBAL VARIBLES USED:          None                                 *
*  GLOBAL VARIBLES CHANGED:       None                                 *
*  MODULES CALLED:                TIME (PLM80.LIB)                     *
*  CALLING MODULES:               None yet                             *
*  AUTHOR:  Capt C. T. Childress                                       *
*  HISTORY:                                                            *
*               1.0 - Capt C. T. Childress -25 SEP 85 configured for   *
*                       CP/M                                           *
***********************************************************************/
DELAY:PROCEDURE PUBLIC;
      DECLARE  I  BYTE;
    DO I=1 TO 40;
       CALL TIME(250); /* TIME IS A BUILT IN FUNCTION OF PLM86 WHICH CAUSES */
                       /* A DELAY BASED ON THE NUMBER IN PARENS              */
    END;
END DELAY;


/***********************************************************************
*  DATE:                   25 SEP 84                                   *
*  VERSION:                1.0                                         *
*  NAME:                   HEX$ASC                                     *
*  MODULE NUMBER:          4.6                                         *
*  FUNCTION:               Converts a HEX number into its ascii characters *
*               for printing to console                                *
*  INPUTS:                 VAL - a hex number                          *
*  OUTPUTS:                HEX$ASC                                     *
*  GLOBAL VARIBLES USED:          ASCII - array of leagal hex characters *
*                                 I - position in string               *
*  GLOBAL VARIBLES CHANGED:       TEMP1 - ASCII output array           *
*  MODULES CALLED:                None                                 *
*  CALLING MODULES:               SNDSEQ, READ$TX$TAB                  *
*  AUTHOR:  Capt C.T. Childress                                        *
*  HISTORY:                                                            *
*               1.0 - Capt C. T. Childress -25 SEP 84                  *
***********************************************************************/
HEX$ASC: PROCEDURE(VAL, I);
   DECLARE (VAL, I) BYTE;

   TEMP1(I) = ASCII(SHR(VAL,4) AND 0FH);
   TEMP1(I+1) = ASCII(VAL AND 0FH);

END HEX$ASC;

/***********************************************************************
```

```
*  DATE:               25 SEP 84                                          *
*  VERSION:            1.0                                                *
*  NAME:               ASC$HEX                                            *
*  MODULE NUMBER:      4.2                                                *
*  FUNCTION:           Converts ASCII characters to their HEX equi-       *
:              vallent number.                                            *
*  INPUTS:             C - the character                                  *
*  OUTPUTS:            ASC$HEX                                            *
*  GLOBAL VARIBLES USED:        None                                      *
*  GLOBAL VARIBLES CHANGED:     None                                      *
*  MODULES CALLED:              None                                      *
*  CALLING MODULES:             READLINE                                  *
*  AUTHOR:  Capt C.T. Childress                                           *
*  HISTORY:                                                               *
*              1.0 - Capt C. T. Childress -25 SEP 84                      *
**************************************************************************/
ASC$HEX: PROCEDURE(C) BYTE;
   DECLARE C BYTE;

   IF (C >= '0' AND C <= '9') THEN
       RETURN (C-30H);
   ELSE
       IF (C >= 'A' AND C <= 'F') THEN
           RETURN (C-37H);

   RETURN C;

END ASC$HEX;

/*************************************************************************
*  DATE:               25 SEP 84                                          *
*  VERSION:            1.0                                                *
*  NAME:               VALID$HEX                                          *
*  MODULE NUMBER:      Not yet used                                       *
*  FUNCTION:           Validates a char to be changed to hex              *
*  INPUTS:             H - char                                           *
*  OUTPUTS:            VALIDHEX - booloean                                *
*  GLOBAL VARIBLES USED:        ASCII - array of valid ascii char         *
*  GLOBAL VARIBLES CHANGED:     None                                      *
*  MODULES CALLED:              None                                      *
*  CALLING MODULES:             None yet                                  *
*  AUTHOR:  Capt C.T. Childress                                           *
*  HISTORY:                                                               *
*              1.0 - Capt C. T. Childress -25 SEP 84                      *
**************************************************************************/
VALID$HEX: PROCEDURE(H) BYTE;
   DECLARE (H,I) BYTE;

   DO I = 0 TO LAST(ASCII);
       IF H = ASCII(I) THEN
```

```
            RETURN TRUE;
      END;
      RETURN FALSE;

   END VALID$HEX;

   /*******************************************************************
   *  DATE:                24 SEP 84                                  *
   *  VERSION:             1.0                                        *
   *  NAME:                INVINT                                     *
   *  MODULE NUMBER:       1.0                                        *
   *  FUNCTION:            Initializes the software for handling all gloabl *
   *               varibles, tables, pointers and the communcations   *
   *               channel.                                           *
   *  INPUTS:              None                                       *
   *  OUTPUTS:             None                                       *
   *  GLOBAL VARIBLES USED:          BYTES$SENT$1, BYTES$RECV$1,      *
   *              TRANS1$RDY, TRANS2$RDY, TRANS3$RDY, TRANS4$RDY      *
   *  GLOBAL VARIBLES CHANGED:       same as above                    *
   *  MODULES CALLED:                None                             *
   *  CALLING MODULES:               main                             *
   *  AUTHOR:  Capt C.T. Childress                                    *
   *  HISTORY:                                                        *
   *              1.0 - Capt C. T. Childress -25 SEP 84               *
   *******************************************************************/
   INVINT: PROCEDURE;

         /*  INITIALIZE 8255 PROGRAMMABLE PERIPHERAL INTERFACE (PPI)  */
         /* SET BAUD RATES FOR LOCAL CHANNEL USARTS  */
         /*  SET PIT #1, REGISTER #1 FOR USART #2 BAUD RATE  */
         /* SET PIT #1, REGISTER #2 FOR USART #3 BAUD RATE  */
         /* SET PIT #2, REGISTER #0 FOR USART #4 BAUD RATE  */
         /*  INITIATE RESET ON ALL USARTS  */
         /*  INITIALIZE THE FOUR USARTS TO: 2 STOP BITS, NO PARITY,  */
         /*     8 BIT CHARACTERS, AND 16X BAUD RATE     */
         /*  INITIALIZE THE  8259 PROGRAMMABLE INTERRUPT CONTROLLER  */

        MSGNUM = 0;
        BYTES$SENT$1 = 0;
        BYTES$SENT$2 = 0;
        BYTES$SENT$3 = 0;
        BYTES$SENT$4 = 0;
        TRANS$1$RDY = TRUE;
        TRANS$2$RDY = TRUE;
        TRANS$3$RDY = TRUE;
        TRANS$4$RDY = TRUE;

   END INVINT;
```

```
/**********************************************************************
*  DATE:                    2 OCT 84                                  *
*  VERSION:                 1.1                                       *
*  NAME:                    INIT$TAB                                  *
*  MODULE NUMBER:           3.0                                       *
*  DESCRIPTION:             Initalizes the pointers and tables used with  *
*             the SBC 544 software.                                   *
*  PASSED VARIABLES:        None                                      *
*  RETURNS:                 None                                      *
*  GLOBAL VARIBLES USED:                                              *
*                                LC01NS, LC02NS, LC03NS, LC04NS, LC01NE,*
*                           LC02NE, LC03NE, LC04NE, LC01SZN LC02SZ, LC03ST,*
*                           LC04SZ, LCNTNS, LCNTNE, LCNTSZ,           *
*                           NT02SZ, TX01NS, TX02NS, TX03NS, TX04NS, TX01NE,*
*                           TX02NE, TX03NE, TX04NE, TX01SZN TX02SZ, TX03ST,*
*                           TX04SZ, STATTB, STAT$NBR                  *
*  GLOBAL VARIBLES CHANGED:       All the above                       *
*  MODULES CALLED:                None                                *
*  CALLING MODULES:               main                                *
*  AUTHOR:                        Capt C.T. Childress                 *
*                                                                     *
*  HISTORY:                                                           *
*             1.1 Capt C.T. Childress - original 544 version          *
**********************************************************************/
INIT$L$TAB: PROCEDURE;
   DECLARE  IX  ADDRESS;

   LCNTNS = 0;
   LCNTNE = 0;
   LCNTSZ = PACKET$TABLE$SIZE;

   NTLCNS = 0;
   NTLCNE = 0;
   NTLCSZ = PACKET$TABLE$SIZE;

   LC01NS = 0;
   LC01NE = 0;
   LC01SZ = DATA$TABLE$SIZE;

   LC02NS = 0;
   LC02NE = 0;
   LC02SZ = DATA$TABLE$SIZE;

   LC03NS = 0;
   LC03NE = 0;
   LC03SZ = DATA$TABLE$SIZE;

   LC04NS = 0;
   LC04NE = 0;
   LC04SZ = DATA$TABLE$SIZE;
   TX01NS = 0;
   TX01NE = 0;
   TX01SZ = DATA$TABLE$SIZE;

   TX02NS = 0;
   TX02NE = 0;
   TX02SZ = DATA$TABLE$SIZE;

   TX03NS = 0;
   TX03NE = 0;
   TX03SZ = DATA$TABLE$SIZE;

   TX04NS = 0;
   TX04NE = 0;
   TX04SZ = DATA$TABLE$SIZE;

   IX = 0;
   DO WHILE IX < STAT$NBR;
        STATTB(IX) = 0;
      IX = IX + 1;
   END;

END INIT$L$TAB;

/*********************************************************************
*  DATE:                  2 OCT 84                                   *
*  VERSION:              1.1                                         *
*  NAME:                 TRNMIT$PKT                                  *
*  MODULE NUMBER:              6.3.2                                 *
*  DESCRIPTION:          This enables data port for packet transmission.*
*               Presently the procedure serves as a null procedure for *
*               simulation purposes.                                 *
*  PASSED VARIABLES:     TABLE                                       *
*  RETURNS:              None                                        *
*  GLOBAL VARIBLES USED:  TRANS$STATE                                *
*  GLOBAL VARIBLES CHANGED:   None                                   *
*  MODULES CALLED:            None                                   *
*  CALLING MODULES:           MOVE$LL                                *
*  AUTHOR:                    Capt C.T. Childress                    *
*                                                                    *
*  HISTORY:                                                          *
*            1.1 Capt C.T. Childress - original 544 version          *
*********************************************************************/
/*
TRNMIT$PKT: PROCEDURE(PORT$NUM);
            DECLARE  PORT$NUM  BYTE;
    DISABLE;
       DO CASE PORT$NUM;
```

```
            ;

            OUTPUT(PORT$1) = TRANS$STATE;

            OUTPUT(PORT$2) = TRANS$STATE;

            OUTPUT(PORT$3) = TRANS$STATE;

            OUTPUT(PORT$4) = TRANS$STATE;

        END;
    ENABLE;

END TRNMIT$PKT;
*/

/***********************************************************************
*  DATE:               15 AUG 85                                       *
*  VERSION:            1.1                                             *
*  NAME:               ERR$CHK                                         *
*  MODULE NUMBER:      4.3                                             *
*  FUNCTION:           Checks the status of ISIS call procedures and   *
*              for an orderly exit incase of error                     *
*  INPUTS:             None                                            *
*  OUTPUTS:            None                                            *
*  GLOBAL VARIBLES USED:         STATUS                                *
*  GLOBAL VARIBLES CHANGED:      None                                  *
*  MODULES CALLED:               ERROR, EXIT                           *
*  CALLING MODULES:              SNDSEQ, READ$CON                      *
*  AUTHOR:  Capt Mark Weber                                            *
*  HISTORY:                                                            *
*              1.1 - Capt Mark Weber -15 AUG 85 changed from CPM exit to*
*                    ISIS exit procedures                              *
*              1.0 - Capt C. T. Childress 25 SEP 84                    *
***********************************************************************/
ERR$CHK: PROCEDURE;
      IF STATUS <> 0 THEN
            DO;
            CALL ERROR(STATUS);
            CALL EXIT;
      END;
END ERR$CHK;

/***********************************************************************
*  DATE:               15 AUG 85                                       *
*  VERSION:            1.1                                             *
*  NAME:               SNDSEQ                                          *
*  MODULE NUMBER:      2.0                                             *
*  FUNCTION:           Sends a message to the system console           *
*  INPUTS:             MSG - the message addess                        *
*                      TOTAL - the count of the char in the buffer        *
*  OUTPUTS:            None (Text to console output)                      *
*  GLOBAL VARIBLES USED:        STATUS                                    *
*  GLOBAL VARIBLES CHANGED:     STATUS                                    *
*  MODULES CALLED:              ERR$CHK, WRITE (ISIS call)                *
*  CALLING MODULES:             main, READ$LINE, LOAD, READ$RX$TAB,       *
*                      READ$TX$TAB, RCV$1                                 *
*  AUTHOR:  Capt Mark Weber                                               *
*  HISTORY:                                                               *
*  HISTORY:                                                               *
*                1.1 - Capt Mark Weber -15 AUG 85 -configured for ISIS    *
*                1.0 - Capt C. T. Childress -25 SEP 84 configured for     *
*                         CP/M                                            *
**************************************************************************/
SNDSEQ: PROCEDURE( MSG, TOTAL);
   DECLARE MSG ADDRESS;
   DECLARE TOTAL ADDRESS;

   CALL WRITE( W$CONN, MSG, TOTAL, .STATUS);
   CALL ERR$CHK;

END SNDSEQ;

/*************************************************************************
*  DATE:               25 SEP 84                                          *
*  VERSION:            1.0                                                *
*  NAME:               LD$TAB$HSKP                                        *
*  MODULE NUMBER:      6.5                                                *
*  FUNCTION:           This procedure housekeeps a specified buffer       *
*              after loading the user data from the host.  The pro-       *
*              cedure determines which table to process, and advances     *
*              the NEX$EMPTY$BYTE address by one PACKET$SIZE, and if      *
*              necessary wrapps the data araound to the begining of       *
*              the queue.                                                 *
*  INPUTS:             TABLE - address of the table to process            *
*  OUTPUTS:            None                                               *
*  GLOBAL VARIBLES USED:        LC01NE (2, 3, 4), LCNTNE, LCNTSZ,         *
*                         LC01SZ (2, 3, 4), NTLCNE, NTLCSZ, HSKP$ERR      *
*                         TX01NE (2, 3, 4), TX01SZ (2, 3, 4)              *
*  GLOBAL VARIBLES CHANGED:     LC01NE (2, 3, 4), TX01NE(2, 3, 4),        *
*                               HSKP$ERR, NTLCNE, LCNTNE                  *
*  MODULES CALLED:              NONE                                      *
*  CALLING MODULES:             READ$LINE,READ$TXTB, SERVICE$LOOP,        *
*                               ROUTE$IN                                  *
*  AUTHOR:  Capt C. T. Childress -25 SEP 84                               *
*  HISTORY:                                                               *
*                1.0 - Capt C. T. Childress -25 SEP 85 configured for     *
*                         CP/M                                            *
**************************************************************************/
```

```
LD$TAB$HSKP: PROCEDURE(TABLE) ;
        DECLARE  TABLE ADDRESS;

      IF (TABLE >=1 AND TABLE <= 11) THEN  /* 6 FOR REAL, 11 FOR SIM */
        DO CASE TABLE;

          ;                     /* CASE ZERO IS NULL */

          DO;                    /* START CASE ONE  */
            LC01NE = LC01NE + DATA$GRAM$SIZE; /* ADVANCE NEXT$EMPTY ADDRESS */
            IF LC01NE >= LC01SZ THEN
                LC01NE = 0;
          END;

          DO;                    /* START CASE TWO  */
            LC02NE = LC02NE + DATA$GRAM$SIZE;  /* ADVANCE NEXT$EMPTY ADDRESS  */
            IF LC02NE >= LC02SZ THEN
                LC02NE = 0;
          END;

          DO;
            LC03NE = LC03NE + DATA$GRAM$SIZE;
            IF LC03NE >= LC03SZ THEN
                LC03NE = 0;
          END;

          DO;
            LC04NE = LC04NE + DATA$GRAM$SIZE;
            IF LC04NE >= LC04SZ THEN
                LC04NE = 0;
          END;

          ;                 /* START OF CASE FIVE  */

          DO;                 /* START OF CASE SIX  */
            LCNTNE = LCNTNE + PACKET$SIZE;
            IF LCNTNE >= LCNTSZ THEN
                LCNTNE = 0;
          END;

         DO;                 /* CASE SEVEN IS NULL */
           NTLCNE = NTLCNE + PACKET$SIZE;
           IF NTLCNE >= NTLCSZ THEN
               NTLCNE = 0;
         END;

         DO;
           TX01NE = TX01NE + DATA$GRAM$SIZE;
           IF TX01NE >= TX01SZ THEN
               TX01NE = 0;
          END;

          DO;
            TX02NE = TX02NE + DATA$GRAM$SIZE;
            IF TX02NE >= TX02SZ THEN
                TX02NE = 0;
          END;

          DO;
            TX03NE = TX03NE + DATA$GRAM$SIZE;
            IF TX03NE >= TX03SZ THEN
                TX03NE = 0;
          END;

          DO;
            TX04NE = TX04NE + DATA$GRAM$SIZE;
            IF TX04NE >= TX04SZ THEN
                TX04NE = 0;
          END;

        END;

        ELSE HSKP$ERR = HSKP$ERR + 1;

END LD$TAB$HSKP;

/**********************************************************************
*  DATE:                 25 SEP 84                                    *
*  VERSION:              1.0                                          *
*  NAME:                 SRCV$TAB$HSKP                                *
*  MODULE NUMBER:        6.8                                          *
*  FUNCTION:             This procedure housekeeps a specified table  *
*                after servicing removing a packet.  The procedure    *
*                determines which table to process, advances the next *
*                byte to service pointer, and performs any necessary  *
*                wrap around requirements                             *
*  INPUTS:               TAB - pointer to table to process            *
*  OUTPUTS:              None                                         *
*  GLOBAL VARIBLES USED:        LC01NS (2, 3, 4), LCNTNS, NTLCNS,     *
*                               TX01NS (2, 3, 4), HSKP$ERR, NTLCTB    *
*  GLOBAL VARIBLES CHANGED:     all above                             *
*  MODULES CALLED:              None                                  *
*  CALLING MODULES:             READ$RX$TAB, READLINE, SERVICE$LOOP,  *
*                        ROUTE$IN                                     *
*  AUTHOR:  Capt C.T. Childress                                       *
*  HISTORY:                                                           *
*                   1.0 - Capt C. T. Childress -25 SEP 85 configured for *
*                         CP/M                                        *
**********************************************************************/
```

```
SRVC$TAB$HSKP: PROCEDURE(TAB) ;
     DECLARE  TAB  ADDRESS;

      IF (TAB >= 1 AND TAB <= 11) THEN /* 7 FOR REAL, 11 FOR SIM */
        DO CASE TAB;

          ;                  /*  CASE ZERO IS NULL  */

          DO;                /*  CASE ONE STARTS HERE  */
            LC01NS = LC01NS + DATA$GRAM$SIZE;
            IF LC01NS >= LC01SZ THEN
                LC01NS = 0;
          END;

          DO;                /*  CASE TWO STARTS HERE  */
            LC02NS = LC02NS + DATA$GRAM$SIZE;
            IF LC02NS >= LC02SZ THEN
                LC02NS = 0;
          END;

          DO;
            LC03NS = LC03NS + DATA$GRAM$SIZE;
            IF LC03NS >= LC03SZ THEN
                LC03NS = 0;
          END;

          DO;                /*  CASE FOUR STARTS HERE  */
            LC04NS = LC04NS + DATA$GRAM$SIZE; /* ADVANCE NEXT SERVICE ADDRESS */
            IF LC04NS >= LC04SZ THEN
                LC04NS = 0;
          END;

          ;                /*  CASE FIVE STARTS HERE  */

          DO;       /*  CASE SIX IS A NULL STATEMENT  */
           LCNTNS = LCNTNS + PACKET$SIZE;
           IF LCNTNS >= LCNTSZ THEN
               LCNTNS = 0;
         END;

          DO;                /*  CASE SEVEN STARTS HERE  */
            NTLCNS = NTLCNS + PACKET$SIZE;   /* ADVANCE NEXT SERVICE ADDRESS */
            IF NTLCNS >= NTLCSZ THEN
                NTLCNS = 0;
          END;

          /* CASES 8, 9, 10, 11 FOR TX01(2,3,4) ARE NOT REQUIRED AS */
          /* THE TXOXNS POINTERS ARE INCREMENTED AND CHECKED IN THE */
          /* TRANSMIT DATAGRAM ROUTINES                              */
        DO;
          TX01NS = TX01NS + DATA$GRAM$SIZE;
          IF TX01NS >= TX01SZ THEN
              TX01NS = 0;
        END;

        DO;
          TX02NS = TX02NS + DATA$GRAM$SIZE;
          IF TX02NS >= TX02SZ THEN
              TX02NS = 0;
        END;

        DO;
          TX03NS = TX03NS + DATA$GRAM$SIZE;
          IF TX03NS >= TX03SZ THEN
              TX03NS = 0;
        END;

        DO;
          TX04NS = TX04NS + DATA$GRAM$SIZE;
          IF TX04NS >= TX04SZ THEN
              TX04NS = 0;
        END;

       END;

       ELSE  HSKP$ERR = HSKP$ERR + 1;
  END SRVC$TAB$HSKP;

/**********************************************************************
*  DATE:                   20 SEP 85                                  *
*  VERSION:                1.2                                        *
*  NAME:                   BUILD$I$PACKET                             *
*  MODULE NUMBER:          6.4                                        *
*  DESCRIPTION:            This procedure receives an address that    *
*               indicates the local input buffer where the incoming   *
*               host data is located, then formats a packet for       *
*               transmission to the datalink layer.  SIM544 uses      *
*               Philster's protocol and only formats the first two of *
*               five bytes of the packe.   Future implementations will*
*               require a change to the packet format.                *
*  PASSED VARIABLES:       TABLE$PRT, PORT                            *
*  RETURNS:                None                                       *
*  GLOBAL VARIBLES USED:         LCNTTB, LCNTNE                       *
*  GLOBAL VARIBLES CHANGED:   All the above                           *
*  MODULES CALLED:            None                                    *
*  CALLING MODULES:           READ$LINE                               *
*  AUTHOR:                    Capt M. Weber                           *
*                                                                     *
*  HISTORY:  1.2 Mark Weber     - X.25 packter format modification      *
*            1.1 C. T. Childress     - original 544 version             *
************************************************************************/
BUILD$I$PACKET: PROCEDURE(TABLE$PTR) ;
                DECLARE TABLE$PTR ADDRESS,
                        LCOXTB BASED TABLE$PTR(1) BYTE;

        LCNTTB(LCNTNE + 0) = 010H;               /* GFI/LGCN              */
        LCNTTB(LCNTNE + 1) = (SOURCF$ADDRESS AND OFOH) OR
                             (SHL(DES1.NATION$ADDRESS, 4) AND OFH);
                                            /* LCN                   */
        LCNTTB(LCNTNE + 2) = 0;                  /* SEQUENCE NUMBER       */
        LCNTTB(LCNTNE + 3) = 044H;          /* SRC, DEST FIELD LENGTH   */
        LCNTTB(LCNTNE + 4) = SOURCE$ADDRESS;
        LCNTTB(LCNTNE + 5) = DESTINATION$ADDRESS;
        LCNTTB(LCNTNE + 6) = 0;                  /* PADDING               */
        LCNTTB(LCNTNE + 7) = 010H;          /* FACILITY FIELD LENGTH    */
        LCNTTB(LCNTNE + 8) = 0;                  /* FACILTTY CODE          */
        LCNTTB(LCNTNE + 9) = 0;              /* FACILITY PARAMETER       */


        CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .LCNTTB(LCNTNE+10));

        CALL LD$TAB$HSKP(6);

END BUILD$I$PACKET;


/***********************************************************************
*  DATE:                          2 OCT 84                              *
*  VERSION:                       1.1                                   *
*  NAME:                          DET$ADDR                              *
*  MODULE NUMBER:                 6.2                                   *
*  DESCRIPTION:                   This module determines the destion-   *
*             ation of data from the local host.  A pointer is          *
*             passed to the routine which gives the location of the     *
*             packet to be evaluated.   The routine processes the       *
*             control byte, the COUNTRY$CODE, and NEtWORK$CODE of       *
*             the packet.                                               *
*             An example of a destination address is  21                *
*             for UNID = 2, Channel = 1.                                *
*  PASSED VARIABLES:              TABLE$PTR                             *
*  RETURNS:                       None                                  *
*  GLOBAL VARIBLES USED:          DESTIONATION, DESTIONATION$ADDRESS,   *
*                         STATTB                                        *
*  GLOBAL VARIBLES CHANGED:       All the ones above                    *
*  MODULES CALLED:                None                                  *
*  CALLING MODULES:             - ROUTE$IN                              *
*  AUTHOR:   C.T. Childress                                             *
*  HISTORY:                                                              *
*            1.1 C.T. Childress - 30 SEP 84 - original SBC 544          *
*                 implementation                                          *
*************************************************************************/
DET$ADDR: PROCEDURE(TABLE$PTR);

DECLARE LOBITS BYTE,
        HIBITS BYTE,
        CONTROL$CODE BYTE,
        COUNTRY$CODE BYTE,
        NETWORK$CODE BYTE,
        HOST$CODE BYTE,
       SRC$HOST$CODE BYTE,
       SRC$NET$CODE BYTE,
       SRC$CONT$CODE BYTE,
       SRC$CONTRY$CODE BYTE,
       TABLE$PTR ADDRESS,
       LCOXTB BASED TABLE$PTR(1) BYTE;

   LOBITS = 0;
   HIBITS = 0;
   CONTROL$CODE = 0;
   COUNTRY$CODE = 0;
   NETWORK$CODE = 0;
   HOST$CODE = 0;
   DESTINATION$ADDRESS = 0;
   SOURCE$ADDRESS = 0;
   DESTINATION = 8;

    CONTROL$CODE = LCOXTB(16) AND 0FH;
    IF CONTROL$CODE = 00 THEN
       DO;
        COUNTRY$CODE = (ROR(LCOXTB(16), 4) AND 0FH);
       IF COUNTRY$CODE = THIS$COUNTRY$CODE THEN
           DO;
           NETWORK$CODE = LCOXTB(17) AND 0FH;
           IF (NETWORK$CODE <= MAX$NETWORK$CODE) THEN
               DO;
               IF (COUNTRY$CODE <> THIS$COUNTRY$CODE) OR
                       ((NETWORK$CODE)<> THIS$UNID$NBR) THEN
                   DESTINATION = 6;         /* LOC TO NET */
               ELSE
                    DESTINATION = 5;        /* LOC TO LOC */
               LOBITS = (ROR(LCOXTB(17), 4) AND 0FH);
               HIBITS = (ROL(LCOXTB(18), 4) AND 0F0H);
               HOST$CODE = LOBITS OR HIBITS;
               IF (HOST$CODE >=0) AND (HOST$CODE <= 63) THEN
                   DESTINATION$ADDRESS = NETWORK$CODE OR 10H;
               ELSE
                   IF (HOST$CODE >=64) AND (HOST$CODE <= 127) THEN
```

```
                        DESTINATION$ADDRESS = NETWORK$CODE OR 20H;
                    ELSE
                        IF (HOST$CODE >= 128) AND (HOST$CODE <= 191) THEN
                            DESTINATION$ADDRESS = NETWORK$CODE OR 30H;
                        ELSE
                            IF (HOST$CODE >= 192) AND (HOST$CODE <=255) THEN
                                DESTINATION$ADDRESS = NETWORK$CODE OR 40H;
                END;
            ELSE
                DO;
                CALL SNDSEQ(.TP$53A, SIZE(TP$53A));
                 STATTB(04) = STATTB(04) + 1;
                 STATTB(00) = STATTB(00) + 1;
            END;
            END;
         ELSE
            DO;     /* NOT FOR THIS COUNTRY, SEND TO NETWORK/UNID 0 */
            CALL SNDSEQ(.TP$53B, SIZE(TP$53B));
             STATTB(03) = STATTB(03) + 1;
             STATTB(00) = STATTB(00) + 1;
         END;
         END;
     ELSE
         DO;
               /* IT IS AT THIS POINT THAT OTHER IP CONTROL CODES WILL
                       BE INCORPORATED INTO THE NETWORK  */
         CALL SNDSEQ(.TP$53C, SIZE(TP$53C));
          STATTB(02) = STATTB(02) + 1;
          STATTB(00) = STATTB(00) + 1;
     END;

     CALL SNDSEQ(.TP$51B, SIZE(TP$51B));
     CALL HEX$ASC(CONTROL$CODE, 0);
     CALL SNDSEQ(.TEMP1, 2);
     CALL SNDSEQ(.TP$51C, SIZE(TP$51C));
     CALL HEX$ASC(COUNTRY$CODE, 0);
     CALL SNDSEQ(.TEMP1, 2);
     CALL SNDSEQ(.TP$51A, SIZE(TP$51A));
     CALL HEX$ASC(NETWORK$CODE, 0);
     CALL SNDSEQ(.TEMP1, 2);
     CALL SNDSEQ(.TP$51D, SIZE(TP$51D));
     CALL HEX$ASC(LOBITS, 0);
     CALL SNDSEQ(.TEMP1, 2);
     CALL SNDSEQ(.TP$51E, SIZE(TP$51E));
     CALL HEX$ASC(HIBITS, 0);
     CALL SNDSEQ(.TEMP1, 2);
     CALL SNDSEQ(.TP$52A, SIZE(TP$52A));
     CALL HEX$ASC(HOST$CODE, 0);
     CALL SNDSEQ(.TEMP1, 2);
     CALL SNDSEQ(.TP$52, SIZE(TP$52));
```

```
   CALL HEX$ASC(DESTINATION$ADDRESS, 0);
   CALL SNDSEQ(.TEMP1, 2);

   IF DESTINATION = 6 THEN     /* LOC TO NET, GET SOURCE INFO */
       DO;
       SRC$NET$CODE = LCOXTB(13) AND 0FH;
       IF (SRC$NET$CODE <= MAX$NETWORK$CODE) THEN
           DO;
           LOBITS = (ROR(LCOXTB(13), 4) AND 0FH);
           HIBITS = (ROL(LCOXTB(14), 4) AND 0F0H);
           SRC$HOST$CODE = LOBITS OR HIBITS;
           IF (SRC$HOST$CODE >=0) AND (SRC$HOST$CODE <= 63) THEN
               SOURCE$ADDRESS = SRC$NET$CODE OR 10H;
           ELSE
               IF (SRC$HOST$CODE >=64) AND (SRC$HOST$CODE <= 127) THEN
                   SOURCE$ADDRESS = SRC$NET$CODE OR 20H;
               ELSE
                   IF (SRC$HOST$CODE >= 128) AND (SRC$HOST$CODE <= 191) THEN
                       SOURCE$ADDRESS = SRC$NET$CODE OR 30H;
                   ELSE
                       IF (SRC$HOST$CODE >= 192) AND (SRC$HOST$CODE <=255) THEN
                           SOURCE$ADDRESS = SRC$NET$CODE OR 40H;
           CALL SNDSEQ(.TP$52B, SIZE(TP$52B));
           CALL HEX$ASC(SOURCE$ADDRESS, 0);
           CALL SNDSEQ(.TEMP1, 2);
           END;
       ELSE
           DO;
           DESTINATION = 8;
           CALL SNDSEQ(.TP$53AA, SIZE(TP$53AA));
            STATTB(04) = STATTB(04) + 1;
            STATTB(00) = STATTB(00) + 1;
           END;

       END;

END DET$ADDR;

/************************************************************************
*  DATE:                          2 OCT 84                              *
*  VERSION:                       1.1                                   *
*  NAME:                          DET$ADDR$NL                           *
*  MODULE NUMBER:                 6.9                                   *
*  DESCRIPTION:                   This module determines the destina-   *
*            tion from the  second byte of the packet header.           *
*  PASSED VARIABLES:              None                                  *
*  RETURNS:                       None                                  *
*  GLOBAL VARIBLES USED:          PORT,   STATTB, NTLCNS                *
*  GLOBAL VARIBLES CHANGED:       PORT, STATTB                          *
*  MODULES CALLED:                SENDSEQ                               *
*  CALLING MODULES:                  ROUTE$IN                                *
*  AUTHOR:   C. T. Childress                                                 *
*  HISTORY:                                                                  *
*              1.1 C.T. Childress -  2 OCT 84 - original SBC 544             *
*                   implementation.                                          *
****************************************************************************/

DET$ADDR$NL: PROCEDURE BYTE ;

    DECLARE  PORT  BYTE,
             BITS  BYTE;

   BITS = (ROR(NTLCTB(NTLCNS), 4) AND 0FH);
   IF (BITS >= 1 AND BITS <= 4) THEN
       DO CASE BITS;
           ;
           PORT = 1;
           PORT = 2;
           PORT = 3;
           PORT = 4;
       END;
   ELSE
       DO;
       PORT = 8;
       STATTB(01) = STATTB(01) + 1;  /*  INCREMENT LOCAL ERROR COUNT  */
   END;
   RETURN PORT;
END DET$ADDR$NL;

/***************************************************************************
*  DATE:                             2 OCT 84                                *
*  VERSION:                          1.1                                     *
*  NAME:                             MOVE$LL                                 *
*  MODULE NUMBER:                    6.3                                     *
*  DESCRIPTION:                      This module routes packtes between      *
*               the local host tables.  The datagrams are not formated       *
*               as packets, but moved as datagrams.  The procedure           *
*               moves a DATAGRAM$SIZE segment starting at the location       *
*               inidicated by TABLE$PTR to the location of the next          *
*               available byte in the designated port.                       *
*  PASSED VARIABLES:                 TABLE$PTR, PORT                         *
*  RETURNS:                          None                                    *
*  GLOBAL VARIBLES USED:             TX01NE, TX02NE, TX03NE, TX04NE, STATTB, *
*                                    L$RO$DEST$ERR                           *
*  GLOBAL VARIBLES CHANGED:          STATTB                                  *
*  MODULES CALLED:                   LD$TAB$HSKP, SND$SEQ                    *
*  CALLING MODULES:                  ROUTE$IN                                *
*  AUTHOR:   C. T. Childress                                                 *
*  HISTORY:                                                                  *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544          *
*                 implementation.                                        *
************************************************************************/
MOVE$LL: PROCEDURE(TABLE$PTR, PORT);

   DECLARE PORT BYTE,
           TABLE$PTR ADDRESS,
           LCOXTB BASED TABLE$PTR(1) BYTE;

    IF(PORT >= 1 AND PORT <= 4) THEN
        DO CASE PORT;

            ;      /*   CASE ZERO IS NULL   */

            DO;    /*   CASE ONE  */
               IF TRANS$1$RDY = TRUE THEN DO;
/*                   TRANS$1$RDY = FALSE;
*/                   CALL SNDSEQ(.TP$24, SIZE(TP$24));
                   CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR,.TX01TB(TX01NE));
                  CALL LD$TAB$HSKP(8);
/*                   CALL TRNMIT$PKT(PORT);
*/                END;
            END;

            DO;     /*   CASE TWO    */
               IF TRANS$2$RDY = TRUE THEN DO;
/*                   TRANS$2$RDY = FALSE;
*/                   CALL SNDSEQ(.TP$25, SIZE(TP$25));
                   CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .TX02TB(TX02NE));
                  CALL LD$TAB$HSKP(9);
/*                   CALL TRNMIT$PKT(PORT);
*/                END;
            END;

            DO;    /*    CASE THREE    */
               IF TRANS$3$RDY = TRUE THEN DO;
/*                   TRANS$3$RDY = FALSE;
*/                   CALL SNDSEQ(.TP$26, SIZE(TP$26));
                   CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .TX03TB(TX03NE));
                  CALL LD$TAB$HSKP(10);
/*                   CALL TRNMIT$PKT(PORT);
*/                END;
            END;

            DO;      /*    CASE  FOUR    */
               IF TRANS$4$RDY = TRUE THEN DO;
/*                   TRANS$4$RDY = FALSE;
*/                   CALL SNDSEQ(.TP$27, SIZE(TP$27));
                   CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .TX04TB(TX04NE));
                  CALL LD$TAB$HSKP(11);
```

```
/*                      CALL TRNMIT$PKT(PORT);
*/                  END;
              END;

          END;                /* END CASE */
      ELSE DO;
          CALL SNDSEQ(.TP$28, SIZE(TP$28));
          STATTB(L$RO$DEST$ERR) = STATTB(L$RO$DEST$ERR) + 1;
      END;

END MOVE$LL;

/***********************************************************************
*  DATE:                           2 OCT 84                            *
*  VERSION:                        1.1                                 *
*  NAME:                           MOVE$NL                             *
*  MODULE NUMBER:                  6.10                                *
*  DESCRIPTION:                    This module routes packtes between  *
*              the local host tables and the NTLCTB table.             *
*              The destination address is an input parameter telling   *
*              which host(port) the packet should be routed to.        *
*  PASSED VARIABLES:               PORT                                *
*  RETURNS:                        None                                *
*  GLOBAL VARIBLES USED:           NTLCTB, TX01NE (2, 3, 4),           *
*                                  TX01TB( 2, 3, 4)                    *
*  GLOBAL VARIBLES CHANGED:        TX01TB(2, 3, 4)                     *
*  MODULES CALLED:                 MOVE$LL, SND$SEQ, BUILD$IPACKET,    *
*                    LD$TAB$HSKP                                       *
*  CALLING MODULES:                ROUTE$IN                            *
*  AUTHOR:   C. T. Childress                                           *
*  HISTORY:                                                            *
*             1.1 C.T. Childress -  2 OCT 84 - original SBC 544        *
*                 implementation.                                      *
***********************************************************************/

MOVE$NL: PROCEDURE(PORT);
   DECLARE PORT BYTE;

   IF (PORT >= 1 AND PORT <= 4) THEN
       DO CASE PORT;

           ;

           DO;
               CALL MOVE(DATA$GRAM$SIZE, .NTLCTB(NTLCNS + 5), .TX01TB(TX01NE));
               CALL SNDSEQ(.TP$30, SIZE(TP$30));
               CALL LD$TAB$HSKP(8);
           END;

           DO;
```

```
               CALL MOVE(DATA$GRAM$SIZE, .NTLCTB(NTLCNS + 5), .TX02TB(TX02NE));
               CALL SNDSEQ(.TP$31, SIZE(TP$31));
               CALL LD$TAB$HSKP(9);
           END;

           DO;
               CALL MOVE(DATA$GRAM$SIZE, .NTLCTB(NTLCNS + 5), .TX03TB(TX03NE));
               CALL SNDSEQ(.TP$32, SIZE(TP$32));
               CALL LD$TAB$HSKP(10);
           END;

           DO;
               CALL MOVE(DATA$GRAM$SIZE, .NTLCTB(NTLCNS + 5), .TX04TB(TX04NE));
               CALL SNDSEQ(.TP$33, SIZE(TP$33));
               CALL LD$TAB$HSKP(11);
           END;

       END;
   ELSE
       CALL SNDSEQ(.TP$34, SIZE(TP$34));

END MOVE$NL;

/************************************************************************
*  DATE:                        2 OCT 84                                *
*  VERSION:                     1.1                                     *
*  NAME:                        ROUTE$IN                                *
*  MODULE NUMBER:               6.0                                     *
*  DESCRIPTION:                 This module routes datagrams from the   *
*              local receive tables to local transmit tables, if        *
*              destioned for another local host, or to the datalink     *
*              layer if destioned for another UNID.  The address byte   *
*              is evaluated for the destionation processing.  This      *
*              procedure along with ROUTE$OUT is called in and endless  *
*              loop by the main program.                                *
*  PASSED VARIABLES:            None                                    *
*  RETURNS:                     None                                    *
*  GLOBAL VARIBLES USED:        LCO1NS(2, 3, 4),                        *
*                        DESTIONATION, STATTB, LCO1TB(2, 3, 4),         *
*                                                  DESTINATION$ADDRESS  *
*  GLOBAL VARIBLES CHANGED:     All of those above                      *
*  MODULES CALLED:              SENDSEQ, SRVC$TAB$HSKP, DET$ADDR,       *
*                 MOVE$LL, SEND$I$PACKET, DET$ADDR$NL, MOVE$NL HEX$ASC  *
*  CALLING MODULES:             main                                    *
*  AUTHOR:   C. T. Childress                                            *
*  HISTORY:                                                             *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544          *
*                implementation.                                        *
************************************************************************/
```

```
ROUTE$IN: PROCEDURE;

     IF(((LC01NE - LC01NS) >= DATA$GRAM$SIZE) OR (LC01NS > LC01NE)) THEN
        DO;
         CALL SNDSEQ(.TP$6, SIZE(TP$6));
         CALL DET$ADDR(.LC01TB(LC01NS));
         IF DESTINATION = 5 THEN
            DO;
             CALL SNDSEQ(.TP$7, SIZE(TP$7));
            CALL MOVE$LL(.LC01TB(LC01NS), (ROR(DESTINATION$ADDRESS, 4) AND 0FH));
             END;
         ELSE
            IF DESTINATION = 6 THEN
               DO;
                CALL SNDSEQ(.TP$8, SIZE(TP$8));
                CALL BUILD$I$PACKET(.LC01TB(LC01NS));
                END;
             ELSE
               DO;
               CALL SNDSEQ(.TP$9, SIZE(TP$9));
               STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
            END;
          CALL SRVC$TAB$HSKP(1);
      END;

     IF(((LC02NE - LC02NS) >= DATA$GRAM$SIZE) OR (LC02NS > LC02NE)) THEN
        DO;
         CALL SNDSEQ(.TP$10, SIZE(TP$10));
         CALL DET$ADDR(.LC02TB(LC02NS));
         IF DESTINATION = 5 THEN
            DO;
             CALL SNDSEQ(.TP$11, SIZE(TP$11));
            CALL MOVE$LL(.LC02TB(LC02NS), (ROR(DESTINATION$ADDRESS, 4) AND 0FH));
             END;
         ELSE
            IF DESTINATION = 6 THEN
                DO;
                CALL SNDSEQ(.TP$12, SIZE(TP$12));
                CALL BUILD$I$PACKET(.LC02TB(LC02NS));
                END;
            ELSE
                DO;
                CALL SNDSEQ(.TP$13, SIZE(TP$13));
               CALL SNDSEQ(.TP$51, SIZE(TP$51));
               CALL HEX$ASC(LOW(DESTINATION),0);
               CALL SNDSEQ(.TEMP1, 2);
               CALL SNDSEQ(.TP$52, SIZE(TP$52));
               CALL HEX$ASC(DESTINATION$ADDRESS,0);
               CALL SNDSEQ(.TEMP1, 2);
                STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
```

```
       END;
     CALL SRVC$TAB$HSKP(2);
 END;

IF(((LC03NE - LC03NS) >= DATA$GRAM$SIZE) OR (LC03NS > LC03NE)) THEN
   DO;
    CALL SNDSEQ(.TP$14, SIZE(TP$14));
    CALL DET$ADDR(.LC03TB(LC03NS));
    IF DESTINATION = 5 THEN
       DO;
        CALL SNDSEQ(.TP$15, SIZE(TP$15));
       CALL MOVE$LL(.LC03TB(LC03NS), (ROR(DESTINATION$ADDRESS, 4) AND 0FH));
        END;
    ELSE
       IF DESTINATION = 6 THEN
          DO;
          CALL SNDSEQ(.TP$16, SIZE(TP$16));
          CALL BUILD$I$PACKET(.LC03TB(LC03NS));
          END;
       ELSE
          DO;
          CALL SNDSEQ(.TP$17, SIZE(TP$17));
          STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
        END;
     CALL SRVC$TAB$HSKP(3);
END;

IF(((LC04NE - LC04NS) >= DATA$GRAM$SIZE) OR (LC04NS > LC04NE)) THEN
   DO;
    CALL SNDSEQ(.TP$18, SIZE(TP$18));
    CALL DET$ADDR(.LC04TB(LC04NS));
    IF DESTINATION = 5 THEN
       DO;
        CALL SNDSEQ(.TP$19, SIZE(TP$19));
       CALL MOVE$LL(.LC04TB(LC04NS), (ROR(DESTINATION$ADDRESS, 4) AND 0FH));
        END;
    ELSE
       IF DESTINATION = 6 THEN
          DO;
          CALL SNDSEQ(.TP$20, SIZE(TP$20));
          CALL BUILD$I$PACKET(.LC04TB(LC04NS));
          END;
       ELSE
          DO;
          CALL SNDSEQ(.TP$21, SIZE(TP$21));
          STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
          END;
     CALL SRVC$TAB$HSKP(4);
END;
```

```
   IF ((NTLCNE - NTLCNS) >= PACKET$SIZE) OR (NTLCNS > NTLCNE) THEN
       DO;
       DESTINATION$ADDRESS = DET$ADDR$NL;
       CALL MOVE$NL(DESTINATION$ADDRESS);
       CALL SRVC$TAB$HSKP(7);
       END;

END ROUTE$IN;

/*******************************************************************
*  DATE:                         18 SEP 85                         *
*  VERSION:                      1.2                               *
*  NAME:                         SERVICE$LOOP                      *
*  MODULE NUMBER:                7.0                               *
*  DESCRIPTION:                  This module routes a frame back to the *
*             network layer software.  The source and destination  *
*             addresses are swithed.                               *
*  PASSED VARIABLES:             NONE                              *
*  RETURNS:                      None                              *
*  GLOBAL VARIBLES USED:         NTLCTB, NTLCNE,                   *
*  GLOBAL VARIBLES CHANGED:      All of those above                *
*  MODULES CALLED:               LD$TAB$HSKP, SRVC$TAB$HSKP        *
*  CALLING MODULES:              LOOP                              *
*  AUTHOR:   Mark Weber                                            *
*  HISTORY:  1.2 Mark Weber - 18 SEP 85 - changed to X.25 packet format*
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544     *
*                implementation.                                   *
*******************************************************************/
SERVICE$LOOP: PROCEDURE;
   DECLARE     INDEX   ADDRESS;

   IF ((LCNTNE - LCNTNS) >= PACKET$SIZE) OR
                    (LCNTNS > LCNTNE) THEN
           DO;
           CALL SNDSEQ(.TP$40, SIZE(TP$40));
           DO INDEX = 0 TO (PACKET$SIZE - 1);          /* SWAP DATA */
               NTLCTB(NTLCNE + INDEX) = LCNTTB(LCNTNS + INDEX);
           END;
           NTLCTB(NTLCNE + 4) = LCNTTB(LCNTNS + 5);
           NTLCTB(NTLCNE + 5) = LCNTTB(LCNTNS + 4);    /* SWAP PACKET HEADER */
           DO INDEX = 0 TO 3;                        /* SWAP IP DEST & SOURCE */
               NTLCTB(NTLCNE + INDEX + 22) = LCNTTB(LCNTNS + INDEX + 26);
               NTLCTB(NTLCNE + INDEX + 26) = LCNTTB(LCNTNS + INDEX + 22);
           END;
           CALL LD$TAB$HSKP(7);
           CALL SRVC$TAB$HSKP(6);
       END;

END SERVICE$LOOP;
```

```
/*****************************************************************
*  DATE:                          2  OCT 84                      *
*  VERSION:                       1.1                            *
*  NAME:                          LOAD                           *
*  MODULE NUMBER:                 4.5                            *
*  DESCRIPTION:                   This module routes datagrams from the *
*             local transmit tables to the local hosts.  Version 1.2 *
*             implements the X.25 packet format                  *
*  PASSED VARIABLES:              CHAN$PTR, DEST$HOST, DEST$UNID *
*  RETURNS:                       None                           *
*  GLOBAL VARIBLES USED:          MSGUM                          *
*  GLOBAL VARIBLES CHANGED:       MSGUM, LC01TB (2, 3, 4)        *
*  MODULES CALLED:                SENDSEQ                        *
*  CALLING MODULES:               READ$LINE                      *
*  AUTHOR:   C. T. CHILDRESS                                     *
*  HISTORY:                                                      *
*           1.1 C.T. Childress -  2 OCT 84 - original SBC 544    *
*                implementation.                                 *
*****************************************************************/
LOAD: PROCEDURE(CHAN$PTR, DEST$UNID, DEST$HOST);

   DECLARE (INDEX, CHAN$PTR) ADDRESS;
   DECLARE (DEST$UNID, DEST$HOST) BYTE;
   DECLARE LCOXTB BASED CHAN$PTR(1) BYTE;

       DO INDEX = 0 TO (DATA$GRAM$SIZE - 1);
           LCOXTB(INDEX) = '*';
       END;

   /* IP SOURCE HEADER */
       LCOXTB( 12) = 10H;         /* CC     = 1, CT     = 0 */
       LCOXTB( 13) = (THIS$UNID$NBR AND OFH) OR
                     (ROL(LOW(CHAN$NUM*56),4) AND OFOH);
                                  /* HC(L) = 6, NC     = 2 */
       LCOXTB( 14) = 70H OR (ROR(LOW(CHAN$NUM*56),4) AND OFH);
                                  /* PC(0) = 7, HC(H) = 0 */
       LCOXTB( 15) = 00H;         /* PC(2) = 0, PC(1) = 0 */

   /* IP DESTINATION HEADER */
       LCOXTB( 16) = 10H;         /* CC     = 1, CT     = 0 */
       LCOXTB( 17) = (DEST$UNID AND OFH) OR
                ROL((DEST$HOST AND OFH), 4);
                                  /* HC(L) = 6, NC     = 2 */
       LCOXTB( 18) = ROR((DEST$HOST AND OFOH),4) OR 70H;
                                  /* PC(0) = 7, HC(H) = 0 */
       LCOXTB( 19) = 00H;         /* PC(2) = 0, PC(1) = 0 */

       CALL MOVE(TCP$DATA$SIZE, .MESSAGE, .LCOXTB( 56));
       IF MSGNUM > 9 THEN
           MSGNUM = 0;
```

```
      LCOXTB( 86) = '0' + MSGNUM;
      MSGNUM = MSGNUM + 1;
      CALL SNDSEQ(.TP$54, SIZE(TP$54));

END    LOAD;

/*******************************************************************
*  DATE:              25 SEP 84                                     *
*  VERSION:           1.0                                           *
*  NAME:              READ$TX$TAB:                                  *
*  MODULE NUMBER:     8.0                                           *
*  FUNCTION:          Reads the local transmit table                *
*  INPUTS:            None                                          *
*  OUTPUTS:           None                                          *
*  GLOBAL VARIBLES USED:       TX01TB (2, 3, 4), TX01TS(2, 3, 4), TEMP2 *
*  GLOBAL VARIBLES CHANGED:    all of those above                   *
*  MODULES CALLED:             SRVC$TAB$HSKP, HEX$ASC, SNDSEQ       *
*  CALLING MODULES:            main                                 *
*  AUTHOR:  Capt C.T. Chrildress                                    *
*  HISTORY:                                                         *
*              1.0 - Capt C. T. Childress                           *
*******************************************************************/

READ$TXTAB:    PROCEDURE;
   DECLARE I BYTE;

      IF ((TX01NE - TX01NS) >= DATA$GRAM$SIZE) OR (TX01NS > TX01NE) THEN
         DO;
         I = 12;
         DO WHILE I <= 18;
              CALL HEX$ASC(TX01TB(TX01NS + I),(I-12)*2);
              I = I + 1;
         END;
         I = 0;
         DO WHILE I <= 15;
              TEMP2(I) = TEMP1(14-I);
              TEMP2(I+1) = TEMP1(15-I);
              I = I + 2;
         END;
         CALL SNDSEQ(.TP$55A, SIZE(TP$55A));
         CALL SNDSEQ(.CRLF, SIZE(CRLF));
         CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
         CALL SNDSEQ(.TX01TB(TX01NS + 56), TCP$DATA$SIZE);
         CALL SRVC$TAB$HSKP(8);
      END;

      IF ((TX02NE - TX02NS) >= DATA$GRAM$SIZE) OR (TX02NS > TX02NE) THEN
         DO;
         I = 12;
         DO WHILE I <= 18;
```

```
               CALL HEX$ASC(TX02TB(TX02NS + I),(I-12)*2);
               I = I + 1;
          END;
          I = 0;
          DO WHILE I <= 15;
               TEMP2(I) = TEMP1(14-I);
               TEMP2(I+1) = TEMP1(15-I);
               I = I + 2;
          END;
          CALL SNDSEQ(.TP$55B, SIZE(TP$55B));
          CALL SNDSEQ(.CRLF, SIZE(CRLF));
          CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
          CALL SNDSEQ(.TX02TB(TX02NS + 56), TCP$DATA$SIZE);
          CALL SRVC$TAB$HSKP(9);
     END;

     IF ((TX03NE - TX03NS) >= DATA$GRAM$SIZE) OR (TX03NS > TX03NE) THEN
          DO;
          I = 12;
          DO WHILE I <= 18;
               CALL HEX$ASC(TX03TB(TX03NS + I),(I-12)*2);
               I = I + 1;
          END;
          I = 0;
          DO WHILE I <= 15;
               TEMP2(I) = TEMP1(14-I);
               TEMP2(I+1) = TEMP1(15-I);
               I = I + 2;
          END;
          CALL SNDSEQ(.TP$55C, SIZE(TP$55C));
          CALL SNDSEQ(.CRLF, SIZE(CRLF));
          CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
          CALL SNDSEQ(.TX03TB(TX03NS + 56), TCP$DATA$SIZE);
          CALL SRVC$TAB$HSKP(10);
     END;

     IF ((TX04NE - TX04NS) >= DATA$GRAM$SIZE) OR (TX04NS > TX04NE) THEN
          DO;
          I = 12;
          DO WHILE I <= 18;
               CALL HEX$ASC(TX04TB(TX04NS + I),(I-12)*2);
               I = I + 1;
          END;
          I = 0;
          DO WHILE I <= 15;
               TEMP2(I) = TEMP1(14-I);
               TEMP2(I+1) = TEMP1(15-I);
               I = I + 2;
          END;
          CALL SNDSEQ(.TP$55D, SIZE(TP$55D));
          CALL SNDSEQ(.CRLF, SIZE(CRLF));
          CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
          CALL SNDSEQ(.TX04TB(TX04NS + 56), TCP$DATA$SIZE);
          CALL SRVC$TAB$HSKP(11);
      END;

END    READ$TXTAB;

/*******************************************************************
*  DATE:               25 SEP 84                                   *
*  VERSION:            1.0                                         *
*  NAME:               READ$LCTAB                                  *
*  MODULE NUMBER:      5.0                                         *
*  FUNCTION:           Reads the local receive tables              *
*  INPUTS:             None                                        *
*  OUTPUTS:            None                                        *
*  GLOBAL VAR.dLES USED:     LC01TB (2, 3, 4), LC01NS (2, 3, 4), TEMP2 *
*  GLOBAL VARIBLES CHANGED:  LC01TB (2, 3, 4), TEMP2               *
*  MODULES CALLED:           HEX$ASC, SNDSEQ, SRVC$TAB$HSKP        *
*  CALLING MODULES:          main                                  *
*  AUTHOR:  Capt C.T. Childress                                    *
*  HISTORY:                                                        *
*             1.0 - Capt C. T. Childress                           *
*******************************************************************/
READ$LCTAB:    PROCEDURE;
   DECLARE I BYTE;

      IF ((LC01NE - LC01NS) >= DATA$GRAM$SIZE) OR (LC01NS > LC01NE) THEN
          DO;
          I = 12;
          DO WHILE I <= 18;
              CALL HEX$ASC(LC01TB(LC01NS + I),(I-12)*2);
              I = I + 1;
          END;
          I = 0;
          DO WHILE I <= 15;
              TEMP2(I) = TEMP1(14-I);
              TEMP2(I+1) = TEMP1(15-I);
              I = I + 2;
          END;
          CALL SNDSEQ(.TP$56A, SIZE(TP$56A));
          CALL SNDSEQ(.CRLF, SIZE(CRLF));
          CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
          CALL SNDSEQ(.LC01TB(LC01NS + 56), TCP$DATA$SIZE);
      END;

      IF ((LC02NE - LC02NS) >= DATA$GRAM$SIZE) OR (LC02NS > LC02NE) THEN
          DO;
          I = 12;
          DO WHILE I <= 18;
```

```
            CALL HEX$ASC(LCO2TB(LCO2NS + I),(I-12)*2);
            I = I + 1;
        END;
        I = 0;
        DO WHILE I <= 15;
            TEMP2(I) = TEMP1(14-I);
            TEMP2(I+1) = TEMP1(15-I);
            I = I + 2;
        END;
        CALL SNDSEQ(.TP$56B, SIZE(TP$56B));
        CALL SNDSEQ(.CRLF, SIZE(CRLF));
        CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
        CALL SNDSEQ(.LCO2TB(LCO2NS + 56), TCP$DATA$SIZE);
    END;

    IF ((LCO3NE - LCO3NS) >= DATA$GRAM$SIZE) OR (LCO3NS > LCO3NE) THEN
        DO;
        I = 12;
        DO WHILE I <= 18;
            CALL HEX$ASC(LCO3TB(LCO3NS + I),(I-12)*2);
            I = I + 1;
        END;
        I = 0;
        DO WHILE I <= 15;
            TEMP2(I) = TEMP1(14-I);
            TEMP2(I+1) = TEMP1(15-I);
            I = I + 2;
        END;
        CALL SNDSEQ(.TP$56C, SIZE(TP$56C));
        CALL SNDSEQ(.CRLF, SIZE(CRLF));
        CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
        CALL SNDSEQ(.LCO3TB(LCO3NS + 56), TCP$DATA$SIZE);
    END;

    IF ((LCO4NE - LCO4NS) >= DATA$GRAM$SIZE) OR (LCO4NS > LCO4NE) THEN
        DO;
        I = 12;
        DO WHILE I <= 18;
            CALL HEX$ASC(LCO4TB(LCO4NS + I),(I-12)*2);
            I = I + 1;
        END;
        I = 0;
        DO WHILE I <= 15;
            TEMP2(I) = TEMP1(14-I);
            TEMP2(I+1) = TEMP1(15-I);
            I = I + 2;
        END;
        CALL SNDSEQ(.TP$56D, SIZE(TP$56D));
        CALL SNDSEQ(.CRLF, SIZE(CRLF));
        CALL SNDSEQ(.TEMP2, SIZE(TEMP2));
```

```
            CALL SNDSEQ(.LC04TB(LC04NS + 56), TCP$DATA$SIZE);
        END;

END     READ$LCTAB;

/*****************************************************************************
*  DATE:                  20 SEP 84                                          *
*  VERSION:               1.0                                                *
*  NAME:                  UPDATE$LCTAB                                       *
*  MODULE NUMBER:         4.7                                                *
*  FUNCTION:              Sets the channel pointer to the current position   *
*              of a table passed to the procedure.                           *
*  INPUTS:                CHAN$NUM                                           *
*  OUTPUTS:               CHAN$NUM                                           *
*  GLOBAL VARIBLES USED:        LC01TB (2, 3, 4), LC01NE (2, 3, 4)           *
*  GLOBAL VARIBLES CHANGED:     LC01TB (2, 3, 4), LC01NE (2, 3, 4)           *
*  MODULES CALLED:              None                                         *
*  CALLING MODULES:             READLINE                                     *
*  AUTHOR:  C. T. Childress                                                  *
*  HISTORY:                                                                  *
*              1.0 - Capt C. T. Childress                                    *
*****************************************************************************/
UPDATE$LCPTR: PROCEDURE(CHAN$NUM) ADDRESS;
   DECLARE (CHAN$NUM, CHAN$PTR) ADDRESS;

   IF (CHAN$NUM >= 1 AND CHAN$NUM <= 4) THEN
       DO CASE CHAN$NUM;
           ;
           CHAN$PTR = .LC01TB(LC01NE);
           CHAN$PTR = .LC02TB(LC02NE);
           CHAN$PTR = .LC03TB(LC03NE);
           CHAN$PTR = .LC04TB(LC04NE);
       END;

   RETURN CHAN$PTR;

END UPDATE$LCPTR;

/*****************************************************************************
*  DATE:                  20 SEP 84                                          *
*  VERSION:               1.0                                                *
*  NAME:                  READ$LINE                                          *
*  MODULE NUMBER:         4.0                                                *
*  FUNCTION:              Reads a line of data from the host console and     *
*              then loads the specified number of datagrams into the         *
*              transmit table according to the specified path                *
*  INPUTS:                 None                                              *
*  OUTPUTS:                None                                              *
*  GLOBAL VARIBLES USED:        BUFFER, CHAN$NUM                             *
*  GLOBAL VARIBLES CHANGED:     BUFFER                                       *
*  MODULES CALLED:              SNDSEQ, ERR$CHK, READ, ASC$HEX, HEX$ASC, *
*                          LD$TAB$TAB                                    *
*  CALLING MODULES:             main                                     *
*  AUTHOR:  C. T. Childress                                              *
*  HISTORY:                                                              *
*          1.0 - Capt C. T. Childress                                    *
*************************************************************************/
READ$LINE: PROCEDURE;

   DECLARE CHAN$PTR ADDRESS,
           (I, DEST$NET$CODE, DEST$HOST$CODE) BYTE;

   I = 0;

   CALL SNDSEQ(.MSG1, SIZE(MSG1));
   CALL READ(R$CONN, .BUFFER, 128, .ACTUAL, .STATUS);
   CALL ERR$CHK;

   IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN
       DO;
       CALL SNDSEQ(.MSG3, SIZE(MSG3));
       CALL READ(R$CONN, .BUFFER, 128, .ACTUAL, .STATUS);
       CALL ERR$CHK;
       CHAN$NUM = DOUBLE(ASC$HEX(BUFFER(0)));
       IF (CHAN$NUM >= 1) AND (CHAN$NUM <= 4) THEN
           DO;
           CHAN$PTR = UPDATE$LCPTR(CHAN$NUM);
           CALL SNDSEQ(.MSG5, SIZE(MSG5));
           CALL READ(R$CONN, .BUFFER, 128, .ACTUAL, .STATUS);
           CALL ERR$CHK;
           DEST$NET$CODE = ASC$HEX(BUFFER(0));

           CALL SNDSEQ(.MSG6, SIZE(MSG6));
           CALL READ(R$CONN, .BUFFER, 128, .ACTUAL, .STATUS);
           CALL ERR$CHK;
           DEST$HOST$CODE = 0;
           DO I = 1 TO (ACTUAL-2);
               DEST$HOST$CODE = ROL(DEST$HOST$CODE, 4);
               DEST$HOST$CODE = DEST$HOST$CODE OR ASC$HEX(BUFFER(I-1));
           END;

           CALL SNDSEQ(.MSG4, SIZE(MSG4));
           CALL READ(R$CONN, .BUFFER, 128, .ACTUAL, .STATUS);
           CALL ERR$CHK;
           IF (BUFFER(0) >= '1') AND (BUFFER(0) <= '9') THEN
               DO I = 1 TO ASC$HEX(BUFFER(0));
                   CALL LOAD(CHAN$PTR, DEST$NET$CODE, DEST$HOST$CODE);
                   CALL LD$TAB$HSKP(CHAN$NUM);
                   CHAN$PTR = UPDATE$LCPTR(CHAN$NUM);
               END;
```

```
        END;
    END;

    CALL SNDSEQ(.TP$50, SIZE(TP$50));
    CALL HEX$ASC(LOW(CHAN$NUM), 0);
    CALL SNDSEQ(.TEMP1, 2);
    CALL SNDSEQ(.TP$51A, SIZE(TP$51A));
    CALL HEX$ASC(DEST$NET$CODE, 0);
    CALL SNDSEQ(.TEMP1, 2);
    CALL SNDSEQ(.TP$52A, SIZE(TP$52A));
    CALL HEX$ASC(DEST$HOST$CODE, 0);
    CALL SNDSEQ(.TEMP1, 2);

    CALL SNDSEQ(.MSG2, SIZE(MSG2));
    CALL READ(R$CONN, .BUFFER, 128, .ACTUAL, .STATUS);
    CALL ERR$CHK;

    IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN
        FOREVER = FALSE;
    ELSE
        FOREVER = TRUE;

END READ$LINE;

/*****************************************************************************/
/*      THIS IS THE MAIN BODY OF THE PROGRAM                                 */
/*****************************************************************************/

BEGIN:

    CALL SNDSEQ(.STARTUP$HDR, SIZE(STARTUP$HDR));
    CALL SNDSEQ(.TP$1, SIZE(TP$1));
    CALL INIT$L$TAB;
    CALL SNDSEQ(.TP$2, SIZE(TP$2));
    CALL SNDSEQ(.TP$3, SIZE(TP$3));
    CALL INVINT;
    CALL SNDSEQ(.TP$4, SIZE(TP$4));
    FOREVER = TRUE;
    CALL READ$LINE;
    DO WHILE FOREVER;
        CALL READ$LCTAB;
         CALL SNDSEQ(.TP$5, SIZE(TP$5));
         CALL ROUTE$IN;
        CALL SERVICE$LOOP;
/*         CALL SNDSEQ(.TP$22, SIZE(TP$22));
*/      CALL READ$TXTAB;
         CALL SNDSEQ(.TP$35, SIZE(TP$35));
        CALL READ$LINE;
    END;
    CALL SNDSEQ(.TP$36, SIZE(TP$36));
```

```
   CALL EXIT;
END MAIN;
/****************************** THE END *******************************/
```

APPENDIX M

SBC 544 Operational Software

OP544.SRC contains the software modified for polled transmit I/O. This software was successfully tested in the LSI-11 network. This software is embedded on the SBC 544. The UNID is assigned UNID number 2, Country Code 9 for operation in the LSI-11 network. Refer to the EE690 gateway software for information on the LSI-11 gateway nodes and to chapter VI for testing within the LSI-11 network.

```
$TITLE('LOCAL NETWORK TEST PROGRAM, 25 SEP 1985')
$INTVECTOR(4,20H)

/***************************************************************************
*  DATE:  24 SEP 85                                                        *
*  VERSION:  1.3                                                           *
*  TITLE:  ISO layer 3B SBC 544 IMPLEMENTATION WITH X.25 PACKET FORMAT     *
*  FILENAME:   OP544A.SRC                                                  *
*  COORDINATOR:  Capt Mark W. Weber                                        *
*  PROJECT:  UNID II                                                       *
*  OPERATING SYSTEM:  8080/8085 CPU (embedded software)                    *
*  LANGUAGE:  PL/M 80                                                      *
*  USE:  This file requires the filename INTR3.LOC include file for oper-  *
*        ating the interrupt driven receive routines and the polled trans- *
*        mit routines.  The include file INTR.LOC has both transmit and    *
*        receive routines interrupt driven.  This file must be linked with *
*        PLM80.LIB, SYSTEM.LIB.  This file maybe linked and located with   *
*        the submit command lnk544(sim544a).                               *
*  CONTENTS:  MAIN - main processing routine                               *
*             INIT$N$TAB - intializes the necessary hardware               *
*             INIT - intializes the 8255 jump table and vectors            *
*             INIT$TAB - intializes the tables and table pointers          *
*             HEX$ASC -  converts HEX to ASCII                             *
*             ASC$HEX - converts ASCII to HEX                              *
*             VALID$HEX - validates HEX numbers                            *
*             SNDSEQ - writes messages to USART 0 for status updates       *
*             LD$TAB$HSKP  - updates the transmit tables                   *
*             SRVC$TAB$HSKP - updates the receive tables                   *
*             RXIN$1 - USART 0 (channel 1) monitor input routine           *
*             TXOUT$1 - USART 0 transmit monitor routine                   *
*             SERVICE$RCV$1  - channel 1 receive interrupt routine         *
*             SERVICE$RCV$2  - channel 2 receive interrupt routine         *
*             SERVICE$RCV$3  - channel 3 receive interrupt routine         *
*             SERVICE$RCV$4  - channel 4 receive interrupt routine         *
*             SERVICE$TRANS$1 - channel 1 transmit pooled routine          *
*             SERVICE$TRANS$2 - channel 2 transmit pooled routine          *
*             SERVICE$TRANS$3 - channel 3 transmit pooled routine          *
*             SERVICE$TRANS$4 - channel 4 transmit pooled routine          *
*             SEND$PACKET - procedure formats a packet for the datalink layer*
*             DET$ADDR - procedufe determines the destionation of local data *
*             DET$ADDR$NL - determines the destionation of data from the   *
*                         datalink layer                                   *
*             MOVE$TO$LOCAL - moves packets from the datalink layer to the *
*                           local network layer                            *
*             ROUTE$IN - processes incomming packets from the transport layer*
*             ROUTE$OUT - processes packets in the local network layer     *
*                        transmit tables                                   *
*             SERVICE$LOOP - software loop for routing datagrams back to the *
*                          local network layer                             *
*             LOOP - SBC 88/45 semaphore simulation                        *
*              SET$TRTA - handles TRTA protocol                            *
*              main - calls proceures to simulate operational SBC 544 in UNID *
*  FUNCTION:   Implements the operation of the SBC 544 in the UNID II using  *
*              the TCP/IP protocol as defined by Phister.  This SBC handles  *
*              the functions of ISO layer 3B which processes the IP protocol *
*              and handles a multi-host requriements.                        *
*  HISTORY:    1.2 Mark Weber - implemented polled transmit rouintes         *
*              1.1 C.T. Childress - 2 OCT 84 - original implementation       *
*              1.0 P. Philster - original                                    *
****************************************************************************/


MAIN: DO:

              /* THE FOLLOWING ARE UNID DEFINED VARIABLES */
              /* NOTE: THESE VARIABLES MAY CHANGE DEPENDING ON THE
                       SOFTWARE CONFIGURATION USED WITHIN THE DELNET */

DECLARE       DATA$GRAM$SIZE  LITERALLY '128',    /* DATAGRAM FROM HOST */
               PACKET$SIZE     LITERALLY '138',    /* DATAGRAM + 5 FOR HEADER */
              FRAME$SIZE      LITERALLY '140',   /* PACKET + 2 FOR HEADER */
               PACKETS$IN$TABLE LITERALLY '10',
               STAT$NBR        LITERALLY '20',     /* STATUS ENTRIES IN STATTB */
               DATA$TABLE$SIZE LITERALLY '1280',   /* DATAGRAM * NBR OF DATAGRAMS */
               PACKET$TABLE$SIZE LITERALLY '1380', /* PACKET * NBR OF PACKETS */
              FRAME$TABLE$SIZE  LITERALLY '1400', /* FRAME * NBR OF PACKETS */
              TCP$DATA$SIZE  LITERALLY '72',     /* TCP DATA SIZE */
              TR               LITERALLY '42H',   /* TRANSMIT REQUEST CHAR */
              TA               LITERALLY '41H',   /* TRANSMIT ACKNOWLEDGE CHAR */
              MAX$RXTA$TRIES LITERALLY '3',      /* MAXIMUM NUMBER OF TA WAIT TRIES */
              OFFSET1          LITERALLY '10',    /* OFFSET FROM PACKET TO IP HEADER */

            /* FOLLOWING ARE NETWORK DEFINED VARIABLES */
            /* NOTES:1. THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
                     2. THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH
                        THIS UNID IS LOCATED.
                     3. MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
                        ARE CURRENTLY OPERATIONAL. CC=0000 IS RESERVED FOR
                        THE DELNET MONITOR.
                     4. MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
                        CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
                     5. FOR DETAILED INFORMATION ON THE ABOVE REFER TO
                        PHISTER'S THESIS, APPENDIX D.  */

              THIS$UNID$NBR    LITERALLY '02',  /* UNIQUE ADDRESS FOR THIS UNID */
              THIS$COUNTRY$CODE LITERALLY '09', /* CC WHERE THIS UNID RESIDES */
              MAX$COUNTRY$CODE LITERALLY '09',  /* INDICATES COUNTRY$CODES IN USE */
              MAX$NETWORK$CODE LITERALLY '03';  /* INDICATES UNIDS OPERATIONAL IN NET */

/* NOTE: THE LITERAL THIS$COUNTRY$CODE OF 9, ABOVE, IS HERE FOR USE WITH THE
```

```
SUMMER QUARTER EE 6.90 PROJECT;I.E., INTERFACE THE UNID II WITH THE NETOS */

DECLARE     L$RI$DEST$ERR   LITERALLY '5',    /* LOCAL ROUTE$IN ERROR */
             L$RO$DEST$ERR   LITERALLY '6';    /* LOCAL ROUTE$OUT ERROR */

       /*  MISCELLANEOUS DECLARATIONS  */

DECLARE     BUSY        LITERALLY    'OFFH',
            TRUE         LITERALLY    'OFFH',
            FALSE        LITERALLY    'ODH',
           READY       LITERALLY    '1',
           DONE        LITERALLY    '2',
            CR           LITERALLY    'ODH',
            LF           LITERALLY    'OAH',
           USARTON     LITERALLY    '0010$0111B',
           USARTOFF    LITERALLY    '0000$0110B';

/*****************************************************************************/
/*    DATA TABLES USED IN THIS PROGRAM                                       */
/*****************************************************************************/

DECLARE        SYS$MEM$BASE    LITERALLY '08001H'; /* SYSTEM MEMORY BASE ADDRESS */

DECLARE        SYS$BASE    BYTE AT (SYS$MEM$BASE);

      /* DECLARATIONS FOR FLAGS AND TABLES IN SYSTEM MEMORY */

DECLARE
   (LSEM$1, LSEM$2, LSEM$3,              /* LOCAL TO NET SEMAPHORE AND */
   LSEM$4, NSEM$1, NSEM$2) BYTE          /* NET TO LOCAL SEMAPHORE */
       AT (.SYS$BASE),

   (LPTR$1, LSPARE$1, LPTR$2, LSPARE$2,         /* LOC TO NET PACKET PTR */
   LPTR$3, LSPARE$3, LPTR$4, LSPARE$4,          /* LOC TO NET PACKET PTR */
   NPTR$1, NSPARE$1, NPTR$2, NSPARE$2) ADDRESS /* NET TO LOC PACKET PTR */
       AT (.SYS$BASE + 6),

    LCO1RX (PACKET$TABLE$SIZE) BYTE     /* LOCAL BOARD RECEIVE TABLES */
       AT (.SYS$BASE + 30),
   LCO2RX (PACKET$TABLE$SIZE) BYTE
       AT (.SYS$BASE + 30 + PACKET$TABLE$SIZE),
   LCO3RX (PACKET$TABLE$SIZE) BYTE
       AT (.SYS$BASE + 30 + PACKET$TABLE$SIZE +
                            PACKET$TABLE$SIZE),
   LCO4RX (PACKET$TABLE$SIZE) BYTE
       AT (.SYS$BASE + 30 + PACKET$TABLE$SIZE +
                            PACKET$TABLE$SIZE +
                            PACKET$TABLE$SIZE),

   NT01RX (FRAME$TABLE$SIZE) BYTE      /* NETWORK BOARD RECEIVE TABLES */
```

```
      AT (.SYS$BASE + 30 + PACKET$TABLE$SIZE +
                           PACKET$TABLE$SIZE +
                           PACKET$TABLE$SIZE +
                           PACKET$TABLE$SIZE),
   NT02RX (FRAME$TABLE$SIZE) BYTE
      AT (.SYS$BASE + 30 + PACKET$TABLE$SIZE +
                           PACKET$TABLE$SIZE +
                           PACKET$TABLE$SIZE +
                           PACKET$TABLE$SIZE +
                           FRAME$TABLE$SIZE);

DECLARE
       LC01TX (DATA$TABLE$SIZE) BYTE,
       LC02TX (DATA$TABLE$SIZE) BYTE,
       LC03TX (DATA$TABLE$SIZE) BYTE,
       LC04TX (DATA$TABLE$SIZE) BYTE,

       (LC01NS, LC01NE, LC01SZ,
       LC02NS, LC02NE, LC02SZ,
       LC03NS, LC03NE, LC03SZ,
       LC04NS, LC04NE, LC04SZ) ADDRESS,

      (NT01NS, NT01NE, NT01SZ,
       NT02NS, NT02NE, NT02SZ) ADDRESS,

      (TX01NS, TX01NE, TX01SZ,
      TX02NS, TX02NE, TX02SZ,
      TX03NS, TX03NE, TX03SZ,
      TX04NS, TX04NE, TX04SZ) ADDRESS,

      STATTB (STAT$NBR) BYTE,

/************************************************************************/
/*   ADDITIONAL DECLARES NEEDED FOR THIS PROGRAM                        */
/************************************************************************/

    /*  INTERNAL VARIABLES USED IN THIS MODULE  */

      (SEND$1, SEND$2, SEND$3, SEND$4) BYTE,

      (BYTES$SENT$1, BYTES$SENT$2,
      BYTES$SENT$3, BYTES$SENT$4) BYTE,

      (BYTES$RECV$1, BYTES$RECV$2,
      BYTES$RECV$3, BYTES$RECV$4) BYTE,

      (TRTA$1,TXTR$1,TXTA$1,RXTR$1,RXTA$1,
      TRTA$2,TXTR$2,TXTA$2,RXTR$2,RXTA$2,
      TRTA$3,TXTR$3,TXTA$3,RXTR$3,RXTA$3,
      TRTA$4,TXTR$4,TXTA$4,RXTR$4,RXTA$4) BYTE,
       (CHAR$1, CHAR$2, CHAR$3, CHAR$4, CHAR$X) BYTE,

       DESTINATION  BYTE,           /* DESTINATION OF THE PACKET */
       DESTINATION$ADDRESS BYTE, /* DESTIN ADDR OF DATAGRAM */
       SOURCE$ADDRESS BYTE,      /* SOURCE ADDR OF DATAGRAM */
       FOREVER   BYTE,

       BRF0         ADDRESS,         /* DATA RATE FACTOR, USART 0 */
       BRF1         ADDRESS,         /* DATA RATE FACTOR, USART 1 */
       BRF2         ADDRESS,         /* DATA RATE FACTOR, USART 2 */
       BRF3         ADDRESS,         /* DATA RATE FACTOR, USART 3 */
       ISR$STAT     BYTE;            /* IRR STATUS BYTE */

/*******************************************************************************/

R$MASK:    PROCEDURE BYTE EXTERNAL;    /* USE THE PLM80.LIB WHEN LINKING */
   END R$MASK;

S$MASK:    PROCEDURE (MASK) EXTERNAL;
   DECLARE MASK BYTE;
   END S$MASK;

/*******************************************************************************/

   /* SIGNON MESSAGE AND DIAGNOSTIC MESSAGES */

DECLARE         HEADER(*) BYTE DATA(CR,LF,
'                          UN.D II #2 LOCAL OS',CR,LF,
'                            TEST PROGRAM',CR,LF,
'                          VERS 1.3, 25 SEP 85',CR,LF,
'                             EXECUTING ',CR,LF);

DECLARE     TP$1(*) BYTE DATA(CR,LF,
'TP$1        Received datagram, putting in LC01TX');
DECLARE        TP$2(*) BYTE DATA(CR,LF,
'TP$2        In ROUTE$OUT');
DECLARE        TP$3(*) BYTE DATA(CR,LF,
'TP$3        Sent TR');
DECLARE        TP$3A(*) BYTE DATA(CR,LF,
'TP$3A       Sent TA');
DECLARE     TP$3B(*) BYTE DATA(CR,LF,
'TP$3B       Received TR');
DECLARE        TP$3C(*) BYTE DATA(CR,LF,
'TP$3C       Received TA');
DECLARE        TP$4(*) BYTE DATA(CR,LF,
'TP$4        Not TRTA, sending datagram');
DECLARE        TP$4A(*) BYTE DATA(CR,LF,
'TP$4A       Completed sending datagram');
DECLARE        TP$5(*) BYTE DATA(CR,LF,
'TP$5        Completed initializing 544 board');
```

```
DECLARE        TP$6(*) BYTE DATA(CR,LF,
'TP$6        Completed initializing variables');
DECLARE    TP$7(*) BYTE DATA(CR,LF,
'TP$7        Completed initializing tables');
DECLARE        TP$8(*) BYTE DATA(CR,LF,
'TP$8        Entering forever loop!');

DECLARE    MSG1(*) BYTE DATA(CR,LF,
'Do you want TR/TA handshake (Y/N) [N] ?');
DECLARE    MSG2(*) BYTE DATA(CR,LF,
'Which channel (1, 2, 3, 4) [1] ?');

/* THE FOLLOWING DECLARE STATEMENTS SET UP THE TRAP, RST5.5, RST6.5,
RST7.5 INTERRUPT TABLE IN EPROM TO JUMP TO LOCATIONS IN THE 8155 RAM,
WHERE ANOTHER JUMP TABLE IS ACCESSABLE BY PROGRAMS IN RAM.  THE RAM
TABLE IS INITITALIZED TO JMP 0 WHERE THE EPROM ENTRYJUMP IS LOCATED. */

DECLARE        JUMP$CODE   LITERALLY '0C3H';
DECLARE        VECTOR$TABLE$BASE LITERALLY '7FF4H';

DECLARE        VECTOR$TABLE$BASE$PTR ADDRESS,
           ADDR ADDRESS AT (.VECTOR$TABLE$BASE$PTR),
           VECTOR$TABLE BASED VECTOR$TABLE$BASE$PTR BYTE;

DECLARE        CODE0(3) BYTE AT (0024H) DATA(0C3H,0F4H,7FH),
           CODE1(3) BYTE AT (002CH) DATA(0C3H,0F7H,7FH),
           CODE2(3) BYTE AT (0034H) DATA(0C3H,0FAH,7FH),
           CODE2A(3) BYTE AT (0038H) DATA(0C3H,0,0),
           CODE3(3) BYTE AT (003CH) DATA(0C3H,0FDH,7FH);

/*
DECLARE
   INT$VECTOR(8)    ADDRESS,    * INTERRUPT VECTORS *
   TRAP$INT         ADDRESS,    * POWER FAIL SENSE *
   INT$75           ADDRESS,    * TIMER INPUTS, TINT0 & TINT1 *
   INT$65           ADDRESS,    * RING INDICATOR AND CARRIER DETECT *
   INT$55           ADDRESS,    * FLAG (FINT) AND MULTIBUS INTERRUPT *
   RIM$MASK         BYTE,       * INTERRUPT MASK RETURNED BY RIM *
   TRAP$INT$PTR     LITERALLY   '024H',     * INTERRUPT LOCATIONS *
   INT$55$PTR       LITERALLY   '02CH';
   INT$65$PTR       LITERALLY   '034H',
   INT$75$PTR       LITERALLY   '03CH',
*/

/************************************************
*       ISBC 544 I/O DECLARATIONS SECTION       *
************************************************/

DECLARE                     /* MASTER/SLAVE PORTS */
   SIM$MASK        LITERALLY '01FH',   /* SIM MASK-TURN OFF INTERRUPTS */
   MASTER          LITERALLY '0E5H',   /* MASTER MODE */
   SLAVE           LITERALLY '0E4H';   /* SLAVE MODE */

DECLARE                          /* 8251 USARTS */
   US$P0$CMD       LITERALLY '0D1H',   /* SERIAL PORT 0 COMMAND */
   US$P0$STAT      LITERALLY '0D1H',   /* SERIAL PORT 0 STATUS */
   US$P0$DATA      LITERALLY '0D0H',   /* SERIAL PORT 0 DATA */
   US$P1$CMD       LITERALLY '0D3H',   /* SERIAL PORT 1 COMMAND */
   US$P1$STAT      LITERALLY '0D3H',   /* SERIAL PORT 1 STATUS */
   US$P1$DATA      LITERALLY '0D2H',   /* SERIAL PORT 1 DATA */
   US$P2$CMD       LITERALLY '0D5H',   /* SERIAL PORT 2 COMMAND */
   US$P2$STAT      LITERALLY '0D5H',   /* SERIAL PORT 2 STATUS */
   US$P2$DATA      LITERALLY '0D4H',   /* SERIAL PORT 2 DATA */
   US$P3$CMD       LITERALLY '0D7H',   /* SERIAL PORT 3 COMMAND */
   US$P3$STAT      LITERALLY '0D7H',   /* SERIAL PORT 3 STATUS */
   US$P3$DATA      LITERALLY '0D6H',   /* SERIAL PORT 3 DATA */
   US$MODE         LITERALLY '04EH',   /* SERIAL PORT MODE */
   US$COMMAND      LITERALLY '027H',   /* SERIAL PORT COMMAND */

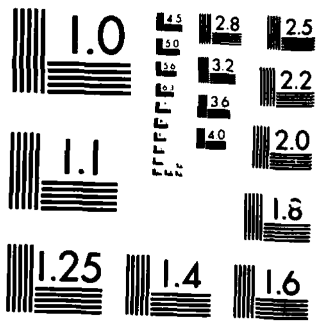
   US$RESET$CMD    LITERALLY '40H',    /* RESET USART */
   US$DTR$ON       LITERALLY '27H',    /* RTS,RXE,DTR,TXE */
   US$CRT$CMD      LITERALLY '37H',    /* RTS,ER,RXE,DTR,TXE */
   US$TTY$CMD      LITERALLY '35H',    /* RTS,ER,RXE,TXE */
   US$DTR$OFF      LITERALLY '25H',    /* RTS,RXE,TXE */
   US$RXRDY        LITERALLY '02H',    /* RECIEVER READY */
   US$TXE          LITERALLY '04H',    /* TRANSMITTER EMPTY */
   US$TXRDY        LITERALLY '01H',    /* TRANSMITTER READY */
   PARITY$MASK     LITERALLY '7FH';    /* MASK OFF PARITY BIT */

DECLARE                          /* 8253 INTERVAL TIMER */
   IT1$CONT     LITERALLY '0DBH',   /* INTERVAL TIMER 1 CONTROL */
   IT1$CNTR0    LITERALLY '0D8H',   /* COUNTER 0, USART 0 */
   IT1$CNTR1    LITERALLY '0D9H',   /* COUNTER 1, USART 1 */
   IT1$CNTR2    LITERALLY '0DAH',   /* COUNTER 2, USART 2 */
   IT2$CONT     LITERALLY '0DFH',   /* INTERVAL TIMER 2 CONTROL */
   IT2$CNTR0    LITERALLY '0DCH',   /* COUNTER 3, USART 3 */
   IT2$CNTR1    LITERALLY '0DDH',   /* COUNTER 4, CNTR5 OR SPLIT CLOCKS */
   IT2$CNTR2    LITERALLY '0DEH',   /* COUNTER 5, RST 7.5 */
   USART$CNTR$M3 LITERALLY '036H',  /* DIVIDE BY N RATE GENERATOR, MODE 3,*/
                                    /* FOR USART CLK x 16, CLK = 1.2288 MHZ */


   B19200       LITERALLY '4',      /* TIMER VALUE FOR 19.2 KBPS */
   B9600        LITERALLY '8',      /* TIMER VALUE FOR 9600 BPS */
   B4800        LITERALLY '16',     /* TIMER VALUE FOR 4800 BPS */
   B2400        LITERALLY '32',     /* TIMER VALUE FOR 2400 BPS */
   B1200        LITERALLY '64',     /* TIMER VALUE FOR 1200 BPS */
   B600         LITERALLY '128',    /* TIMER VALUE FOR 600 BPS */
   B300         LITERALLY '256',    /* TIMER VALUE FOR 300 BPS */
   B150         LITERALLY '512',    /* TIMER VALUE FOR 150 BPS */
```

AD-A164 042 DEVELOPMENT AND IMPLEMENTATION OF THE X25 PROTOCOL FOR THE UNIVERSAL NETW..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. M W WEBER 2/3

UNCLASSIFIED DEC 85 AFIT/GE/ENG/85D-52-VOL-2 F/G 17/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
   B110        LITERALLY '698';    /* TIMER VALUE FOR 110 BPS */

DECLARE                         /*8155 PERIPHERAL INTERFACE*/
   PI$PORTA    LITERALLY '0E9H',   /* PORT A (OUTPUT) */
   PI$PORTB    LITERALLY '0EAH',   /* PORT B (INPUT) */
   PI$PORTC    LITERALLY '0EBH',   /* PORT C (INPUT) */
   PI$STAT     LITERALLY '0E8H',   /* PPI STATUS */
   PI$CMD      LITERALLY '0E8H',   /* PPI COMMAND */
   PI$CNTR$LO  LITERALLY '0ECH',   /* PPI COUNTER LO BYTE */
   PI$CNTR$HI  LITERALLY '0EDH',   /* PPI COUNTER HI BYTE */
   PI$CNTR$LOCNT LITERALLY '16384', /* PPI COUNTER TIME CONST */
   PI$CNTR$HICNT LITERALLY '75',   /* PPI COUNTER TIME CONST */
   PI$INIT$CMD1  LITERALLY '041H', /* PPI INITIALIZATION COMMAND 1 */
                                   /* A OUT, B & C IN, STOP COUNT */
   PI$INIT$CMD2  LITERALLY '0C1H', /* PPI INITIALIZATION COMMAND 2 */
                                   /* A OUT, B & C IN, START COUNT */
   PI$INIT$US$INT1 LITERALLY '0F0H', /* USART AND INT CONT RESET */
   PI$INIT$US$INT2 LITERALLY '0C0H', /* USART AND INT CONT NORMAL */


   PI$PORTC$STAT   LITERALLY '0CCH',   /*PORT C STATUS*/
   PI$PORTC$CTL    LITERALLY '0CEH',   /*PORT C CONTROL*/
   PI$M2M1     LITERALLY '0C6H',   /*A-MODE 1, B-MODE 2*/
   PI$OBF      LITERALLY '080H',   /*OUTPUT BUFFER READY*/
   PI$IBF      LITERALLY '02H';    /*INPUT BUFFER READY'*/


DECLARE                         /*8259 INTERRUPT CONTROLLER*/
   IC$PORTA    LITERALLY '0E6H',   /* PORT A */
   IC$PORTB    LITERALLY '0E7H',   /* PORT B */
   IC$ICW1     LITERALLY '56H',    /* INIT COMMAND WORD 1,
                                   (A7A6A5) = 010; EDGE TRIG;
                                   INTERVAL = 4; SINGLE; NO ICW4 */
   IC$ICW2     LITERALLY '00H',    /* INIT COMMAND WORD 2,
                                   (A15-A8) = 0 */
   IC$ICW3     LITERALLY '00H',    /* INIT COMMAND WORD 3,
                                   NO SLAVE IN IR */
   IC$ICW4     LITERALLY '0CH',    /* INIT COMMAND WORD 4, NOT USED */
   IC$MASK     LITERALLY '0',      /* INTERRUPT MASK, OCW1, NOT USED;
                                   0 = ALL INTERRUPTS ENABELLED */
   INIT$MASK   LITERALLY '10101010B',
                                   /* INITIAL INTERRUPT MASK, OCW1;
                                   RECEIVE INTR ON, TRANSMIT INTR OFF */
   IC$EOI      LITERALLY '0A0H',   /* END OF INTERRUPT CMD, OCW2,
                                   ROTATE (PRIORITY) ON NON-SPECIFIC EOI */
   IC$OCW3IR   LITERALLY '0AH',    /* READ IRR LEVEL, OCW3,
                                   NO SPECIAL MASK MODE; NO POLL;
                                   READ IR REG (NOT USED) */
   IC$OCW3IS   LITERALLY '0BH',    /* READ ISR LEVEL, OCW3,
                                   NO SPECIAL MASK MODE; NO POLL;
```

```
                                  READ IS REG (NOT USED) */
   IC$OCW3$SMMS LITERALLY '60H',  /* SPECIAL MASK MODE SET */
   IC$OCW3$SMMR LITERALLY '40H';  /* SPECIAL MASK MODE RESET */

/*****************************************************************
*  DATE:                  24 SEP 85                              *
*  VERSION:               1.2                                    *
*  NAME:                  INIT$N$TAB                             *
*  MODULE NUMBER:         2.0                                    *
*  DESCRIPTION:           Initalizes the hardware devices found on the *
*              SBC 544  (8255, 8551As, 8259, 8253s ).  All ports may *
*              be used for communications with other hosts.       *
*  PASSED VARIABLES:      None                                   *
*  RETURNS:               None                                   *
*  GLOBAL VARIBLES USED:        BRF0, BRF1, BRF2, BRF3, ISR$STAT *
*  GLOBAL VARIBLES CHANGED:     All the above                    *
*  MODULES CALLED:              None                             *
*  CALLING MODULES:             main                             *
*  AUTHOR:                      Capt C.T. Childress              *
*                                                                *
*  HISTORY:                                                      *
*            1.0 Capt C.T. Childress - original version          *
*****************************************************************/

     /*  INITIALIZE 8155 PROGRAMMABLE PERIPHERAL INTERFACE (PPI)  */
     /*  SET DATA RATES FOR LOCAL CHANNEL USARTS:                 */
     /*      SET PIT #1, REGISTER #0 FOR USART #0 DATA RATE       */
     /*      SET PIT #1, REGISTER #1 FOR USART #1 DATA RATE       */
     /*      SET PIT #1, REGISTER #2 FOR USART #2 DATA RATE       */
     /*      SET PIT #2, REGISTER #0 FOR USART #3 DATA RATE       */
     /*  INITIATE RESET ON ALL USARTS                             */
     /*  INITIALIZE THE FOUR USARTS TO: 2 STOP BITS, NO PARITY,   */
     /*     8 BIT CHARACTERS, AND 16X DATA RATE                   */
     /*  INITIALIZE THE  8259 PROGRAMMABLE INTERRUPT CONTROLLER   */


/***********************************
* DEVICE INITIALIZATION SECTION    *
***********************************/

INITIALIZE$BOARD:
   /* THIS PROCEDURE INITIALIZES THE iSBC 544 BOARD */
   PROCEDURE;

PI$INIT:       /* 8155 PARALLEL INTERFACE INITIALIZATION */
   OUTPUT(PI$CMD) = PI$INIT$CMD1;
   OUTPUT(PI$PORTA) = PI$INIT$US$INT1; /* RESETS THE 8251 USARTS */
   OUTPUT(PI$PORTA) = PI$INIT$US$INT2;
   OUTPUT(PI$CNTR$LO) = PI$CNTR$LOCNT;
   OUTPUT(PI$CNTR$HI) = PI$CNTR$HICNT;
   OUTPUT(PI$CMD) = PI$INIT$CMD2;

IT$INIT:       /* 8253 INTERVAL TIMER INITIALIZATION */
   BRF0 = B9600;
   BRF1 = B9600;
   BRF2 = B9600;
   BRF3 = B9600;
   OUTPUT(IT1$CONT) = USART$CNTR$M3;           /* USART 0 */
   OUTPUT(IT1$CNTR0) = LOW(BRF0);
   OUTPUT(IT1$CNTR0) = HIGH(BRF0);
   OUTPUT(IT1$CONT) = 40H OR USART$CNTR$M3;    /* USART 1 */
   OUTPUT(IT1$CNTR1) = LOW(BRF1);
   OUTPUT(IT1$CNTR1) = HIGH(BRF1);
   OUTPUT(IT1$CONT) = 80H OR USART$CNTR$M3;    /* USART 2 */
   OUTPUT(IT1$CNTR2) = LOW(BRF2);
   OUTPUT(IT1$CNTR2) = HIGH(BRF2);
   OUTPUT(IT2$CONT) = USART$CNTR$M3;           /* USART 3 */
   OUTPUT(IT2$CNTR0) = LOW(BRF3);
   OUTPUT(IT2$CNTR0) = HIGH(BRF3);

IC$INIT:       /* 8259 INTERRUPT CONTROLLER INITIALIZATION */

/*THE FOLLOWING CODE INITIALIZES THE 8259A. THE INTERRUPTS ARE
USED FOR THIS PROGRAM. ALL INTERRUPTS ARE ON EXCEPT FOR THE RST TYPES */

   OUTPUT(IC$PORTA) = IC$ICW1;
   OUTPUT(IC$PORTB) = IC$ICW2;
   OUTPUT(IC$PORTB) = INIT$MASK;   /* OCW1 */
   OUTPUT(IC$PORTA) = IC$EOI;      /* OCW2 */
   OUTPUT(IC$PORTA) = IC$OCW3IS;   /* OCW3 */
   ISR$STAT = INPUT(IC$PORTA);

US$INIT:       /* INITIALIZE THE USARTS */
               /* ASYNC MODE, 8 DATA BITS, 1 STOP BIT, NO PARITY, x16 CLOCK
                  DTR, RTS ON, RECV ON, TRANSMIT OFF                       */
   OUTPUT(US$P0$CMD) = US$MODE;
   OUTPUT(US$P0$CMD) = USARTON;
   OUTPUT(US$P1$CMD) = US$MODE;
   OUTPUT(US$P1$CMD) = USARTON;
   OUTPUT(US$P2$CMD) = US$MODE;
   OUTPUT(US$P2$CMD) = USARTON;
   OUTPUT(US$P3$CMD) = US$MODE;
   OUTPUT(US$P3$CMD) = USARTON;

END INITIALIZE$BOARD;

/************************************************************************
*  DATE:                 24 SEP 85                                      *
*  VERSION:              1.1                                            *
*  NAME:                 INIT                                           *
*  MODULE NUMBER:        4.0                                            *
*  DESCRIPTION:          Initalizes the pointers and tables used with   *
*               the SBC 544 software.  The vector table may be used     *
*               when UNID II is ready for full operation.  Presetly,    *
*               the interrupt table is located in the 256 bytes of RAM *
*               available to the 8255.  This allows modification of the *
*               table without changing EPROMS.  For this implementation *
*               the interrput table is commented out.                   *
*  PASSED VARIABLES:     None                                           *
*  RETURNS:              None                                           *
*  GLOBAL VARIBLES USED:       VECTOR TABLE,  BYTES$SENT$1, BYTES$SENT$2,*
*                        BYTES$SENT$2, BYTES$SENT$3, BYTES$SENT$4,      *
*                        BYTES$RCV$1, BYTES$RCV$2, BYTES$RCV$3,         *
*                        BYTES$RCV$4, SEND$F, SEND$2, SEND$3, SEND$4,   *
*                        TRTA$1,TRTA$2, TRTA$3, TRTA$4, TXTR$1, TXTR$2, *
*                        TXTR$3, TXTR$4, TXTA$1, TXTA$2, TXTA$3, TXTA$4,*
*                        CHAR$1, CHAR$2, CHAR$3, CHAR$4, CHAR$X         *
*  GLOBAL VARIBLES CHANGED:    All the above                            *
*  MODULES CALLED:             None                                     *
*  CALLING MODULES:            main                                     *
*  AUTHOR:                     Capt C.T. Childress                      *
*                                                                       *
*  HISTORY:                                                             *
*            1.1 Capt C.T. Childress - original 544 version             *
*************************************************************************/
INIT: PROCEDURE;
   DECLARE I BYTE;

/* THE FOLLOWING CODE INITIALIZES THE JUMP TABLE IN 8155 RAM TO POINT
TO THE USER'S INTERRUPT SERVICE ROUTINES AT INTR$VECTOR$5$5, ETC.     */

/* ADDR = .INTR$VECTOR$5$5;
   VECTOR$TABLE = JUMP$CODE;
   ADDR = ADDR + 1;
   VECTOR$TABLE = LOW(VECTOR$TABLE$BASE);
   ADDR = ADDR + 1;
   VECTOR$TABLE = HIGH(VECTOR$TABLE$BASE);

   ADDR = .INTR$VECTOR$6$5;
   VECTOR$TABLE = JUMP$CODE;
   ADDR = ADDR + 1;
   VECTOR$TABLE = LOW(VECTOR$TABLE$BASE + 3);
   ADDR = ADDR + 1;
   VECTOR$TABLE = HIGH(VECTOR$TABLE$BASE + 3);

   ADDR = .INTR$VECTOR$7$5;
   VECTOR$TABLE = JUMP$CODE;
   ADDR = ADDR + 1;
   VECTOR$TABLE = LOW(VECTOR$TABLE$BASE + 6);
   ADDR = ADDR + 1;
   VECTOR$TABLE = HIGH(VECTOR$TABLE$BASE + 6);
*/

/* INITIALIZES 8155 JUMP TABLE TO JMP 0 */

   I = 0;
   ADDR = VECTOR$TABLE$BASE;        /* = 7FF4H */
   DO WHILE I <= 11;
       VECTOR$TABLE = JUMP$CODE;
       ADDR = ADDR + 1;
       VECTOR$TABLE = 0;
       ADDR = ADDR + 1;
       VECTOR$TABLE = 0;
       ADDR = ADDR + 1;
       I = I + 3;
   END;

    BYTES$SENT$1 = 0;
    BYTES$SENT$2 = 0;
    BYTES$SENT$3 = 0;
    BYTES$SENT$4 = 0;

   BYTES$RECV$1 = 0;
   BYTES$RECV$2 = 0;
   BYTES$RECV$3 = 0;
   BYTES$RECV$4 = 0;

   SEND$1 = FALSE;
   SEND$2 = FALSE;
   SEND$3 = FALSE;
   SEND$4 = FALSE;

   TRTA$1,TXTR$1,TXTA$1,RXTR$1,RXTA$1 = FALSE;
   TRTA$2,TXTR$2,TXTA$2,RXTR$2,RXTA$2 = FALSE;
   TRTA$3,TXTR$3,TXTA$3,RXTR$3,RXTA$3 = FALSE;
   TRTA$4,TXTR$4,TXTA$4,RXTR$4,RXTA$4 = FALSE;

   CHAR$1 = '1';
   CHAR$2 = '2';
   CHAR$3 = '3';
   CHAR$4 = '4';
   CHAR$X = 'X';

END INIT;

/**********************************************************************
*  DATE:                      2 OCT 84                               *
*  VERSION:                   1.1                                    *
*  NAME:                      INIT$TAB                               *
*  MODULE NUMBER:        5.0                                            *
*  DESCRIPTION:          Initalizes the pointers and tables used with   *
*             the SBC 544 software.                                     *
*  PASSED VARIABLES:     None                                           *
*  RETURNS:              None                                           *
*  GLOBAL VARIBLES USED:     LSEM$1, LSEM$2, LSEM$3, LSEM$4, NSEM$1,    *
*                        NSEM$2, LSPARE$1, LSPARE$2, LSPARE$3, LSPARE$3,*
*                        NSPARE$1, NSPARE$1, LPTR$1, LPTR$2, LPTR$3,    *
*                        LPTR$4, LC01NS, LC02NS, LC03NS, LC04NS, LC01NE,*
*                        LC02NE, LC03NE, LC04NE, LC01SZN LC02SZ, LC03ST,*
*                        LC04SZ, NT01NS, NT02NS, NT01NE, NT02NE, NT01SZ,*
*                        NT02SZ, TX01NS, TX02NS, TX03NS, TX04NS, TX01NE,*
*                        TX02NE, TX03NE, TX04NE, TX01SZN TX02SZ, TX03ST,*
*                        TX04SZ, STATTB, STAT$NBR                       *
*  GLOBAL VARIBLES CHANGED:   All the above                             *
*  MODULES CALLED:            None                                      *
*  CALLING MODULES:           main                                      *
*  AUTHOR:                    Capt C.T. Childress                       *
*                                                                       *
*  HISTORY:                                                             *
*           1.1 Capt C.T. Childress - original 544 version              *
*************************************************************************/
INIT$TAB: PROCEDURE;
   DECLARE  IX  BYTE;

   LSEM$1 = DONE;  /* INITIALIZATION OF THE SEMAPHORE FLAGS */
   LSEM$2 = DONE;
   LSEM$3 = DONE;
   LSEM$4 = DONE;

   NSEM$1 = DONE;
   NSEM$2 = DONE;

   LSPARE$1 = 0;   /* THE SPARE ADDRESS LOCATIONS SHOULD BE SET TO THE  */
   LSPARE$2 = 0;   /* SEGMENT NUMBER INTO WHICH THE LOCAL BOARD MEMORY  */
   LSPARE$3 = 0;   /* WILL BE MAPPED INTO SYSTEM MEMORY. THIS VALUE IS  */
   LSPARE$4 = 0;   /* CURRENTLY 0 FOR THE LSPARE$X VARIABLES.           */

   NSPARE$1 = 0;   /* SAME AS FOR LSPARE$X DISCUSSION ABOVE             */
   NSPARE$2 = 0;

   LPTR$1 = 0;
   LPTR$2 = 0;
   LPTR$3 = 0;
   LPTR$4 = 0;

   NPTR$1 = 0;
   NPTR$2 = 0;

   NT01NS = 0;
```

```
*  VERSION:            1.1                                              *
*  NAME:               SNDSEQ                                           *
*  MODULE NUMBER:      3.0                                              *
*  DESCRIPTION:        Sends messages to port 0 of the SBC 544 board    *
*              for a local monitor.  The procesure checks the output    *
*              buffer status in a loop until the buffer is empty, then  *
*              places one byte at a time until the message is           *
*              finished.                                                *
*  PASSED VARIABLES:   MSG, TOTAL                                       *
*  RETURNS:            None                                             *
*  GLOBAL VARIBLES USED:      None                                      *
*  GLOBAL VARIBLES CHANGED:   None                                      *
*  MODULES CALLED:            None                                      *
*  CALLING MODULES:           main                                      *
*  AUTHOR:                    Capt C.T. Childress                       *
*                                                                       *
*  HISTORY:                                                             *
*          1.1 Capt C.T. Childress - original 544 version               *
************************************************************************/
SNDSEQ: PROCEDURE(MSG, TOTAL);
        DECLARE  MSG  ADDRESS,
       CHAROUT BASED MSG(1) BYTE;
        DECLARE  (COUNT, TOTAL) BYTE;

        COUNT = 0;
LOOP:   DO WHILE COUNT < TOTAL;
           DO WHILE NOT (INPUT(US$P0$STAT) AND 1); END;
           OUTPUT(US$P0$DATA) = CHAROUT(COUNT);
               COUNT = COUNT + 1;
        END LOOP;

END SNDSEQ;
/***********************************************************************
*  DATE:                2 OCT 84                                        *
*  VERSION:            1.1                                              *
*  NAME:               LD$TAB$HSKP                                      *
*  MODULE NUMBER:      7.2.2                                            *
*  DESCRIPTION:        This procedure houskeeps the specified buffer    *
*              after loding th user data from the host.  This action    *
*              requires updating the NE pointer of the specified table.*
*              When a pointer comes to the end of a table it is looped *
*              back to the beginning.                                   *
*  PASSED VARIABLES:   TABLE                                            *
*  RETURNS:            None                                             *
*  GLOBAL VARIBLES USED:       LC01NE                                   *
*                      LC02NE, LC03NE, LC04NE, TX01NE, TX02N3, TX03N3,*
*                      TX04NE, NT01NE, NT02NE                           *
*  GLOBAL VARIBLES CHANGED:   All the above                             *
*  MODULES CALLED:            None                                      *
*  CALLING MODULES:           main                                      *
```

```
      NT01NE = 0;
      NT01SZ = FRAME$TABLE$SIZE;

      NT02NS = 0;
      NT02NE = 0;
      NT02SZ = FRAME$TABLE$SIZE;

      LC01NS = 0;
      LC01NE = 0;
      LC01SZ = PACKET$TABLE$SIZE;

      LC02NS = 0;
      LC02NE = 0;
      LC02SZ = PACKET$TABLE$SIZE;

      LC03NS = 0;
      LC03NE = 0;
      LC03SZ = PACKET$TABLE$SIZE;

      LC04NS = 0;
      LC04NE = 0;
      LC04SZ = PACKET$TABLE$SIZE;

      TX01NS = 0;
      TX01NE = 0;
      TX01SZ = DATA$TABLE$SIZE;

      TX02NS = 0;
      TX02NE = 0;
      TX02SZ = DATA$TABLE$SIZE;

      TX03NS = 0;
      TX03NE = 0;
      TX03SZ = DATA$TABLE$SIZE;

      TX04NS = 0;
      TX04NE = 0;
      TX04SZ = DATA$TABLE$SIZE;

      IX = 0;
      DO WHILE IX < STAT$NBR;
         STATTB(IX) = 0;
         IX = IX + 1;
      END;

   END INIT$TAB;

/*****************************************************************************
 *  DATE:               2 OCT 84                                             *
*  AUTHOR:                    Capt C.T. Childress                          *
*                                                                          *
*  HISTORY:                                                                *
*             1.1 Capt C.T. Childress - original 544 version               *
***************************************************************************/
LD$TAB$HSKP: PROCEDURE(TABLE) ;
    DECLARE  TABLE BYTE;

    IF (TABLE >=1 AND TABLE <= 10) THEN     /* 8 FOR REAL, 10 FOR SIM */
        DO CASE TABLE;

          ;                        /* CASE ZERO IS NULL */

           /* CASES 1, 2, 3, 4 FOR LC01(2,3,4) ARE NOT REQUIRED AS */
           /* THE LCOXNS POINTERS ARE INCREMENTED AND CHECKED IN THE */
           /* RECEIVE DATAGRAM INTERRUPT ROUTINES. USE FOR SIMULATION */
           /* PURPOSES ONLY. CASE 9 IS FOR SIMULATION ONLY          */

          DO;
            LC01NE = LC01NE + PACKET$SIZE;
            IF LC01NE >= LC01SZ THEN
               LC01NE = 0;
          END;

          DO;
            LC02NE = LC02NE + PACKET$SIZE;
            IF LC02NE >= LC02SZ THEN
               LC02NE = 0;
          END;

          DO;
            LC03NE = LC03NE + PACKET$SIZE;
            IF LC03NE >= LC03SZ THEN
               LC03NE = 0;
          END;

          DO;
            LC04NE = LC04NE + PACKET$SIZE;
            IF LC04NE >= LC04SZ THEN
               LC04NE = 0;
          END;

         DO;
           TX01NE = TX01NE + DATA$GRAM$SIZE;
           IF TX01NE >= TX01SZ THEN
               TX01NE = 0;
         END;

         DO;
           TX02NE = TX02NE + DATA$GRAM$SIZE;
          IF TX02NE >= TX02SZ THEN
              TX02NE = 0;
        END;

        DO;
          TX03NE = TX03NE + DATA$GRAM$SIZE;
          IF TX03NE >= TX03SZ THEN
              TX03NE = 0;
        END;

        DO;
          TX04NE = TX04NE + DATA$GRAM$SIZE;
          IF TX04NE >= TX04SZ THEN
              TX04NE = 0;
        END;

        DO;
          NT01NE = NT01NE + FRAME$SIZE;
          IF NT01NE >= NT01SZ THEN
              NT01NE = 0;
        END;

        DO;
          NT02NE = NT02NE + FRAME$SIZE;
          IF NT02NE >= NT02SZ THEN
              NT02NE = 0;
        END;

      END;

      ELSE
      DO;
          STATTB(7) = STATTB(7) + 1;
          STATTB(0) = STATTB(0) + 1;
      END;

END LD$TAB$HSKP;

/*************************************************************************
*  DATE:                 2 OCT 84                                        *
*  VERSION:              1.1                                             *
*  NAME:                 SRVC$TAB$HSKP                                   *
*  MODULE NUMBER:        7.4                                             *
*  DESCRIPTION:          This procedure houskeeps the specified buffer   *
             after serving the table.  This action updates the           *
*            next to service (NS) pointer of the specified table.        *
*            When a pointer comes to the end of a table it is looped     *
*            back to the beginning.                                      *
*  PASSED VARIABLES:     TABLE                                           *
*  RETURNS:                None                                            *
*  GLOBAL VARIBLES USED:          LC01NS                                   *
*                          LC02NS, LC03NS, LC04NS, TX01NS, TX02N3, TX03N3,*
*                          TX04NS, NT01NS, NT02NS                          *
*  GLOBAL VARIBLES CHANGED:   All the above                                *
*  MODULES CALLED:            None                                         *
*  CALLING MODULES:           main                                         *
*  AUTHOR:                    Capt C.T. Childress                          *
*                                                                          *
*  HISTORY:                                                                *
*            1.1 Capt C.T. Childress - original 544 version                *
**************************************************************************/
SRVC$TAB$HSKP: PROCEDURE(TABLE) ;
    DECLARE  TABLE  BYTE;

    IF (TABLE >= 1 AND TABLE <= 10) THEN    /* 8 FOR REAL, 10 FOR SIM */
        DO CASE TABLE;

          ;                  /*  CASE ZERO IS NULL  */

          DO;
            LC01NS = LC01NS + PACKET$SIZE;
            IF LC01NS >= LC01SZ THEN
               LC01NS = 0;
          END;

          DO;
            LC02NS = LC02NS + PACKET$SIZE;
            IF LC02NS >= LC02SZ THEN
               LC02NS = 0;
          END;

          DO;
            LC03NS = LC03NS + PACKET$SIZE;
            IF LC03NS >= LC03SZ THEN
               LC03NS = 0;
          END;

          DO;
            LC04NS = LC04NS + PACKET$SIZE;
            IF LC04NS >= LC04SZ THEN
               LC04NS = 0;
          END;

          /* CASES 5, 6, 7, 8 FOR TX01(2,3,4) ARE NOT REQUIRED AS */
          /* THE TXOXNS POINTERS ARE INCREMENTED AND CHECKED IN THE */
          /* TRANSMIT DATAGRAM INTERRUPT ROUTINES. USE FOR SIMULATION */
          /* PURPOSES ONLY. CASE 9 IS FOR SIMULATION ONLY         */

        DO;
```

```
           TX01NS = TX01NS + DATA$GRAM$SIZE;
           IF TX01NS >= TX01SZ THEN
                TX01NS = 0;
         END;

         DO;
           TX02NS = TX02NS + DATA$GRAM$SIZE;
           IF TX02NS >= TX02SZ THEN
                TX02NS = 0;
         END;

         DO;
           TX03NS = TX03NS + DATA$GRAM$SIZE;
           IF TX03NS >= TX03SZ THEN
                TX03NS = 0;
         END;

         DO;
           TX04NS = TX04NS + DATA$GRAM$SIZE;
           IF TX04NS >= TX04SZ THEN
                TX04NS = 0;
         END;

         DO;
           NT01NS = NT01NS + FRAME$SIZE;
           IF NT01NS >= NT01SZ THEN
                NT01NS = 0;
         END;

         DO;
           NT02NS = NT02NS + FRAME$SIZE;
           IF NT02NS >= NT02SZ THEN
                NT02NS = 0;
         END;

        END;

        ELSE
           DO;
               STATTB(8) = STATTB(8) + 1;
               STATTB(0) = STATTB(0) + 1;
           END;

  END SRVC$TAB$HSKP;

/*****************************************************************************/
/*  INCLUDES THE INTERRUPT DRIVER ROUTINES */

$ INCLUDE(INTR3.LOC)
```

```
/*******************************************************************
*  DATE:                2 OCT 84                                   *
*  VERSION:            1.1                                         *
*  NAME:               SEND$PACKET                                 *
*  MODULE NUMBER:      7.3                                         *
*  DESCRIPTION:        This procedure receives an address that     *
*              indicates the local input buffer where the incoming *
*              host data is located, then formats a packet for     *
*              transmission to the datalink layer.  This implementation*
*              changes Phister's format.  Ten bytes are used the   *
*              packet header instead of five bytes.  See Appendix G*
*              for the current packet format.                      *
*                   Byte 0:  GFI / LCGN                            *
*                   Byte 1:  LCN                                   *
*                   Byte 2:  Packet Sequence Number                *
*                   Byte 3:  Source Length and Destination Length  *
*                   Byte 4:  Source Address                        *
*                   Byte 5:  Destionation Address                  *
*                   Byte 6:  Padding byte (total padding = 10 bits *
*                   Byte 7:  2 bits padding and Facilty Length     *
*                   Byte 8:  Facility Code                         *
*                   Byte 9:  Facility Parameter                    *
*  PASSED VARIABLES:   TABLE$PRT, PORT                             *
*  RETURNS:            None                                        *
*  GLOBAL VARIBLES USED:       LPTR$1, LPTR$2, LSEM$1, LSEM$2, LSEM$3,*
*                      LSEM$4, LPTR$3, LPT4$4                      *
*  GLOBAL VARIBLES CHANGED:    All the above                       *
*  MODULES CALLED:             None                                *
*  CALLING MODULES:            main                                *
*  AUTHOR:                     Capt C.T. Childress                 *
*                                                                  *
*  HISTORY:                                                        *
*           1.1 Capt C.T. Childress - original 544 version         *
*******************************************************************/
SEND$PACKET: PROCEDURE(TABLE$PTR, PORT);
    DECLARE TABLE$PTR ADDRESS,
           (PORT) BYTE,
           LCOXTB BASED TABLE$PTR (1) BYTE;

        LCOXTB( 0) = 010H;                         /* GFI/LGCN                */
        LCOXTB( 1) = (SOURCE$ADDRESS AND 0F0H) OR (SHL(DESTINATION$ADDRESS, 4)
                      AND 0FH);                    /* LCN                     */
        LCOXTB( 2) = 0;                            /* SEQUENCE NUMBER         */
        LCOXTB( 3) = 044H;                     /* SRC, DEST FIELD LENGTH   */
        LCOXTB( 4) = SOURCE$ADDRESS;
        LCOXTB( 5) = DESTINATION$ADDRESS;
        LCOXTB( 6) = 0;                            /* PADDING                 */
        LCOXTB( 7) = 010H;                     /* FACILITY FIELD LENGTH    */
        LCOxTB( 8) = 0;                            /* FACILTTY CODE           */
        LCOXTB( 9) = 0;                         /* FACILITY PARAMETER      */
```

```
       DO CASE PORT;
           ;

           DO;
           LPTR$1 = TABLE$PTR;
           LSEM$1 = READY;
           END;

           DO;
           LPTR$2 = TABLE$PTR;
           LSEM$2 = READY;
           END;

           DO;
           LPTR$3 = TABLE$PTR;
           LSEM$3 = READY;
           END;

           DO;
           LPTR$4 = TABLE$PTR;
           LSEM$4 = READY;
           END;

       END;    /* CASE */

END SEND$PACKET;

/***********************************************************************
*  DATE:                        2 OCT 84                              *
*  VERSION:                     1.1                                   *
*  NAME:                        DET$ADDR                              *
*  MODULE NUMBER:               7.1                                   *
*  DESCRIPTION:                 This module determines the destion-   *
*              ation of data from the local host.  A pointer is       *
*              passed to the routine which gives the location of the *
*              packet to be evaluated.   The routine processes the    *
*              control byte, the COUNTRY$CODE, and NEtWORK$CODE of    *
*              the packet.  The routine returns "LN" for local to     *
*              network, "LL" for local to local, and the DESTINATION- *
*              ADDRESS.  An example of a destination address is  21   *
*              for UNID = 2, Channel = 1.                             *
*  PASSED VARIABLES:            TABLE$PTR                             *
*  RETURNS:                     None                                  *
*  GLOBAL VARIBLES USED:        DESTIONATION, DESTIONATION$ADDRESS,   *
*                      STATTB                                         *
*  GLOBAL VARIBLES CHANGED:     All the ones above                    *
*  MODULES CALLED:              None                                  *
*  CALLING MODULES:             ROUTE$IN                              *
*  AUTHOR:   C.T. Childress                                           *
*  HISTORY:                                                              *
*             1.1 C.T. Childress - 30 SEP 85 - original SBC 544          *
*                  implementation                                        *
*************************************************************************/
DET$ADDR: PROCEDURE(TABLE$PTR);

DECLARE LOBITS BYTE,
        HIBITS BYTE,
       IPCNTL BYTE,
        CONTROL$CODE BYTE,
        COUNTRY$CODE BYTE,
        NETWORK$CODE BYTE,
        HOST$CODE BYTE,
       SRC$HOST$CODE BYTE,
       SRC$NET$CODE BYTE,
       SRC$CONT$CODE BYTE,
       SRC$CONTRY$CODE BYTE,
       TABLE$PTR ADDRESS,
       LCOXRX BASED TABLE$PTR(1) BYTE;

   LOBITS = 0;
   HIBITS = 0;
   IPCNTL =0;
   CONTROL$CODE = 0;
   COUNTRY$CODE = 0;
   NETWORK$CODE = 0;
   HOST$CODE = 0;
   DESTINATION$ADDRESS = 0;
   SOURCE$ADDRESS = 0;
   DESTINATION = -1;

   IPCNTL = LCOXRX(1) AND 0E0H;
   IF IPCNTL = 0 THEN
   DO;

    CONTROL$CODE = ROR(LCOXRX(16), 4) AND 0FH;
    IF CONTROL$CODE = 00 THEN
       DO;
        COUNTRY$CODE = LCOXRX(16) AND 0FH;
       IF COUNTRY$CODE = THIS$COUNTRY$CODE THEN  /* ELSE TO UNID 0 */
           DO;
           NETWORK$CODE = ROR(LCOXRX(17), 4) AND 0FH;
           IF (NETWORK$CODE <= MAX$NETWORK$CODE) THEN
               DO;
               IF (COUNTRY$CODE <> THIS$COUNTRY$CODE) OR
                       ((NETWORK$CODE)<> THIS$UNID$NBR) THEN
                   DESTINATION = 1;        /* LOC TO NET */
               ELSE
                    DESTINATION = 0;       /* LOC TO LOC */
               LOBITS = (ROR(LCOXRX(18), 4) AND 0FH);
```

```
             HIBITS = (ROL(LCOXRX(17), 4) AND OFOH);
             HOST$CODE = LOBITS OR HIBITS;
             IF (HOST$CODE >=0) AND (HOST$CODE <= 63) THEN
                 DESTINATION$ADDRESS = (ROL(NETWORK$CODE, 4) AND OFOH) OR 1;
             ELSE
                 IF (HOST$CODE >=64) AND (HOST$CODE <= 127) THEN
                     DESTINATION$ADDRESS = (ROL(NETWORK$CODE, 4) AND OFOH) OR 2;
                 ELSE
                     IF (HOST$CODE >= 128) AND (HOST$CODE <= 191) THEN
                         DESTINATION$ADDRESS = (ROL(NETWORK$CODE, 4) AND OFOH) OR 3;
                     ELSE
                         IF (HOST$CODE >= 192) AND (HOST$CODE <=255) THEN
                             DESTINATION$ADDRESS = (ROL(NETWORK$CODE, 4) AND OFOH) OR 4;
             END;
         ELSE
             DO;  /* NOT WITHIN NETWORK CODES FOR THIS$COUNTRY$CODE */
              STATTB(4) = STATTB(4) + 1;
         END;
         END;
      ELSE
         DO;     /* NOT FOR THIS COUNTRY, SEND TO NETWORK/UNID 0 */
          STATTB(3) = STATTB(3) + 1;
     END;
     END;
ELSE
    DO;    /* IT IS AT THIS POINT THAT OTHER X.121 CONTROL CODES
             SOFTWARE SUPPORT WILL BE INCORPORATED INTO THE NETWORK  */
     STATTB(2) = STATTB(2) + 1;
END;

END;
ELSE
    IF IPCNTL = OCOH THEN
        DO;
        /* IP CONTROL; LOOK AT SUBCODE, CHECK SUBCODE FOR SQUELCH
        OR UNSQUELCH AND ACT ACCORDINGLY */
        END;
    ELSE
        DO;
        DESTINATION = -1;
        STATTB(10) = STATTB(10) + 1;
        END;


IF DESTINATION = 1 THEN    /* LOC TO NET, GET SOURCE INFO */
    DO;
    SRC$NET$CODE = ROR(LCOXRX(13), 4) AND OFH;
    IF (SRC$NET$CODE = THIS$UNID$NBR) THEN
        DO;
        LOBITS = (ROR(LCOXRX(14), 4) AND OFH);
```

```
            HIBITS = (ROL(LCOXRX(13), 4) AND OFOH);
            SRC$HOST$CODE = LOBITS OR HIBITS;
            IF (SRC$HOST$CODE >=0) AND (SRC$HOST$CODE <= 63) THEN
                SOURCE$ADDRESS = (ROL(SRC$NET$CODE, 4) AND OFOH) OR 1;
            ELSE
                IF (SRC$HOST$CODE >=64) AND (SRC$HOST$CODE <= 127) THEN
                    SOURCE$ADDRESS = (ROL(SRC$NET$CODE, 4) AND OFOH) OR 2;
                ELSE
                    IF (SRC$HOST$CODE >= 128) AND (SRC$HOST$CODE <= 191) THEN
                        SOURCE$ADDRESS = (ROL(SRC$NET$CODE, 4) AND OFOH) OR 3;
                    ELSE
                        IF (SRC$HOST$CODE >= 192) AND (SRC$HOST$CODE <=255) THEN
                                SOURCE$ADDRESS = (ROL(SRC$NET$CODE, 4) AND OFOH) OR 4;
            END;
        ELSE
            DO;
            DESTINATION = -1;
             STATTB(9) = STATTB(9) + 1;
            END;

        END;

    IF DESTINATION = -1 THEN
        STATTB(0) = STATTB(0) + 1;

END DET$ADDR;

/*************************************************************************
*  DATE:                          2 OCT 84                              *
*  VERSION:                       1.1                                   *
*  NAME:                          DET$DEST$NL                           *
*  MODULE NUMBER:                 7.5                                   *
*  DESCRIPTION:                   This module determines the destina-   *
*           tion from the  second byte of the packet header.            *
*  PASSED VARIABLES:              TABLE$PTR                             *
*  RETURNS:                       PORT                                  *
*  GLOBAL VARIBLES USED:          NTOXRX, STATTB,                       *
*  GLOBAL VARIBLES CHANGED:       NTOXRX, STATTB                        *
*  MODULES CALLED:                SENDSEQ                               *
*  CALLING MODULES:               ROUTE$IN                              *
*  AUTHOR:    C. T. Childress                                           *
*  HISTORY:                                                             *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544          *
*                implementation.                                        *
*************************************************************************/
DET$ADDR$NL: PROCEDURE(TABLE$PTR) BYTE;

    DECLARE  PORT BYTE,
            TABLE$PTR ADDRESS,
            NTOXRX BASED TABLE$PTR (1) BYTE;
```

```
   PORT = NTOXRX(0) AND 0FH;
   IF (PORT >= 1 AND PORT <= 4) THEN
       RETURN PORT;
   ELSE
       DO;
       PORT = -1;
       STATTB(1) = STATTB(1) + 1;  /*  INCREMENT LOCAL ERROR COUNT  */
       STATTB(0) = STATTB(0) + 1;
       RETURN PORT;
   END;

END DET$ADDR$NL;

/*********************************************************************
*  DATE:                        2 OCT 84                             *
*  VERSION:                     1.1                                  *
*  NAME:                        MOVETO$LOCAL                         *
*  MODULE NUMBER:               7.2                                  *
*  DESCRIPTION:                 This module routes packtes between   *
*               the local host tables.  The datagrams are not formated *
*               as packets, but moved as datagrams.  The procedure   *
*               moves a DATAGRAM$SIZE segment starting at the location *
*               inidicated by TABLE$PTR to the location of the next  *
*               available byte in the designated port.               *
*  PASSED VARIABLES:            TABLE$PTR, PORT                      *
*  RETURNS:                     None                                 *
*  GLOBAL VARIBLES USED:        TX01NE, TX02NE, TX03NE, TX04NE, STATTB *
*                               LC01TX (2, 3, 4)                     *
*  GLOBAL VARIBLES CHANGED:     STATTB, LC01TX (2, 3, 4)             *
*  MODULES CALLED:              None                                 *
*  CALLING MODULES:             ROUTE$IN                             *
*  AUTHOR:   C. T. Childress                                         *
*  HISTORY:                                                          *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544       *
*                implementation.                                     *
*********************************************************************/
MOVETO$LOCAL: PROCEDURE(TABLE$PTR, PORT);

   DECLARE PORT BYTE,
           TABLE$PTR ADDRESS;

    IF(PORT >= 1 AND PORT <= 4) THEN
       DO;
        DO CASE PORT;

           ;     /*   CASE ZERO IS NULL   */

           CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .LC01TX(TX01NE));
```

```
            CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .LC02TX(TX02NE));

            CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .LC03TX(TX03NE));

            CALL MOVE(DATA$GRAM$SIZE, TABLE$PTR, .LC04TX(TX04NE));

        END;               /* END CASE */
       CALL LD$TAB$HSKP(PORT + 4);
       END;
    ELSE DO;
        STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
       STATTB(0) = STATTB(0) + 1;
    END;

END MOVETO$LOCAL;

/**********************************************************************
*  DATE:                           2 OCT 84                           *
*  VERSION:                        1.1                                *
*  NAME:                           ROUTE$IN                           *
*  MODULE NUMBER:                  7.0                                *
*  DESCRIPTION:                    This module routes datagrams from the *
*              local receive tables to local transmit tables, if      *
*              destioned for another local host, or to the datalink   *
*              layer if destioned for another UNID.  The address byte *
*              is evaluated for the destionation processing.  This    *
*              procedure along with ROUTE$OUT is called in and endless *
*              loop by the main program.                              *
*  PASSED VARIABLES:               None                               *
*  RETURNS:                        None                               *
*  GLOBAL VARIBLES USED:           LC01NS, LC02NS, LC03NS, LC04NS,    *
*                          DESTIONATION, STATTB, LSEM$1, LSEM$2, LSEM$3, *
*                          L$SEM$4, NSEM$1, NSEM$2, DESTINATION$ADDRESS *
*  GLOBAL VARIBLES CHANGED:        All of those above                 *
*  MODULES CALLED:                 SENDSEQ, SRVC$TAB$HSKP, DET$ADDR,  *
*                   MOVE$TO$LOCAL, SEND$PACKET, DET$ADDR$NL           *
*  CALLING MODULES:                main                               *
*  AUTHOR:   C. T. Childress                                          *
*  HISTORY:                                                           *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544        *
*                 implementation.                                     *
**********************************************************************/
ROUTE$IN: PROCEDURE;
   DECLARE NETR1 BASED NPTR$1 (1) BYTE,
           NETR2 BASED NPTR$2 (1) BYTE;
               /* NETRX POINTS TO A PACKET SIZED ENTRY */

    IF (((LC01NE - LC01NS) >= DATA$GRAM$SIZE) OR (LC01NS > LC01NE)) THEN
        DO;
        CALL DET$ADDR(.LC01RX(LC01NS + OFFSET1));
        IF DESTINATION = 0 THEN
           DO;
           CALL MOVETO$LOCAL(.LC01RX(LC01NS + OFFSET1), (DESTINATION$ADDRESS AND 0FH));
           END;
        ELSE
           IF DESTINATION = 1 THEN
              DO;
              IF LSEM$1 = DONE THEN
                  CALL SEND$PACKET(.LC01RX(LC01NS), 1);
              END;
             ELSE
              DO;
              STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
              END;
        CALL SRVC$TAB$HSKP(1);
        END;

   IF (((LC02NE - LC02NS) >= DATA$GRAM$SIZE) OR (LC02NS > LC02NE)) THEN
       DO;
        CALL DET$ADDR(.LC02RX(LC02NS + OFFSET1));
        IF DESTINATION = 0 THEN
           DO;
           CALL MOVETO$LOCAL(.LC02RX(LC02NS + OFFSET1), (DESTINATION$ADDRESS AND 0FH));
           END;
        ELSE
           IF DESTINATION = 1 THEN
              DO;
              IF LSEM$2 = DONE THEN
                  CALL SEND$PACKET(.LC02RX(LC02NS), 2);
              END;
             ELSE
              DO;
              STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
              END;
        CALL SRVC$TAB$HSKP(2);
        END;

   IF (((LC03NE - LC03NS) >= DATA$GRAM$SIZE) OR (LC03NS > LC03NE)) THEN
       DO;
        CALL DET$ADDR(.LC03RX(LC03NS + OFFSET1));
        IF DESTINATION = 0 THEN
           DO;
           CALL MOVETO$LOCAL(.LC03RX(LC03NS + OFFSET1), (DESTINATION$ADDRESS AND 0FH));
           END;
        ELSE
           IF DESTINATION = 1 THEN
              DO;
              IF LSEM$3 = DONE THEN
                  CALL SEND$PACKET(.LC03RX(LC03NS), 3);
```

```
                 END;
               ELSE
                 DO;
                 STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
                 END;
           CALL SRVC$TAB$HSKP(3);
           END;

      IF (((LC04NE - LC04NS) >= DATA$GRAM$SIZE) OR (LC04NS > LC04NE)) THEN
          DO;
           CALL DET$ADDR(.LC04RX(LC04NS + OFFSET1));
           IF DESTINATION = 0 THEN
              DO;
              CALL MOVETO$LOCAL(.LC04RX(LC04NS + OFFSET1), (DESTINATION$ADDRESS AND 0FH));
              END;
           ELSE
              IF DESTINATION = 1 THEN
                 DO;
                 IF LSEM$4 = DONE THEN
                     CALL SEND$PACKET(.LC04RX(LC04NS), 4);
                 END;
               ELSE
                 DO;
                 STATTB(L$RI$DEST$ERR) = STATTB(L$RI$DEST$ERR) + 1;
                 END;
           CALL SRVC$TAB$HSKP(4);
           END;

     IF NSEM$1 = READY THEN
         DO;
         DESTINATION$ADDRESS = DET$ADDR$NL(.NETR1(0));
         IF DESTINATION$ADDRESS >= 0 THEN
             CALL MOVETO$LOCAL(.NETR1(OFFSET1), DESTINATION$ADDRESS);
         NSEM$1 = DONE;
         CALL SRVC$TAB$HSKP(9);  /* FOR SIMULATION ONLY */
         END;

     IF NSEM$2 = READY THEN
         DO;
         DESTINATION$ADDRESS = DET$ADDR$NL(.NETR2(0));
         IF DESTINATION$ADDRESS >= 0 THEN
             CALL MOVETO$LOCAL(.NETR2(OFFSET1), DESTINATION$ADDRESS);
         NSEM$2 = DONE;
         CALL SRVC$TAB$HSKP(10); /* FOR SIMULATION ONLY */
         END;

END ROUTE$IN;

/************************************************************************
```

```
*  DATE:                          25 SEP 85                                  *
*  VERSION:                       1.2                                        *
*  NAME:                          ROUTE$OUT                                  *
*  MODULE NUMBER:                 8.0                                        *
*  DESCRIPTION:                   This module routes datagrams from the      *
*                 local transmit tables to the local hosts.  Version 1.2     *
*                 removes the interrupt dirven transmit procedures and       *
*                 replaces them with polled routintes.  This procedure       *
*                 along with ROUTE$IN is called in an endless loop by        *
*                 the main program.                                          *
*  PASSED VARIABLES:              None                                       *
*  RETURNS:                       None                                       *
*  GLOBAL VARIBLES USED:          TRTA$1 (2,3,4), TXTR$1 (2,3,4),            *
*                          SEND$1 (2,3,4), TX01NE (2,3,4), TX01NS (2,3,4)*
*  GLOBAL VARIBLES CHANGED:       All of those above                         *
*  MODULES CALLED:                SENDSEQ, SERVICE$TRANS$1 (2, 3, 4)         *
*  CALLING MODULES:               main                                       *
*  AUTHOR:   Mark Weber                                                      *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - implemented polled transmit        *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544               *
*                  implementation.                                           *
*****************************************************************************/
ROUTE$OUT: PROCEDURE;

   IF (((TX01NE - TX01NS) >= DATA$GRAM$SIZE) OR (TX01NS > TX01NE)) AND
         (NOT SEND$1) THEN
      DO;
      CALL SNDSEQ(.TP$2, SIZE(TP$2));
      IF (TRTA$1 AND (((NOT TXTR$1) AND (NOT RXTA$1)) AND
                  ((NOT RXTR$1) AND (NOT TXTA$1)))) THEN
          DO;
          CALL SNDSEQ(.TP$3, SIZE(TP$3));
          TXTR$1 = TRUE;
          SEND$1 = TRUE;
          OUTPUT(US$PO$DATA) = TR;
          END;
      IF ((NOT TRTA$1) OR ((TXTR$1 AND RXTA$1) AND
                  ((NOT RXTR$1) AND (NOT TXTA$1)))) THEN
          DO;
          CALL SNDSEQ(.(' TO TRANS$1,'), 12);
          CALL SNDSEQ(.TP$4, SIZE(TP$4));
          SEND$1 = TRUE;
          CALL SERVICE$TRANS$1;
          END;
      END;


   IF (((TX02NE - TX02NS) >= DATA$GRAM$SIZE) OR (TX02NS > TX02NE)) AND
         (NOT SEND$2) THEN
      DO;
```

```
    CALL SNDSEQ(.TP$2, SIZE(TP$2));
    IF (TRTA$2 AND (((NOT TXTR$2) AND (NOT RXTA$2)) AND
              ((NOT RXTR$2) AND (NOT TXTA$2)))) THEN
        DO;
        CALL SNDSEQ(.TP$3, SIZE(TP$3));
        TXTR$2 = TRUE;
        SEND$2 = TRUE;
        OUTPUT(US$P1$DATA) = TR;
        END;
    IF ((NOT TRTA$2) OR ((TXTR$2 AND RXTA$2) AND
              ((NOT RXTR$2) AND (NOT TXTA$2)))) THEN
        DO;
        CALL SNDSEQ(.(' TO TRANS$2,'), 12);
        CALL SNDSEQ(.TP$4, SIZE(TP$4));
        SEND$2 = TRUE;
        CALL SERVICE$TRANS$2;
        END;
    END;


IF (((TX03NE - TX03NS) >= DATA$GRAM$SIZE) OR (TX03NS > TX03NE)) AND
        (NOT SEND$3) THEN
    DO;
    CALL SNDSEQ(.TP$2, SIZE(TP$2));
    IF (TRTA$3 AND (((NOT TXTR$3) AND (NOT RXTA$3)) AND
              ((NOT RXTR$3) AND (NOT TXTA$3)))) THEN
        DO;
        CALL SNDSEQ(.TP$3, SIZE(TP$3));
        TXTR$3 = TRUE;
        SEND$3 = TRUE;
        OUTPUT(US$P2$DATA) = TR;
        END;
    IF ((NOT TRTA$3) OR ((TXTR$3 AND RXTA$3) AND
              ((NOT RXTR$3) AND (NOT TXTA$3)))) THEN
        DO;
        CALL SNDSEQ(.(' TO TRANS$3,'), 12);
        CALL SNDSEQ( TP$4, SIZE(TP$4));
        SEND$3 = TRUE;
        CALL SERVICE$TRANS$3;
        END;
    END;


IF (((TX04NE - TX04NS) >= DATA$GRAM$SIZE) OR (TX04NS > TX04NE)) AND
        (NOT SEND$4) THEN
    DO;
    CALL SNDSEQ(.TP$2, SIZE(TP$2));
    IF (TRTA$4 AND (((NOT TXTR$4) AND (NOT RXTA$4)) AND
              ((NOT RXTR$4) AND (NOT TXTA$4)))) THEN
        DO;
```

```
          CALL SNDSEQ(.TP$3, SIZE(TP$3));
          TXTR$4 = TRUE;
          SEND$4 = TRUE;
          OUTPUT(US$P3$DATA) = TR;
          END;
      IF ((NOT TRTA$4) OR ((TXTR$4 AND RXTA$4) AND
                ((NOT RXTR$4) AND (NOT TXTA$4)))) THEN
          DO;
          CALL SNDSEQ(.(' TO TRANS$4,'), 12);
          CALL SNDSEQ(.TP$4, SIZE(TP$4));
          SEND$4 = TRUE;
          CALL SERVICE$TRANS$4;
          END;
      END;

END    ROUTE$OUT;

/**********************************************************************
*  DATE:                          2 OCT 84                            *
*  VERSION:                       1.1                                 *
*  NAME:                          SERVICE$LOOP                        *
*  MODULE NUMBER:                 9.1                                 *
*  DESCRIPTION:                   This module routes a frame back to the *
*              network layer software.  The source and destination   *
*              addresses are swithed.  This procedure simulates only  *
*              one datalink channel ( channel 1 ).                    *
*  PASSED VARIABLES:              TABLE$PTR, PORT                     *
*  RETURNS:                       None                                *
*  GLOBAL VARIBLES USED:          NT01NE, LSEM$1 (2, 3, 4), NPTR$1, NSEM1*
*  GLOBAL VARIBLES CHANGED:       All of those above                  *
*  MODULES CALLED:                LD$TAB$HSKP                         *
*  CALLING MODULES:               LOOP                                *
*  AUTHOR:   C. T. Childress                                          *
*  HISTORY:                                                           *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544        *
*                implementation.                                      *
**********************************************************************/
SERVICE$LOOP: PROCEDURE(TABLE$PTR, PORT);
   DECLARE      INDEX   ADDRESS,
                PORT BYTE,
                TABLE$PTR ADDRESS,
                LC0XRX BASED TABLE$PTR (1) BYTE;

   DO INDEX = 0 TO (PACKET$SIZE - 1);          /* SWAP DATA */
      NT01RX(NT01NE + INDEX + 2) = LC0XRX(INDEX);
   END;
   NT01RX(NT01NE + 0) = 0;
   NT01RX(NT01NE + 1) = 0;
   NT01RX(NT01NE + 3) = ROR(NT01RX(NT01NE + 3), 4);   /* SWAP SRC/DEST */
   NT01RX(NT01NE + 6) = LCOXRX(5);
   NT01RX(NT01NE + 7) = LCOXRX(4);     /* SWAP PACKET HEADER */

   DO INDEX = 0 TO 3;                  /* SWAP IP DEST & SOURCE */
       NT01RX(NT01NE + INDEX + 24) = LCOXRX(INDEX + 26);
       NT01RX(NT01NE + INDEX + 28) = LCOXRX(INDEX + 22);
   END;

   CALL LD$TAB$HSKP(9);
   DO CASE PORT;
       ;
       LSEM$1 = DONE;
       LSEM$2 = DONE;
       LSEM$3 = DONE;
       LSEM$4 = DONE;
   END;
   NPTR$1 = .NT01RX(NT01NS + 2);
   NSEM$1 = READY;

END SERVICE$LOOP;

/**********************************************************************
*  DATE:                          2 OCT 84                            *
*  VERSION:                       1.1                                 *
*  NAME:                          LOOP                                *
*  MODULE NUMBER:                 9.0                                 *
*  DESCRIPTION:                   This module simulates the operaiton *
*              of the SBC 88/45.  Semaphores and pointers are set     *
*              and the frame is then looped back to the sender.       *
*              This routine operates only on datalink channel 1 and   *
*              the frame must be destioned for the same UNID and      *
*              CHANNEL as the was the source.                         *
*  PASSED VARIABLES:              None                                *
*  RETURNS:                       None                                *
*  GLOBAL VARIBLES USED:          LSEM$1 (2, 3, 4), NSEM$1,           *
*                         SEND$1 (2, 3, 4)                            *
*  GLOBAL VARIBLES CHANGED:       All of those above                  *
*  MODULES CALLED:                SERVICE$LOOP                        *
*  CALLING MODULES:               main                                *
*  AUTHOR:   C. T. Childress                                          *
*  HISTORY:                                                           *
*             1.1 C.T. Childress -  2 OCT 84 - original SBC 544       *
*                  implementation.                                    *
**********************************************************************/
LOOP: PROCEDURE;        /* NSEM$1 IS USED FOR THE SIMULATION AND SHOULD NOT
                  BE USED FOR THE 88/45 OPERATIONAL SOFTWARE.  THE 88/45
                  NEEDS ONLY TO INTERROGATE THE LSEM$X VARIABLE.      */
   IF (LSEM$1 = READY AND NSEM$1 = DONE) AND (NOT SEND$1) THEN
      CALL SERVICE$LOOP(LPTR$1, 1);

   IF (LSEM$2 = READY AND NSEM$1 = DONE) AND (NOT SEND$2) THEN
      CALL SERVICE$LOOP(LPTR$2, 2);

   IF (LSEM$3 = READY AND NSEM$1 = DONE) AND (NOT SEND$3) THEN
      CALL SERVICE$LOOP(LPTR$3, 3);

   IF (LSEM$4 = READY AND NSEM$1 = DONE) AND (NOT SEND$4) THEN
      CALL SERVICE$LOOP(LPTR$4, 4);

END LOOP;

/************************************************************************
*  DATE:                         2 OCT 84                               *
*  VERSION:                      1.1                                    *
*  NAME:                         SET$TRTA                               *
*  MODULE NUMBER:                7.0                                    *
*  DESCRIPTION:                  This module performes the TRTA         *
*             handshake reinitialization for each loop in the main      *
*             program.  This procedeure is called in an endless         *
*             loop by the main program.                                 *
*  PASSED VARIABLES:             None                                   *
*  RETURNS:                      None                                   *
*  GLOBAL VARIBLES USED:         TRTA$1 (2, 3, 4), CHAR$X               *
*  GLOBAL VARIBLES CHANGED:      All of those above                     *
*  MODULES CALLED:               SNDSEQ, RXIN$1                         *
*  CALLING MODULES:              main                                   *
*  AUTHOR:    C. T. Childress                                           *
*  HISTORY:                                                             *
*           1.1 C.T. Childress -  2 OCT 84 - original SBC 544           *
*                implementation.                                        *
************************************************************************/
SET$TRTA: PROCEDURE;

   CALL SNDSEQ(.MSG1, SIZE(MSG1));
   HALT;
   DO WHILE ((CHAR$X = 'Y') OR (CHAR$X = 'y'));
       IF ((CHAR$X = 'Y') OR (CHAR$X = 'y')) THEN
           DO;
           CALL SNDSEQ(.MSG2, SIZE(MSG2));
           HALT;
           CHAR$X = CHAR$X - 31H;
           IF ((CHAR$X >= 0) AND (CHAR$X <= 3)) THEN
               DO CASE CHAR$X;
                    TRTA$1 = TRUE;
                    TRTA$2 = TRUE;
                    TRTA$3 = TRUE;
                    TRTA$4 = TRUE;
                END;
            ELSE
                TRTA$1, TRTA$2, TRTA$3, TRTA$4 = FALSE;
            END;
        CALL SNDSEQ(.MSG1, SIZE(MSG1));
        HALT;
    END;

END SET$TRTA;

/**********************************************************************/
/*     THIS IS THE MAIN BODY OF THE PROGRAM                           */
/**********************************************************************/
/*****************************************************************
*  DATE:                         2 OCT 84                         *
*  VERSION:                      1.1                              *
*  NAME:                         main                             *
*  MODULE NUMBER:                None                             *
*  DESCRIPTION:                  This is the main program module. *
*              The main program is set up to make successive calls to *
*              the ROUTE$IN AND ROUTE$OUT procedures.  This allows  *
*              the SBC544 to process local host messages.  An       *
*              addtitional call to LOOP serves   to provide the      *
*              dummy 88/45 interface procedures.  When configured    *
*              with an operation SBC 88/45, the call to LOOP must be *
*              removed.                                              *
*  PASSED VARIABLES:             None                             *
*  RETURNS:                      None                             *
*  GLOBAL VARIBLES USED:         FOREVER                          *
*  GLOBAL VARIBLES CHANGED:      FOREVER                          *
*  MODULES CALLED:               SNDSEQ, INITIALIZE$BOARD, INIT,  *
*                                INIT$TAB, SET$TRTA, ROUTE$OUT,   *
*                                ROUTE$IN, LOOP                   *
*  CALLING MODULES:              None                             *
*  AUTHOR:   C. T. Childress                                      *
*  HISTORY:                                                       *
*             1.1 C.T. Childress -  2 OCT 84 - original SBC 544   *
*                 implementation.                                 *
*****************************************************************/

BEGIN:

    DISABLE;
    CALL S$MASK(SIM$MASK);
    CALL INITIALIZE$BOARD;
    CALL SNDSEQ(.HEADER, SIZE(HEADER));
    CALL SNDSEQ(.TP$5, SIZE(TP$5));
    CALL INIT;
    CALL SNDSEQ(.TP$6, SIZE(TP$6));
    CALL INIT$TAB;
   CALL SNDSEQ(.TP$7, SIZE(TP$7));
   ENABLE;

   CALL SET$TRTA;
    FOREVER = TRUE;
   CALL SNDSEQ(.TP$8, SIZE(TP$8));
    DO WHILE FOREVER;
        CALL ROUTE$IN;
       CALL ROUTE$OUT;
       CALL LOOP;
    END;

END MAIN;

/****************************** THE END *******************************/
```

INTR3.LOC

The following listing is the include file used with the source code for OP544.SRC. This include file contains the modified I/O procedures for the polled transmit ports of the SBC 544.

```
INCLUDE SOURCE CODE FOR OP544.SRC  (INTR3.LOC)

/************************************************************************
*  DATE:                           25 SEP 85                            *
*  VERSION:                        1.2                                  *
*  NAME:                           RXIN$1                               *
*  MODULE NUMBER:                  7.6                                  *
*  DESCRIPTION:                    This procedure is used with the      *
*              SET$TRTA routne.  This procedure is used when channel    *
*              one of the SBC544 must serve as a monitor and read input*
*              values from the terminal.                                *
*  PASSED VARIABLES:               None                                 *
*  RETURNS:                        None                                 *
*  GLOBAL VARIBLES USED:           CHAR$X                               *
*  GLOBAL VARIBLES CHANGED:        CHAR$X                               *
*  MODULES CALLED:                 None                                 *
*  CALLING MODULES:                SET$TRTA                             *
*  AUTHOR:   Mark Weber                                                 *
*  HISTORY:                                                             *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544          *
*                implementation.                                        *
************************************************************************/
RXIN$1: PROCEDURE INTERRUPT 8;

   CHAR$X = INPUT(US$PO$DATA);
   OUTPUT(US$PO$DATA) = CHAR$X;
   OUTPUT(IC$PORTA) = IC$EOI;
END RXIN$1;

/************************************************************************
*  DATE:                           25 SEP 85                            *
*  VERSION:                        1.2                                  *
*  NAME:                           TXOUT$1                              *
*  MODULE NUMBER:                  7.6                                  *
*  DESCRIPTION:                    This procedure is polled by the      *
*              SET$TRTA routne.  This procedure is used when channel    *
*              one of the SBC544 must serve as a monitor and read input*
*              values from the terminal.                                *
*  PASSED VARIABLES:               None                                 *
*  RETURNS:                        None                                 *
*  GLOBAL VARIBLES USED:           None                                 *
*  GLOBAL VARIBLES CHANGED:        None                                 *
*  MODULES CALLED:                 None                                 *
*  CALLING MODULES:                None                                 *
*  AUTHOR:   Mark Weber                                                 *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - changed to polled routine     *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544          *
*                implementation.                                        *
************************************************************************/
/*   THIS PROCEDURE IS USED WHEN THE LOCAL CHANNEL SERVES ONLY AS A MONITOR
TXOUT$1: PROCEDURE ;
   OUTPUT(IC$PORTA)   = IC$EOI;
```

```
INCLUDE SOURCE CODE FOR OP544.SRC  (INTR3.LOC)

END TXOUT$1;
*/
/*************************************************************************
*  DATE:                         25 SEP 85                               *
*  VERSION:                      1.2                                     *
*  NAME:                         SERVICE$RCV$1                           *
*  MODULE NUMBER:                7.6                                     *
*  DESCRIPTION:                  This procedure is interrupt driven and  *
*              operates at all times once intialized.  The procedure     *
*              checks for valid handshakes between the host and UND,     *
*              then receives one byte of data at a time.  The datagram   *
*              is loaded into the receive table of PACKET$TABLE$SIZE     *
*              offset by the amount OFFSET$1.  Procedure SERVICE$RCV$1   *
*              was added to the program in version 1.2.                  *
*  PASSED VARIABLES:             None                                    *
*  RETURNS:                      None                                    *
*  GLOBAL VARIBLES USED:         LC01NE, BYTES$RECV$1, RXTR$1, RXTA$1,   *
*                         SEMD$1 TXTA$1, TXTR$1                          *
*  GLOBAL VARIBLES CHANGED:      All of those above                      *
*  MODULES CALLED:               SNDSEQ,                                 *
*  CALLING MODULES:              NONE (interrupt driven)                 *
*  AUTHOR:   Mark Weber                                                  *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - added SERVICE$RCV$1            *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544           *
*                 implementation.                                        *
*************************************************************************/
/*
SERVICE$RCV$1: PROCEDURE INTERRUPT 8;

   CHAR$2 = INPUT(US$PO$DATA);

   IF ((NOT TRTA$1) OR ((RXTR$1 AND TXTA$1) AND
            ((NOT TXTR$1) AND (NOT RXTA$1)))) THEN
       DO;
        LC01RX(LC01NE + OFFSET1) = CHAR$1;
       BYTES$RECV$1 = BYTES$RECV$1 + 1;
        LC01NE = LC01NE + 1;
       IF BYTES$RECV$1 >= DATA$GRAM$SIZE THEN
           DO;
           LC01NE = LC01NE + OFFSET1;
           IF(LC01NE >= LC01SZ) THEN
               LC01NE = 0;
           BYTES$RECV$1 = 0;
           RXTR$1 = FALSE;
           TXTA$1 = FALSE;
           SEND$1 = FALSE;
           END;
       END;

   IF TRTA$1 THEN
```

```
      DO;
      IF CHAR$1 = TA THEN
          IF ((TXTR$1 AND (NOT RXTA$1)) AND
                  ((NOT RXTR$1) AND (NOT TXTA$1))) THEN
              DO;
              RXTA$1 = TRUE;
              SEND$1 = FALSE;
              CALL SNDSEQ(.TP$3C, SIZE(TP$3C));
              END;
      IF CHAR$1 = TR THEN
          IF (((NOT RXTR$1) AND (NOT TXTA$1)) AND
                  ((NOT TXTR$1) AND (NOT RXTA$1))) THEN
              DO;
              RXTR$1 = TRUE;
              TXTA$1 = TRUE;
              SEND$1 = TRUE;
              CALL SNDSEQ(.TP$3B, SIZE(TP$3B));
              CALL SNDSEQ(.TP$3A, SIZE(TP$3A));
              OUTPUT(US$PO$DATA) = TA;
              END;
      END;

   OUTPUT(IC$PORTA) = IC$EOI;

END SERVICE$RCV$1;
*/
/*********************************************************************
*  DATE:                           2 OCT 84                          *
*  VERSION:                        1.1                               *
*  NAME:                           SERVICE$RCV$2                     *
*  MODULE NUMBER:                  7.7                               *
*  DESCRIPTION:                    This procedure is interrupt driven and *
*              operates at all times once intialized.  The procedure *
*              checks for valid handshakes between the host and UND, *
*              then receives one byte of data at a time.  The datagram *
*              is loaded into the receive table of PACKET$TABLE$SIZE *
*              offset by the amount OFFSET$1.                        *
*  PASSED VARIABLES:               None                              *
*  RETURNS:                        None                              *
*  GLOBAL VARIBLES USED:           LCO2NE, BYTES$RECV$2, RXTR$2, RXTA$2, *
*                          SEMD$2  TXTA$2, TXTR$2                    *
*  GLOBAL VARIBLES CHANGED:        All of those above                *
*  MODULES CALLED:                 SNDSEQ,                           *
*  CALLING MODULES:                NONE (interrupt driven)           *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:                                                          *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544       *
*                implementation.                                     *
*********************************************************************/
SERVICE$RCV$2: PROCEDURE INTERRUPT 10;
```

```
INCLUDE SOURCE CODE FOR OP544.SRC  (INTR3.LOC)

   CHAR$2 = INPUT(US$P1$DATA);

   IF ((NOT TRTA$2) OR ((RXTR$2 AND TXTA$2) AND
              ((NOT TXTR$2) AND (NOT RXTA$2)))) THEN
       DO;
        LCO2RX(LCO2NE + OFFSET1) = CHAR$2;
       BYTES$RECV$2 = BYTES$RECV$2 + 1;
        LCO2NE = LCO2NE + 1;
       IF BYTES$RECV$2 >= DATA$GRAM$SIZE THEN
           DO;
           LCO2NE = LCO2NE + OFFSET1;
           IF(LCO2NE >= LCO2SZ) THEN
               LCO2NE = 0;
           BYTES$RECV$2 = 0;
           RXTR$2 = FALSE;
           TXTA$2 = FALSE;
           SEND$2 = FALSE;
           END;
       END;

   IF TRTA$2 THEN
       DO;
       IF CHAR$2 = TA THEN
           IF ((TXTR$2 AND (NOT RXTA$2)) AND
                  ((NOT RXTR$2) AND (NOT TXTA$2))) THEN
               DO;
               RXTA$2 = TRUE;
               SEND$2 = FALSE;
               CALL SNDSEQ(.TP$3C, SIZE(TP$3C));
               END;
       IF CHAR$2 = TR THEN
           IF (((NOT RXTR$2) AND (NOT TXTA$2)) AND
                  ((NOT TXTR$2) AND (NOT RXTA$2))) THEN
               DO;
               RXTR$2 = TRUE;
               TXTA$2 = TRUE;
               SEND$2 = TRUE;
               CALL SNDSEQ(.TP$3B, SIZE(TP$3B));
               CALL SNDSEQ(.TP$3A, SIZE(TP$3A));
               OUTPUT(US$P1$DATA) = TA;
               END;
       END;

   OUTPUT(IC$PORTA) = IC$EOI;

END SERVICE$RCV$2;

/*************************************************************************
*  DATE:                          2 OCT 84                               *
```

```
                                                                          *
*  VERSION:                          1.1                                  *
*  NAME:                             SERVICE$RCV$3                        *
*  MODULE NUMBER:                    7.8                                  *
*  DESCRIPTION:                      This procedure is interrupt driven and *
*               operates at all times once intialized.  The procedure      *
*               checks for valid handshakes between the host and UND,      *
*               then receives one byte of data at a time.  The datagram    *
*               is loaded into the receive table of PACKET$TABLE$SIZE      *
*               offset by the amount OFFSET$1.                             *
*  PASSED VARIABLES:                 None                                 *
*  RETURNS:                          None                                 *
*  GLOBAL VARIBLES USED:             LCO2NE, BYTES$RECV$3, RXTR$3, RXTA$3, *
*                            SEMD$3  TXTA$3, TXTR$3                       *
*  GLOBAL VARIBLES CHANGED:          All of those above                   *
*  MODULES CALLED:                   SNDSEQ,                              *
*  CALLING MODULES:                  NONE (interrupt driven)              *
*  AUTHOR:   Mark Weber                                                   *
*  HISTORY:                                                               *
*             1.1 C.T. Childress -  2 OCT 84 - original SBC 544           *
*                   implementation.                                       *
*************************************************************************/
SERVICE$RCV$3: PROCEDURE INTERRUPT 12;

   CHAR$3 = INPUT(US$P2$DATA);

   IF ((NOT TRTA$3) OR ((RXTR$3 AND TXTA$3) AND
              ((NOT TXTR$3) AND (NOT RXTA$3)))) THEN
       DO;
        LCO3RX(LCO3NE + OFFSET1) = CHAR$3;
       BYTES$RECV$3 = BYTES$RECV$3 + 1;
        LCO3NE = LCO3NE + 1;
       IF BYTES$RECV$3 >= DATA$GRAM$SIZE THEN
           DO;
           LCO3NE = LCO3NE + OFFSET1;
           IF(LCO3NE >= LCO3SZ) THEN
               LCO3NE = 0;
           BYTES$RECV$3 = 0;
           RXTR$3 = FALSE;
           TXTA$3 = FALSE;
           SEND$3 = FALSE;
           END;
       END;

   IF TRTA$3 THEN
       DO;
       IF CHAR$3 = TA THEN
           IF ((TXTR$3 AND (NOT RXTA$3)) AND
                   ((NOT RXTR$3) AND (NOT TXTA$3))) THEN
               DO;
               RXTA$3 = TRUE;
```

```
                SEND$3 = FALSE;
                CALL SNDSEQ(.TP$3C, SIZE(TP$3C));
                END;
        IF CHAR$3 = TR THEN
            IF (((NOT RXTR$3) AND (NOT TXTA$3)) AND
                    ((NOT TXTR$3) AND (NOT RXTA$3))) THEN
                DO;
                RXTR$3 = TRUE;
                TXTA$3 = TRUE;
                SEND$3 = TRUE;
                CALL SNDSEQ(.TP$3B, SIZE(TP$3B));
                CALL SNDSEQ(.TP$3A, SIZE(TP$3A));
                OUTPUT(US$P2$DATA) = TA;
                END;
        END;

    OUTPUT(IC$PORTA) = IC$EOI;

END SERVICE$RCV$3;

/*********************************************************************
*  DATE:                            2 OCT 84                         *
*  VERSION:                         1.1                              *
*  NAME:                            SERVICE$RCV$4                    *
*  MODULE NUMBER:                   7.9                              *
*  DESCRIPTION:                     This procedure is interrupt driven and *
*               operates at all times once intialized.  The procedure *
*               checks for valid handshakes between the host and UND, *
*               then receives one byte of data at a time.  The datagram *
*               is loaded into the receive table of PACKET$TABLE$SIZE *
*               offset by the amount OFFSET$1.                        *
*  PASSED VARIABLES:                None                             *
*  RETURNS:                         None                             *
*  GLOBAL VARIBLES USED:            LC04NE, BYTES$RECV$4, RXTR$4, RXTA$4, *
*                            SEMD$4 TXTA$4, TXTR$4                   *
*  GLOBAL VARIBLES CHANGED:         All of those above               *
*  MODULES CALLED:                  SNDSEQ,                          *
*  CALLING MODULES:                 NONE (interrupt driven)          *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:                                                          *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544       *
*                implementation.                                     *
*********************************************************************/
SERVICE$RCV$4: PROCEDURE INTERRUPT 14;

    CHAR$4 = INPUT(US$P3$DATA);

    IF ((NOT TRTA$4) OR ((RXTR$4 AND TXTA$4) AND
                ((NOT TXTR$4) AND (NOT RXTA$4)))) THEN
        DO;
         LC04RX(LC04NE + OFFSET1) = CHAR$4;
        BYTES$RECV$4 = BYTES$RECV$4 + 1;
         LC04NE = LC04NE + 1;
        IF BYTES$RECV$4 >= DATA$GRAM$SIZE THEN
            DO;
            LC04NE = LC04NE + OFFSET1;
            IF(LC04NE >= LC04SZ) THEN
                LC04NE = 0;
            BYTES$RECV$4 = 0;
            RXTR$4 = FALSE;
            TXTA$4 = FALSE;
            SEND$4 = FALSE;
            END;
        END;

    IF TRTA$4 THEN
        DO;
        IF CHAR$4 = TA THEN
            IF ((TXTR$4 AND (NOT RXTA$4)) AND
                    ((NOT RXTR$4) AND (NOT TXTA$4))) THEN
                DO;
                RXTA$4 = TRUE;
                SEND$4 = FALSE;
                CALL SNDSEQ(.TP$3C, SIZE(TP$3C));
                END;
        IF CHAR$4 = TR THEN
            IF (((NOT RXTR$4) AND (NOT TXTA$4)) AND
                    ((NOT TXTR$4) AND (NOT RXTA$4))) THEN
                DO;
                RXTR$4 = TRUE;
                TXTA$4 = TRUE;
                SEND$4 = TRUE;
                CALL SNDSEQ(.TP$3B, SIZE(TP$3B));
                CALL SNDSEQ(.TP$3A, SIZE(TP$3A));
                OUTPUT(US$P3$DATA) = TA;
                END;
        END;

    OUTPUT(IC$PORTA) = IC$EOI;

END SERVICE$RCV$4;

/****************************************************************************/
/*  PROCEDURE   SERVICE$TRANS$1   SENDS DATA OUT CHANNEL ONE                */
/*                                                                          */
/*      THE PURPOSE OF THIS PROCEDURE IS TO SEND A DATAGRAM OF DATA OUT     */
/*      LOCAL CHANNEL ONE. A SINGLE BYTE IS TRANSMITTED EACH TIME AN        */
/*      INTERRUPT IS GENERATED BY USART ONE ON THE TRANSMIT SIDE.           */
/*                                                                          */
/*        INPUT - NONE (INTERRUPT DRIVEN)                                         */
/*        PROCESSING - SENDS A BYTE OF DATA FROM THE TRANSMIT ARRAY TO            */
/*                THE DATA PORT.       WHEN MESSAGE IS DONE IT RESETS             */
/*                THE TRANSMIT INTERRUPT AND SETS TRANS$1$RDY TO TRUE.            */
/*         OUTPUT - NONE.                                                         */
/*         INTERFACE - CALLED BY MAIN PROCEDURE.                                  */
/*                                                                                */
/********************************************************************************/

/*****************************************************************************
*  DATE:                         25 SEP 85                                  *
*  VERSION:                      1.2                                        *
*  NAME:                         SERVICE$TRANS$1                            *
*  MODULE NUMBER:                8.4                                        *
*  DESCRIPTION:                  This procedure is a polled transmit        *
*              service routine that is called in an endless loop            *
*              through procedure ROUTE$OUT.  The procedure transmits        *
*              a DATAGRAM$SIZE segment of data in the local trasnmit        *
*              table.  The receive interrupts stay active during the        *
*              operation of this prodecure.                                 *
*  PASSED VARIABLES:             None                                       *
*  RETURNS:                      None                                       *
*  GLOBAL VARIBLES USED:         LC01NE, BYTES$SENT$1, TXTR$1, TXTA$1,      *
*                         SEMD$1 RXTA$1, RXTR$1                             *
*  GLOBAL VARIBLES CHANGED:      All of those above                         *
*  MODULES CALLED:               SNDSEQ,                                    *
*  CALLING MODULES:              ROUTE$OUT                                  *
*  AUTHOR:   Mark Weber                                                     *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - polled transmit routines          *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544              *
*                 implementation.                                           *
*****************************************************************************/
SERVICE$TRANS$1: PROCEDURE ;

      DO;
         DO WHILE BYTES$SENT$1 < DATA$GRAM$SIZE;
             DO WHILE NOT (INPUT(US$PO$STAT) AND 1); END;
             OUTPUT(US$PO$DATA) = LC01TX(TX01NS);
             BYTES$SENT$1 = BYTES$SENT$1 + 1;
             TX01NS = TX01NS + 1;
         END;
         IF BYTES$SENT$1 >= DATA$GRAM$SIZE THEN
         DO;
             BYTES$SENT$1 = 0;
             IF TX01NS >= TX02SZ THEN
                 TX01NS = 0;
             TXTR$1 = FALSE;
             RXTA$1 = FALSE;
             SEND$1 = FALSE;
             CALL SNDSEQ(.TP$4A, SIZE(TP$4A));
```

```
            END;
        END;


END SERVICE$TRANS$1;

/*****************************************************************************
*  DATE:                            25 SEP 85                                *
*  VERSION:                         1.2                                      *
*  NAME:                            SERVICE$TRANS$2                          *
*  MODULE NUMBER:                   8.5                                      *
*  DESCRIPTION:                     This procedure is a polled transmit      *
*              service routine that is called in an endless loop             *
*              through procedure ROUTE$OUT.  The procedure transmits         *
*              a DATAGRAM$SIZE segment of data in the local trasnmit         *
*              table.  The receive interrupts stay active during the         *
*              operation of this prodecure.                                  *
*  PASSED VARIABLES:                None                                     *
*  RETURNS:                         None                                     *
*  GLOBAL VARIBLES USED:            LCO2NE, BYTES$SENT$2, TXTR$2, TXTA$2,    *
*                           SEMD$2  RXTA$2, RXTR$2                           *
*  GLOBAL VARIBLES CHANGED:         All of those above                       *
*  MODULES CALLED:                  SNDSEQ,                                  *
*  CALLING MODULES:                 ROUTE$OUT                                *
*  AUTHOR:   Mark Weber                                                      *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - polled transmit routines           *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544               *
*                implementation.                                             *
*****************************************************************************/
SERVICE$TRANS$2: PROCEDURE ;

        DO;
            DO WHILE BYTES$SENT$2 < DATA$GRAM$SIZE;
                DO WHILE NOT (INPUT(US$P1$STAT) AND 1); END;
                OUTPUT(US$P1$DATA) = LCO2TX(TXO2NS);
                BYTES$SENT$2 = BYTES$SENT$2 + 1;
                TXO2NS = TXO2NS + 1;
            END;
            IF BYTES$SENT$2 >= DATA$GRAM$SIZE THEN
            DO;
                BYTES$SENT$2 = 0;
                IF TXO2NS >= TXO2SZ THEN
                    TXO2NS = 0;
                TXTR$2 = FALSE;
                RXTA$2 = FALSE;
                SEND$2 = FALSE;
                CALL SNDSEQ(.TP$4A, SIZE(TP$4A));
            END;
        END;
```

```
END SERVICE$TRANS$2;

/*********************************************************************
*  DATE:                            25 SEP 85                        *
*  VERSION:                         1.2                              *
*  NAME:                            SERVICE$TRANS$3                  *
*  MODULE NUMBER:                   8.6                              *
*  DESCRIPTION:                     This procedure is a polled transmit  *
*            service routine that is called in an endless loop       *
*            through procedure ROUTE$OUT.  The procedure transmits    *
*            a DATAGRAM$SIZE segment of data in the local trasnmit    *
*            table.  The receive interrupts stay active during the    *
*            operation of this prodecure.                             *
*  PASSED VARIABLES:                None                             *
*  RETURNS:                         None                             *
*  GLOBAL VARIBLES USED:            LC03NE, BYTES$SENT$3, TXTR$3, TXTA$3,  *
*                           SEMD$3 RXTA$3, RXTR$3                    *
*  GLOBAL VARIBLES CHANGED:         All of those above               *
*  MODULES CALLED:                  SNDSEQ,                          *
*  CALLING MODULES:                 ROUTE$OUT                        *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - polled transmit routines   *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544       *
*                implementation.                                     *
*********************************************************************/
SERVICE$TRANS$3: PROCEDURE ;

      DO;
          DO WHILE BYTES$SENT$3 < DATA$GRAM$SIZE;
              DO WHILE NOT (INPUT(US$P2$STAT) AND 1); END;
              OUTPUT(US$P2$DATA) = LC03TX(TX03NS);
              BYTES$SENT$3 = BYTES$SENT$3 + 1;
              TX03NS = TX03NS + 1;
          END;
          IF BYTES$SENT$3 >= DATA$GRAM$SIZE THEN
          DO;
              BYTES$SENT$3 = 0;
              IF TX03NS >= TX03SZ THEN
                  TX03NS = 0;
              TXTR$3 = FALSE;
              RXTA$3 = FALSE;
              SEND$3 = FALSE;
              CALL SNDSEQ(.TP$4A, SIZE(TP$4A));
          END;
      END;

END SERVICE$TRANS$3;
```

```
/*************************************************************************
*  DATE:                          25 SEP 85                             *
*  VERSION:                       1.2                                   *
*  NAME:                          SERVICE$TRANS$4                       *
*  MODULE NUMBER:                 8.7                                   *
*  DESCRIPTION:                   This procedure is a polled transmit   *
*            service routine that is called in an endless loop          *
*            through procedure ROUTE$OUT.  The procedure transmits      *
*            a DATAGRAM$SIZE segment of data in the local trasnmit      *
*            table.  The receive interrupts stay active during the      *
*            operation of this prodecure.                               *
*  PASSED VARIABLES:              None                                  *
*  RETURNS:                       None                                  *
*  GLOBAL VARIBLES USED:          LC04NE, BYTES$SENT$4, TXTR$4, TXTA$4, *
*                         SEMD$4 RXTA$4, RXTR$4                         *
*  GLOBAL VARIBLES CHANGED:       All of those above                    *
*  MODULES CALLED:                SNDSEQ,                               *
*  CALLING MODULES:               ROUTE$OUT                             *
*  AUTHOR:   Mark Weber                                                 *
*  HISTORY:  1.2 Mark Weber - 25 SEP 85 - polled transmit routines      *
*            1.1 C.T. Childress -  2 OCT 84 - original SBC 544          *
*                implementation.                                        *
*************************************************************************/
SERVICE$TRANS$4: PROCEDURE ;

       DO;
           DO WHILE BYTES$SENT$4 < DATA$GRAM$SIZE;
               DO WHILE NOT (INPUT(US$P3$STAT) AND 1); END;
               OUTPUT(US$P3$DATA) = LC04TX(TX04NS);
               BYTES$SENT$4 = BYTES$SENT$4 + 1;
               TX04NS = TX04NS + 1;
           END;
           IF BYTES$SENT$4 >= DATA$GRAM$SIZE THEN
           DO;
               BYTES$SENT$4 = 0;
               IF TX04NS >= TX04SZ THEN
                   TX04NS = 0;
               TXTR$4 = FALSE;
               RXTA$4 = FALSE;
               SEND$4 = FALSE;
               CALL SNDSEQ(.TP$4A, SIZE(TP$4A));
           END;
       END;

END SERVICE$TRANS$4;

/******************************************************************************/
```

APPENDIX N

DATA LINK SIMULATION SOFTWARE

1. NETX25.SRC - Main program module . . . . N - 2
2. LAPB0.SRC - Module with LAP B procedures. . . . . . . N - 45
3. LAPB1.SRC - Module with LAP B procedures. . . . . . . N - 84
4. PCKT.SRC - Module with Packet Layer procedures . . . . N - 97

```
$TITLE('UNID II NETWORK TEST PROGRAM, 18 NOV 85')
$XREF OPTIMIZE(2)
/**********************************************************************
*  DATE:  18 NOV 85                                                   *
*  VERSION:  1.2                                                      *
*  TITLE:  ISO layer 2 LAP B simulation                               *
*  FILENAME:  NETX25.SRC                                              *
*  COORDINATOR:  Capt Mark W. Weber                                   *
*  PROJECT:  UNIT II                                                  *
*  OPERATING SYSTEM:  INTEL SYSTEM III/230                            *
*  LANGUAGE:  PL/M 86                                                 *
*  USE:  This file requires no includes, but must be linked with LAPB0.OBJ, *
*        LAPB1.OBJ, PCKT.OBJ, and SMALL.LIB.  The program may be linked and *
*        with the SUBMIT file NETX.25.CSD.                            *
*  CONTENTS:  MAIN - main processing routine                          *
*             INIT$N$TAB - intializes the necessary tables            *
*             HEX$ASC -  converts HEX to ASCII                        *
*             ASC$HEX - converts ASCII to HEX                         *
*             VALID$HEX - validates HEX numbers                       *
*             SENDSEQ - writes messages to the system console         *
*             LD$TAB$HSKP  - updates the transmit tables              *
*             SRVC$TAB$HSKP - updates the receive tables              *
*             BUILD$I$FRAME - contstructs the proper I frame          *
*             SERVICE$LOOP - sends transmitted frames to the receive table *
*             SERVICE$XMIT$A - dummy transmit procedure, channel A    *
*             SERVICE$XMIT$B - dummy transmit prodedure, channel B    *
*             LOAD - loads packtes to send to the datalink transmit tables *
*             READTAB - reads received data packets                   *
*             FIND$I$FRAME$ - finds the first I frame in the table    *
*             INITACK - resets transmit counters and timers           *
*             ROUTE$OUT - sends frames found in the datalink tramsmit tables *
*             ROUTE$IN - processes received frames located in datalink or *
*                        network receive tables                       *
*             START$DM$MODE - initializes the UNID for SABM operation *
*             READ$LINE - reads system console inputs                 *
*             START$INFO$XER - SABM mode operation                    *
*  FUNCTION:  Simulates the operation of the SBC 88/45 in the UNID II using *
*             the datalink layer as described by CCITT recommendation X.25. *
*             ISIS calls are used to provide a user interface and to trace *
*             the process flow of the LAP B protocol imployed by the CCITT *
*              X.25 recommendation.                                   *
*  HISTORY:  1.2 Mark Weber - implemented X.25 datalink procedures    *
*            1.1 TRANSLATED 5 APR 84 by C.T. Chrildress               *
**********************************************************************/


MAIN:  DO;
```

```
/********************  EXTERNAL PROCEDURES FOR ISIS SYSTEM CALLS *************/

DQ$DECODE$EXCEPTION:   PROCEDURE (ERRNUM, EXCEPTION$P, STATUS) EXTERNAL;
                       DECLARE ERRNUM WORD;
                       DECLARE (EXCEPTION$P, STATUS) POINTER;
                       END DQ$DECODE$EXCEPTION;

DQ$CLOSE:   PROCEDURE (AFTN, STATUS) EXTERNAL;
            DECLARE AFTN WORD, STATUS POINTER;
            END DQ$CLOSE;

DQ$DETACH:  PROCEDURE (CONNECTION, EXCEPT$P) EXTERNAL;
            DECLARE CONNECTION WORD, EXCEPT$P POINTER;
            END DQ$DETACH;

DQ$EXIT:    PROCEDURE (COMPLETION$CODE) EXTERNAL;
            DECLARE COMPLETION$CODE WORD;
            END DQ$EXIT;

DQ$ATTACH:  PROCEDURE(PATH$P, STATUS) WORD EXTERNAL;
            DECLARE (PATH$P, STATUS) POINTER;
            END DQ$ATTACH;

DQ$CREATE:  PROCEDURE (PATH$P, STATUS) WORD EXTERNAL;
            DECLARE (PATH$P, STATUS) POINTER;
            END DQ$CREATE;

DQ$OPEN:    PROCEDURE (AFTN, MODE, NUM$BUF, STATUS) EXTERNAL;
            DECLARE AFTN WORD, STATUS POINTER;
            DECLARE (MODE, NUM$BUF) BYTE;
            END DQ$OPEN;

DQ$READ:    PROCEDURE (AFTN, BUFFER, COUNT, STATUS) ADDRESS EXTERNAL;
            DECLARE (AFTN, COUNT) WORD;
            DECLARE (BUFFER, STATUS) POINTER;
            END DQ$READ;

DQ$WRITE:   PROCEDURE (AFTN, BUFFER, COUNT, STATUS) EXTERNAL;
            DECLARE (AFTN, COUNT) WORD;
            DECLARE (BUFFER, STATUS) POINTER;
            END DQ$WRITE;

SND$DM:      PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
            DECLARE (CHANNEL, P$BIT) BYTE;
            END SND$DM;

SND$SABM:    PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
            DECLARE (CHANNEL, P$BIT) BYTE;
            END SND$SABM;
```

```
RCV$IN$SEQ:    PROCEDURE (CHANNEL, SEQ$NUM) BYTE EXTERNAL;
               DECLARE (CHANNEL, SEQ$NUM) BYTE;
               END RCV$IN$SEQ;

RCV$I$FRAME:   PROCEDURE (CHANNEL, SEQ$NUM) EXTERNAL;
               DECLARE (CHANNEL, SEQ$NUM) BYTE;
               END RCV$I$FRAME;

SND$RR:      PROCEDURE (CHANNEL, P$BIT, ADDR) EXTERNAL;
            DECLARE (CHANNEL, P$BIT, ADDR) BYTE;
            END SND$RR;

UP$DATE$SEND$STATE:  PROCEDURE (CHANNEL, SEQ$NUM) EXTERNAL;
                    DECLARE (CHANNEL, SEQ$NUM) BYTE;
                    END UP$DATE$SEND$STATE;

SND$REJ:      PROCEDURE (CHANNEL, P$BIT, ADDR) EXTERNAL;
             DECLARE (CHANNEL, P$BIT, ADDR) BYTE;
             END SND$REJ;

SND$RNR:      PROCEDURE (CHANNEL, P$BIT, ADDR) EXTERNAL;
             DECLARE (CHANNEL, P$BIT, ADDR) BYTE;
             END SND$RNR;

SND$UA:       PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
             DECLARE (CHANNEL, P$BIT) BYTE;
             END SND$UA;

SND$DISC:     PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
             DECLARE (CHANNEL, P$BIT) BYTE;
             END SND$DISC;

SND$CMDR:     PROCEDURE (CHANNEL, P$BIT, CNTL$ERROR, ERROR$STATUS) EXTERNAL;
             DECLARE (CHANNEL, P$BIT, CNTL$ERROR, ERROR$STATUS) BYTE;
             END SND$CMDR;

RCV$SABM:     PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
             DECLARE (CHANNEL, P$BIT) BYTE;
             END RCV$SABM;

RCV$UA:       PROCEDURE (CHANNEL, F$BIT) EXTERNAL;
             DECLARE (CHANNEL, F$BIT)BYTE;
             END RCV$UA;

RCV$REJ:      PROCEDURE (CHANNEL, P$BIT, SEQ$NUM, ADDR) EXTERNAL;
             DECLARE (CHANNEL, P$BIT, SEQ$NUM, ADDR) BYTE;
             END RCV$REJ;

RCV$RNR:      PROCEDURE (CHANNEL, P$BIT, SEQ$NUM, ADDR) EXTERNAL;
             DECLARE (CHANNEL, P$BIT, SEQ$NUM, ADDR) BYTE;
```

```
          END RCV$RNR;

RCV$RR:    PROCEDURE (CHANNEL, P$BIT, SEQ$NUM, ADDR) EXTERNAL;
          DECLARE (CHANNEL, P$BIT, SEQ$NUM, ADDR) BYTE;
          END RCV$RR;

RCV$DISC:  PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
          DECLARE (CHANNEL, P$BIT) BYTE;
          END RCV$DISC;

RCV$CMDR:  PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
          DECLARE (CHANNEL, P$BIT) BYTE;
          END RCV$CMDR;

RCV$DM:    PROCEDURE (CHANNEL, P$BIT) EXTERNAL;
          DECLARE (CHANNEL, P$BIT) BYTE;
          END RCV$DM;

FRAME$PRESENT:  PROCEDURE (CHANNEL) BYTE EXTERNAL;
               DECLARE CHANNEL BYTE;
               END FRAME$PRESENT;

PRINTI:    PROCEDURE (NUM) EXTERNAL;
          DECLARE NUM INTEGER;
          END PRINTI;

DSPLY$FRAME$HDR:  PROCEDURE (CHANNEL) EXTERNAL;
                 DECLARE CHANNEL BYTE;
                 END DSPLY$FRAME$HDR;

TIME$DELAY$CHA:   PROCEDURE EXTERNAL;
                 END TIME$DELAY$CHA;

TIME$DELAY$CHB:   PROCEDURE EXTERNAL;
                 END TIME$DELAY$CHB;

ROUTE$PACKET:     PROCEDURE EXTERNAL;
                  END ROUTE$PACKET;

READ$TAB:         PROCEDURE EXTERNAL;
                  END READ$TAB;

FIND$IFRAME:      PROCEDURE (TABLE) BYTE EXTERNAL;
                  DECLARE TABLE BYTE;
                  END FIND$IFRAME;

DECLARE (CHANNEL, P$BIT, F$BIT, SEQ$NUM, CNTL$ERROR, ERROR$STATUS) BYTE;

DECLARE (ACTUAL, STATUS) ADDRESS;
DECLARE STATUS$PTR (81) BYTE;
DECLARE BUFFER (128) BYTE;
DECLARE (R$CONN, W$CONN, F$CONN) ADDRESS PUBLIC;
DECLARE    CR           LITERALLY 'ODH',
     LF          LITERALLY 'OAH';
DECLARE CR$LF (2) BYTE DATA (ODH, OAH);
DECLARE        MESSAGE(*) BYTE DATA(ODH, OAH,
'THIS IS THE TEST MESSAGE                    THIS IS THE TEST MESSAGE!!!!!');


/**************************** END EXTERNALS *****************************/


DECLARE
        FALSE       LITERALLY 'OH', /* USE AS FLAGS TO TEST */
        TRUE        LITERALLY 'OFFH', /* BITS FOR BRANCHING */
        CONCTC      LITERALLY 'OD5H', /* NETWORK MONITOR CTC PORT ADDRESS */
        CONCMD      LITERALLY 'ODFH',
                          /* NETWORK MONITOR USART COMMAND PORT ADDRESS */
        CONDAT      LITERALLY 'ODEH',
                          /* NETWORK MONITOR USART DATA PORT ADDRESS */
        NET$RI$DEST$ERR LITERALLY '10', /* NET ROUTE$IN DEST ERROR ENTRY */
        NET$RO$DEST$ERR LITERALLY '11', /* NET ROUTE$OUT DEST ERROR ENTRY */
        PACKET$SIZE     LITERALLY '138', /* PACKET IS 138 BYTE BLOCK */
        PACKETS$IN$TABLE LITERALLY '10', /* # PACKETS IN TABLE */
        PACKET$TABLE$SIZE LITERALLY '1380',
            I$FRAME$SIZE      LITERALLY '140',
        U$FRAME$SIZE      LITERALLY '2',
        S$FRAME$SIZE      LITERALLY '2',
        CMDR$FRAME$SIZE   LITERALLY '5',
        FRAMES$IN$TABLE   LITERALLY '10',
        FRAME$TABLE$SIZE  LITERALLY '1400',
        DATA$SIZE         LITERALLY '128',
        IP$DATA$SIZE      LITERALLY '96',
        TCP$DATA$SIZE     LITERALLY '72',
        TEST              LITERALLY '0';

        /* NETWORK VARIABLES FOR THIS UNID */

        /* NOTES: 1.  THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
              2.  THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH THIS
              UNID IS LOCATED.
              3.  MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
              ARE CURRENTLY OPERATIONAL.  CC = 0000 IS RESERVED
              FOR THE DELNET MONITOR.
              4.  MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
              CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
              5.  FOR DETAILED INFORMATION ON THE ABOVE, REFER TO
              PHISTER'S THESIS, APPENDIX D.                        */

DECLARE
```

```
   THIS$UNID$NBR LITERALLY '02H',  /* UNIQUE ADDRESS OF THIS UNID */
   THIS$COUNTRY$CODE LITERALLY '01H', /* COUNTRY WHERE THIS UNID RESIDES */
   MAX$COUNTRY$CODE  LITERALLY '01H', /* COUNTRIES CURRENTLY OPERATIONAL */
   MAX$NETWORK$CODE  LITERALLY '03H', /* NUMBER OF UNIDS OPERATIONAL IN CC */


   STAT$NBR   LITERALLY '20',         /* NUMBER OF ENTRIES IN STATUS TABLE */

      /* VARIABLES USED IN N.MAIN$U2 AND N.INSIO$U2 */
   CTCNOA      BYTE PUBLIC,
                 /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL A */
   CTCNOB      BYTE PUBLIC,
                /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL B */
   MAXNOA      LITERALLY '2',      /* PREVIOUSLY 64H = 100D */
                /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL A */
   MAXNOB      LITERALLY '2',      /* PREVIOUSLY 64H = 100D */
                /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL B */
   RETRANS$A   BYTE,
               /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   RETRANS$B   BYTE,
               /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$A    LITERALLY '6',
               /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$B    LITERALLY '6';
               /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */

DECLARE BUSYSTATUS LITERALLY '0FFH',
      NMBR$MSK    LITERALLY '07H',
      ESC         LITERALLY '1BH',
      EOT         LITERALLY '04H';
DECLARE ASCII(*)   BYTE PUBLIC DATA('0123456789ABCDEF');
DECLARE TEMP(24) WORD PUBLIC INITIAL('************************');
DECLARE MSGNUM     BYTE PUBLIC;
DECLARE OUT$TAB$FULL  BYTE PUBLIC;
DECLARE A$ADD        LITERALLY '0000$0011B',  /*LAP B ADDRESS BYTE FORMATS */
        B$ADD        LITERALLY '0000$0001B';
DECLARE FILE$OUT     LITERALLY '0FFH';
DECLARE READY        LITERALLY '1';
DECLARE DONE         LITERALLY '2';

DECLARE I$CNTL       LITERALLY '0000$0001B',  /*LAP B FRAME CONTROL BYTE FORMATS*/
        RR$CNTL      LITERALLY '0000$0001B',
       RNR$CNTL    LITERALLY '0000$0101B',
       REJ$CNTL    LITERALLY '0000$1001B',
       DM$CNTL     LITERALLY '0000$1111B',
       SABM$CNTL   LITERALLY '0010$1111B',
       DISC$CNTL   LITERALLY '0100$0011B',
       UA$CNTL     LITERALLY '0110$0011B',
       CMDR$CNTL   LITERALLY '1000$0111B';
DECLARE P$BIT$MASK  LITERALLY '010H';
```

```
   /*********  GLOBAL CONSTANTS USED BY LAP B POCESSES ***************/

DECLARE (SABM$MODE$A, SABM$MODE$B)  BYTE PUBLIC;
DECLARE (RNR$MODE$A, RNR$MODE$B)    BYTE PUBLIC;
DECLARE (UA$ACK$CHA, UA$ACK$CHB)    BYTE PUBLIC;
DECLARE DM$MODE                     BYTE PUBLIC;
DECLARE U$CMD$QUE$A STRUCTURE(ACK BYTE, CMD BYTE) PUBLIC;
DECLARE U$CMD$QUE$B STRUCTURE(ACK BYTE, CMD BYTE) PUBLIC;

/****************************************************************************/
/* DEFINITIONS FOR THE NETWORK SERIAL INPUT/OUTPUT USARTS                  */
/****************************************************************************/

DECLARE
         BAUD$LSB        BYTE,
        BAUD$MSB         BYTE,
        NUM$BYTES$SENT   INTEGER;

   /* MORE TO BE ADDED LATER */

/****************************************************************************/
/* ADDITIONAL GENERAL DECLARES NEEDED FOR THIS PROGRAM                     */
/****************************************************************************/

DECLARE        TIMCHA           BYTE PUBLIC,
           TIMCHB          BYTE PUBLIC,
           HSKP$ERR        INTEGER PUBLIC;
   /* MORE TO BE ADDED LATER */

/****************************************************************************/
/* DATA TABLES USED IN THIS PROGRAM                                        */
/****************************************************************************/

DECLARE
         NT01RX(FRAME$TABLE$SIZE)  BYTE PUBLIC,
        NT01NS  INTEGER PUBLIC,
        NT01NE  INTEGER PUBLIC,
        NT01SZ  INTEGER PUBLIC,

        NT02RX(FRAME$TABLE$SIZE)  BYTE PUBLIC,
        NT02NS  INTEGER PUBLIC,
        NT02NE  INTEGER PUBLIC,
        NT02SZ  INTEGER PUBLIC,

        NT01TX(FRAME$TABLE$SIZE)  BYTE PUBLIC,
        TX01NS  INTEGER PUBLIC,
        TX01NE  INTEGER PUBLIC,
        TX01SZ  INTEGER PUBLIC,

        NT02TX(FRAME$TABLE$SIZE)  BYTE PUBLIC,
       TX02NS  INTEGER PUBLIC,
       TX02NE  INTEGER PUBLIC,
       TX02SZ  INTEGER PUBLIC,

       LCNTTB(PACKET$TABLE$SIZE)   BYTE PUBLIC,
       LCNTNS  INTEGER PUBLIC,
       LCNTNE  INTEGER PUBLIC,
       LCNTSZ  INTEGER PUBLIC,

       NTLCTB(PACKET$TABLE$SIZE)   BYTE PUBLIC,
       NTLCNS  INTEGER PUBLIC,
       NTLCNE  INTEGER PUBLIC,
       NTLCSZ  INTEGER PUBLIC,

        I$FRAME$QUE(FRAME$TABLE$SIZE)  BYTE PUBLIC,
        I$FRAME$QUE$NS INTEGER PUBLIC,
        I$FRAME$QUE$NE INTEGER PUBLIC,
        I$FRAME$QUE$SZ INTEGER PUBLIC,

       STATTB(STAT$NBR)    BYTE;

/***********************************************************************/
/*      SEMAPHORE AND TABLE POINTER DECLAREATIONS                      */
/***********************************************************************/

DECLARE        SYS$MEM$BASE    LITERALLY '08001H'; /* SYSTEM MEMORY BASE ADDRESS */

DECLARE        SYS$BASE    BYTE;

       /* DECLARATIONS FOR FLAGS AND TABLES IN SYSTEM MEMORY */

DECLARE
   (LSEM$1, LSEM$2, LSEM$3,                      /* LOCAL TO NET SEMAPHORE AND */
   LSEM$4, NSEM$1, NSEM$2) BYTE PUBLIC,          /* NET TO LOCAL SEMAPHORE */

   (LPTR$1, LSPARE$1, LPTR$2, LSPARE$2,          /* LOC TO NET PACKET PTR */
   LPTR$3, LSPARE$3, LPTR$4, LSPARE$4,           /* LOC TO NET PACKET PTR */
   NPTR$1, NSPARE$1, NPTR$2, NSPARE$2) POINTER PUBLIC;
                                                 /* NET TO LOC PACKET PTR */


/*
DECLARE        FRAME   STRUCTURE(ADDRES       BYTE,
                                 CONTROL      BYTE,
                                 PACKET$DATA(PACKET$SIZE) BYTE);

DECLARE        PACKET  STRUCTURE(GFI$LGCN     BYTE,
                                 LCN          BYTE,
                                 SEQUENCE     BYTE,
                                 SRC$DST$LEN  BYTE,
                                SOURCE         BYTE,
                                DEST           BYTE,
                                 PADDING        BYTE,
                                FAC$LEN        BYTE,
                                FAC$CODE       BYTE,
                                FAC$PARAM      BYTE,
                                DATAM(DATA$SIZE) BYTE);

DECLARE         IPDATA  STRUCTURE(VERS$IHL  BYTE,
                                TYPE$SERV BYTE,
                                TOT$LEN1  BYTE,
                                TOT$LEN2  BYTE,
                                ID$1      BYTE,
                                ID$2      BYTE,
                                FLAG$FRAG BYTE,
                                FRAGOFF   BYTE,
                                TIME$LIVE BYTE,
                                PROTO     BYTE,
                                CHKSUM$1  BYTE,
                                CHKSUM$2  BYTE,
                                SORC$ADDR(4) BYTE,
                                DEST$ADDR(4) BYTE,
                                OPTIONS(3) BYTE,
                                PADDING   BYTE,
                                DATAM(IP$DATA$SIZE) BYTE);

DECLARE         TCPDATA STRUCTURE(SOURCE$PORT(2)    BYTE,
                                DESTIN$PORT(2)    BYTE,
                                SEQUEN$NUM(4)     BYTE,
                                ACK$NUM(4)        BYTE,
                                DATA$OFF$PLUS     BYTE,
                                RESERV$PLUS       BYTE,
                                WINDOW(2)         BYTE,
                                CHECKSUM(2)       BYTE,
                                URGENT$PTR(2)     BYTE,
                                OPTIONS(3)        BYTE,
                                PADDING           BYTE,
                                DATAM(TCP$DATA$SIZE) BYTE);
*/

/* MISCELLANEOUS DECLARATIONS  */

DECLARE
    FOREVER BYTE PUBLIC,
    DESTINATION WORD PUBLIC,        /* DESTINATION OF A FRAME */
    SEQ$NUM$A   BYTE PUBLIC,        /* ACKNOWLEDGE VARIABLE DECLARATIONS */
    SEQ$NUM$B   BYTE PUBLIC,
    SEND$STATE$A    BYTE PUBLIC,
    SEND$STATE$B    BYTE PUBLIC,
    RCV$STATE$A     BYTE PUBLIC,
        RCV$STATE$B     BYTE PUBLIC;

DECLARE      STARTUP$HDR(*) BYTE DATA(CR,LF,
'                            UNID II #3 NETWORK OS',CR,LF,
'                           VERS 1.2,  18 NOV 1985',CR,LF,
'                                   EXECUTING',CR,LF);

DECLARE      TP$1(*) BYTE DATA(CR,LF,
'TP$1             ENTERING INIT$N$TAB PROCEDURE');
DECLARE      TP$2(*) BYTE DATA(CR,LF,
'TP$2             ENTERING INSIO PROCEDURE');
DECLARE      TP$3(*) BYTE DATA(CR,LF,
'TP$3             STARTING DO FOREVER LOOP -------->');
DECLARE      TP$4(*) BYTE DATA(CR,LF,
'TP$4             ISIDE    DO FOREVER LOOP =>');
DECLARE      TP$5(*) BYTE DATA(CR,LF,
'TP$5             INCOMING FRAME LOCATED IN NETWORK CHANNEL A');
/*           TP$6(*) BYTE is located in module LAPB                 */
/*           TP$7(*) BYTE is located in module LAPB                 */
DECLARE      TP$8(*) BYTE DATA(CR,LF,
'TP$8             FRAME IS INCOMING S FRAME');
DECLARE      TP$9(*) BYTE DATA(CR,LF,
'TP$9             THIS SEQ$BIT$A = 1');
DECLARE      TP$10(*) BYTE DATA(CR,LF,
'TP$10            THIS SEQ$BIT$A = 0');
DECLARE      TP$11(*) BYTE DATA(CR,LF,
'TP$11            FRAME IS INCOMING I FRAME');
DECLARE      TP$12(*) BYTE DATA(CR,LF,
'TP$12            INPUT SEQ$BIT$A = 1');
DECLARE      TP$13(*) BYTE DATA(CR,LF,
'TP$13            INPUT SEQ$BIT$A = 0');
DECLARE      TP$14(*) BYTE DATA(CR,LF,
'TP$14            INCOMING FRAME LOCATED IN NETWORK CHANNEL B');
/*           TP$15(*) BYTE is located in module LAPB                 */
/*           TP$16(*) BYTE is located in module LAPB                 */
DECLARE      TP$17(*) BYTE DATA(CR,LF,
'TP$17            FRAME IS INCOMING S FRAME');
DECLARE      TP$18(*) BYTE DATA(CR,LF,
'TP$18            THIS SEQ$BIT$B = 1');
DECLARE      TP$19(*) BYTE DATA(CR,LF,
'TP$19            THIS SEQ$BIT$B = 0');
DECLARE      TP$20(*) BYTE DATA(CR,LF,
'TP$20            FRAME IS INCOMING I FRAME').
DECLARE      TP$21(*) BYTE DATA(CR,LF,
'TP$21            INPUT SEQ$BIT$B = 1');
DECLARE      TP$22(*) BYTE DATA(CR,LF,
'TP$22            INPUT SEQ$BIT$B = 0');
/*           TP$23 TP$24, TP$25 IS IN MODULE PCKT              */
DECLARE      TP$26(*) BYTE PUBLIC DATA(CR,LF,
'TP$26            OUTGOING FRAME LOCATED IN NETWORK CHANNEL A');
```

```
DECLARE      TP$27(*) BYTE DATA(CR,LF,
'TP$27           FRAME IS NT01TX TO NT02RX TRANSFER');
DECLARE      TP$28(*) BYTE DATA(CR,LF,
'TP$28           OUTGOING FRAME LOCATED IN NETWORK CHANNEL B');
DECLARE      TP$29(*) BYTE DATA(CR,LF,
'TP$29           FRAME IS NT02TX TO NT01RX TRANSFER');

/*           TP$ 30 THROUGH TP$37 ARE CONTIANED IN MODULE LAPB1    */
DECLARE      TP$38(*) BYTE DATA(CR,LF,
'TP$38           BUILDING I FRAME FOR CHANNEL A');
DECLARE      TP$39(*) BYTE DATA(CR,LF,
'TP$39           BUILDING I FRAME FOR CHANNEL B');
DECLARE      TP$40(*) BYTE DATA(CR,LF,
'TP$40           BUILDING S FRAME FOR CHANNEL A');
DECLARE      TP$41(*) BYTE DATA(CR,LF,
'TP$41           BUILDING S FRAME FOR CHANNEL B');
DECLARE      TP$42(*) BYTE DATA(CR,LF,
'TP$42           EXIT DM MODE / ENTERING START INFO XFER');
DECLARE      TP$43(*) BYTE DATA(CR,LF,
'TP$43         < END OF ONE INFO XFER ITERATION >');
DECLARE      TP$44(*) BYTE DATA(CR,LF,
'TP$44           HAVE EXITED DO FOREVER LOOP <----',CR,LF);
DECLARE      TP$45(*) BYTE DATA(CR,LF,
'TP$45           DATA IS NT01RX TO NTLCTB TRANSFER');
DECLARE      TP$46(*) BYTE DATA(CR,LF,
'TP$46           DATA IS NT02RX TO NTLCTB TRANSFER');
DECLARE      TP$47(*) BYTE DATA(CR,LF,
'TP$47           ERROR: FRAME DESIGNATION NOT B$ADD');
DECLARE      TP$48(*) BYTE DATA(CR,LF,
'TP$48           ERROR: FRAME DESIGNATION NOT A$ADD');
/*           TP$49(*) is located in module LAPB                */
/*           TP$50(*) is located in module LAPB                */
/*           TP$51(*) is located in module LAPB                */
DECLARE      TP$52(*) BYTE DATA(CR,LF,
'TP$52           INPUT SEQ$BIT$B = 0');

DECLARE      TP$53A(*) BYTE DATA(CR,LF,
'TP$53A          GENERATING I FRAME BACK TO SENDER');
DECLARE         TP$53B(*) BYTE DATA(CR,LF,
'TP$53B          S/U FRAMES DUMPED');
DECLARE         TP$54(*) BYTE DATA(CR,LF,
'TP$54           LOADED TEST PACKET IN LCNTTB');
/*           TP$55 located in module LAPB1.SRC              */
DECLARE         TP$56(*) BYTE DATA(CR,LF,
'TP$56           RETRANS$A >= 10; DUMPED FRAME');
DECLARE         TP$57(*) BYTE DATA(CR,LF,
'TP$57          RETRANS$B >= 10; DUMPED FRAME');

DECLARE         TP$58(*) BYTE DATA(CR,LF,
'TP$58           ACK A = TRUE');
```

```
DECLARE    TP$59(*) BYTE DATA(CR,LF,
'TP$59          ACK B = TRUE');

DECLARE         MSG1(*) BYTE DATA(CR,LF,
'Do you want to load the test message? ');
DECLARE         MSG2(*) BYTE DATA(CR,LF,
'Do you want to stop the test? ');
DECLARE         MSG3(*) BYTE DATA(CR,LF,
'How many packets to load (1-9)? ');
DECLARE         MSG4(*) BYTE DATA(CR,LF,
'Send to which UNID (1 or 3)? ');
DECLARE         MSG5(*) BYTE DATA(CR,LF,
'Send any U or S frames? ');
DECLARE         MSG6(*) BYTE DATA(CR,LF,
'ENTER:  0 - SND$CMDR,    1 - SND$RP,    2 - SND$RNR,     3 - SND$REJ',CR,LF,
'        4 - SND$UA,      5 - SND$DISC,  6 - SND$DM,      7 - SND$SABM',CR,LF);

/****************************************************************************/
/************************************************************************
*  DATE:                30 SEP 84                                       *
*  VERSION:             1.0                                             *
*  NAME:                ERR$CHK                                         *
*  MODULE NUMBER:       7.3                                             *
*  DESCRIPTION:         Checks for errors in the status returned by     *
*              ISIS systems calls.  IF an error occurs an oderly exit  *
*              from the program is provided and an ISIS error           *
*              is printed.
*  PASSED VARIABLES:    None                                            *
*  RETURNS:             None                                            *
*  GLOBAL VARIBLES USED:        STATUS                                  *
*  GLOBAL VARIBLES CHANGED:     None                                    *
*  MODULES CALLED:              DQ$DECODE, DQ$WRITE, DQ$EXIT            *
*  CALLING MODULES:             ALL EXTERNALLY DECALRED ISIS CALLS      *
*  AUTHOR:   C.T. Chiledress                                            *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M         *
*                 version                                               *
************************************************************************/
ERR$CHK: PROCEDURE PUBLIC;
   IF STATUS <> 0 THEN         /* <> 0 IS AN ERROR */
      DO;
         CALL DQ$DECODE$EXCEPTION ( STATUS, @STATUS$PTR, @STATUS);
         CALL DQ$WRITE (W$CONN, @STATUS$PTR(1), STATUS$PTR(0), @STATUS);
         CALL DQ$WRITE (W$CONN, @CRLF, 2, @STATUS);
         CALL DQ$EXIT (0);
      END;
END ERR$CHK;

/****************************************************************************/
/************************************************************************
*  DATE:                 28 AUG 85                                      *
```

```
                                                                         *
*  VERSION:               2.0                                            *
*  NAME:                  INIT$N$TAB                                     *
*  MODULE NUMBER:         6.0                                            *
*  DESCRIPTION:           Initalizes the varibles used for the newtwork  *
*            tables, sequence counters, and time out counters.          *
*  PASSED VARIABLES:      None                                           *
*  RETURNS:               None                                           *
*  GLOBAL VARIBLES USED:      TIMCHA, TIMCHB, CTCNOA, CTCNOB, FOREVER,   *
*                         MSGNUM, TRETRANS$A,RETRANS$B, NT01NS, NT01NE,  *
*                         NT01SZ, NT02NS, NT02NE, NT02SZ, LCNTNS, LCNTNE,*
*                         LCNTSZ, NTLCNS, NTLCNE, NTLCSZ, OUFRAME$CHA$NS,*
*                         TX01NE, TX01SZ, U$CMD$QUE$A, U$CMD$QUE$B       *
*                         TX02NS, TX02NE,                                *
*                         TX02SZ                                         *
*  GLOBAL VARIBLES CHANGED:   All the above                              *
*  MODULES CALLED:            None                                       *
*  CALLING MODULES:           main                                       *
*  AUTHOR:                    Capt Mark Weber                            *
*                                                                        *
*  HISTORY:  2.0 Capt Mark Weber - changed the sequence varibles used    *
*            1.0 Capt C.T. Childress - original translated PL/M          *
*                version                                                 *
*************************************************************************/
INIT$N$TAB: PROCEDURE;

   DECLARE INDEX BYTE;

      /* VARIABLES FOR BOTH NETWORK CHANNELS */
   SEND$STATE$A = FALSE;          /* SEQ NUM GOING INTO FRAME */
   SEND$STATE$B = FALSE;          /* SEQ NUM GOING INTO FRAME */
   RCV$STATE$A  = FALSE;          /* CURRENT SEQUENCE NUM  */
   RCV$STATE$B  = FALSE;          /* CURRENT SEQUENCE NUM  */

   TIMCHA = TRUE;            /* FLAG FOR CH A WAIT LOOP */
   TIMCHB = TRUE;            /* FLAG FOR CH B WAIT LOOP */
   CTCNOA = 0;
   CTCNOB = 0;

   FOREVER = TRUE;         /* FLAG FOR MAIN LOOP */
   MSGNUM = 0;

   RETRANS$A = 0;
   RETRANS$B = 0;

   NT01NS = 0;
   NT01NE = 0;
   NT01SZ = FRAME$TABLE$SIZE;

   NT02NS = 0;
   NT02NE = 0;
   NT02SZ = FRAME$TABLE$SIZE;

   TX01NS = 0;
   TX01NE = 0;
   TX01SZ = FRAME$TABLE$SIZE;

   TX02NS = 0;
   TX02NE = 0;
   TX02SZ = FRAME$TABLE$SIZE;

   LCNTNS = 0;
   LCNTNE = 0;
   LCNTSZ = PACKET$TABLE$SIZE;

   NTLCNS = 0;
   NTLCNE = 0;
   NTLCSZ = PACKET$TABLE$SIZE;

   LSEM$1 = DONE;  /* INITIALIZATION OF THE SEMAPHORE FLAGS */
   LSEM$2 = DONE;
   LSEM$3 = DONE;
   LSEM$4 = DONE;

   NSEM$1 = DONE;
   NSEM$2 = DONE;

   LSPARE$1 = @LCNTTB(0);  /* THE SPARE ADDRESS LOCATIONS SHOULD BE SET TO THE  */
   LSPARE$2 = @LCNTTB(0);  /* SEGMENT NUMBER INTO WHICH THE LOCAL BOARD MEMORY  */
   LSPARE$3 = @LCNTTB(0);  /* WILL BE MAPPED INTO SYSTEM MEMORY. THIS VALUE IS  */
   LSPARE$4 = @LCNTTB(0);  /* CURRENTLY 0 FOR THE LSPARE$X VARIABLES.           */

   NSPARE$1 = @LCNTTB(0);  /* SAME AS FOR LSPARE$X DISCUSSION ABOVE             */
   NSPARE$2 = @LCNTTB(0);

   LPTR$1 = @LCNTTB(0);
   LPTR$2 = @LCNTTB(0);
   LPTR$3 = @LCNTTB(0);
   LPTR$4 = @LCNTTB(0);

   NPTR$1 = @LCNTTB(0);
   NPTR$2 = @LCNTTB(0);

          /*   INITIALIZE THE U$CMD$QUE                */

      U$CMD$QUE$A.ACK, U$CMD$QUE$B.ACK = TRUE;
      U$CMD$QUE$A.CMD, U$CMD$QUE$B.CMD = DISC$CNTL;

      /*     INITIALIZE PACKET DEFALTS USED BY THIS SIMULATION
   PACKET.GFI$LGCN =          01H;
   PACKET.SEQUENCE =            0;
   PACKET.SRC$DST$LEN =       044H;
   PACKET.SOURCE =            013H;
   PACKET.DEST =              011H;
   PACKET.PADDING =             0;
   PACKET.FAC$LEN =           010;
   PACKET.FAC$CODE =            0;
   PACKET.FAC$PARAM =           0;      */

END INIT$N$TAB;

/****************************************************************************
PROCEDURES TO CONVERT HEX TO ASCII FOR USE WITH DISPLAYING A FRAME

****************************************************************************/
/**************************************************************************
*  DATE:                30 SEP 84                                         *
*  VERSION:             1.0                                               *
*  NAME:                HEX$ASC                                           *
*  MODULE NUMBER:       9.3.7.2                                           *
*  DESCRIPTION:         Convers a HEX number to a printable ASCII         *
*  PASSED VARIABLES:    B                                                 *
*  RETURNS:             W (the ASCII letters)                             *
*  GLOBAL VARIBLES USED:        ASCII(*)                                  *
*  GLOBAL VARIBLES CHANGED:     None                                      *
*  MODULES CALLED:              None                                      *
*  CALLING MODULES:             DSPLY$FRAME$HDR                           *
*  AUTHOR:                      Capt C.T. Childress                       *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M           *
*                version                                                  *
**************************************************************************/
HEX$ASC: PROCEDURE(B) WORD PUBLIC;
   DECLARE B BYTE;
   DECLARE W WORD;

   W = ASCII(SHR(B,4) AND 0FH);
   W = ROL(W,8) AND 0FF00H;
   W = W OR ASCII(B AND 0FH);
   W = ROL(W,8);

   RETURN W;

END HEX$ASC;
/**************************************************************************
*  DATE:                        30 SEP 84                                 *
*  VERSION:                     1.0                                       *
*  NAME:                        ASC$HEX                                   *
*  MODULE NUMBER:               7.4                                       *
*  DESCRIPTION:                 Converts an ASCII representatin of a HEX  *
*              number into a HEX word.                                 *
*  PASSED VARIABLES:         C - the ASCII                             *
*  RETURNS:                  ASC$HEX the HEX work                      *
*  GLOBAL VARIBLES USED:     None                                      *
*  GLOBAL VARIBLES CHANGED:  None                                      *
*  MODULES CALLED:           None                                      *
*  CALLING MODULES:          READ$LINE                                 *
*  AUTHOR:                   Capt C. T. Childress                      *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                version                                               *
***********************************************************************/

ASC$HEX: PROCEDURE(C) WORD;
   DECLARE C BYTE;

   IF C <= '9' THEN
       RETURN DOUBLE(C-30H);
   ELSE
       RETURN DOUBLE(C-37H);

END ASC$HEX;
/**********************************************************************
*  DATE:                     30 SEP 84                                 *
*  VERSION:                  1.0                                       *
*  NAME:                     VALID$HEX                                 *
*  MODULE NUMBER:            None as yet                               *
*  DESCRIPTION:              Checks to see if the ASCII characters     *
*              make up a valid HEX number.                             *
*  PASSED VARIABLES:         H - the ASCII characters                  *
*  RETURNS:                  VALID$HEX - a flag                        *
*  GLOBAL VARIBLES USED:     None                                      *
*  GLOBAL VARIBLES CHANGED:  None                                      *
*  MODULES CALLED:           None                                      *
*  CALLING MODULES:          None as yet                               *
*  AUTHOR:                   Capt C.T. Childress                       *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                version                                               *
***********************************************************************/
VALID$HEX: PROCEDURE (H) BYTE;

   DECLARE (H, I) BYTE;

   DO I = 0 TO LAST(ASCII);
       IF H = ASCII(I) THEN
           RETURN TRUE;
   END;
   RETURN FALSE;

END VALID$HEX;
```

```
/*********************************************************************
*  DATE:                         30 SEP 84                           *
*  VERSION:                      1.0                                 *
*  NAME:                         SENDSEQ                             *
*  MODULE NUMBER:                5.0                                 *
*  DESCRIPTION:                  This procedure takes a message string *
*              and outputs it either to the system ISIS console or  *
*              when implemented in the SBC 88/45 board to the       *
*              SBC 86/12A monitor.  The code for the SBC 86/12 A is *
*              courrently commented out. The varible FILE$OUT when  *
*              set, allows all ouput to the console to be placed in *
*              the file FILE.OUT for a hard copy.                   *
*  PASSED VARIABLES:             MSG, TOTAL                          *
*  RETURNS:                      None                                *
*  GLOBAL VARIBLES USED:         BUFFER (as used by ISIS calls)      *
*  GLOBAL VARIBLES CHANGED:      BUFFER (as changed by ISIS calls)   *
*  MODULES CALLED:               DQ$WRITE, DQ$READ ERR$CHK           *
*  CALLING MODULES:              main, READLINE, LOAD, ROUTE$IN, ROUTE$OUT*
*                   BUILD$I$FRAME, BUILD$S$FRAME, SERVICE$LOOP       *
*  AUTHOR:   Capt C.T. Childress                                     *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M     *
*                 version                                            *
*********************************************************************/
SENDSEQ: PROCEDURE (MSG, TOTAL) PUBLIC REENTRANT;
   DECLARE MSG POINTER;
   DECLARE TOTAL WORD;

   CALL DQ$WRITE (W$CONN, MSG, TOTAL, @STATUS);
   CALL ERR$CHK;
   IF FILE$OUT THEN DO;
       CALL DQ$WRITE (F$CONN, MSG, TOTAL, @STATUS);
       CALL ERR$CHK;
   END;

END SENDSEQ;

/******************************************************************
*  DATE:                         28 AUG 85                           *
*  VERSION:                      1.1                                 *
*  NAME:                         LD$TAB$HSKP                         *
*  MODULE NUMBER:                7.8.2                               *
*  DESCRIPTION:                  This procedure house keeps the specified *
*              table (TABLE).  The procedure determines which table  *
*              to process and then advances the table pointer by the *
*              distance FRAME$SIZE.  Currently, FRAME$SIZE is always *
*              I$FRAME$SIZE (140 bytes) or PACKET$SIZE so as to keep *
*              a constant number of frames or packets in each table. *
*              This feature will only be needed when varible length  *
*              I frames are supported.                               *
*              frames in each table.                                 *
*  PASSED VARIABLES:          TABLE, FRAME$SIZE                        *
*  RETURNS:                   None                                     *
*  GLOBAL VARIBLES USED:      NT01NE, NT02NE, NT01SZ, NT02SZ,          *
*                        TX01NE, TX01NE,                               *
*                        TX01SZ, TX02SZ, NTLCNE,                       *
*                        LCNTNE, LCNTSZ                                *
*  GLOBAL VARIBLES CHANGED:   NT01NE, NOT02NE, TX01NE,                 *
*                        TX02NE, NTLCNE, LCNTNE                        *
*  MODULES CALLED:       None                                          *
*  CALLING MODULES:      LOAD, BUILD$I$FRAME, BUILD$S$FRAME, ROUTE$IN, *
*                        SERVICE$LOOP                                  *
*  AUTHOR:                                                             *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                 version                                              *
***********************************************************************/
LD$TAB$HSKP: PROCEDURE(TABLE, FRAME$SIZE) PUBLIC REENTRANT;

    DECLARE    TABLE   BYTE;
    DECLARE FRAME$SIZE INTEGER;
   DECLARE TP$LD$TAB(*) BYTE DATA(CR,LF,
   'TP$LD$TAB            ENTERING LD$TAB$HSKP      ');

   IF TEST THEN
   DO;
       CALL SENDSEQ(@TP$LD$TAB, LENGTH(TP$LD$TAB));
       CALL PRINTI(INT(TABLE));
   END;
    IF (TABLE >= 1 AND TABLE <= 6) THEN
   DO CASE TABLE;

       ;        /* ZERO CASE IS NULL AND IS AN ERROR CASE */

       DO;       /* HSKP INCOMING NET CH A TABLE */
           NT01NE = NT01NE + FRAME$SIZE;
           IF NT01NE >= NT01SZ THEN   /* IF TABLE WRAP */
               NT01NE = 0;
           IF TEST THEN CALL PRINTI(NT01NE);
       END;

       DO;       /* HSKP INCOMING NET CHB TABLE */
           NT02NE = NT02NE + FRAME$SIZE;
           IF NT02NE >= NT02SZ THEN    /* IF TABLE WRAP */
               NT02NE = 0;
           IF TEST THEN CALL PRINTI(NT02NE);
       END;

       DO;      /* HSKP OUTGOING NET CH A TABLE */
           TX01NE = TX01NE + FRAME$SIZE;
           IF TX01NE >= TX01SZ THEN  /* IF TABLE WRAP */
               TX01NE = 0;
```

```
            IF TEST THEN CALL PRINTI(TX01NE);
        END;

        DO;     /* HSKP OUTGOING NET CH B TABLE */
            TX02NE = TX02NE + FRAME$SIZE;
            IF TX02NE >= TX02SZ THEN  /* IF TABLE WRAP */
                TX02NE = 0;
            IF TEST THEN CALL PRINTI(TX02NE);
        END;

        DO;     /* HSKP NETWORK TO LOCAL TABLE */
            NTLCNE = NTLCNE + PACKET$SIZE;
            IF NTLCNE >= NTLCSZ THEN    /* IF TABLE WRAP */
                NTLCNE = 0;
            IF TEST THEN CALL PRINTI(NTLCNE);
        END;

        DO;     /* HSKP LOCAL TO NETWORK TABLE */
            LCNTNE = LCNTNE + PACKET$SIZE;
            IF LCNTNE >= LCNTSZ THEN    /* IF TABLE WRAP */
                LCNTNE = 0;
            IF TEST THEN CALL PRINTI(LCNTNE);
        END;

    END;
     ELSE HSKP$ERR = HSKP$ERR + 1;
END LD$TAB$HSKP;

/***************************************************************************
*  DATE:                        28 AUG 85                                  *
*  VERSION:                     1.1                                        *
*  NAME:                        SRVC$TAB$HSKP                              *
*  MODULE NUMBER:               8.3.2                                      *
*  DESCRIPTION:                 The purpose of this procedure is to        *
*           housekeep a specified table after servicing a packet or       *
*           frame from a specific table.  The varible FRAME$SIZE          *
*           is currently a constant I$FRAME$SIZE or PACKET$SIZE to        *
*           keep the number of frames or packets in a table constant.*
*           This vairable will only be necessary when varible length      *
*           I frames are supported.                                        *
*  PASSED VARIABLES:            TABLE, FRAME$SIZE                          *
*  RETURNS:                     None                                       *
*  GLOBAL VARIBLES USED:        HSKP$ERR, NT01NS, NT02NS, NTLCNS,          *
*                       LCNTNS, TX01NS, TX02NS                             *
*  GLOBAL VARIBLES CHANGED:     All above                                  *
*  MODULES CALLED:              PRINTI                                     *
*  CALLING MODULES:             LOAD, ROUTE$IN, ROUTE$OUT,                  *
*  AUTHOR:   Mark Weber                                                    *
*  HISTORY:  1.1 Mark Weber - 28 AUG 85 - added varible FRAME$SIZE         *
*            1.0 C.T. Childress - 30 SEP 84 - -original translated PL/M*
*                  version                                              *
*********************************************************************/
SRVC$TAB$HSKP: PROCEDURE(TABLE, FRAME$SIZE) PUBLIC REENTRANT;

     DECLARE TABLE BYTE;
     DECLARE FRAME$SIZE INTEGER;
    DECLARE TP$SRVC$TAB(*) BYTE DATA(CR,LF,
    'TP$SRVC$TAB            ENTERING SRVC$TAB$HSKP    ');

    IF TEST THEN
     DO:
        CALL SENDSEQ(@TP$SRVC$TAB, LENGTH(TP$SRVC$TAB));
        CALL PRINTI(INT(TABLE));
    END;
     IF TABLE >= 1 AND TABLE <= 6 THEN
    DO CASE TABLE;

        ;   /* ZEROTH ENTRY IS NULL AND AN ERROR */

        DO; /* IF CALLED TO HSKP INCOMING NET CH A TABLE */
             NT01NS = NT01NS + FRAME$SIZE;
             IF NT01NS >= NT01SZ THEN          /* IF TABLE WRAP */
                 NT01NS = 0;
             IF TEST THEN CALL PRINTI(NT01NS);
        END;

        DO; /* IF CALLED TO HSKP INCOMING NET CH B TABLE */
             NT02NS = NT02NS + FRAME$SIZE;
             IF NT02NS >= NT02SZ THEN          /* IF TABLE WRAP */
                 NT02NS = 0;
             IF TEST THEN CALL PRINTI(NT02NS);
        END;

        DO; /* IF CALLED TO HSKP OUTGOING NET CH A TABLE */
             TX01NS = TX01NS + FRAME$SIZE;
             IF TX01NS >= TX01SZ THEN      /* IF TABLE WRAP */
                 TX01NS = 0;
             IF TEST THEN CALL PRINTI(TX01NS);
        END;

        DO; /* IF CALLED TO HSKP OUTGOING NET CH B TABLE */
             TX02NS = TX02NS + FRAME$SIZE;
             IF TX02NS >= TX02SZ THEN      /* IF TABLE WRAP */
                 TX02NS = 0;
             IF TEST THEN CALL PRINTI(TX02NS);
        END;

        DO; /* IF CALLED TO HSKP NETWORK TO LOCAL TABLE */
             NTLCNS = NTLCNS + FRAME$SIZE;
             IF NTLCNS >= NTLCSZ THEN
```

```
              NTLCNS = 0;
           IF TEST THEN CALL PRINTI(NTLCNS);
        END;

        DO; /* IF CALLED TO HOUSEKEEP LOCAL TO NET TABLE */
           LCNTNS = LCNTNS + FRAME$SIZE;
           IF LCNTNS >= LCNTSZ THEN        /* IF TABLE WRAP */
              LCNTNS = 0;
           IF TEST THEN CALL PRINTI(LCNTNS);
        END;

     END;
     ELSE HSKP$ERR = HSKP$ERR + 1;
END SRVC$TAB$HSKP;
/*********************************************************************
*  DATE:                         28 AUG 85                           *
*  VERSION:                      1.1                                 *
*  NAME:                         BUILD$I$FRAME                       *
*  MODULE NUMBER:                9.1.11.1                            *
*  DESCRIPTION:                  The purpose of this procedure is to *
*             build an I FRAME for a packet received from one of the *
*                local hosts.  The first two bytes of the frame and  *
*             network headers are filled out, then the I frame is    *
*             placed in the approriate network transmission table.   *
*             Finally, a packect from LCNTTB is loaded the chosen    *
*             transmit table.   This procedure simulates the process *
*             needed to move a packect from one of the four SBC 544  *
*             channels to the SBC 88/45 transmit channel.            *
*  PASSED VARIABLES:             TABLE                               *
*  RETURNS:                      None                                *
*  GLOBAL VARIBLES USED:         HSKP$ERR, NT01NS, NT02NS, NTLCNS,   *
*                        LCNTNS, TX01NS, TX02NS                      *
*  GLOBAL VARIBLES CHANGED:      All above                           *
*  MODULES CALLED:               None                                *
*  CALLING MODULES:              ROUTE$IN                            *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.1 Mark Weber - 28 AUG 85 - changed header format      *
*            1.0 C.T. Childress - 30 SEP 84 - -original translated PL/M*
*               version                                              *
*********************************************************************/
BUILD$I$FRAME: PROCEDURE(TABLE) PUBLIC REENTRANT;

     DECLARE TABLE WORD,
        DEST$BYTE BYTE;

     IF TABLE >= 1 AND TABLE <= 2 THEN
   DO CASE TABLE;

        ;    /* ZEROTH ENTRY IS NULL AND AN ERROR */
        DO; /* I FRAME IS GOING OUT NETWORK CHANNEL A */
            CALL SENDSEQ(@TP$38, LENGTH(TP$38));
            NT01TX (TX01NE+ 0) = B$ADD;
            /* Take the receive state variable and place it in the uppermost
               three bits of the control byte.  Take the send state
               variable and place it in bits 4 through 2 ( total is 8 to
               1 with 8 being MSB )                                          */
            NT01TX (TX01NE+ 1) = (((SHL(RCV$STATE$A, 5) AND 0E0H) OR 010H) OR
                                   (SHL(SEND$STATE$A, 1) AND 0EH));
            CALL MOVB( @LCNTTB (LCNTNS), @NT01TX (TX01NE+2),
                PACKET$SIZE);
            CALL LD$TAB$HSKP (3, IFRAME$SIZE);
        END;

        DO; /* I FRAME IS GOING OUT NETWORK CHANNEL B */
            CALL SENDSEQ(@TP$39, LENGTH(TP$39));
            NT02TX (TX02NE+ 0) = A$ADD;
            /* Take the receive state variable and place it in the uppermost
               three bits of the control byte.  Take the send state
               variable and place it in bits 4 through 2 ( total is 8 to
               1 with 8 being MSB )                                          */
            NT02TX (TX02NE+ 1) = (((SHL(RCV$STATE$B, 5) AND 0E0H) OR 010H) OR
                                   (SHL(SEND$STATE$B, 1) AND 0EH));
            CALL MOVB( @LCNTTB (LCNTNS), @NT02TX (TX02NE+2),
                PACKET$SIZE);
            CALL LD$TAB$HSKP (4, I$FRAME$SIZE);
        END;
    END;
END BUILD$I$FRAME;

/***********************************************************************
*  DATE:                        31 AUG 85                               *
*  VERSION:                     1.1                                     *
*  NAME:                        SERVICE$LOOP                            *
*  MODULE NUMBER:               9.3.2.1                                 *
*  DESCRIPTION:                 This procedure servies as dummy trans-  *
*              mit routines for the high speed datalink layer soff-     *
*              ware.  The routine loops back I frames by exchanging     *
*              source and destination headers.  When an I frame is      *
*              found the source and destination address are swapped     *
*              and the I frame is looped to the opposing channel        *
*              receive table (i.e. frames from channel A are sent to    *
*              channel B receive table).  The same process is followed  *
*              for S and U frames except for RR frames which are        *
*              discared.  RR frames are not looped back as they are     *
*              tested through the RCV$I$FRAME procedure.                *
*  PASSED VARIABLES:            TABLE, FRAME$SIZE                       *
*  RETURNS:                     NONE                                    *
*  GLOBAL VARIBLES USED:        NT01NE, NT02NE, TX01NE, TX02NE,         *
*                       NT01NS, NT02NS, TX01NS, TX02NS, NT01RX, NT02RX  *
*  GLOBAL VARIBLES CHANGED:    NT01RX, NT02RX                          *
*  MODULES CALLED:             LD$TAB$HSKP                             *
*  CALLING MODULES:                                                    *
*  AUTHOR:   Mark Weber                                                *
*  ALOGRITHM:     IF frame present in transmit table then              *
*                     copy frame to intermediate storage               *
*                     IF NOT I frame then                              *
*                        Loop all S/R frames except RR frames          *
*                        Update receive table                          *
*                     ELSE                                             *
*                        Copy frame to receive table                   *
*                        Change network header source and destionation *
*                            address                                   *
*                        Change TCP/IT header source and destination   *
*                            address                                   *
*                        Update receive table                          *
*                   END IF                                             *
*               END IF                                                 *
*  HISTORY:  1.1 Mark Weber - 30 AUB 85- Changed procedure to loop     *
*                back S and U frames                                   *
*            1.0 C.T. Childress - 30 SEP 85- original translated PL/M  *
*                version                                               *
***********************************************************************/
SERVICE$LOOP: PROCEDURE(TABLE, FRAME$SIZE) REENTRANT;
   DECLARE CHANNEL BYTE,
           ADDR(I$FRAME$SIZE) BYTE,
           FRAME$SIZE  INTEGER,
           TABLE   BYTE,
           INDEX   INTEGER,
           ORIGIN  INTEGER;

   ORIGIN = 0;

   DO CASE TABLE;

      ;       /* ZERO IS NULL CASE */

      DO;
      IF ((TX01NE - TX01NS) >= FRAME$SIZE) OR     /* FRAME PRESENT*/
          (TX01NS > TX01NE) THEN DO;  /*If frame present, loop to channel B*/

          DO INDEX = 0 TO (FRAME$SIZE - 1);
              ADDR(INDEX) = NT01TX(TX01NS + INDEX);
          END;

          IF (ADDR(ORIGIN + 1) AND I$CNTL) = 1 THEN  /* CHECK FOR S OR U FRAME */
          DO;                                       /* DO'NT LOOP RR FRAMES */
              DO INDEX = 0 TO (FRAME$SIZE - 1);   /* LOOP EVERYTHING ELSE*/
                  NT02RX(NT02NE + INDEX) = ADDR(ORIGIN + INDEX);
              END;
```

```
                CALL LD$TAB$HSKP(2, I$FRAME$SIZE);
                IF TEST THEN CALL SENDSEQ(@TP$53B, LENGTH(TP$53B));
                                                    /* LOOP THE S / U FRAME */
            END;
            ELSE DO;                                /* HAVE I FRAME     */
                CALL SENDSEQ(@TP$53A, LENGTH(TP$53A));
                DO INDEX = 0 TO (FRAME$SIZE - 1);           /* SWAP DATA */
                    NT02RX(NT02NE + INDEX) = ADDR(ORIGIN + INDEX);
                END;
                NT02RX(NT02NE + 3) = ROL(ADDR(ORIGIN + 3), 4); /* SWAP FRAME HEADER */
                NT02RX(NT02NE + 6) = ADDR(7);
                NT02RX(NT02NE + 7) = ADDR(6);
                DO INDEX = 0 TO 3;                  /* SWAP IP DEST & SOURCE */
                    NT02RX(NT02NE + INDEX + 24) = ADDR(ORIGIN + INDEX + 28);
                    NT02RX(NT02NE + INDEX + 28) = ADDR(ORIGIN + INDEX + 24);
                END;
                CALL LD$TAB$HSKP( 2, I$FRAME$SIZE );
            END;    /* END ELSE */
            END;        /* END IF FRAME PRESENT */
        END;            /* CASE = 1 */

        DO;         /* CASE 2   */
        IF ((TX02NE - TX02NS) >= FRAME$SIZE) OR
            (TX02NS > TX02NE) THEN DO;  /* If frame present, loop to channel A */

            DO INDEX = 0 TO (FRAME$SIZE - 1);
                ADDR(INDEX) = NT02TX(TX02NS + INDEX);
            END;

            IF (ADDR(ORIGIN + 1) AND I$CNTL) = 1 THEN  /* CHECK FOR S OR FRAME */
            DO;
                DO INDEX = 0 TO (FRAME$SIZE -1);    /* LOOP EVERYTHING ELSE*/
                    NT01RX(NT01NE + INDEX) = ADDR(ORIGIN + INDEX);
                END;
                CALL LD$TAB$HSKP(1, I$FRAME$SIZE);
                IF TEST THEN CALL SENDSEQ(@TP$53B, LENGTH(TP$53B));
                                                    /* LOOP THE S / U FRAME */
            END;
            ELSE DO;
                CALL SENDSEQ(@TP$53A, LENGTH(TP$53A));
                DO INDEX = 0 TO (FRAME$SIZE - 1);           /* COPY THE  DATA */
                    NT01RX(NT01NE + INDEX) = ADDR(ORIGIN + INDEX);
                END;
                NT01RX(NT01NE + 3) = ROL(ADDR(ORIGIN + 3), 4);  /* SWAP FRAME HEADER */
                NT01RX(NT01NE + 6) = ADDR(ORIGIN + 7);      /* SWAP PACKET HEADER */
                NT01RX(NT01NE + 7) = ADDR(ORIGIN + 6);
                DO INDEX = 0 TO 3;                  /* SWAP IP DEST & SOURCE */
                    NT01RX(NT01NE + INDEX + 24) = ADDR(ORIGIN + INDEX + 28);
                    NT01RX(NT01NE + INDEX + 28) = ADDR(ORIGIN + INDEX + 24);
                END;
```

```
               CALL LD$TAB$HSKP( 1, I$FRAME$SIZE );
            END;
            END;         /* END IF FRAME PRESENT */
        END;             /* CASE = 2 */

END;       /* CASE TABLE */

END SERVICE$LOOP;

/**********************************************************************
*  DATE:                       3 SEP 85                                *
*  VERSION:                    1.0                                     *
*  NAME:                       SERVICE$XMIT$A                          *
*  MODULE NUMBER:              9.3.2                                   *
*  DESCRIPTION:                This is a dummy module.  The fully      *
*              implemented module will contain the transmit interrupts.*
*              Currently this module calls a loop back procedrue which *
*              sends the transmit message into the receive table.      *
*  PASSED VARIABLES:           FRAME$SIZE                              *
*  RETURNS:                    None                                    *
*  GLOBAL VARIBLES USED:       None                                    *
*  GLOBAL VARIBLES CHANGED:    None                                    *
*  MODULES CALLED:             SERVICE$LOOP                            *
*  CALLING MODULES:            ROUTE$OUT                               *
*  AUTHOR:                                                             *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                version                                               *
**********************************************************************/
SERVICE$XMIT$A: PROCEDURE (FRAME$SIZE);

   DECLARE FRAME$SIZE INTEGER;

   CALL SERVICE$LOOP(1,FRAME$SIZE);

END SERVICE$XMIT$A;

/**********************************************************************
*  DATE:                          3 SEP 85                             *
*  VERSION:                       1.0                                  *
*  NAME:                          SERVICE$XMIT$B                       *
*  MODULE NUMBER:                 9.3.4                                *
*  DESCRIPTION:                   This is a dummy procedure.  The      *
*              fully implemented procedrue will have the interrupt     *
*              routines for channel B.  Currently, a loop back pro-    *
*              cedrue is called to return the message back to the      *
*              receive table.                                          *
*  PASSED VARIABLES:              FRAME$SIZE                           *
*  RETURNS:                       None                                 *
*  GLOBAL VARIBLES USED:          None                                 *
*  GLOBAL VARIBLES CHANGED:       None                                 *
*  MODULES CALLED:                  SERVICE LOOP                      *
*  CALLING MODULES:                 ROUTE$OUT                         *
*  AUTHOR:                                                            *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M       *
*               version                                               *
**********************************************************************/
SERVICE$XMIT$B: PROCEDURE(FRAME$SIZE);

DECLARE FRAME$SIZE INTEGER;

   CALL SERVICE$LOOP(2,FRAME$SIZE);

END SERVICE$XMIT$B;

/*********************************************************************
*  DATE:                            3 SEP 85                          *
*  VERSION:                         1.0                               *
*  NAME:                            LOAD                              *
*  MODULE NUMBER:                   7.5                               *
*  DESCRIPTION:                     This procedure loads the test messages*
*             into the local receive channel buffer for routing to the*
*             network transmit table.  This procedrue is used for     *
*             simulation purposes only.  In operational software,     *
*             tables LCNTTB and NTLCTB would be replaced by the       *
*             transmit and receive tables on the SBC 544.             *
*  PASSED VARIABLES:            DEST$UNID                             *
*  RETURNS:                     None                                  *
*  GLOBAL VARIBLES USED:        LCNTNE, UNID$NBR, THIS$UNID$NBR, LCNTTB *
*  GLOBAL VARIBLES CHANGED:     LCNTNE, MGSNUM, LCNTTB                *
*  MODULES CALLED:              LD$TAB$HSKP, HEX$ASC, SENDSEQ         *
*  CALLING MODULES:             READ$LINE                             *
*  AUTHOR:                                                            *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M       *
*               version                                               *
**********************************************************************/
LOAD: PROCEDURE(DEST$UNID);

   DECLARE INDEX INTEGER;
   DECLARE DEST$UNID  WORD;
   DECLARE TEMP$L(60) WORD;

       DO INDEX = 0 TO (PACKET$SIZE - 1);
           LCNTTB(LCNTNE + INDEX) = '*';
       END;

   /* PACKET HEADER */
       LCNTTB(LCNTNE + 0) = 010H;       /* GFI/LGCN        */
       LCNTTB(LCNTNE + 1) = (LOW(DEST$UNID AND 0FH) OR
                            (ROL(THIS$UNID$NBR, 4) AND 0F0H)); /*SRC, DST */
       LCNTTB(LCNTNE + 2) = 0;          /* SEQUENCE NUMBER  */
```

```
      LCNTTB(LCNTNE + 3) = 044H;        /* DST/SRC FIELD LENGTH */
      LCNTTB(LCNTNE + 4) = (LOW(DEST$UNID) AND OFH) OR 10H; /* DEST = 1, CH = 1 */
      LCNTTB(LCNTNE + 5) = (THIS$UNID$NBR AND OFH) OR 10H;/* SORC = 3, CH = 1 */
      LCNTTB(LCNTNE + 6) = 0;           /* PADDING              */
      LCNTTB(LCNTNE + 7) = 010H;        /* FACILITY FIELD LENGTH*/
      LCNTTB(LCNTNE + 8) = 0;           /* FACILITY CODE        */
      LCNTTB(LCNTNE + 9) = 0;           /* FACILITY PARAMETER   */

   /* IP SOURCE HEADER */
      LCNTTB(LCNTNE + 22) = 10H;        /* CT    = 0, CC    = 1 */
      LCNTTB(LCNTNE + 23) = (THIS$UNID$NBR AND OFH) OR 60H;/* NC    = 3, HC(L) = 6 */
      LCNTTB(LCNTNE + 24) = 70H;        /* HC(H) = 0, PC(0) = 7 */
      LCNTTB(LCNTNE + 25) = 00H;        /* PC(1) = 0, PC(2) = 0 */

   /* IP DESTINATION HEADER */
      LCNTTB(LCNTNE + 26) = 10H;        /* CT    = 0, CC    = 1 */
      LCNTTB(LCNTNE + 27) = (LOW(DEST$UNID) AND OFH) OR 60H;/* NC    = 1, HC(L) = 6 */
      LCNTTB(LCNTNE + 28) = 70H;        /* HC(H) = 0, PC(0) = 7 */
      LCNTTB(LCNTNE + 29) = 00H;        /* PC(1) = 0, PC(2) = 0 */

      CALL MOVB(@MESSAGE, @LCNTTB(LCNTNE + 66), TCP$DATA$SIZE);
      IF MSGNUM > 9 THEN
          MSGNUM = 0;
      LCNTTB(LCNTNE + 96) = '0' + MSGNUM;
      MSGNUM = MSGNUM + 1;
   /* Display the frame to be sent                        */
      DO INDEX = 0 TO 29;
          IF (INDEX <= 9) OR (INDEX >= 22) THEN
              TEMP$L(INDEX) = HEX$ASC(LCNTTB(LCNTNE + INDEX));
          ELSE
              TEMP$L(INDEX) = '**';
      END;
      CALL SENDSEQ(@(CR,LF),2);
      CALL SENDSEQ(@LCNTTB(LCNTNE + 66), TCP$DATA$SIZE);
      CALL SENDSEQ(@(CR,LF),2);
      CALL SENDSEQ(@TEMP$L, 30);
      CALL SENDSEQ(@(CR,LF),2);
      CALL LD$TAB$HSKP(6, PACKET$SIZE);
      CALL SENDSEQ(@TP$54, LENGTH(TP$54));

END    LOAD;

/*********************************************************************
*  DATE:                         30 SEP 84                           *
*  VERSION:                      1.0                                 *
*  NAME:                         INITACK                             *
*  MODULE NUMBER:                9.3.6                               *
*  DESCRIPTION:                  This procedure resets the transmit I *
*              frame flags, counters, and calls SRVC$TAB$HSKP to up- *
*               the next to service pointers of the specified table.   *
*  PASSED VARIABLES:            TABLE                                  *
*  RETURNS:                     None                                   *
*  GLOBAL VARIBLES USED:        TIMECHA, TIMECHB, CTCNOA, CTCNOB,      *
*                    RETRANS$, RETRANS$B                               *
*  GLOBAL VARIBLES CHANGED:     All the above                          *
*  MODULES CALLED:              SRVC$TAB$HSKP                          *
*  CALLING MODULES:             ROUTE$OUT                              *
*  AUTHOR:                                                             *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                version                                               *
***********************************************************************/
INITACK:   PROCEDURE(TABLE) PUBLIC REENTRANT;

   DECLARE TABLE BYTE;

   IF (TABLE >= 3) AND (TABLE <= 4) THEN DO;
       IF FRAME$PRESENT(TABLE - 2) THEN CALL SRVC$TAB$HSKP(TABLE, I$FRAME$SIZE);
       DO CASE TABLE;

            ;       /* ZEROTH ENTRY IS NULL AND AN ERROR */

            ;       /* FIRST  ENTRY IS NULL AND AN ERROR */

            ;       /* SECOND ENTRY IS NULL AND AN ERROR */

            DO;
                TIMCHA = TRUE;
                CTCNOA = 0;
                RETRANS$A = 0;
            END;

            DO;
                TIMCHB = TRUE;
                CTCNOB = 0;
                RETRANS$B = 0;
            END;
       END;         /* END CASE */
   END;             /* END IF   */

END INITACK;


/**********************************************************************
*  DATE:                        29 AUG 85                              *
*  VERSION:                     1.0                                    *
*  NAME:                        ROUTE$OUT                              *
*  MODULE NUMBER:               9.2                                    *
*  DESCRIPTION:                 This procedure sends frames out of the *
*               the tramsit buffers in the order in which they occur.  *
*               The buffers are implemented as circular FIFOs.  When a  *
*               a frame is next to tramsmit, the procedure looks at the *
*               frame control byte.  If the frame is an information     *
*               the SEND$STATE$A and SEND$STATE$B counters are updated. *
*               If the frame is a S$FRAME, the psuedo time out mechan-  *
*               ism is started.  If a U FRAME is sent, a positive       *
*               ACKNOLDGEMENT is always returned. The program first     *
*               checks for the presence of a frame in the transmit      *
*               table (module FRAME$PRESENT is true), then the pro-     *
*               cedue checks the first and second bytes of the received *
*               frame.  If the address byte is correct for the received *
*               channel, the processing continues, otherwise, the       *
*               RETRANS error count is updated.  For valid address      *
*               bytes, the procedure goes on to determine the length    *
*               of the frame received.  The frame length information is *
*               then sent to the tramsmt procedures, which in this      *
*               simulation, merely loop the sent data back to the       *
*               receive tables.                                         *
*                  This procedure calls SERVICE$XMIT$A/B     to per-    *
*               form dummy transmission processing.  Procedure INITACK  *
*               handles the TI timer simulation.  TIME$DELAY$CHA/CHA    *
*               gives a simulated delay.                                *
*         NOTE: 1.  There are two very important parameters relating    *
*               to this procedure that must be considered proior to the *
*               modification of this module.  First, the variable       *
*               MAX$NETWORK$CODE.  All active UNIDs on the network will *
*               start with 0 and proceed to increment in a clockwise    *
*               mannor.  In this way, the addresses can be compared     *
*               to MAX$NETWORK$CODE to be sure that Non-existant UNIDs  *
*               will not apprear iin transmitted frames.                *
*                2.  The seconde parameter is MAXNUM.  MAXNUM is the    *
*               number of times the time out cycly loops through the    *
*               retransmission period for an I frame.   This period     *
*               allows time for a valid acknowledgement to be received  *
*               after the I frame is transmitted.  The basic period is  *
*               set through N.SIO$U2 for 27 milliseconds.  IF MAXNUM =  *
*               10, then the wait loop is 270 milliconds.               *
* PASSED VARIABLES:          None                                       *
* RETURNS:                   None                                       *
* GLOBAL VARIBLES USED:      TX01NE, TX02NE, TX01NS, TX02NS, MAXNUM,    *
*                     RETRANS$A/B, MAXRETRANS$A/B                       *
* GLOBAL VARIBLES CHANGED:   None                                       *
* MODULES CALLED:            DSPLY$FRAME$HDR, SERVICE$XMITA/B,          *
*                INITACK,                  TIME$DELAY$CHA/CHB           *
* CALLING MODULES:           START$DATA$XFER, START$DM$MODE             *
* ALOGRITHM:        IF FRAME$PRESENT channel a then                     *
*                     DSPLY$FRAME$HEADER                                *
*                     IF NOT I frame then                               *
*                        IF command address or response address then    *
*                           IF CMDR frame then FRAME$SIZE = CMDR SIZE   *
*                            ELSE FRAME$SIZE = S$FRAME$SIZE                 *
*                            SERVICE the channel                            *
*                            RESET the timer                                *
*                         END IF                                            *
*                      ELSE I frame                                         *
*                         IF time out false then update the time delay      *
*                         ELSE SERVICE the channel                          *
*                           UPDATE the send state variavle                  *
*                           Increment the retransmit varible                *
*                           Update the time delay                           *
*                         END IF                                            *
*                      END IF                                               *
*                   END IF                                                  *
*                   IF FRAME$PRESENT channel B then                         *
*                      SERVICE THE SAME AS CHANNEL A                        *
*                   END IF                                                  *
*  AUTHOR:   Mark Weber                                                     *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.               *
****************************************************************************/
ROUTE$OUT:  PROCEDURE REENTRANT;

   DECLARE (FRAME$SIZE, NEXT$FRAME) INTEGER;
   DECLARE (CNTL$BYTE$A, CNTL$BYTE$B) BYTE;
   DECLARE TP$27A(*) BYTE DATA(CR,LF,
   'TP$27A        <==CONTROL BYTE IS NOT AN I FRAME==>  ');

   /***************CHANNEL A PROCESSING*****************/
   IF FRAME$PRESENT(1) THEN
   DO;
       CALL SEND$SEQ(@TP$26, LENGTH(TP$26));
       CALL DSPLY$FRAME$HDR(3);
       IF (((NT01TX (TX01NS) AND A$ADD) = A$ADD) OR
           ((NT01TX (TX01NS) AND B$ADD) = B$ADD)) THEN
       DO;
           CNTL$BYTE$A = NT01TX(TX01NS + 1);
           IF ((CNTL$BYTE$A AND 01H) = 1) THEN
           DO;
               IF(((CNTL$BYTE$A AND CMDR$CNTL) = CMDR$CNTL) OR
                   ((CNTL$BYTE$A AND CMDR$CNTL) = (CMDR$CNTL OR 010H)))THEN
                   FRAME$SIZE = CMDR$FRAME$SIZE;
               ELSE FRAME$SIZE = U$FRAME$SIZE;
               CALL SERVICE$XMIT$A(FRAME$SIZE);            /* ITS AN S/U FRAME*/
               CALL INITACK(3);
               CALL SENDSEQ(@TP$27, LENGTH(TP$27));
               CALL SENDSEQ(@TP$27A, LENGTH(TP$27A));
           END;
           ELSE DO;                                        /* ITS AN I FRAME */
               IF TIMCHA = FALSE THEN
                   CALL TIME$DELAY$CHA;
               ELSE
```

```
                DO;
                    CALL SENDSEQ(@TP$27, LENGTH(TP$27));
                    IF NOT RNR$MODE$A THEN
                       CALL SERVICE$XMIT$A(I$FRAME$SIZE);   /* SERVICE THE */
                    RETRANS$A = RETRANS$A + 1;              /* TIME OUT    */
                    CALL TIME$DELAY$CHA;
                END;
                 IF ((TX01NS + I$FRAME$SIZE) >= FRAME$TABLE$SIZE)
                     THEN NEXT$FRAME = 0;
                     ELSE NEXT$FRAME = TX01NS + I$FRAME$SIZE;
                 IF (((NT01TX(NEXT$FRAME + 1) AND 1) = 1) AND
                   (((TX01NE - NEXT$FRAME) >= I$FRAME$SIZE) OR
                     (NEXT$FRAME > TX01NE )))   THEN
                 DO;
                     CALL MOVB(@NT01TX(TX01NS), @I$FRAME$QUE(I$FRAME$QUE$NE),
                          I$FRAME$SIZE);
                     CALL MOVB(@NT01TX(NEXT$FRAME), @NT01TX(TX01NS),
                          I$FRAME$SIZE);
                     CALL MOVB(@I$FRAME$QUE(I$FRAME$QUE$NE), @NT01TX(NEXT$FRAME),
                          I$FRAME$SIZE);
                 END;
           END;    /* END NTOXTX     = 80H */
       END;        /* END    A$ADD COMPARISON      */
       ELSE DO;
           CALL SENDSEQ(@TP$48, LENGTH(TP$48));
           STATTB (11) = STATTB (11) + 1;
           STATTB (14) = STATTB (14) + 1;
           CALL INITACK(3);
       END;        /* END  ADDRESS COMPARISON   */
       IF RETRANS$A >= MAXRETRANS$A THEN DO;
           CALL INITACK(3);
           CALL SENDSEQ(@TP$56, LENGTH(TP$56));
           CALL SND$CMDR(1,1,CNTL$BYTE$A,1);
       END;
   END;    /* END (TX01NE - TX01NS) CONDITION */

                                           /* SERVICE CHAN B */
   IF FRAME$PRESENT(2) THEN
   DO;
       CALL SENDSEQ(@TP$28, LENGTH(TP$28));
       CALL DSPLY$FRAME$HDR(4);
       IF (((NT02TX (TX02NS) AND B$ADD) = B$ADD) OR
           ((NT02TX (TX02NS) AND A$ADD) = A$ADD)) THEN
       DO;
           CNTL$BYTE$B = NT02TX(TX02NS + 1);
           IF ((CNTL$BYTE$B AND 01H) = 1) THEN
           DO;
               IF(((CNTL$BYTE$B AND CMDR$CNTL) = CMDR$CNTL) OR
                   ((CNTL$BYTE$B AND CMDR$CNTL) = (CMDR$CNTL OR 010H)))THEN
```

```
                        FRAME$SIZE = CMDR$FRAME$SIZE;
                        ELSE FRAME$SIZE = U$FRAME$SIZE;
                    CALL SERVICE$XMIT$B(FRAME$SIZE);            /* ITS AN S/U FRAME*/
                    CALL INITACK(4);
                    CALL SENDSEQ(@TP$29, LENGTH(TP$29));
                    CALL SENDSEQ(@TP$27A, LENGTH(TP$27A));
                    END;
                ELSE DO;                                        /* ITS AN I FRAME */
                    IF TIMCHB = FALSE THEN
                        CALL TIME$DELAY$CHB;
                    ELSE
                    DO;
                        CALL SENDSEQ(@TP$29, LENGTH(TP$29));
                        IF NOT RNR$MODE$B THEN
                           CALL SERVICE$XMIT$B(IFRAME$SIZE);
                        RETRANS$B = RETRANS$B + 1;              /* SERVICE THE  */
                        CALL TIME$DELAY$CHB;                    /* TIME OUT     */
                    END;
                     IF ((TX02NS + I$FRAME$SIZE) <= FRAME$TABLE$SIZE)
                         THEN NEXT$FRAME = 0;
                         ELSE NEXT$FRAME = TX02NS + I$FRAME$SIZE;
                     IF (((NT02TX(NEXT$FRAME + 1) AND 1) = 1) AND
                       (((TX02NE - NEXT$FRAME) >= I$FRAME$SIZE) OR
                         (NEXT$FRAME > TX02NE )))   THEN
                     DO;
                         CALL MOVB(@NT02TX(TX02NS), @I$FRAME$QUE(I$FRAME$QUE$NE),
                              I$FRAME$SIZE);
                         CALL MOVB(@NT02TX(NEXT$FRAME), @NT02TX(TX02NS),
                              I$FRAME$SIZE);
                         CALL MOVB(@I$FRAME$QUE(I$FRAME$QUE$NE), @NT02TX(NEXT$FRAME),
                              I$FRAME$SIZE);
                     END;
                END;     /* END NTOXTX     = 80H */
            END;         /* END    ADDRESS COMPARISON      */
            ELSE DO;
                CALL SENDSEQ(@TP$47, LENGTH(TP$47));
                STATTB (11) = STATTB (11) + 1;
                STATTB (14) = STATTB (14) + 1;
                CALL INITACK(4);
            END;         /* END   B$ADD COMPARISON  */
            IF RETRANS$B >= MAXRETRANS$B THEN DO;
                CALL INITACK(4);
                CALL SENDSEQ(@TP$57, LENGTH(TP$57));
                CALL SND$CMDR(2,1,CNTL$BYTE$B,1);
            END;
        END;    /* END (TX02NE - TX02NS) CONDITION */

    END ROUTE$OUT;

    /***********************************************************************
```

```
*  DATE:                     28 AUG 85                                     *
*  VERSION:                  1.0                                           *
*  NAME:                     ROUTE$IN                                      *
*  MODULE NUMBER:            9.1                                           *
*  DESCRIPTION:              This procedure decodes the received           *
*            control byte and processes each frame in accordance to        *
*            the type of frame received.  The procedure first              *
*            exaimines the local host receive tables for packets           *
*            destioned for the UNID datalink layer.  A packet is           *
*            then exaimined for the shortest route to the destin-          *
*            ation.  The appropriate channel is then loaded with           *
*            the packet.  Each datalink layer receive table is then        *
*            exaimined for a frame present in the table.  If a frame       *
*            is found, the control byte is decoded and the appro-          *
*            priate receive routine is then envoked.   When the            *
*            ROUTE$IN procedure is envoked while not in the SABM           *
*            mode, only a SABM command is allowed.  Any other              *
*            received frames cause the DM response to be sent.             *
*            Should an invalid format control byte be encountered,         *
*            an error message is printed and a CMDF frame is gener-        *
*            ated.                                                         *
*  PASSED VARIABLES:         CONTROL$BYTE$CHA, CONTROL$BYTE$CHB,           *
*                            P$BIT$A, P$BIT$B,                             *
*  RETURNS:                  None                                          *
*  GLOBAL VARIBLES USED:     SABM$MODE$A, SABM$MODE$B, DESTINATION         *
*                      OUT$TAB$FULL, NT01NE, NT02NE, NT01NS, NT02NS        *
*  GLOBAL VARIBLES CHANGED:  DESTINATION, OUT$TAB$FULL                     *
*  MODULES CALLED:           REC$I$FRAME, RCV$RR, RCV$REJ, RCV$RNR,        *
*              RCV$UA, RCV$DISC, RCV$CMDR, RCV$SABM, RCV$DM, SND$DM,       *
*              SND$CMDR, BUILD$I$FRAME, SRVC$TAB$HSKP, FIND$I$FRAME        *
*  CALLING MODULES:          START$INFO$XFER                               *
*  ALOGRITHM:                                                              *
*                   IF frame in channel A transmit table then              *
*                      IF in SABM$MODE$A then                              *
*                         IF RCV$SABM frame then enter SABM mode           *
*                         ELSE send DM response                            *
*                         END IF                                           *
*                      ELSE IF I frame then process I frame                *
*                      ELSE IF UA frame then process UA frame              *
*                      ELSE IF DISC frame then process DISC frame          *
*                      ELSE IF CMDF frame then process CMDF frame          *
*                      ELSE IF SABM frame then process SABM frame          *
*                      ELSE IF RNR frame  then process RNR  frame          *
*                      ELSE IF REJ frame  then process REJ  frame          *
*                      ELSE IF RR  frame  then process RR   frame          *
*                      ELSE send CMDR response and send error message      *
*                   END IF                                                 *
*                   IF frame in channel B transmit table then              *
*                      PROCESS THE SAME AS WITH CHANNEL A                  *
*                      USING THE CHANNEL B PROCEDURES                      *
*                    Call ROUTE$PACET to network tables                 *
*  AUTHOR:    Mark Weber                                                 *
*  HISTORY:   1.1 Mark Weber -28 AUG 85-added LAP B procedures           *
*             1.0 C.T. Childress -30 SEP 84- original transnlated PL/M   *
*                  version                                               *
**************************************************************************/
ROUTE$IN:  PROCEDURE REENTRANT;

   DECLARE TP$64(*) BYTE DATA(CR,LF,
   'TP$64           Entered ROUTE$IN Module');
   DECLARE TP$65(*) BYTE DATA(CR,LF,
   'TP$65           INVALID CONTROL BYTE FOUND IN FRAME ON CHA');
   DECLARE TP$65A(*) BYTE DATA(CR,LF,
   'TP$65A          INVALID ADDRESS BYTE FOUND IN FRAME ON CHA');
   DECLARE TP$66(*) BYTE DATA(CR,LF,
   'TP$66           INVALID CONTROL BYTE FOUND IN FRAME ON CHB');
   DECLARE TP$66A(*) BYTE DATA(CR,LF,
   'TP$66A          UNVALID ADDRESS BYTE FOUND IN FRAME ON CHB');
   DECLARE TP$66B(*) BYTE DATA(CR,LF,
   'TP$66B          INSIDE CHANNEL A OF ROUTE IN');
   DECLARE TP$66C(*) BYTE DATA(CR,LF,
   'TP$66C          INSIDE CHANNEL B OF ROUTE IN');
   DECLARE (CONTROL$BYTE$CHA, CONTROL$BYTE$CHB) BYTE;
   DECLARE (P$BIT$A, P$BIT$B)                   BYTE;
   DECLARE (SEQ$NUM$A, SEQ$NUM$B)               BYTE;
   DECLARE (ADDRESS$A, ADDRESS$B)               BYTE;

/*----------------------CHANNEL A PROCESSING-----------------------------*/
   CALL SENDSEQ(@(CR,LF), 2);
    CALL SENDSEQ(@('ROUTE$IN CHA NS & NE ='), 22);
   CALL PRINTI(NT01NS);
   CALL PRINTI(NT01NE);
   CALL SENDSEQ(@(CR,LF), 2);

   ADDRESS$A = NT01RX(NT01NS);


   IF(((NT01NE - NT01NS) >= I$FRAME$SIZE) OR (NT01NS > NT01NE)) THEN
       IF (ADDRESS$A= A$ADD) OR (ADDRESS$A = B$ADD) THEN
       DO;
           /******FRAME IS PRESENT IN RECEIVE TABLE********/
           CALL SENDSEQ(@TP$66B, LENGTH(TP$66B));
           CONTROL$BYTE$CHA = NT01RX(NT01NS + 1);
           SEQ$NUM$A = SHR((CONTROL$BYTE$CHA AND 0E0H), 5);
           P$BIT$A = SHR((CONTROL$BYTE$CHA AND 010H), 4);
            CALL DSPLY$FRAME$HDR(1);
           IF NOT SABM$MODE$A THEN
           DO;
               IF ((CONTROL$BYTE$CHA AND SABM$CNTL) = SABM$CNTL)
                   THEN CALL RCV$SABM(1,1);
```

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                      ELSE CALL SND$DM(1,1);
            END;
            ELSE IF((CONTROL$BYTE$CHA AND 01H) = 0) THEN          /*I FRAME*/
                  CALL RCV$I$FRAME(1,P$BIT$A);
            ELSE IF ((CONTROL$BYTE$CHA AND 0EFH) = UA$CNTL)       /*UA FRAME*/
                THEN CALL RCV$UA(1,P$BIT$A);
            ELSE IF ((CONTROL$BYTE$CHA AND 0FH) = RR$CNTL)        /*RR FRAME*/
                THEN CALL RCV$RR(1,P$BIT$A, SEQ$NUM$A, ADDRESS$A);
            ELSE IF ((CONTROL$BYTE$CHA AND 0FH) = RNR$CNTL)       /*RNR FRAME*/
                THEN CALL RCV$RNR(1,P$BIT$A, SEQ$NUM$A, ADDRESS$B);
            ELSE IF ((CONTROL$BYTE$CHA AND 0FH) = REJ$CNTL)       /*REJ FRAME*/
                THEN CALL RCV$REJ(1,P$BIT$A, SEQ$NUM$A, ADDRESS$B);
            ELSE IF ((CONTROL$BYTE$CHA AND 0EFH) = SABM$CNTL)     /*SABM FRAME*/
                THEN CALL RCV$SABM(1,P$BIT$A);
            ELSE IF ((CONTROL$BYTE$CHA AND 0EFH) = DISC$CNTL)     /*DISC FRAME*/
                THEN CALL RCV$DISC(1,P$BIT$A);
            ELSE IF ((CONTROL$BYTE$CHA AND 0EFH) = CMDR$CNTL)     /*CMDR FRAME*/
                THEN CALL RCV$CMDR(1,P$BIT$A);
            ELSE IF ((CONTROL$BYTE$CHA AND 0EFH) = DM$CNTL)       /*DM FRAME*/
                THEN CALL RCV$DM(1,P$BIT$A);
            ELSE
            DO; /* IGNORE INVALID CONTROL FIELD FRAMES */
                CALL SEND$SEQ(@TP$65, LENGTH(TP$65));
                CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
            END;
            IF NOT SABM$MODE$A THEN
                    CALL SENDSEQ(@(CR,LF,'ROUTE$IN NOT IN SABM$MODE$A'), 29);
        END;    /* CHANNEL A PROCESSING     */
        ELSE
        DO;     /* IGNORE INVALID FRAMES    */
            CALL SEND$SEQ(@TP$65A, LENGTH(TP$65A));
            CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
        END;

/*------------------CHANNEL B PROCESSING ---------------------------------*/
   CALL SENDSEQ(@(CR,LF),2);
    CALL SENDSEQ(@('ROUTE$IN CHB NS & NE ='), 22);
   CALL PRINTI(NT02NS);
   CALL PRINTI(NT02NE);
   CALL SENDSEQ(@(CR,LF),2);

   ADDRESS$B = NT02RX(NT02NS);
   IF(((NT02NE - NT02NS) >= I$FRAME$SIZE) OR (NT02NS > NT02NE)) THEN
       IF (ADDRESS$B = A$ADD) OR (ADDRESS$B = B$ADD) THEN
       DO;
           /******FRAME IS PRESENT IN RECEIVE TABLE********/
           CALL SENDSEQ(@TP$66C, LENGTH(TP$66C));
           CONTROL$BYTE$CHB = NT02RX(NT02NS + 1);
           SEQ$NUM$B = SHR((CONTROL$BYTE$CHB AND 0E0H), 5);
           P$BIT$B = SHR((CONTROL$BYTE$CHB AND 010H), 4);
```

```
              CALL DSPLY$FRAME$HDR(2);
             IF NOT SABM$MODE$B THEN
             DO;
                 IF ((CONTROL$BYTE$CHB AND SABM$CNTL) = SABM$CNTL)
                     THEN CALL RCV$SABM(2,1);
                     ELSE CALL SND$DM(2,1);
             END;
             ELSE IF((CONTROL$BYTE$CHB AND 01H) = 0) THEN        /*I FRAME*/
                  CALL RCV$I$FRAME(2,P$BIT$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0FH) = RR$CNTL)      /*RR FRAME*/
                 THEN CALL RCV$RR(2,P$BIT$B, SEQ$NUM$B, ADDRESS$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0FH) = RNR$CNTL)     /*RNR FRAME*/
                 THEN CALL RCV$RNR(2,P$BIT$B, SEQ$NUM$B, ADDRESS$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0FH) = REJ$CNTL)     /*REJ FRAME*/
                 THEN CALL RCV$REJ(2,P$BIT$B, SEQ$NUM$B, ADDRESS$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0EFH) = SABM$CNTL)   /*SABM FRAME*/
                 THEN CALL RCV$SABM(2,P$BIT$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0EFH) = DISC$CNTL)   /*DISC FRAME*/
                 THEN CALL RCV$DISC(2,P$BIT$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0EFH) = UA$CNTL)     /*UA FRAME*/
                 THEN CALL RCV$UA(2,P$BIT$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0EFH) = CMDR$CNTL)   /*CMDR FRAME*/
                 THEN CALL RCV$CMDR(2,P$BIT$B);
             ELSE IF ((CONTROL$BYTE$CHB AND 0EFH) = DM$CNTL)     /*DM FRAME*/
                 THEN CALL RCV$DM(2,P$BIT$B);
             ELSE
             DO;
                 CALL SEND$SEQ(@TP$66, LENGTH(TP$66));
                 CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
             END;
             IF NOT SABM$MODE$B THEN
                     CALL SENDSEQ(@(CR,LF,'ROUTE$IN NOT IN SABM$MODE$B'), 29);
         END;    /* CHANNEL B PROCESSING     */
         ELSE
         DO;     /* IGNORE INVALID FRAMES    */
             CALL SEND$SEQ(@TP$66A, LENGTH(TP$66A));
             CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
         END;
     IF (SABM$MODE$A AND SABM$MODE$B) THEN CALL ROUTE$PACKET;

END ROUTE$IN;

/***********************************************************************
*  DATE:                          30 SEP 84                            *
*  VERSION:                       1.0                                  *
*  NAME:                          READ$LINE                            *
*  MODULE NUMBER:                 7.0                                  *
*  DESCRIPTION:                   This procedure reads the input data  *
*              from the ISIS OS.  This procedure is used for simu-     *
*              purposes only.                                          *
*  PASSED VARIABLES:          None                                      *
*  RETURNS:                   None                                      *
*  GLOBAL VARIBLES USED:      BUFFER, MSG1, MSG4, MSG3, ACTUAL, R$CONN  *
*                       STATUS, LOOP, MAC$NETWORK $CODE                 *
*  GLOBAL VARIBLES CHANGED:   BUFFER, ACTUAL, LOOP                      *
*  MODULES CALLED:            SENDSEQ, ERR$CHK, DQ$READ, ASC$HEX,       *
*                             LOAD                                      *
*  CALLING MODULES:           main, INFO$XFER                           *
*  AUTHOR:   C.T. Childress 30 SEP 84                                   *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M         *
*                version                                                *
***********************************************************************/
READ$LINE: PROCEDURE;

   DECLARE INDEX WORD;
   DECLARE LOOP  WORD;

   INDEX = 0;

   CALL SENDSEQ(@MSG1, LENGTH(MSG1));
   ACTUAL = DQ$READ(R$CONN, @BUFFER, 128, @STATUS);
   CALL ERR$CHK;

   IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN DO;
       CALL SENDSEQ(@MSG4, LENGTH(MSG4));
       ACTUAL = DQ$READ(R$CONN, @BUFFER, 128, @STATUS);
       CALL ERR$CHK;
       LOOP = ASC$HEX(BUFFER(0));
       IF (LOOP >= 1) AND (LOW(LOOP) <= MAX$NETWORK$CODE) THEN DO;
           CALL SENDSEQ(@MSG3, LENGTH(MSG3));
           ACTUAL = DQ$READ(R$CONN, @BUFFER, 128, @STATUS);
           CALL ERR$CHK;
           IF (BUFFER(0) >= '1') AND (BUFFER(0) <= '9') THEN
               DO INDEX = 1 TO ASC$HEX(BUFFER(0));
               CALL LOAD(LOOP);
               END;
       END;
   END;

   /**  ASK FOR ANY CONTROL FRAMES SENT  **/
   CALL SENDSEQ(@MSG5, LENGTH(MSG5));
   ACTUAL = DQ$READ(R$CONN, @BUFFER, 128, @STATUS);
   CALL ERR$CHK;

   IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN DO;
       CALL SENDSEQ(@MSG6, LENGTH(MSG6));
       ACTUAL = DQ$READ(R$CONN, @BUFFER, 128, @STATUS);
       CALL ERR$CHK;
       LOOP = ASC$HEX(BUFFER(0));
       IF LOOP <= 7 THEN
```

```
          DO CASE LOOP;
              DO;                 /* CASE 0                 */
                  CALL SND$CMDR(1,1,1,1);
                  CALL SND$CMDR(2,1,1,1);
              END;                /* CASE 1                 */
              DO;                 /* CASE 1                 */
                  CALL SND$RR(1,1,B$ADD);
                  CALL SND$RR(2,1,A$ADD);
              END;                /* CASE 1                 */
              DO;                 /* CASE 2                 */
                  CALL SND$RNR(1,1,B$ADD);
                  CALL SND$RNR(2,1,A$ADD);
              END;                /* CASE 2                 */
              DO;                 /* CASE 3                 */
                  CALL SND$REJ(1,1,B$ADD);
                  CALL SND$REJ(2,1,A$ADD);
              END;                /* CASE 3                 */
              DO;                 /* CASE 4                 */
                  CALL SND$UA(1,1);
                  CALL SND$UA(2,1);
              END;                /* CASE 4                 */
              DO;                 /* CASE 5                 */
                  CALL SND$DISC(1,1);
                  CALL SND$DISC(2,1);
              END;                /* CASE 5                 */
              DO;                 /* CASE 6                 */
                  CALL SND$DM(1,1);
                  CALL SND$DM(2,1);
              END;                /* CASE 6                 */
              DO;                 /* CASE 7                 */
                  CALL SND$SABM(1,1);
                  CALL SND$SABM(2,1);
              END;                /* CASE 7                 */
          END;                    /* END CASE               */
   END;                           /* ASK FOR CONTROL FRAME*/

   CALL SENDSEQ(@MSG2, LENGTH(MSG2));
   ACTUAL = DQ$READ(R$CONN, @BUFFER, 128, @STATUS);
   CALL ERR$CHK;

   IF (BUFFER(0) = 'Y') OR (BUFFER(0) = 'y') THEN
       FOREVER = FALSE;
   ELSE
       FOREVER = TRUE;

END READ$LINE;

/***********************************************************************
*  DATE:                       28 AUG 85                               *
*  VERSION:                    1.0                                     *
*  NAME:                     START$DM$MODE                                    *
*  MODULE NUMBER:            8.0                                              *
*  DESCRIPTION:              This procedure initalizes both channels          *
*               to the SABM mode.  The UNIDs will stay in the DM state        *
*               until both channels have received SABM commands.              *
*  PASSED VARIABLES:                                                          *
*  RETURNS:                                                                   *
*  GLOBAL VARIBLES USED:                                                      *
*  GLOBAL VARIBLES CHANGED:                                                   *
*  MODULES CALLED:             RCV$SABM, SND$SABM, RCV$UA, SND$DM,            *
*                              ROUTE$OUT                                      *
*  CALLING MODULES:            main                                           *
*  AUTHOR:   Mark Weber                                                       *
*  HISTORY:  1.0 Mark Weber- 28 AUG 85-original PL/M version                  *
*****************************************************************************/
START$DM$MODE:  PROCEDURE;

   DECLARE (CONTROL$BYTE$CHA, CONTROL$BYTE$CHB) BYTE;
   DECLARE (P$BIT$A, P$BITB) BYTE;
   DECLARE (SEQ$NUM$A, SEQ$NUM$B) BYTE;
   DECLARE TP$62(*) BYTE DATA(CR,LF,
    'TP$62             ENTERING THE  DM MODE',CR,LF);
   DECLARE TP$62A(*) BYTE DATA(CR,LF,
    'TP$62A            IN SABM$MODE$A',CR,LF);
   DECLARE TP$62B(*) BYTE DATA(CR,LF,
    'TP$62B            IN SABM$MODE$B',CR,LF);

   SABM$MODE$A = FALSE;
   SABM$MODE$B = FALSE;
    TX01NS, TX01NE, TX02NS, TX02NE = 0;
    NT01NS, NT01NE, NT02NS, NT02NE = 0;
    RCV$STATE$A, RCV$STATE$B       = 0;
    SEND$STATE$A, SEND$STATE$B     = 0;
    CALL READLINE;
   CALL SENDSEQ(@TP$62, LENGTH(TP$62));
   DO WHILE NOT (SABM$MODE$A AND SABM$MODE$B);
       IF((NT01NE - NT01NS) >= I$FRAME$SIZE) OR (NT01NS > NT01NE) THEN
       DO;
           /******FRAME IS PRESENT IN RECEIVE TABLE********/
           CONTROL$BYTE$CHA = NT01RX(NT01NS + 1);
           SEQ$NUM$A = SHL((CONTROL$BYTE$CHA AND 0E0H), 5);
           P$BIT$A = CONTROL$BYTE$CHA AND 010H;
           IF NOT SABM$MODE$A THEN                    /* CHECK FOR SABM COMMAND*/
           DO;
               IF ((CONTROL$BYTE$CHA AND SABM$CNTL) = SABM$CNTL)
                   THEN CALL RCV$SABM(1,1);
               ELSE IF ((CONTROL$BYTE$CHA AND UA$CNTL) = UA$CNTL)  /*UA FRAME*/
                   THEN CALL RCV$UA(1,P$BIT$A);
               ELSE CALL SND$DM(1,1);                   /* SND UA RESPONSE*/
           END; /* END IF ELSE ON RECEIVED FRAMES                          */
```

```
        END;    /*  END REVEIVED FRAME PROCEDUES FOR CHANNEL A            */
            /*  IF NO FRAME RECEIVED, SEND A SABM COMMAND            */
    ELSE CALL SND$SABM(1,1);

    /*************CHANNEL B PROCESSING ********************************/
    IF((NT02NE - NT02NS) >= I$FRAME$SIZE) OR (NT02NS > NT02NE) THEN
    DO;
        /******FRAME IS PRESENT IN RECEIVE TABLE********/
        CONTROL$BYTE$CHB = NT02RX(NT02NS + 1);
        SEQ$NUM$B = SHL((CONTROL$BYTE$CHB AND 0E0H), 5);
        P$BIT$B = CONTROL$BYTE$CHB AND 010H;
        IF NOT SABM$MODE$B THEN                 /* CHECK FOR SABM COMMAND*/
        DO;
            IF ((CONTROL$BYTE$CHB AND SABM$CNTL) = SABM$CNTL)
                THEN CALL RCV$SABM(2,1);
            ELSE IF ((CONTROL$BYTE$CHB AND UA$CNTL) = UA$CNTL)  /*UA FRAME*/
                THEN CALL RCV$UA(2,P$BIT$A);
            ELSE CALL SND$DM(2,1);                   /* SND UA RESPONSE*/
        END; /* END IF ELSE ON RECEIVED FRAMES                       */
    END;    /*  END REVEIVED FRAME PROCEDUES FOR CHANNEL A           */
            /*  IF NO FRAME RECEIVED, SEND A SABM COMMAND            */
    ELSE CALL SND$SABM(2,1);
    IF SABM$MODE$A THEN CALL SENDSEQ(@TP$62A, LENGTH(TP$62A));
    IF SABM$MODE$B THEN CALL SENDSEQ(@TP$62B, LENGTH(TP$62B));

        /***********CHECK FOR ANY FRAMES SENT********************/
    CALL ROUTE$OUT;
   END;    /*END WHILE */
END START$DM$MODE;


/*********************************************************************
*  DATE:                       28 AUG 85                             *
*  VERSION:                    1.0                                   *
*  NAME:                       START$INFO$XFER                       *
*  MODULE NUMBER:              9.0                                   *
*  DESCRIPTION:                This is the driver module for the inform- *
*            ation transfer phase (state p4 of X.25).  This module   *
*            calls the receive and transmit portions of the LAP B    *
*            protocol currently implemented.                         *
*  PASSED VARIABLES:           None                                  *
*  RETURNS:                    None                                  *
*  GLOBAL VARIBLES USED:       SABM$MODE                             *
*  GLOBAL VARIBLES CHANGED:    SABM$MODE                             *
*  MODULES CALLED:             ROUTE$IN, ROUTE$OUT                   *
*  CALLING MODULES:            main                                  *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber - 28 AUG 85 - original PL/M version      *
*********************************************************************/
START$INFO$XFER:  PROCEDURE;
```

```
   DECLARE TP$63(*) BYTE DATA(CR,LF,
   'TP$63           Entering information transfer state (p4 of X.25)');

   RNR$MODE$A = FALSE;
   RNR$MODE$B = FALSE;      /*READY TO RECEIVE INFORMATION FRAMES*/
   CALL SENDSEQ(@TP$63, LENGTH(TP$63));
   DO WHILE ((SABM$MODE$A AND SABM$MODE$B) AND FOREVER);
       CALL ROUTE$IN;
       CALL ROUTE$OUT;
       CALL READ$TAB;
       CALL SENDSEQ(@TP$43, LENGTH(TP$43));
       CALL READ$LINE;
   END;                /* END ONE SERVICE OF TRANSMIT AND RECEIVE  */

END START$INFO$XFER;

/*******************************************************************
*  DATE:                          16 SEP 85                        *
*  VERSION:                       1.1                              *
*  NAME:                          main                             *
*  MODULE NUMBER:                 None                             *
*  DESCRIPTION:                   This is the main module for the data-  *
*              link layer simulation test.  The main module acts as  *
*              as an executive procedure, calling the primary pro-   *
*              cedures implementing the LAP B protocol.  Of primary  *
*              concern are the modules READ$LINE, START$DM$MODE, and *
*              START$INFO$XFER.  READ$LINE evaluates user responses  *
*              and loads the proper table with correctely formatted  *
*              frames or packets.  START$DM$MODE simulates the initial-*
*              zation for the SABM mode operation.  START$INFO$XFER  *
*              calls the primary SABM mode routines ROUTE$IN and     *
*              ROUTE$OUT for information transfer in the SABM mode.  *
*  PASSED VARIABLES:              W$CONNM R$CONN F$CONN STATUS     *
*  RETURNS:                       STATUS                           *
*  GLOBAL VARIBLES USED:          FOREVER, R$CONN, F$CONN, W$CONN  *
*  GLOBAL VARIBLES CHANGED:       FOREVER                          *
*  MODULES CALLED:                DQ$OPEN, DQ$CLOSE, ERR$CHK, DQ$ATTACK  *
*                DQ$CREATE, SENDSEQ, INIT$N$TAB, READ$LINE,        *
*                START$DM$MODE, START$INFOR$XFER, DQ$DETACH, DQ$EXIT *
*  CALLING MODULES:               NONE (MAIN MODULE)               *
*  ALOGRITHM:  MAIN:    OPEN write device (system console)        *
*                       OPEN read device  (system console)         *
*                       OPEN file output  (FILE.OUT)               *
*                       Send start up header                       *
*                       Send initialization message                *
*                       Initialize global varibles, tables,        *
*                           and poiters                            *
*                       Ask to continue the test                   *
*                       Read response varible FOREVER              *
*                       Send system start message                  *
*                        While FOREVER true                               *
*                             Send inside FOREVER loop message            *
*                             Start DM Mode                               *
*                             Send exited DM Moded message                *
*                             Start Information Transfer Phase            *
*                             Send exited Information Transfer Phase      *
*                        END while loop                                   *
*                        Send end of test message                         *
*                        Close output file (FILE.OUT)                     *
*                        Close write device                               *
*                        Clsoe read device                                *
*               END MAIN;                                                 *
*  AUTHOR:   1.1 Mark Weber - 16 SEP 85 - LAP B datalink implementation*
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M          *
*                version                                                  *
*************************************************************************/

BEGIN:

   /* THE FOLLOWING DQ$xxxxx CALLS MUST BE THE FIRST EXECUTABLE CODE IN
       THIS MODULE FOR THE ISIS-II CONSOLE I/O TO OPERATE PROPERLY.
       DO NOT CHANGE THE LOCATION OF THIS CODE OR IT WILL NOT WORK!
       DO NOT MAKE 'BEGIN:' PUBLIC AND THE START(BEGIN) OPTION WITH
           LINK86 OR IT WILL NOT WORK!                                 */

   W$CONN = DQ$CREATE (@(4, ':CO:'), @STATUS);
   CALL ERR$CHK;
   CALL DQ$OPEN (W$CONN, 2, 0, @STATUS);
   CALL ERR$CHK;

   R$CONN = DQ$ATTACH (@(4, ':CI:'), @STATUS);
   CALL ERR$CHK;
   CALL DQ$OPEN (R$CONN, 1, 0, @STATUS);
   CALL ERR$CHK;

   F$CONN = DQ$CREATE (@(8, 'FILE.OUT'), @STATUS);
   CALL ERR$CHK;
   CALL DQ$OPEN (F$CONN, 2, 1, @STATUS);
   CALL ERR$CHK;

    CALL SENDSEQ(@STARTUP$HDR, LENGTH(STARTUP$HDR));

    CALL SENDSEQ(@TP$1, LENGTH(TP$1));

   CALL INIT$N$TAB;

    CALL SENDSEQ(@TP$2, LENGTH(TP$2));

   CALL READ$LINE;
```

```
    CALL SENDSEQ(@TP$3, LENGTH(TP$3));

    DO WHILE FOREVER;

       CALL SENDSEQ(@TP$4, LENGTH(TP$4));

       CALL START$DM$MODE;
                              /* BOTH CHANNELS ARE NOW IN SABM$MODE   */

       CALL SENDSEQ(@TP$42, LENGTH(TP$42));

       CALL START$INFO$XFER;

    END;

    CALL SENDSEQ(@TP$44, LENGTH(TP$44));

   CALL DQ$CLOSE(F$CONN, @STATUS);
   CALL ERR$CHK;
   CALL DQ$CLOSE(W$CONN, @STATUS);
   CALL ERR$CHK;
   CALL DQ$CLOSE(R$CONN, @STATUS);
   CALL ERR$CHK;
   CALL DQ$DETACH(F$CONN, @STATUS);
   CALL ERR$CHK;
   CALL DQ$DETACH(W$CONN, @STATUS);
   CALL ERR$CHK;
   CALL DQ$DETACH(R$CONN, @STATUS);
   CALL ERR$CHK;
   CALL DQ$EXIT(0);

END MAIN;      /* END MAIN MODULE */

/****************************** THE END ********************************/
```

2. LAPBO.SRC - Module with LAP B procedures

```
$TITLE('UNID II NETWORK TEST PROGRAM, 5 NOV 85')
$XREF OPTIMIZE(2)
/*************************************************************************
*  DATE:     6 NOV 86                                                    *
*  VERSION:  1.0                                                         *
*  TITLE:  ISO layer 2 LAP B simulation                                  *
*  FILENAME:  LAPBO.SRC                                                  *
*  COORDINATOR:  Capt Mark W. Weber                                      *
*  PROJECT:  UNIT II                                                     *
*  OPERATING SYSTEM:  INTEL SYSTEM III/230                               *
*  LANGUAGE:  PL/M 86                                                    *
*  USE:  This file requires no includes.  Compliaton is with the compact *
*        and other default vaules of the PLM86 compiler.  Linking requires *
*        the main module, NETX25.OBJ, the module LAPB1.OBJ, and SMALL.LIB. *
*        Use the SUBMIT file NETX25.CSD for locating and linking the object *
*        code.                                                           *
*  CONTENTS:  LAPB - module containg ISO layer two procedures            *
*             PRINTI - prints an integer given the hex input             *
*             DSPLY$FRAME$HDR - displays the frame header and prints the *
*                                pointer locations in the transmit and   *
*                                receieve tables                         *
*             STO$U$CMD - stores the control byte given in a FIFO queue  *
*             FIND$U$CMD - finds the next U command to service           *
*             UP$DATE$SEND$STATE - updates the send state varible        *
*             SND$CMDR -  places a CMDR formatted frame in the tramsit queue *
*             RESET$QUE - places the next to process pointer at specified *
*                          location to retransmit a frame                *
*             SND$DM - places a DM formated response in transmit queue   *
*             SND$SABM - places a SABM fomatted frame in the transmit queue *
*             SND$IN$SEQ - checks for in sequence send state varibles    *
*             RCV$IN$SEQ - checks for in sequence receive state varibles *
*             SND$RR - places a RR frame in the transmit queue           *
*             SND$REJ - places a REJ frame in the transmit queue         *
*             SND$RNR - places a RNR frame in the transmit queue         *
*             SND$UA - places a UA frame in the transmit queue           *
*             SND$DISC - places a DISC frame in the transmit queue       *
*             RCV$I$FRAME - processes received I$FRAMES, and is entry point *
*                            point for ISO layer 3 receive packet software *
*             RCV$SABM - processes received SABM frames                  *
*             RCV$UA - processes received UA frames                      *
*             RCV$REJ - processes received REJ frames                    *
*             RCV$RNR - processes received RNR frames                    *
*             RCV$RR - processes received RR frames                      *
*             RCV$DICS - processes received DICS frames                  *
*             RCV$CMDR - processes received CMDR frames                  *
*             FRAME$PRESENT - checks for a frame in the datalink receive *
*                              table                                     *
*  FUNCTION:  Simulates the operation of the SBC 88/45 in the UNID II using *
*             the datalink layer as described by CCITT recommendation X.25. *
*             ISIS calls are used to provide a user interface and to trace *
*             the process flow of the LAP B protocol imployed by the CCITT   *
*              X.25 recommendation.                                          *
*  HISTORY:  1.0 Mark Weber - 7 SEP 84 - original version                    *
*****************************************************************************/

LAPB$MODULE: DO;

/*******************  EXTERNAL PROCEDURES FOR ISIS SYSTEM CALLS *************/

LD$TAB$HSKP:  PROCEDURE (TABLE, FRAME$SIZE) EXTERNAL;
               DECLARE TABLE BYTE, FRAME$SIZE INTEGER;
             END LD$TAB$HSKP;

SRVC$TAB$HSKP:  PROCEDURE (TABLE, FRAME$SIZE) EXTERNAL;
                 DECLARE TABLE BYTE, FRAME$SIZE INTEGER;
               END SRVC$TAB$HSKP;

SENDSEQ:        PROCEDURE (MSG, TOTAL) EXTERNAL;
                 DECLARE MSG POINTER, TOTAL WORD;
               END SENDSEQ;

DET$DEST$LN:    PROCEDURE WORD EXTERNAL;
               END DET$DEST$LN;

DET$DEST$ONE:   PROCEDURE WORD EXTERNAL;
               END DET$DEST$ONE;

DET$DEST$TWO:   PROCEDURE WORD EXTERNAL;
               END DET$DEST$TWO;

HEX$ASC:        PROCEDURE (C) WORD EXTERNAL;
               DECLARE C BYTE;
               END HEX$ASC;

INITACK:        PROCEDURE (TABLE) EXTERNAL;
               DECLARE TABLE BYTE;
               END INITACK;

DECLARE    CR  LITERALLY 'ODH',
       LF  LITERALLY 'OAH';


/**************************** END EXTERNALS ******************************/


DECLARE
       FALSE        LITERALLY 'OH', /* USE AS FLAGS TO TEST */
       TRUE         LITERALLY 'OFFH', /* BITS FOR BRANCHING */
       CONCTC       LITERALLY 'OD5H', /* NETWORK MONITOR CTC PORT ADDRESS */
       CONCMD       LITERALLY 'ODFH',
                          /* NETWORK MONITOR USART COMMAND PORT ADDRESS */
   CONDAT       LITERALLY 'ODEH',
                          /* NETWORK MONITOR USART DATA PORT ADDRESS */
   NET$RI$DEST$ERR LITERALLY '10', /* NET ROUTE$IN DEST ERROR ENTRY */
   NET$RO$DEST$ERR LITERALLY '11', /* NET ROUTE$OUT DEST ERROR ENTRY */
   PACKET$SIZE     LITERALLY '138', /* PACKET IS 138 BYTE BLOCK */
   PACKETS$IN$TABLE LITERALLY '10', /* # PACKETS IN TABLE */
   PACKET$TABLE$SIZE LITERALLY '1380',
       I$FRAME$SIZE       LITERALLY '140',
   U$FRAME$SIZE       LITERALLY '2',
   S$FRAME$SIZE       LITERALLY '2',
   CMDR$FRAME$SIZE    LITERALLY '5',
   FRAMES$IN$TABLE    LITERALLY '10',
   FRAME$TABLE$SIZE   LITERALLY '1400',
   DATA$SIZE       LITERALLY '128',
   IP$DATA$SIZE    LITERALLY '96',
   TCP$DATA$SIZE   LITERALLY '72';


   /* NETWORK VARIABLES FOR THIS UNID */

   /* NOTES: 1.  THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
         2.  THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH THIS
         UNID IS LOCATED.
         3.  MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
         ARE CURRENTLY OPERATIONAL.  CC = 0000 IS RESERVED
         FOR THE DELNET MONITOR.
         4.  MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
         CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
         5.  FOR DETAILED INFORMATION ON THE ABOVE, REFER TO
         PHISTER'S THESIS, APPENDIX D.                            */

DECLARE
   THIS$UNID$NBR LITERALLY '02H',  /* UNIQUE ADDRESS OF THIS UNID */
   THIS$COUNTRY$CODE LITERALLY '01H', /* COUNTRY WHERE THIS UNID RESIDES */
   MAX$COUNTRY$CODE  LITERALLY '01H', /* COUNTRIES CURRENTLY OPERATIONAL */
   MAX$NETWORK$CODE  LITERALLY '03H', /* NUMBER OF UNIDS OPERATIONAL IN CC */


   STAT$NBR   LITERALLY '20',    /* NUMBER OF ENTRIES IN STATUS TABLE */

       /* VARIABLES USED IN N.MAIN$U2 AND N.INSIO$U2 */
   CTCNOA      BYTE,
                 /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL A */
   CTCNOB      BYTE,
                /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL B */
   MAXNOA      LITERALLY '3',      /* PREVIOUSLY 64H = 100D */
                /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL A */
   MAXNOB      LITERALLY '3',      /* PREVIOUSLY 64H = 100D */
                /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL B */
   RETRANS$A    BYTE,
                /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   RETRANS$B    BYTE,
                /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$A    LITERALLY '6',
                /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$B    LITERALLY '6';
                /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */

DECLARE BUSYSTATUS LITERALLY '0FFH',
        NMBR$MSK    LITERALLY '07H',
        ESC         LITERALLY '1BH',
        EOT         LITERALLY '04H';
DECLARE ASCII(16)  BYTE EXTERNAL;
DECLARE TEMP(24)    WORD EXTERNAL;
DECLARE MSGNUM     BYTE EXTERNAL;
DECLARE OUT$TAB$FULL  BYTE EXTERNAL;
DECLARE A$ADD        LITERALLY '0000$0011B',  /*LAP B ADDRESS BYTE FORMATS */
        B$ADD        LITERALLY '0000$0001B';

DECLARE TEST         LITERALLY '0';           /* 0 - OPTIONAL PRINT STATEMENTS
                                                    NOT MADE               */
DECLARE I$CNTL       LITERALLY '0000$0001B',  /*LAP B FRAME CONTROL BYTE FORMATS*/
        RR$CNTL      LITERALLY '0000$0001B',
        RNR$CNTL    LITERALLY '0000$0101B',
        REJ$CNTL    LITERALLY '0000$1001B',
        DM$CNTL     LITERALLY '0000$1111B',
        SABM$CNTL   LITERALLY '0010$1111B',
        DISC$CNTL   LITERALLY '0100$0011B',
        UA$CNTL     LITERALLY '0110$0011B',
        CMDR$CNTL   LITERALLY '1000$0111B';
DECLARE P$BIT$MASK  LITERALLY '010H';

   /*********  GLOBAL CONSTANTS USED BY LAP B POCESSES ***************/

DECLARE (SABM$MODE$A, SABM$MODE$B)  BYTE EXTERNAL;
DECLARE (RNR$MODE$A, RNR$MODE$B)    BYTE EXTERNAL;
DECLARE (UA$ACK$CHA, UA$ACK$CHB)    BYTE EXTERNAL;
DECLARE DM$MODE                     BYTE EXTERNAL;
DECLARE U$CMD$QUE$A STRUCTURE(ACK BYTE, CMD BYTE) EXTERNAL;
DECLARE U$CMD$QUE$B STRUCTURE(ACK BYTE, CMD BYTE) EXTERNAL;

   /* MORE TO BE ADDED LATER */

/********************************************************************************/
/* ADDITIONAL GENERAL DECLARES NEEDED FOR THIS PROGRAM         */
/********************************************************************************/

DECLARE       TIMCHA          BYTE EXTERNAL,
           TIMCHB          BYTE EXTERNAL,
         HSKP$ERR        INTEGER EXTERNAL;
   /* MORE TO BE ADDED LATER */

/*****************************************************************************/
/* DATA TABLES USED IN THIS PROGRAM                                       */
/*****************************************************************************/

DECLARE
        NT01RX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       NT01NS  INTEGER EXTERNAL,
       NT01NE  INTEGER EXTERNAL,
       NT01SZ  INTEGER EXTERNAL,

       NT02RX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       NT02NS  INTEGER EXTERNAL,
       NT02NE  INTEGER EXTERNAL,
       NT02SZ  INTEGER EXTERNAL,

       NT01TX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       TX01NS  INTEGER EXTERNAL,
       TX01NE  INTEGER EXTERNAL,
       TX01SZ  INTEGER EXTERNAL,

       NT02TX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       TX02NS  INTEGER EXTERNAL,
       TX02NE  INTEGER EXTERNAL,
       TX02SZ  INTEGER EXTERNAL,

        I$FRAME$QUE(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
        I$FRAME$QUE$NS INTEGER EXTERNAL,
        I$FRAME$QUE$NE INTEGER EXTERNAL,
        I$FRAME$QUE$SZ INTEGER EXTERNAL,

       LCNTTB(PACKET$TABLE$SIZE)   BYTE EXTERNAL,
       LCNTNS  INTEGER EXTERNAL,
       LCNTNE  INTEGER EXTERNAL,
       LCNTSZ  INTEGER EXTERNAL,

       NTLCTB(PACKET$TABLE$SIZE)   BYTE EXTERNAL,
       NTLCNS  INTEGER EXTERNAL,
       NTLCNE  INTEGER EXTERNAL,
       NTLCSZ  INTEGER EXTERNAL,

       STATTB(STAT$NBR)    BYTE;

/* MISCELLANEOUS DECLARATIONS  */

DECLARE
       FOREVER BYTE EXTERNAL,
       DESTINATION WORD EXTERNAL,      /* DESTINATION OF A FRAME */
```

```
      SEQ$NUM$A    BYTE EXTERNAL,          /* ACKNOWLEDGE VARIABLE DECLARATIONS */
      SEQ$NUM$B    BYTE EXTERNAL,
      SEND$STATE$A     BYTE EXTERNAL,
      SEND$STATE$B     BYTE EXTERNAL,
      RCV$STATE$A      BYTE EXTERNAL,
      RCV$STATE$B      BYTE EXTERNAL;

/*  MESSAGES SENT TO MONITOR PORT       */

   DECLARE TP$75(*) BYTE DATA(CR,LF,
   'TP$75          ERROR IN RCV$CMDR    CHANNEL NUMBER');
    DECLARE TP$75A(*) BYTE DATA(CR,LF,
   'TP$75A         ENTERING RCV$CMDR,   CHANNEL A');
    DECLARE TP$75B(*) BYTE DATA(CR,LF,
   'TP$75B         ENTERING RCV$CMDR,   CHANNEL B');


/*******************************************************************
*  DATE:                          11 SEP 85                        *
*  VERSION:                         1.0                            *
*  NAME:                          PRINTI                           *
*  MODULE NUMBER:                 8.3.2.2                          *
*  DESCRIPTION:                   This procedure prints integers   *
*              passed to it.  It first converts the integer to ASCII *
*              then it calls SENDSEQ to print the ASCII sttring.    *
*  PASSED VARIABLES:              NUM                              *
*  RETURNS:                       None                             *
*  GLOBAL VARIBLES USED:          TEMP1                            *
*  GLOBAL VARIBLES CHANGED:       TEMP1                            *
*  MODULES CALLED:                SEND$SEQ                         *
*  CALLING MODULES:               DSPLY$FRAME$HDR                  *
*  AUTHOR:   Mark Weber                                            *
*  HISTORY:  1.0 Mark Weber                                        *
*******************************************************************/
PRINTI:  PROCEDURE (NUM) PUBLIC;
   DECLARE (NUM,I, X) INTEGER;
   DECLARE TEMP1(6) BYTE;
   DECLARE TEMP2(6) BYTE;

   DO I = 0 TO 5;
       TEMP1(I), TEMP2(I) = '*';
   END;
   I=0;
   X = NUM MOD 10;
   TEMP1(I) = ASCII(X);
   DO WHILE NUM > 0;
       I = I + 1;
       NUM = NUM/10;
       X = NUM MOD 10;
       TEMP1(I) = ASCII(X);
   END;
   DO X = 0 TO I;
      TEMP2(X) = TEMP1(I - X);
   END;
   CALL SENDSEQ(@TEMP2, 6);
END PRINTI;

/***********************************************************************
*  DATE:                        7 SEP 85                               *
*  VERSION:                     1.0                                    *
*  NAME:                        DSPLY$FRAME$HDR                        *
*  MODULE NUMBER:               9.3.7                                  *
*  DESCRIPTION:                 This procedure displys the header bytes *
*              in frames ready to be served by ROUTE$OUT and ROUTE$IN  *
*              and prints the pointer values NE and NS for the         *
*              specified transmit table.                               *
*  PASSED VARIABLES:            CHANNEL                                *
*  RETURNS:                     None                                   *
*  GLOBAL VARIBLES USED:        TX01NE, TX01NS, TX02NE, TX02NS, TEMP   *
*                               NX01NE, NX01NS, NX02NE, NX02NS         *
*  GLOBAL VARIBLES CHANGED:     TEMP                                   *
*  MODULES CALLED:              SEND$DATA, HEX$ASC                     *
*  CALLING MODULES:             ROUTE$OUT                              *
*  AUTHOR:   Mark Weber                                                *
*  HISTORY:  1.0 Mark Weber - 7 SEP 85 - original                      *
***********************************************************************/
DSPLY$FRAME$HDR:  PROCEDURE(CHANNEL) PUBLIC REENTRANT;

   DECLARE CHANNEL BYTE;
   DECLARE (INDEX, SIZE) INTEGER;
   DECLARE TP$DSP$F$RCVA(*) BYTE DATA(CR,LF,
   'TP$DSP$F$RCV-A        FRAME NOW BEING SERVED',CR,LF);
   DECLARE TP$DSP$F$RCVB(*) BYTE DATA(CR,LF,
   'TP$DSP$F$RCV-B        FRAME NOW BEING SERVED',CR,LF);
   DECLARE TP$DSP$F$SNDA(*) BYTE DATA(CR,LF,
   'TP$DSP$F$SND-A        FRAME NOW BEING SERVED',CR,LF);
   DECLARE TP$DSP$F$SNDB(*) BYTE DATA(CR,LF,
   'TP$DSP$F$SND-B        FRAME NOW BEING SERVED',CR,LF);

   DO CASE CHANNEL;
      ;          /* 0 IS A NULL           */
      DO;        /* CASE 1, CHANNEL A     */
         IF NT01NS <> NT01NE THEN
         DO;
            CALL SENDSEQ(@TP$DSP$F$RCVA, LENGTH(TP$DSP$F$RCVA));
            IF ((NT01RX(NT01NS + 1) AND I$CNTL) = 0) THEN
               DO INDEX = 0 TO 11;
                  TEMP(INDEX) = HEX$ASC(NT01RX(NT01NS + INDEX));
               END;
            ELSE
```

```
                    DO INDEX = 0 TO 11;
                        IF INDEX >= 2 THEN
                            TEMP(INDEX) = '*';
                        ELSE TEMP(INDEX) = HEX$ASC(NT01RX(NT01NS + INDEX));
                    END;
                CALL SENDSEQ(@TEMP, LENGTH(TEMP));
            END;
            CALL SENDSEQ(@(CR,LF), 2);
            CALL PRINTI(NT01NS);
            CALL PRINTI(NT01NE);
        END;        /* CASE 1               */
        DO;         /* CASE 2               */
            IF NT02NS <> NT02NE THEN
            DO;
                CALL SENDSEQ(@TP$DSP$F$RCVB, LENGTH(TP$DSP$F$RCVB));
                IF ((NT02RX(NT02NS + 1) AND I$CNTL) = 0) THEN
                    DO INDEX = 0 TO 11;
                        TEMP(INDEX) = HEX$ASC(NT02RX(NT02NS + INDEX));
                    END;
                ELSE
                    DO INDEX = 0 TO 11;
                        IF INDEX >= 2 THEN
                            TEMP(INDEX) = '*';
                        ELSE TEMP(INDEX) = HEX$ASC(NT02RX(NT02NS + INDEX));
                    END;
                CALL SENDSEQ(@TEMP, LENGTH(TEMP));
            END;
            CALL SENDSEQ(@(CR,LF), 2);
            CALL PRINTI(NT02NS);
            CALL PRINTI(NT02NE);
        END;        /* CASE 2               */
        DO;         /* CASE 3, CHANNEL A    */
            IF TX01NS <> TX01NE THEN
            DO;
                CALL SENDSEQ(@TP$DSP$F$SNDA, LENGTH(TP$DSP$F$SNDA));
                IF ((NT01TX(TX01NS + 1) AND I$CNTL) = 0) THEN
                    DO INDEX = 0 TO 11;
                        TEMP(INDEX) = HEX$ASC(NT01TX(TX01NS + INDEX));
                    END;
                ELSE
                    DO INDEX = 0 TO 11;
                        IF INDEX >= 2 THEN
                            TEMP(INDEX) = '*';
                        ELSE TEMP(INDEX) = HEX$ASC(NT01TX(TX01NS + INDEX));
                    END;
                CALL SENDSEQ(@TEMP, LENGTH(TEMP));
            END;
            CALL SENDSEQ(@(CR,LF), 2);
            CALL PRINTI(TX01NS);
            CALL PRINTI(TX01NE);
```

```
       END;         /* CASE 3                  */
       DO;          /* CASE 4                  */
           IF TX02NS <> TX02NE THEN
           DO;
               CALL SENDSEQ(@TP$DSP$F$SNDB, LENGTH(TP$DSP$F$SNDB));
               IF ((NT02TX(TX02NS + 1) AND I$CNTL) = 0) THEN
                   DO INDEX = 0 TO 11;
                       TEMP(INDEX) = HEX$ASC(NT02TX(TX02NS + INDEX));
                   END;
               ELSE
                   DO INDEX = 0 TO 11;
                       IF INDEX >= 2 THEN
                           TEMP(INDEX) = '*';
                       ELSE TEMP(INDEX) = HEX$ASC(NT02TX(TX02NS + INDEX));
                   END;
               CALL SENDSEQ(@TEMP, LENGTH(TEMP));
           END;
           CALL SENDSEQ(@(CR,LF), 2);
           CALL PRINTI(TX02NS);
           CALL PRINTI(TX02NE);
       END;         /* CASE 4                  */
   END;             /* END CASE                */
END DSPLY$FRAME$HDR;

/************************************************************************
*  DATE:                         29 AUG 85                              *
*  VERSION:                      1.0                                    *
*  NAME:                         FRAME$PRESENT                          *
*  MODULE NUMBER:                9.3.1                                  *
*  DESCRIPTION:                  This function  determines if a frame is *
*              waiting in the transmit buffer for processing.  A TRUE   *
*              value is returned if a frame is found.                   *
*  PASSED VARIABLES:             CHANNEL                                *
*  RETURNS:                      STATUS                                 *
*  GLOBAL VARIBLES USED:         TX01NE, TX02NE                         *
*  GLOBAL VARIBLES CHANGED:      None                                   *
*  MODULES CALLED:               SENDSEQ                                *
*  CALLING MODULES:              ROUTE$OUT                              *
*  AUTHOR:   Mark Weber                                                 *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.           *
************************************************************************/
FRAME$PRESENT:  PROCEDURE(CHANNEL) BYTE PUBLIC;

DECLARE CHANNEL BYTE;
DECLARE STATUS BYTE;
DECLARE TP$89(*) BYTE DATA(CR,LF,
'TP$89          ENTERING FRAME$PRESENT, CHANNEL A');
DECLARE TP$89A(*) BYTE DATA(CR,LF,
'TP$89A         ENTERING FRAME$PRESENT, CHANNEL B');
```

```
   IF((CHANNEL = 1) OR (CHANNEL = 2))THEN
       DO CASE CHANNEL;
            ;       /* CASE 0 IS NULL    */
            DO;     /* CASE 1            */
                IF TEST THEN CALL SENDSEQ(@TP$89, LENGTH(TP$89));
                IF( ((TX01NE - TX01NS) >= I$FRAME$SIZE) OR
                  (TX01NS > TX01NE) ) THEN
                    STATUS = TRUE;
                ELSE STATUS = FALSE;
            END;    /* CASE 1            */
            DO;     /* CASE 2            */
                IF TEST THEN CALL SENDSEQ(@TP89A, LENGTH(TP$89A));
                IF( ((TX02NE - TX02NS) >= I$FRAME$SIZE) OR
                  (TX02NS > TX02NE) ) THEN
                    STATUS = TRUE;
                ELSE STATUS = FALSE;
            END;    /* CASE 2            */
       END;         /* END CASE          */
   RETURN STATUS;
END FRAME$PRESENT;

/*********************************************************************
*  DATE:                             23 AUG 85                       *
*  VERSION:                            1.0                           *
*  NAME:                             STO$U$CMD                       *
*  MODULE NUMBER:                      8.5.2                         *
*  DESCRIPTION:                      This procedure stores all U command *
*              frames in a variable when a command is sent.  Receiving *
*              a UA reponse activates the last U command not         *
*              acknowlegded.                                         *
*  PASSED VARIABLES:                 CHANNEL, CNTL$BYTE              *
*  RETURNS:                          None                            *
*  GLOBAL VARIBLES USED:             U$CMD$QUE$A, U$CMD$QUE$A        *
*  GLOBAL VARIBLES CHANGED:          all of above                    *
*  MODULES CALLED:                   None                            *
*  CALLING MODULES:                  SND$SABM, SND$DISC, SENDSEQ     *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber                                          *
*********************************************************************/
STO$U$CMD:  PROCEDURE(CHANNEL, CNTL$BYTE) PUBLIC;

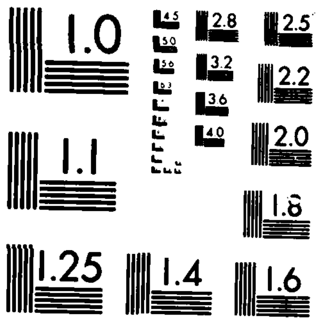
   DECLARE(CHANNEL, CNTL$BYTE) BYTE;
   DECLARE TP$STO$A(*) BYTE DATA(CR,LF,
   'TP$STO$A           ENTERING STO$U$CMD, CHANNEL A');
   DECLARE TP$STO$B(*) BYTE DATA(CR,LF,
   'TP$STO$B           ENTERING STO$U$CMD, CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
               ;       /* CASE 0 IS NULL    */
```

```
        DO;          /* CASE 1              */
            CALL SENDSEQ(@TP$STO$A, LENGTH(TP$STO$A));
            IF (U$CMD$QUE$A.ACK = TRUE) THEN
            DO;
                U$CMD$QUE$A.ACK = FALSE;
                U$CMD$QUE$A.CMD = CNTL$BYTE;
            END;
        END;         /* END CASE 1          */
        DO;          /* CASE 2              */
            CALL SENDSEQ(@TP$STO$B, LENGTH(TP$STO$B));
            IF (U$CMD$QUE$B.ACK = TRUE) THEN
            DO;
                U$CMD$QUE$B.ACK = FALSE;
                U$CMD$QUE$B.CMD = CNTL$BYTE;
            END;
        END;         /* END CASE 2          */
    END;             /* END CASE            */
END STO$U$CMD;

/*********************************************************************
*  DATE:                               23 AUG 85                      *
*  VERSION:                              1.0                          *
*  NAME:                               FIND$U$CMD                     *
*  MODULE NUMBER:                        8.3.3                        *
*  DESCRIPTION:                        This procedure finds  the last *
*              unacknowlegded U command sent.  When found the command *
*              is then processed.                                     *
*  PASSED VARIABLES:                   CHANNEL                        *
*  RETURNS:                            None                           *
*  GLOBAL VARIBLES USED:               U$CMD$QUE$A, U$CMD$QUE$B,      *
*                              RCV$STATE$A, RCV$STATE$B, NT01NE, NT02NE, *
*                              TX01NE, TX01NE                         *
*  GLOBAL VARIBLES CHANGED:            all of above                   *
*  MODULES CALLED:                     None                           *
*  CALLING MODULES:                    RCV$SABM, RCV$DISC             *
*  AUTHOR:   Mark Weber                                               *
*  HISTORY:  1.0 Mark Weber -23 AUG 85                                *
*********************************************************************/
FIND$U$CMD:  PROCEDURE(CHANNEL) PUBLIC REENTRANT;

   DECLARE CHANNEL  BYTE;
   DECLARE CNTL$BYTE  BYTE;
   DECLARE TP$86(*) BYTE DATA(CR,LF,
   'TP$86           ERROR IN U$CMD$QUE$A RETRIVAL');
   DECLARE TP$86A(*) BYTE DATA(CR,LF,
   'T?$86A          ENTERING FIND$U$CMD CHANNEL A');
   DECLARE TP$87(*) BYTE DATA(CR,LF,
   'TP$87           ERROR IN U$CMD$QUE$B RETRIVAL');
   DECLARE TP$87A(*) BYTE DATA(CR,LF,
   'TP$87A          ENTERING FIND$U$CMD CHANNEL B');
```


1.0
4.5
5.0
5.6
6.3
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

```
IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
    DO CASE CHANNEL;
            ;       /* CASE 0 IS NULL    */
        DO;         /* CASE 1            */
            CALL SENDSEQ(@TP$86A, LENGTH(TP$86A));
            IF (U$CMD$QUE$A.ACK = FALSE)THEN
            DO;
                U$CMD$QUE$A.ACK = TRUE;
                CNTL$BYTE = U$CMD$QUE$A.CMD;
                DO CASE SHR(CNTL$BYTE, 5);
                    SABM$MODE$A = FALSE;        /* CASE 0 IS DM/SARM COMMAND    */
                    DO;
                        SABM$MODE$A = TRUE;     /* CASE 1 IS A SABM COMMAND     */
                         RNR$MODE$A  = FALSE;
                        SEND$STATE$A = 0;
                        RCV$STATE$A = 0;
                        NT01NE, NT01NS = 0;
                        TX01NE, TX01NS = 0;
                    END;
                    DO;
                        SABM$MODE$A = FALSE;    /* CASE 2 IS A DISC COMMAND     */
                         RNR$MODE$A  = FALSE;
                        SEND$STATE$A = 0;
                        RCV$STATE$A = 0;
                        NT01NE, NT01NS = 0;
                        TX01NE, TX01NS = 0;
                    END;
                    ;                           /* CASE 3 IS A UA RESPONSE      */
                    ;                           /* CASE 4 IS A CMDR RESPONSE    */
                    CALL SEND$SEQ(@TP$86, LENGTH(TP$86));   /*ERROR OCCURED         */
                    CALL SEND$SEQ(@TP$86, LENGTH(TP$86));   /*ERROR OCCURED         */
                    CALL SEND$SEQ(@TP$86, LENGTH(TP$86));   /*ERROR OCCURED         */
                END;    /*  END CMDR CASE       */
            END;
        END;        /* END CASE 1        */
        DO;         /* CASE 2            */
            CALL SENDSEQ(@TP$87A, LENGTH(TP$87A));
            IF (U$CMD$QUE$B.ACK = FALSE) THEN
            DO;
                U$CMD$QUE$B.ACK = TRUE;
                CNTL$BYTE = U$CMD$QUE$B.CMD;
                DO CASE SHR(CNTL$BYTE, 5);
                    SABM$MODE$B = FALSE;        /* CASE 0 IS DM/SARM COMMAND    */
                    DO;
                        SABM$MODE$B = TRUE;     /* CASE 1 IS A SABM COMMAND     */
                         RNR$MODE$B  = FALSE;
                        SEND$STATE$B = 0;
                        RCV$STATE$B  = 0;
                        NT02NE, NT02NS = 0;
                        TX02NE, TX02NS = 0;
```

```
                      END;
                      DO;
                          SABM$MODE$B = FALSE;     /* CASE 2 IS A DISC COMMAND     */
                           RNR$MODE$B  = FALSE;
                          SEND$STATE$B =0;
                          RCV$STATE$B = 0;
                          NT02NE, NT02NS = 0;
                          TX02NE, TX02NS = 0;
                      END;
                                                   /* CASE 3 IS A UA RESPONSE      */
                      ;
                      ;                            /* CASE 4 IS A CMDR RESPONSE      */
                      CALL SEND$SEQ(@TP$86, LENGTH(TP$86));   /*ERROR OCCURED        */
                      CALL SEND$SEQ(@TP$86, LENGTH(TP$86));   /*ERROR OCCURED        */
                      CALL SEND$SEQ(@TP$86, LENGTH(TP$86));   /*ERROR OCCURED        */
                  END;/*  END CMDR CASE   */
              END;
          END;        /* END CASE 2       */
      END;            /* END CHANNEL CASE */
END FIND$U$CMD;

/*********************************************************************
*  DATE:                          29 AUG 85                           *
*  VERSION:                       1.0                                 *
*  NAME:                          UP$DATE$SEND$STATE                  *
*  MODULE NUMBER:                 9.2.2.2                             *
*  DESCRIPTION:                   This procedure increments the send state *
*              varibles SEND$STATE$ OR SEND$STATE$B when called to the *
*              the next modulo 8 sequence number to transmit.  This   *
*              procedure also performs the window function necessary  *
*              for the LAP B protocol.  Thewindow is currently 1.     *
*  PASSED VARIABLES:              CHANNEL, SEQ$NUM                    *
*  RETURNS:                       None                                *
*  GLOBAL VARIBLES USED:          SEND$STATE$A, SEND$STATE$B          *
*  GLOBAL VARIBLES CHANGED:       SEND$STATE$A, SEND$STATE$B          *
*  MODULES CALLED:                INITACK, SENDSEQ, PRINTI            *
*  CALLING MODULES:               SND$RR,                             *
*  ALOGRITHM:            CASE OF CHANNEL                              *
*                          CHANNEL A:  IF SEND$STATE$A <= RCV$STATE$A + 1 *
*                                         THEN INCREMENT SEND$STATE$A *
*                                         ELSE DO NOT INCREMENT       *
*                                      END IF                         *
*                          CHANNEL B:  IF SEND$STATE$B <= RCV$STATE$B + 1 *
*                                         THEN INCREMENT SEND$STATE$B *
*                                         ELSE DO NOT INCREMENT       *
*                                      END IF                         *
*                        END CASE OF CHANNEL                          *
*  AUTHOR:   Mark Weber                                               *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.         *
*********************************************************************/
UP$DATE$SEND$STATE:  PROCEDURE(CHANNEL, SEQ$NUM) PUBLIC;
```

```
   DECLARE (CHANNEL, SEQ$NUM) BYTE;
    DECLARE TP$69(*) BYTE DATA(CR,LF,
   'TP$69         ERROR IN CHANNEL SELECTION FOR UP$DATA$SEND$STATE');
    DECLARE TP$69A(*) BYTE DATA(CR,LF,
   'TP$69A         SEND$STATE$A HAS BEEN UPDATED:  ');
    DECLARE TP$69B(*) BYTE DATA(CR,LF,
   'TP$69B         SEND$STATE$B HAS BEEN UPDATED:  ');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;   /*  CASE 0 IS NULL  */
           DO;
               IF (SEQ$NUM = (SEND$STATE$A + 1) MOD 8) THEN
                   CALL INITACK(CHANNEL + 2);
               SEND$STATE$A = SEQ$NUM;
               CALL SENDSEQ(@TP$69A, LENGTH(TP$69A));
               CALL PRINTI(INT(SEND$STATE$A));
           END; /* CASE 1          */
           DO;  /* CASE 2          */
               IF (SEQ$NUM = (SEND$STATE$B +1) MOD 8) THEN
                   CALL INITACK(CHANNEL + 2);
                   SEND$STATE$B = SEQ$NUM;
               CALL SENDSEQ(@TP$69B, LENGTH(TP$69B));
               CALL PRINTI(INT(SEND$STATE$B));
           END; /* CASE 2          */
       END;     /* END CASE        */
   ELSE CALL SENDSEQ(@TP$69, LENGTH(TP$69));
END UP$DATE$SEND$STATE;

/*********************************************************************
*  DATE:                        29 AUG 85                            *
*  VERSION:                     1.0                                  *
*  NAME:                        SND$CMDR                             *
*  MODULE NUMBER:               9.2.9                                *
*  DESCRIPTION:                 This procedure issures a CMDR FRAME to the*
*              transmit buffer of the UNID network when called.  The *
*              procedure sends the control byte of the frame causeing *
*              the error condition and sets bits within the information*
*              byte to reflect the conditions causing the error.     *
*                                                                    *
*  PASSED VARIABLES:            CHANNEL, P$BIT, CNTL$ERR, ERROR$STATUS *
*  RETURNS:                     None                                 *
*  GLOBAL VARIBLES USED:        TX01NE, TX02NE, NT01TX, NT02TX       *
*  GLOBAL VARIBLES CHANGED:     TX01NE, TX02NE, NT01TX, NT02TX       *
*  MODULES CALLED:              UP$DATE$SEND$STATE, LD$TAB$HSKP, SENDSEQ *
*  CALLING MODULES:             RCV$I$FRAME                          *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.        *
*********************************************************************/
SND$CMDR:  PROCEDURE(CHANNEL, P$BIT, CNTL$ERROR, ERROR$STATUS) PUBLIC;
```

```
   DECLARE (CHANNEL, P$BIT, CNTL$ERROR, ERROR$STATUS) BYTE;
   DECLARE CONTROL$BYTE BYTE;
   DECLARE STATE BYTE;
   DECLARE TP$83(*) BYTE DATA(CR,LF,
   'TP$83          ERROR IN SND$CMDR CHANNEL NUMBER');
    DECLARE TP$83A(*) BYTE DATA(CR,LF,
   'TP$83A         ENTERING SND$CMDR, CHANNEL A');
    DECLARE TP$83B(*) BYTE DATA(CR,LF,
   'TP$83B         ENTERING SND$CMDR, CHANNEL B');

   STATE = 0;
   IF (P$BIT = 1) THEN
       CONTROL$BYTE = CMDR$CNTL OR  010H;
   ELSE CONTROL$BYTE = CMDR$CNTL;
   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL      */
           DO;     /*  CASE 1              */
               CALL SENDSEQ(@TP$83A, LENGTH(TP$83A));
               SABM$MODE$A = TRUE;
               STATE = (SHL(SEND$STATE$A, 4) OR RCV$STATE$A);
               NT01TX(TX01NE + 0) = A$ADD;
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               NT01TX(TX01NE + 2) = CNTL$ERROR;
               NT01TX(TX01NE + 3) = STATE;
               NT01TX(TX01NE + 4) = ERROR$STATUS;
               CALL LD$TAB$HSKP(3, I$FRAME$SIZE);
           END;/*  END CASE 1          */
           DO;/*   CASE 2              */
               CALL SENDSEQ(@TP$83B, LENGTH(TP$83B));
               SABM$MODE$B = TRUE;
               STATE = (SHL(SEND$STATE$B, 4) OR RCV$STATE$B);
               NT02TX(TX02NE + 0) = B$ADD;
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               NT02TX(TX02NE + 2) = CNTL$ERROR;
               NT02TX(TX02NE + 3) = STATE;
               NT02TX(TX02NE + 4) = ERROR$STATUS;
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;/*  END CASE 2          */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$83, LENGTH(TP$83));   /* ERROR IN CHANNEL NUMBER */
END SND$CMDR;

/*********************************************************************
*  DATE:                      29 AUG 85                              *
*  VERSION:                   1.0                                    *
*  NAME:                      RESET$QUE                              *
*  MODULE NUMBER:             None                                   *
*  DESCRIPTION:               This procedure places the next to send *
*              pointer (OUTFRAME$CHX$NS) at the location of the I    *
*               FRAME indicated by the sequence number.  The procedure *
*               first searches for I FRAMES and then examines them for *
*               the correct seqeucne number.  Once the correct sequence *
*               number is found, if it is found, the next to send      *
*               pointer is reset.  Transmission will begin at that point*
*               and every frame at the found sequence number or greater *
*               will be sent.  A CMDR frame is sent if no sequence     *
*               number match is found.  This procedure is not used with *
*               the current single frame window protocol, but is       *
*               included for demonstration purposes.                   *
*  PASSED VARIABLES:         CHANNEL, SEQ$NUM                          *
*  RETURNS:                  None                                      *
*  GLOBAL VARIBLES USED:     TX01NE, TX02NE                            *
*  GLOBAL VARIBLES CHANGED:  TX01NE, TX02NE                            *
*  MODULES CALLED:           None                                      *
*  CALLING MODULES:          None                                      *
*  AUTHOR:   Mark Weber                                                *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.          *
***********************************************************************/
RESET$QUE:  PROCEDURE(CHANNEL, SEQ$NUM) PUBLIC;

   DECLARE (CHANNEL, SEQ$NUM) BYTE;
   DECLARE INDEX INTEGER;
   DECLARE FRAME$CNTL BYTE;
   DECLARE (SEQ$FOUND, SEQ$PURGED) BYTE;
   DECLARE TP$81(*) BYTE DATA(CR,LF,
   'TP$81          ERROR IN RESET$QUE CHANNEL NUMBER');
    DECLARE TP$81A(*) BYTE DATA(CR,LF,
   'TP$81A         ENTERING RESET$QUE, CHANNEL A');
    DECLARE TP$81B(*) BYTE DATA(CR,LF,
   'TP$81B         ENTERING RESET$QUE, CHANNEL B');

   SEQ$FOUND = FALSE;
   SEQ$PURGED = FALSE;
   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
            ;        /* CASE 0 IS NULL        */
           DO;       /* CASE 1                */
               CALL SENDSEQ(@TP$81A, LENGTH(TP$81A));
               INDEX = TX01NS;
               DO WHILE NOT (SEQ$FOUND OR SEQ$PURGED);
                   FRAME$CNTL = NT01TX(INDEX + 1);
                   IF ((FRAME$CNTL AND 01H) = 0) THEN
                       IF ((FRAME$CNTL AND 0E0H) = SHL(SEQ$NUM, 5)) THEN
                           DO;
                               TX01NS = INDEX;
                               SEQ$FOUND = TRUE;
                           END;
                       ELSE SEQ$FOUND = FALSE;
                   IF NOT SEQ$FOUND THEN
```

```
                       DO;
                           IF ((INDEX - I$FRAME$SIZE) >= 0) THEN
                               INDEX = INDEX - I$FRAME$SIZE;
                           ELSE
                               INDEX = FRAME$TABLE$SIZE - I$FRAME$SIZE;
                           IF (INDEX = TX01NS) THEN
                               SEQ$PURGED = TRUE;
                       END;
               END;    /*  END WHILE        */
               IF SEQ$PURGED THEN
               DO;     /*  THE NEXT FRAME TRAMSMITTED IS A CMDR FRAME  */
                   CALL SND$CMDR(1,1, FRAME$CNTL, 08H);
                   TX01NS = TX01NE;
                   CALL LD$TAB$HSKP(3, IFRAME$SIZE);
               END;
           END;        /* END CASE 1        */
           DO;     /* CASE 2                */
               CALL SENDSEQ(@TP$81B, LENGTH(TP$81B));
               INDEX = TX02NS;
               DO WHILE NOT (SEQ$FOUND OR SEQ$PURGED);
                   FRAME$CNTL = NT02TX(INDEX + 1);
                   IF ((FRAME$CNTL AND 01H) = 0) THEN
                       IF ((FRAME$CNTL AND 0E0H) = SHL(SEQ$NUM, 5)) THEN
                           DO;
                               TX02NS = INDEX;
                               SEQ$FOUND = TRUE;
                           END;
                       ELSE SEQ$FOUND = FALSE;
                   IF NOT SEQ$FOUND THEN
                       DO;
                           IF ((INDEX - I$FRAME$SIZE) >= 0) THEN
                               INDEX = INDEX - I$FRAME$SIZE;
                           ELSE
                               INDEX = FRAME$TABLE$SIZE - I$FRAME$SIZE;
                           IF (INDEX = TX02NS) THEN
                               SEQ$PURGED = TRUE;
                       END;
               END;    /*  END WHILE        */
               IF SEQ$PURGED THEN
               DO;     /* THE NEXT FRAME TRANSMITTED IS A CMDR FRAME   */
                   CALL SND$CMDR(2,1, FRAME$CNTL, 08H);
                   TX02NS = TX02NE;
                   CALL LD$TAB$HSKP(3, IFRAME$SIZE);
               END;
           END;        /* END CASE 2        */
       END;            /* END CASE          */
   ELSE CALL SENDSEQ(@TP$81, LENGTH(TP$81));
END RESET$QUE;

/*************************************************************************
```

```
                                                                          *
*  DATE:                            28 AUG 85                              *
*  VERSION:                           1.0                                  *
*  NAME:                            SND$DM                                 *
*  MODULE NUMBER:                     8.4                                  *
*  DESCRIPTION:                     This procedure sends a DM response     *
*              U frame in responce to any frzme other than a SABM          *
*              command while not in the SABM mode.                         *
*  PASSED VARIABLES:                CHANNEL                                *
*  RETURNS:                         None                                   *
*  GLOBAL VARIBLES USED:            NT01NE, NT02NE                         *
*  GLOBAL VARIBLES CHANGED:         NT01NE, NT02NE                         *
*  MODULES CALLED:                  LD$TAB$HSKP, SENDSEQ                   *
*  CALLING MODULES:                 START$DM$MODE,                         *
*  AUTHOR:    Mark Weber                                                   *
*  HISTORY:  1.0 Mark Weber
**************************************************************************/
SND$DM:  PROCEDURE(CHANNEL, P$BIT) PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE CONTROL$BYTE BYTE;
    DECLARE TP88(*) BYTE DATA(CR,LF,
   'TP88         SND$DM HAS ERROR IN CHANNEL SELECTION ',CR,LF);
   DECLARE TP$88A(*) BYTE DATA(CR,LF,
   'TP$88A         ENTERING SND$DM,    CHANNEL A');
   DECLARE TP$88B(*) BYTE DATA(CR,LF,
   'TP$88B         ENTERING SND$DM,    CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;        /*  CASE 0 IS NULL  */
           DO;      /*  CASE 1 FOR CHANNEL A                          */
               CALL SENDSEQ(@TP$88A, LENGTH(TP$88A));
               NT01TX(TX01NE + 0) =B$ADD;        /* DM IS A RESPONSE */
               IF P$BIT = FALSE THEN
                   CONTROL$BYTE = DM$CNTL;
               ELSE
                  CONTROL$BYTE = DM$CNTL OR 10H;
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(3,      I$FRAME$SIZE);
            END;   /* CASE 1                                            */

           DO;      /*  CASE 2 FOR CHANNEL B                          */
               CALL SENDSEQ(@TP$88B, LENGTH(TP$88B));
               NT02TX(TX02NE + 0) =A$ADD;        /* DM IS A RESPONSE */
               IF P$BIT = FALSE THEN
                   CONTROL$BYTE = DM$CNTL;
               ELSE
                  CONTROL$BYTE = DM$CNTL OR 10H;
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
            END;   /* CASE 2                                         */

        END;        /* END CASE                                      */

    ELSE CALL SENDSEQ(@TP88, LENGTH(TP$88));
END SND$DM;

/*********************************************************************
*  DATE:                          28 AUG 85                          *
*  VERSION:                         1.0                              *
*  NAME:                          SND$SABM                           *
*  MODULE NUMBER:                   8.5                              *
*  DESCRIPTION:                   This procedure sends a SABM command *
*              U frame for transmission to the channel indicated by  *
*              the passed parameter.                                 *
*  PASSED VARIABLES:              CHANNEL                            *
*  RETURNS:                       None                               *
*  GLOBAL VARIBLES USED:          NT01NE, NT02NE, TX01NE, TX02NE     *
*  GLOBAL VARIBLES CHANGED:       NT01NE, NT02NE, TX01NE, TX02NE     *
*  MODULES CALLED:                LD$TAB$HSKP, STO$U$CMD, SENDSEQ    *
*  CALLING MODULES:               START$DM$MODE,                     *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber                                          *
*********************************************************************/
SND$SABM:  PROCEDURE(CHANNEL, P$BIT) PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE CONTROL$BYTE BYTE;
    DECLARE TP60(*) BYTE DATA(CR,LF,
   'TP60          SND$SABM DOES NOT HAVE TABLE SPECIFIED',CR,LF);
    DECLARE TP$60A(*) BYTE DATA(CR,LF,
   'TP$60A        ENTERING SND$SABM, CHANNEL A');
    DECLARE TP$60B(*) BYTE DATA(CR,LF,
   'TP$60B        ENTERING SND$SABM, CHANNEL B');

   IF (CHANNEL = 1 OR CHANNEL = 2) THEN
       DO CASE CHANNEL;
           ;        /*  CASE 0 IS NULL  */
           DO;      /*  CASE 1 FOR CHANNEL A                       */
               CALL SENDSEQ(@TP$60A, LENGTH(TP$60A));
               NT01TX(TX01NE + 0) =A$ADD;
               IF P$BIT = FALSE THEN
                   CONTROL$BYTE = SABM$CNTL;
               ELSE
                  CONTROL$BYTE = SABM$CNTL OR 10H;
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL STO$U$CMD(1, CONTROL$BYTE);
               CALL LD$TAB$HSKP(3,     I$FRAME$SIZE);
            END;   /* CASE 1                                         */
```

```
          DO;      /*  CASE 2 FOR CHANNEL B                               */
             CALL SEND$SEQ(@TP$60B, LENGTH(TP$60B));
             NTO2TX(TXO2NE + 0) =B$ADD;
             IF P$BIT = FALSE THEN
                CONTROL$BYTE = SABM$CNTL;
             ELSE
               CONTROL$BYTE = SABM$CNTL OR 10H;
             NTO2TX(TXO2NE + 1) = CONTROL$BYTE;
             CALL STO$U$CMD(2, CONTROL$BYTE);
             CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;   /* CASE 2                                                */

      END;       /* END CASE                                               */

   ELSE CALL SENDSEQ(@TP60, LENGTH(TP$60));
END SND$SABM;

/*********************************************************************
*  DATE:                        28 AUG 85                            *
*  VERSION:                     1.0                                  *
*  NAME:                        RCV$IN$SEQ                           *
*  MODULE NUMBER:               9.2.2.1                              *
*  DESCRIPTION:                 This function returns a TRUE value if *
*            the sequence number in the reveived I$FRAME is the ome  *
*            expected, otherwise FALSE is returned.                  *
*  PASSED VARIABLES:            CHANNEL, SEQ$NUM                     *
*  RETURNS:                     SEQUENCE                             *
*  GLOBAL VARIBLES USED:        RCV$STATE$A, RCV$STATE$B             *
*  GLOBAL VARIBLES CHANGED:     All the above                        *
*  MODULES CALLED:              PRINTI, SENDSEQ                      *
*  CALLING MODULES:             RCV$I$FRAME, RCV$RR, RCV$RNR, RCV$REJ *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber -28 AUG 85-original PL/M version         *
*********************************************************************/
RCV$IN$SEQ:  PROCEDURE(CHANNEL, SEQ$NUM) BYTE PUBLIC;

   DECLARE (CHANNEL, SEQ$NUM) BYTE;
   DECLARE SEQUENCE BYTE;
   DECLARE     TP$49(*) BYTE DATA(CR,LF,
   'TP$49          RCV$SEQ$A IS IN ERROR:  ');
   DECLARE     TP$50(*) BYTE DATA(CR,LF,
   'TP$50          RCV$SEQ$B IS IN ERROR:  ');
   DECLARE     TP$51(*) BYTE DATA(CR,LF,
   'TP$51          RCV$SEQ HAS CHANNEL ERROR');

   SEQUENCE = FALSE;
   IF ((CHANNEL = 1) OR (CHANNEL =2)) THEN
       DO CASE CHANNEL;
           ;   /* CASE 0 IS NULL          */
          DO; /* CASE 1                   */
```

```
            IF (RCV$STATE$A = SEQ$NUM) THEN
                SEQUENCE = TRUE;
            ELSE
            DO;
                CALL SENDSEQ(@TP$49, LENGTH(TP$49));
                CALL PRINTI(INT(RCV$STATE$A));
            END;
        END;/* CASE 1                       */

        DO; /* CASE 2                       */
            IF (RCV$STATE$B = SEQ$NUM) THEN
                SEQUENCE = TRUE;
            ELSE
            DO;
                CALL SENDSEQ(@TP$50, LENGTH(TP$50));
                CALL PRINTI(INT(RCV$STATE$B));
            END;
        END;/* CASE 2                       */
    END;    /* END CASE                     */
    ELSE CALL SENDSEQ(@TP$51, LENGTH(TP$51));
  RETURN SEQUENCE;
END RCV$IN$SEQ;

/*********************************************************************
*  DATE:                       28 AUG 85                             *
*  VERSION:                    1.0                                   *
*  NAME:                       SND$RR                                *
*  MODULE NUMBER:              9.2.2.6                               *
*  DESCRIPTION:                This procedure sends a RR FRAME when  *
*            envoked by the calling routine.                         *
*  PASSED VARIABLES:           CHANNEL, P$BIT                        *
*  RETURNS:                    None                                  *
*  GLOBAL VARIBLES USED:       NT01TX, NT02TX, TX01NE, TX02NE        *
*  GLOBAL VARIBLES CHANGED:    all the above                         *
*  MODULES CALLED:             LD$TAB$HSKP, SENDSEQ                  *
*  CALLING MODULES:            RCV$I$FRAME, READ$LINE                *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber -28 AUG 85-original PL/M version         *
*********************************************************************/
SND$RR:  PROCEDURE(CHANNEL, P$BIT, ADDR) PUBLIC REENTRANT;

  DECLARE (CHANNEL, P$BIT, ADDR) BYTE;
  DECLARE CONTROL$BYTE BYTE;
   DECLARE TP$70(*) BYTE DATA(CR,LF,
  'TP$70          ERROR IN CHANNEL SELECTION FOR SND$RR');
   DECLARE TP$70A(*) BYTE DATA(CR,LF,
  'TP$70A         ENTERING SND$RR,    CHANNEL A');
   DECLARE TP$70B(*) BYTE DATA(CR,LF,
  'TP$70B         ENTERING SND$RR,    CHANNEL B');
```

```
   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;   /*  CASE 0 IS NULL      */
           DO;/*   CASE 1              */
               CALL SENDSEQ(@TP$70A, LENGTH(TP$70A));
               IF (P$BIT = 1)  THEN
                   CONTROL$BYTE = (RR$CNTL OR (010H OR SHL(RCV$STATE$A, 5)));
               ELSE CONTROL$BYTE = (RR$CNTL OR SHL(RCV$STATE$A, 5));
               NT01TX(TX01NE + 0) = ADDR;      /* RR FRAME IS A RESPONSE */
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(3, I$FRAME$SIZE);
               END;/*  END CASE 1          */
           DO;/*   CASE 2              */
               CALL SENDSEQ(@TP$70B, LENGTH(TP$70B));
               IF (P$BIT = 1) THEN
                   CONTROL$BYTE = (RR$CNTL OR (010H OR SHL(RCV$STATE$B, 5)));
               ELSE CONTROL$BYTE = (RR$CNTL OR SHL(RCV$STATE$B, 5));
               NT02TX(TX02NE + 0) = ADDR;      /* RR FRAME IS A RESPONSE */
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;/*  END CASE 2          */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$70, LENGTH(TP$70));
END SND$RR;


/*************************************************************************
*  DATE:                        29 AUG 85                                *
*  VERSION:                     1.0                                      *
*  NAME:                        SND$REJ                                  *
*  MODULE NUMBER:               9.2.2.9                                  *
*  DESCRIPTION:                 This procedure issures a REJ FRAME to the *
*              transmit buffer of the UNID network when called.          *
*  PASSED VARIABLES:            CHANNEL, P$BIT                           *
*  RETURNS:                     None                                     *
*  GLOBAL VARIBLES USED:        NT01TX, NT02TX, TX01NE, TX02NE           *
*  GLOBAL VARIBLES CHANGED:     NT01TX, NT02TX                           *
*  MODULES CALLED:              LD$TAB$HSKP, SENDSEQ                     *
*  CALLING MODULES:             RCV$I$FRAME, READ$LINE                   *
*  AUTHOR:   Mark Weber                                                  *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.            *
*************************************************************************/
SND$REJ:  PROCEDURE(CHANNEL, P$BIT, ADDR) PUBLIC;

   DECLARE (CHANNEL, P$BIT, ADDR)BYTE;
   DECLARE CONTROL$BYTE BYTE;
   DECLARE TP$74(*) BYTE DATA(CR,LF,
   'TP$74          ERROR IN SNDREJ CHANNEL NUMBER');
    DECLARE TP$74A(*) BYTE DATA(CR,LF,
   'TP$74A         ENTERING SND$REJ,   CHANNEL A');
```

```
    DECLARE TP$74B(*) BYTE DATA(CR,LF,
   'TP$74B          ENTERING SND$REJ,    CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL       */
           DO;     /*  CASE 1               */
               CALL SENDSEQ(@TP$74A, LENGTH(TP$74A));
               IF (P$BIT = 1) THEN
                   CONTROL$BYTE = (REJ$CNTL OR (010H OR SHL(RCV$STATE$A, 5)));
               ELSE CONTROL$BYTE = (REJ$CNTL OR SHL(RCV$STATE$A, 5));
               NT01TX(TX01NE + 0) = ADDR;      /* REJ IS A COMMAND */
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(3, I$FRAME$SIZE);
           END;/*  END CASE 1             */
           DO;/*   CASE 2                 */
               CALL SENDSEQ(@TP$74B, LENGTH(TP$74B));
               IF (P$BIT = 1) THEN
                   CONTROL$BYTE = (REJ$CNTL OR (010H OR SHL(RCV$STATE$B, 5)));
               ELSE CONTROL$BYTE = (REJ$CNTL OR SHL(RCV$STATE$B, 5));
               NT02TX(TX02NE + 0) = ADDR;      /* REJ IS A COMMAND */
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;/*  END CASE 2             */
       END;    /*  END CASE               */
   ELSE CALL SENDSEQ(@TP$74, LENGTH(TP$74));   /* ERROR IN CHANNEL NUMBER */
END SND$REJ;

/*********************************************************************
*  DATE:                       29 AUG 85                             *
*  VERSION:                    1.0                                   *
*  NAME:                       SND$RNR                               *
*  MODULE NUMBER:              7.8                                   *
*  DESCRIPTION:                This procedure issures a RNR FRAME to the *
*             transmit buffer of the UNID network when called.  The  *
*             procedure sets the global variable RNR$MODE to TRUE.   *
*             This suspends the ROUTE$IN procedure's ability to      *
*             any more I$FRAMEs.  The condition is cleared when a    *
*             a RR or REJ frame is reveived by ROUTE$IN.             *
*  PASSED VARIABLES:           CHANNEL, P$BIT                        *
*  RETURNS:                    None                                  *
*  GLOBAL VARIBLES USED:       NT01TX, NT01TX, TX01NE, TX02NE,       *
*                              RNR$MODE$A, RNR$MODE$B                *
*  GLOBAL VARIBLES CHANGED:    All globals used                      *
*  MODULES CALLED:             LD$STA$HSKP                           *
*  CALLING MODULES:            RCV$I$FRAME, READ$LINE                *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.        *
*********************************************************************/
SND$RNR:  PROCEDURE(CHANNEL, P$BIT, ADDR) PUBLIC;
```

```
   DECLARE (CHANNEL, P$BIT, ADDR) BYTE;
   DECLARE CONTROL$BYTE BYTE;
   DECLARE TP$71(*) BYTE DATA(CR,LF,
   'TP$71          ERROR IN SNDRNR CHANNEL NUMBER');
    DECLARE TP$71A(*) BYTE DATA(CR,LF,
   'TP$71A         ENTERING SND$RNR,   CHANNEL A');
    DECLARE TP$71B(*) BYTE DATA(CR,LF,
   'TP$71B         ENTERING SND$RNRM,  CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL      */
           DO;     /*  CASE 1              */
               CALL SENDSEQ(@TP$71A, LENGTH(TP$71A));
               IF (P$BIT = 1) THEN
                   CONTROL$BYTE = (RNR$CNTL OR (010H OR SHL(RCV$STATE$A, 5)));
                   ELSE CONTROL$BYTE = (RNR$CNTL OR SHL(RCV$STATE$A, 5));
               RNR$MODE$A = TRUE;
               NT01TX(TX01NE + 0) = ADDR;           /* RNR IS A COMMAND */
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(3, I$FRAME$SIZE);
           END;/*  END CASE 1          */
           DO;/*   CASE 2              */
               CALL SENDSEQ(@TP$71B, LENGTH(TP$71B));
               IF (P$BIT = 1) THEN
                   CONTROL$BYTE = (RNR$CNTL OR (010H OR SHL(RCV$STATE$B, 5)));
               ELSE CONTROL$BYTE = (RNR$CNTL OR SHL(RCV$STATE$A, 5));
               RNR$MODE$B = TRUE;
               NT02TX(TX02NE + 0) = ADDR;           /* RNR IS A COMMAND */
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;/*  END CASE 2          */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$71, LENGTH(TP$71));   /* ERROR IN CHANNEL NUMBER */
END SND$RNR;

/*********************************************************************
*  DATE:                       29 AUG 85                              *
*  VERSION:                    1.0                                    *
*  NAME:                       SND$UA                                 *
*  MODULE NUMBER:              8.2.2                                  *
*  DESCRIPTION:                This procedure issures a UA  FRAME to the *
*              transmit buffer of the UNID network when called.  The  *
*              procedure sets the global variable RNR$MODE to TRUE.   *
*              This suspends the ROUTE$IN procedure's ability to      *
*              any more I$FRAMEs.  The condition is cleared when a    *
*              a RR or REJ frame is reveived by ROUTE$IN.             *
*  PASSED VARIABLES:           CHANNEL, P$BIT                         *
*  RETURNS:                    None                                   *
*  GLOBAL VARIBLES USED:       NT01TX, NT02TX, TX01NE, TX02NE         *
*  GLOBAL VARIBLES CHANGED:  NT01TX, NT02TX, TX01NE, TX02NE          *
*  MODULES CALLED:           LD$TAB$HSKP                             *
*  CALLING MODULES:          RCV$I$FRAME, READ$LINE                  *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.        *
*********************************************************************/
SND$UA:  PROCEDURE(CHANNEL, P$BIT) PUBLIC REENTRANT;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE CONTROL$BYTE BYTE;
   DECLARE TP$72(*) BYTE  DATA(CR,LF,
   'TP$72          ERROR IN SND$UA CHANNEL NUMBER');
   DECLARE TP$72A(*) BYTE DATA(CR,LF,
   'TP$72A         ENTERING SND$UA,    CHANNEL A');
   DECLARE TP$72B(*) BYTE DATA(CR,LF,
   'TP$72B         ENTERING SND$UA,    CHANNEL B');

   IF (P$BIT = 1) THEN
       CONTROL$BYTE = (UA$CNTL OR 010H);
   ELSE CONTROL$BYTE = UA$CNTL;
   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL      */
           DO;     /*  CASE 1              */
               CALL SENDSEQ(@TP$72A, LENGTH(TP$72A));
               NT01TX(TX01NE + 0) = B$ADD;          /* UA IS A RESPONSE */
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(3, I$FRAME$SIZE);
           END;/*  END CASE 1          */
           DO;/*   CASE 2              */
               CALL SENDSEQ(@TP$72B, LENGTH(TP$72B));
               NT02TX(TX02NE + 0) = A$ADD;          /* US IS A RESPONCE */
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;/*  END CASE 2          */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$72, LENGTH(TP$72));   /* ERROR IN CHANNEL NUMBER */
END SND$UA;


/*********************************************************************
*  DATE:                     29 AUG 85                               *
*  VERSION:                  1.0                                     *
*  NAME:                     SND$DISC                                *
*  MODULE NUMBER:            7.11                                    *
*  DESCRIPTION:              This procedure issures a DISC FRAME to the*
*              transmit buffer of the UNID network when called.  The *
*              procedure sets the global variable SABM$MODE to FALSE. *
*              This suspends the START$DATA$XFER procedure and control *
*              returns to the main program where the DM mode is again *
*              entered.                                                 *
*  PASSED VARIABLES:          CHANNEL, P$BIT                            *
*  RETURNS:                   None                                      *
*  GLOBAL VARIBLES USED:      NT01TX, NT02TX, TX01NE, TX02NE            *
*  GLOBAL VARIBLES CHANGED:   NT01TX, NT02TX, TX01NE, TX02NE            *
*  MODULES CALLED:            LD$TAB$HSKP                               *
*  CALLING MODULES:           RCV$I$FRAME, READ$LINE                    *
*  AUTHOR:   Mark Weber                                                 *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.           *
***********************************************************************/
SND$DISC:  PROCEDURE(CHANNEL, P$BIT) PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE CONTROL$BYTE BYTE;
   DECLARE TP$73(*) BYTE DATA(CR,LF,
   'TP$73          ERROR IN DISC$UA CHANNEL NUMBER');
    DECLARE TP$73A(*) BYTE DATA(CR,LF,
   'TP$73A          ENTERING SND$DISC,  CHANNEL A');
    DECLARE TP$73B(*) BYTE DATA(CR,LF,
   'TP$73B          ENTERING SND$DISC,  CHANNEL B');

   IF (P$BIT = 1) THEN
       CONTROL$BYTE = (DISC$CNTL OR 010H);
   ELSE CONTROL$BYTE = DISC$CNTL;
   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL      */
           DO;     /*  CASE 1              */
               CALL SENDSEQ(@TP$73A, LENGTH(TP$73A));
               NT01TX(TX01NE + 0) = A$ADD;      /* DISC IS A COMMAND */
               NT01TX(TX01NE + 1) = CONTROL$BYTE;
               CALL STO$U$CMD$(1, DISC$CNTL);
               CALL LD$TAB$HSKP(3, I$FRAME$SIZE);
           END;/*  END CASE 1          */
           DO;/*   CASE 2              */
               CALL SENDSEQ(@TP$73B, LENGTH(TP$73B));
               NT02TX(TX02NE + 0) = B$ADD;      /* DISC IS A COMMAND */
               NT02TX(TX02NE + 1) = CONTROL$BYTE;
               CALL STO$U$CMD(2, DISC$CNTL);
               CALL LD$TAB$HSKP(4, I$FRAME$SIZE);
           END;/*  END CASE 2          */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$73, LENGTH(TP$73));   /* ERROR IN CHANNEL NUMBER */
END SND$DISC;

/***********************************************************************
*  DATE:                      28 AUG 85                                 *
*  VERSION:                   1.0                                       *
*  NAME:                      RCV$I$FRAME                               *
*  MODULE NUMBER:                9.2.2                                    *
*  DESCRIPTION:                  This procedure processes all I frames    *
*           received by the network side of UNID II.  Frames are          *
*           sent to the appropriate transmit table and an acknow-         *
*          ledgement RR frame is sent if no I frame is in the            *
*           transmit buffer.                                              *
*  PASSED VARIABLES:             CHANNEL, P$BIT                           *
*  RETURNS:                      None                                     *
*  GLOBAL VARIBLES USED:         SEND$STATE$A,RCV$STATE$A, SEND$STATE$B   *
*                      RCV$STATE$B, NT01TX, NT02TX, LCNTTB, TX01NS        *
*                      TX02NS                                             *
*  GLOBAL VARIBLES CHANGED:      SEND$STATE$A, RCV$STATE$A, SEND$STATE$B  *
*                      RCV$STATE$B, NT01TX, NT02TX, TX01NS, TX02NS        *
*  MODULES CALLED:               IN$SEQ                                   *
*  CALLING MODULES:              ROUTE$IN                                 *
*  AUTHOR:   Mark Weber                                                   *
*  HISTORY:  1.0 Mark Weber -28 AUG 85-original PL/M version              *
*************************************************************************/
RCV$I$FRAME:  PROCEDURE(CHANNEL, P$BIT) PUBLIC;

   DECLARE(CHANNEL, P$BIT) BYTE;
   DECLARE (RCV$SEQ$NUM, SND$SEQ$NUM) BYTE;
   DECLARE TP$6(*) BYTE  DATA(CR,LF,
   'TP$6           FRAME IS NT01RX TO NT02TX TRANSFER');
   DECLARE TP$7(*) BYTE DATA(CR,LF,
   'TP$7           DATA IS DESTINED FOR THIS UNID');
   DECLARE TP$15(*) BYTE DATA(CR,LF,
   'TP$15          FRAME IS NT02RX TO NT01TX TRANSFER');
   DECLARE TP$16(*) BYTE DATA(CR,LF,
   'TP$16          I FRAME SEND TO THE NTLC TABLE');
   DECLARE TP$67(*) BYTE DATA(CR,LF,
   'TP$67          Entering module RCV$I$FRAME');
   DECLARE TP$68(*) BYTE DATA(CR,LF,
   'TP$68          ERROR IN I$FRAME CHANNEL CALL  ');
   DECLARE TP$68A(*) BYTE DATA(CR,LF,
   'TP$68A         ERROR IN I$FRAME SEQUENCE NUMBER  ');

   IF (CHANNEL = 1 OR CHANNEL = 2) THEN
       DO CASE CHANNEL;
           ;       /* CASE 0 IS NULL AND ERROR */
           DO;     /* CASE 1                   */
               SND$SEQ$NUM = (SHR(NT01RX(NT01NS + 1), 1) AND 07);
               RCV$SEQ$NUM = (SHR(NT01RX(NT01NS + 1), 5));
               IF  (NOT RNR$MODE$A) THEN
               DO;
                   IF (RCV$INSEQ( 1, SND$SEQ$NUM)) THEN
                    DO;
                       RCV$STATE$A = (SND$SEQ$NUM + 1) MOD 8;
                       CALL UPDATE$SEND$STATE(1, RCV$SEQ$NUM);
                       IF (P$BIT = 1) THEN        /* SEND ACK BACK TO SENDER*/
                       DO;
                           IF (NT01TX(TX01NS + 1) AND I$CNTL) = 0
                               AND FRAME$PRESENT(1) THEN
                               NT01TX(TX01NS + 1) = (SHL(RCV$STATE$A, 5) OR
                               (NT01TX(TX01NS + 1) AND 01FH));
                           ELSE CALL SND$RR(1,1,B$ADD);
                       END;
                       DESTINATION = DET$DEST$ONE;
                       IF (DESTINATION = 'NN') THEN /* FRAME BACK TO NETWORK */
                       DO;
                           CALL SENDSEQ(@TP$6, LENGTH(TP$6));
/***                this kills the I frames for the simulation          ***/
/***                this code must be included for operation software   ***/
/***                       CALL MOVB(@NT01RX(NT01NS),
                           @NT02TX(TX02NE), I$FRAME$SIZE);
                           NT02TX(TX02NE + 1) = (SHL(RCV$STATE$B, 5) OR 010H)
                                             OR SHL(SEND$STATE$B, 1);
                           CALL LD$TAB$HSKP(4,I$FRAME$SIZE);                 ***/
                       END;
                       ELSE    /* DESTINATION = NL */  /* FRAME TO LOCAL TABLES */
                       DO;
                           CALL SENDSEQ(@TP$7, LENGTH(TP$7));
                           CALL MOVB( @NT01RX(NT01NS + 2), @NTLCTB(NTLCNE),
                           PACKET$SIZE);
                           CALL LD$TAB$HSKP(5,PACKET$SIZE);
                       END;
                   END;
                   ELSE
                   DO;  /* MESSAGE WAS OUT OF SEQUENCE, SEND REJ FRAME */
                       CALL SENDSEQ(@TP$68A, LENGTH(TP$68A));
                       CALL SND$REJ(1,1,B$ADD);
                   END;
               END;
               CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
           END;     /* CASE 1                        */

           DO;      /* CASE 2                        */
               SND$SEQ$NUM = (SHR(NT02RX(NT02NS + 1), 1) AND 07);
               RCV$SEQ$NUM = (SHR(NT02RX(NT02NS + 1), 5));
               IF  (NOT RNR$MODE$B) THEN
                DO;
                       IF (RCV$INSEQ( 2, SND$SEQ$NUM)) THEN
                   DO;
                      RCV$STATE$B = (SND$SEQ$NUM +1) MOD 8;
                      CALL UPDATE$SEND$STATE(2, RCV$SEQ$NUM);
                      IF (P$BIT = 1) THEN          /* SEND ACK BACK TO SENDER */
                      DO;
                          IF ((NT02TX(TX02NS + 1) AND I$CNTL) = 0)
                              AND FRAME$PRESENT(2)  THEN
                              NT02TX(TX02NS + 1) = (SHL(RCV$STATE$B, 5) OR
                                    (NT02TX(TX02NS + 1) AND 01FH));
                         ELSE CALL SND$RR(2,1,A$ADD);
                     END;
                     DESTINATION = DET$DEST$TWO;
                     IF (DESTINATION = 'NN') THEN /* FRAME BACK TO NETWORK*/
                     DO;
                         CALL SENDSEQ(@TP$15, LENGTH(TP$15));
/***                 this kills the I  frames for the simulation       ***/
/***                 this code must be included for operation software ***/
/***                     CALL MOVB(@NT02RX(NT02NS),
                         @NT01TX(TX01NE), I$FRAME$SIZE);
                         NT01TX(TX01NE + 1) = (SHL(RCV$STATE$A, 5) OR 010H)
                                         OR SHL(SEND$STATE$A, 1);
                         CALL LD$TAB$HSKP(3,I$FRAME$SIZE);                 ***/
                     END;
                     ELSE    /* DESTINATION = NL */  /* FRAME TO LOCAL TABLES */
                     DO;
                         CALL SENDSEQ(@TP$16, LENGTH(TP$16));
                         CALL MOVB( @NT02RX(NT02NS + 2), @NTLCTB(NTLCNE),
                         PACKET$SIZE);
                         CALL LD$TAB$HSKP(5,PACKET$SIZE);
                     END;
                 END;
                 ELSE
                 DO;  /* MESSAGE WAS OUT OF SEQUENCE, SEND REJ FRAME */
                     CALL SENDSEQ(@TP$68A, LENGTH(TP$68A));
                     CALL SND$REJ(2,1,A$ADD);
                 END;
             END;
             CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
         END;        /* CASE 2                          */
       END;          /* END CASE                        */
   ELSE CALL SENDSEQ(@TP$68, LENGTH(TP$68));        /*  ERROR IN CHANNEL CALL  */
END RCV$I$FRAME;

/*********************************************************************
*  DATE:                          28 AUG 85                         *
*  VERSION:                       1.0                               *
*  NAME:                          RCV$SABM                          *
*  MODULE NUMBER:                 8.2                               *
*  DESCRIPTION:                   This procedure is invoked when a SABM  *
*              frame is received.  When a SABM frame is found, a UA *
*              frame is sent to the source and the SABM mode is enterd.*
*              The receive table pointer to the next frame to process *
*              is then bumped ahead by one I FRAME size.  Later ver-  *
*              may make use of the variable frame adjustment to place *
*              more then ten frames in the receive table.           *
*  PASSED VARIABLES:              CHANNEL                           *
*  RETURNS:                       None                              *
*  GLOBAL VARIBLES USED:          NT01NE, NT02NE, TX01NE, TX02NE,   *
*                                NT01NS, NT02NS, TX01NE, TX02NS,         *
*                           SABM$MODE$A, SABM$MODE$B, RNR$MODE$A,        *
*                           RNR$MODE$B                                   *
*  GLOBAL VARIBLES CHANGED:     All globals used                         *
*  MODULES CALLED:              SND$UA                                   *
*  CALLING MODULES:             START$DM$MODE, ROUTE$IN                  *
*  AUTHOR:   Mark Weber                                                  *
*  HISTORY:  1.0 Mark Weber -30 AUG 85- original translated PL/M         *
*                version                                                 *
*************************************************************************/
RCV$SABM:  PROCEDURE(CHANNEL, P$BIT)PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE TP$61(*) BYTE DATA(CR,LF,
    'TP$61          P BIT WAS NOT SET WHEN SABM WAS RECEIVED',CR,LF);
   DECLARE TP$61A(*) BYTE DATA(CR,LF,
   'TP$61A          ENTERING RCV$SABM,  CHANNEL A');
   DECLARE TP$61B(*) BYTE DATA(CR,LF,
   'TP$61B          ENTERING RCV$SABM,  CHANNEL B');

   IF (CHANNEL = 1 OR CHANNEL = 2) THEN
       DO CASE CHANNEL;
           ;   /*CASE 0 IS NULL            */
           DO; /*CASE 1 IS FOR CHANNEL A   */
               CALL SENDSEQ(@TP$61A, LENGTH(TP$61A));
               IF P$BIT = 1 THEN
                   DO;
                       CALL SND$UA(1,1);
                       SABM$MODE$A = TRUE;
                       RNR$MODE$A = FALSE;
                       SEND$STATE$A = 0;
                       RCV$STATE$A =0;
                       TX01NS, TX01NE = 0;
                       NT01NE, NT01NS = 0;
                   END;
               ELSE CALL SENDSEQ(@TP$61, LENGTH(TP$61));
           END;   /*CASE 1                 */

           DO; /*CASE 2 IS FOR CHANNEL B   */
               CALL SENDSEQ(@TP$61B, LENGTH(TP$61B));
               IF P$BIT = 1 THEN
                   DO;
                       CALL SND$UA(2,1);
                       SABM$MODE$B = TRUE;
                       RNR$MODE$B = FALSE;
                       SEND$STATE$B = 0;
                       RCV$STATE$B = 0;
                       TX02NS, TX02NE = 0;
                       NT02NE, NT02NS = 0;
                   END;
               ELSE CALL SENDSEQ(@TP$61, LENGTH(TP$61));
            END;   /*CASE 2                    */
        END;        /* END CASE                */
END RCV$SABM;

/*********************************************************************
*  DATE:                         28 AUG 85                           *
*  VERSION:                      1.0                                 *
*  NAME:                         RCV$DM                              *
*  MODULE NUMBER:                9.2.10                              *
*  DESCRIPTION:                  This procedure is invoked when a DM *
*              frame is received.  When a DM   frame is found, no    *
*              actions are undertaken.   The DM response frame is    *
*              used to indicate a temporyary inactive DCE or DTE.    *
*  PASSED VARIABLES:             CHANNEL                             *
*  RETURNS:                      None                                *
*  GLOBAL VARIBLES USED:         None                                *
*  GLOBAL VARIBLES CHANGED:      None                                *
*  MODULES CALLED:               None                                *
*  CALLING MODULES:              ROUTE$IN                            *
*  AUTHOR:   Mark Weber                                              *
*  HISTORY:  1.0 Mark Weber -30 AUG 85- original translated PL/M     *
*                version                                             *
*********************************************************************/
RCV$DM:  PROCEDURE(CHANNEL, P$BIT)PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE TP$82A(*) BYTE DATA(CR,LF,
   'TP$82A         ENTERING RCV$DM,  CHANNEL A');
   DECLARE TP$82B(*) BYTE DATA(CR,LF,
   'TP$82B         ENTERING RCV$DM,  CHANNEL B');

   IF (CHANNEL = 1 OR CHANNEL = 2) THEN
       DO CASE CHANNEL;
            ;   /*CASE 0 IS NULL           */
           DO; /*CASE 1 IS FOR CHANNEL A   */
               CALL SENDSEQ(@TP$82A, LENGTH(TP$82A));
               CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
           END;   /*CASE 1                 */

           DO; /*CASE 2 IS FOR CHANNEL B   */
               CALL SENDSEQ(@TP$82B, LENGTH(TP$82B));
               CALL SRVC$TAB$HSKP(2, IFRAME$SIZE);
           END;   /*CASE 2                 */
       END;       /* END CASE              */
END RCV$DM;

/*********************************************************************
*  DATE:                        29 AUG 85                            *
*  VERSION:                 1.0                                          *
*  NAME:                    RCV$UA                                       *
*  MODULE NUMBER:           8.3                                          *
*  DESCRIPTION:             This procedure processes reveived UA         *
*               FRAMES.  When a UA FRAME is received the last U FRAME    *
*               command received is acted upon.  The P$bit is reserved   *
*               for future use in error dectection and correction.       *
*                                                                        *
*  PASSED VARIABLES:        CHANNEL, P$BIT                               *
*  RETURNS:                 None                                         *
*  GLOBAL VARIBLES USED:    RNR$MODE$A, RNR$MODE$B                       *
*  GLOBAL VARIBLES CHANGED: RNR$MODE$A, RNR$MODE$B                       *
*  MODULES CALLED:          INITACK, SRVC$TAB$HSKP, SENDSEQ,             *
*                           FIND$U$CMD                                   *
*  CALLING MODULES:         RCV$I$FRAME, START$DM$MODE                   *
*  AUTHOR:   Mark Weber                                                  *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.            *
*************************************************************************/
RCV$UA:  PROCEDURE(CHANNEL, F$BIT) PUBLIC REENTRANT;

   DECLARE (CHANNEL, F$BIT) BYTE;
   DECLARE TP$76(*) BYTE DATA(CR,LF,
   'TP$76          ERROR IN RCV$UA    CHANNEL NUMBER');
   DECLARE TP$76A(*) BYTE DATA(CR,LF,
   'TP$76A         ENTERING RCV$UA,     CHANNEL A');
   DECLARE TP$76B(*) BYTE DATA(CR,LF,
   'TP$76B         ENTERING RCV$UA,     CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;        /*  CASE 0 IS NULL       */
           DO;      /*  CASE 1               */
               CALL SENDSEQ(@TP$76A, LENGTH(TP$76A));
               CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
               CALL FIND$U$CMD(1);
               RNR$MODE$A = FALSE;
           END;/*  END CASE 1            */
           DO;/*   CASE 2                */
               CALL SENDSEQ(@TP$76B, LENGTH(TP$76B));
               CALL SRVC$TAB$HSKP(2, IFRAME$SIZE);
               CALL FIND$U$CMD(2);
               RNR$MODE$B = FALSE;
           END;/*  END CASE 2            */
       END;    /*  END CASE              */
   ELSE CALL SENDSEQ(@TP$76, LENGTH(TP$76));   /* ERROR IN CHANNEL NUMBER */
END RCV$UA;

/************************************************************************
*  DATE:                    29 AUG 85                                    *
*  VERSION:                 1.0                                          *
*  NAME:                      RCV$REJ                                  *
*  MODULE NUMBER:             9.2.4                                    *
*  DESCRIPTION:               This procedure processes reveived REJ    *
*             FRAMES.  When a REJ FRAME is received, A UA FRAME is     *
*             send out.  The REJ command is then acted upon.  The      *
*             SEND$STATE variable is updated and, if in the RNR$MODE,  *
*             the mode is terminated.                                  *
*  PASSED VARIABLES:          CHANNEL, P$BIT                           *
*  RETURNS:                   None                                     *
*  GLOBAL VARIBLES USED:      TX01NE, TX02NE, RNR$MODE$A, RNR$MODE$B,  *
*                             NT01TX, NT02TX                           *
*  GLOBAL VARIBLES CHANGED:   All gloabals used                        *
*  MODULES CALLED:            INTIACK, SND$CMDR,  LD$TAB$HSKP,         *
*                             RCV$IN$SEQ, SEND$SEQ, UPDATE$SEND$STATE  *
*  CALLING MODULES:           ROUTE$IN                                 *
*  AUTHOR:   Mark Weber                                                *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.          *
*********************************************************************/
RCV$REJ:  PROCEDURE(CHANNEL, P$BIT, RCV$SEQ$NUM, ADDR) PUBLIC;

   DECLARE (CHANNEL, P$BIT, RCV$SEQ$NUM, ADDR)BYTE;
    DECLARE SND$SEQ$NUM BYTE;
   DECLARE TP$77(*) BYTE DATA(CR,LF,
   'TP$77          ERROR IN RCV$REJ  CHANNEL NUMBER');
    DECLARE TP$77A(*) BYTE DATA(CR,LF,
   'TP$77A         ENTERING RCV$REJ,   CHANNEL A');
    DECLARE TP$77B(*) BYTE DATA(CR,LF,
   'TP$77B         ENTERING RCV$REJ,   CHANNEL B');


   IF (ADDR = A$ADD) OR (ADDR = B$ADD) THEN  /* SAME ACTION FOR COMMAND AND
                                                RESPONSE, IGNORE THE P/F BIT */
       IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
           DO CASE CHANNEL;
               ;        /*  CASE 0 IS NULL      */
               DO;      /*  CASE 1              */
                   CALL SENDSEQ(@TP$77A, LENGTH(TP$77A));
                   RNR$MODE$A = FALSE;
                    SND$SEQ$NUM = (SHR(NT01TX(TX01NS + 1), 1) AND 07);
                   IF ((SEND$STATE$A + 1) = RCV$SEQ$NUM) THEN
                       CALL UPDATE$SEND$STATE(1, RCV$SEQ$NUM);
                    ELSE   /* FRAME NOT IN QUEUE */
                    DO;
                       CALL SND$CMDR(1,1,NT01TX(TX01NS + 1),2);
                        CALL SRVC$TAB$HSKP(3, I$FRAME$SIZE);
                    END;
                   CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
               END;/*  END CASE 1           */
               DO;/*   CASE 2               */
                   CALL SENDSEQ(@TP$77B, LENGTH(TP$77B));
```

```
                     RNR$MODE$B = FALSE;
                      SND$SEQ$NUM = (SHR(NT02TX(TX02NS + 1), 1) AND 07);
                     IF ((SEND$STATE$B + 1)  = RCV$SEQ$NUM) THEN
                         CALL UPDATE$SEND$STATE(2, RCV$SEQ$NUM);

                      ELSE   /* FRAME NOT IN QUEUE */
                      DO;
                          CALL SND$CMDR(2,1,NT02TX(TX02NS + 1),2);
                          CALL SRVC$TAB$HSKP(4, I$FRAME$SIZE);
                      END;
                     CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
                 END;/*  END CASE 2          */
             END;    /*  END CASE            */
         ELSE CALL SENDSEQ(@TP$77, LENGTH(TP$77));   /* ERROR IN CHANNEL NUMBER */
END RCV$REJ;


/*********************************************************************
*  DATE:                         29 AUG 85                           *
*  VERSION:                      1.0                                 *
*  NAME:                         RCV$RNR                             *
*  MODULE NUMBER:                9.2.5                               *
*  DESCRIPTION:                  This procedure processes reveived RNR
*              FRAMES.  When a RNR FRAME is received, A UA FRAME is  *
*              send out.  The RNR command is then acted upon.  The   *
*              SEND$STATE variable is updated and, if in the RNR$MODE, *
*              the mode is initiated.                                *
*  PASSED VARIABLES:             CHANNEL, P$BIT                      *
*  RETURNS:                      None                                *
*  GLOBAL VARIBLES USED:         TX01NE, TX02NE, RNR$MODE$A, RNR$MODE$B, *
*                                NT01TX, NT02TX                      *
*  GLOBAL VARIBLES CHANGE?:      All globals used                    *
*  MODULES CALLED:               RCV$IN$SEQ, INITACK, SRVC$TAB$HSKP, *
*                                UPDATE$SEND$STATE                   *
*  CALLING MODULES:              ROUTE$IN                            *
*  AUTHOR:    Mark Weber                                             *
*  HISTORY:   1.0 Mark Weber -29 AUG 85-original PL/M version.       *
*********************************************************************/
RCV$RNR:  PROCEDURE(CHANNEL, P$BIT, SEQ$NUM, ADDR)PUBLIC;

   DECLARE (CHANNEL, P$BIT, SEQ$NUM, ADDR) BYTE;
   DECLARE TP$78(*) BYTE DATA(CR,LF,
   'TP$78          ERROR IN RCV$RNR  CHANNEL NUMBER');
    DECLARE TP$78A(*) BYTE DATA(CR,LF,
   'TP$78A         ENTERING RCV$RNR,   CHANNEL A');
    DECLARE TP$78B(*) BYTE DATA(CR,LF,
   'TP$78B         ENTERING RCV$RNR,   CHANNEL B');

   IF (P$BIT = 1) THEN
       IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
```

```
           DO CASE CHANNEL;
               ;        /*  CASE 0 IS NULL      */
               DO;      /*  CASE 1              */
                   CALL SENDSEQ(@TP$78A, LENGTH(TP$78A));
                   IF (ADDR = A$ADD) THEN
                   DO;
                       RNR$MODE$A = TRUE;
                       CALL UPDATE$SEND$STATE(1, SEQ$NUM);
                   END;
                   CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
               END;/*  END CASE 1           */
               DO;/*   CASE 2               */
                   CALL SENDSEQ(@TP$78B, LENGTH(TP$78B));
                   IF (ADDR = B$ADD) THEN
                   DO;
                       RNR$MODE$B = TRUE;
                       CALL UPDATE$SEND$STATE(2, SEQ$NUM);
                   END;
                   CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
               END;/*  END CASE 2           */
           END;    /*  END CASE             */
       ELSE CALL SENDSEQ(@TP$78, LENGTH(TP$78));   /* ERROR IN CHANNEL NUMBER */
END RCV$RNR;

/*******************************************************************
*  DATE:                        29 AUG 85                          *
*  VERSION:                     1.0                                *
*  NAME:                        RCV$RR                             *
*  MODULE NUMBER:               9.2.6                              *
*  DESCRIPTION:                 This procedure processes reveived RR
*              FRAMES.  When a RR  FRAME is received, A UA FRAME is *
*              send out.  The RNR command is then acted upon.  The *
*              SEND$STATE variable is updated and, if in the RNR$MODE, *
*              the mode is initiated.                              *
*  PASSED VARIABLES:            CHANNEL, P$BIT                     *
*  RETURNS:                     None                               *
*  GLOBAL VARIBLES USED:        RNR$MODE$A, RCV$STATE$, RNR$MODE$B, *
*                               RCV$STATE$B                        *
*  GLOBAL VARIBLES CHANGED:     All globals used                   *
*  MODULES CALLED:              INITACK, SND$CMDR,  LD$TAB$HSKP    *
*  CALLING MODULES:             ROUTE$IN                           *
*  AUTHOR:   Mark Weber                                            *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.      *
*******************************************************************/
RCV$RR:  PROCEDURE(CHANNEL, P$BIT, SEQ$NUM, ADDR)PUBLIC;

   DECLARE (CHANNEL, P$BIT, SEQ$NUM, ADDR)BYTE;
   DECLARE TP$79(*) BYTE DATA(CR,LF,
   'TP$79          ERROR IN RCV$RR   CHANNEL NUMBER');
    DECLARE TP$79A(*) BYTE DATA(CR,LF,
    'TP$79A          ENTERING RCV$RR,     CHANNEL A');
     DECLARE TP$79B(*) BYTE DATA(CR,LF,
    'TP$79B          ENTERING RCV$RR,     CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
            ;        /*  CASE 0 IS NULL       */
           DO;       /*  CASE 1               */
               CALL SENDSEQ(@TP$79A, LENGTH(TP$79A));
               IF (ADDR = A$ADD) THEN
               DO;
                   RNR$MODE$A = FALSE;
                   CALL UPDATE$SEND$STATE(1, SEQ$NUM);
               END;
               CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
           END;/*  END CASE 1           */
           DO;/*   CASE 2               */
               CALL SENDSEQ(@TP$79B, LENGTH(TP$79B));
               IF (ADDR = B$ADD) THEN
               DO;
                   RNR$MODE$B = FALSE;
                   CALL UPDATE$SEND$STATE(2, SEQ$NUM);
               END;
               CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
           END;/*  END CASE 2           */
       END;    /*  END CASE             */
   ELSE CALL SENDSEQ(@TP$79, LENGTH(TP$79));   /* ERROR IN CHANNEL NUMBER */
END RCV$RR;


/*********************************************************************
*  DATE:                        29 AUG 85                             *
*  VERSION:                     1.0                                   *
*  NAME:                        RCV$DISC                              *
*  MODULE NUMBER:               9.2.7                                 *
*  DESCRIPTION:                 This procedure processes reveived DISC *
*               FRAMES.  When a DISC FRAME is receive, program control *
*               is returned to the main program where the DM mode will *
*               be entered.                                           *
*                                                                     *
*  PASSED VARIABLES:            CHANNEL, P$BIT                        *
*  RETURNS:                     None                                  *
*  GLOBAL VARIBLES USED:        TX01NE, TX02NE, RNR$MODE$A, RNR$MODE$B, *
*                         SABM$MODE$A, SABM$MODE$B, SEND$STATE$A,     *
*                         SEND$STATE$B, RCV$STATE$A, RCV$STATE$B,     *
*                         NT01NE, NT02NE, TX01NS, TX02NS, NT01NS, NT02NS *
*  GLOBAL VARIBLES CHANGED:     TX01NE, TX02NE                        *
*  MODULES CALLED:              SENDSEQ                               *
*  CALLING MODULES:             ROUTE$IN                              *
*  AUTHOR:   Mark Weber                                               *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.          *
***********************************************************************/
RCV$DISC:  PROCEDURE(CHANNEL, P$BIT)PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE TP$80(*) BYTE DATA(CR,LF,
   'TP$80          ERROR IN RCV$DICS   CHANNEL NUMBER');
    DECLARE TP$80A(*) BYTE DATA(CR,LF,
   'TP$80A         ENTERING RCV$DISC,  CHANNEL A');
    DECLARE TP$80B(*) BYTE DATA(CR,LF,
   'TP$80B         ENTERING RCV$DISC,  CHANNEL B');

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL      */
          DO;      /*  CASE 1              */
              CALL SENDSEQ(@TP$80A, LENGTH(TP$80A));
              IF (P$BIT = 1) THEN CALL SND$UA(1,1);
              RNR$MODE$A = FALSE;
              SABM$MODE$A = FALSE;
              RCV$STATE$A = 0;
              SEND$STATE$A = 0;
              NT01NE = 0;
              NT01NS = 0;
              TX01NE = 0;
              TX01NS = 0;
          END;/*  END CASE 1           */
          DO;/*   CASE 2               */
              CALL SENDSEQ(@TP$80B, LENGTH(TP$80B));
              IF (P$BIT = 1) THEN CALL SND$UA(2,1);
              RNR$MODE$B = FALSE;
              SABM$MODE$B = FALSE;
              RCV$STATE$B = 0;
              SEND$STATE$B = 0;
              NT02NE = 0;
              NT02NS = 0;
              TX02NE = 0;
              TX02NS = 0;
          END;/*  END CASE 2           */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$80, LENGTH(TP$80));   /* ERROR IN CHANNEL NUMBER */
END RCV$DISC;


/**********************************************************************
*  DATE:                       29 AUG 85                              *
*  VERSION:                    1.0                                    *
*  NAME:                       RCV$CMDR                               *
*  MODULE NUMBER:              9.2.9                                  *
*  DESCRIPTION:                This procedure processes reveived CMDR *
*              FRAMES.  When a CMDR FRAME is receive, program deter-     *
*              mines the appropriate error recovery actions.  This       *
*              actions are not specifically stated in the X.25 rec-      *
*              commendation.  Presently only limited error recovery      *
*              occurrs.                                                  *
*  PASSED VARIABLES:          CHANNEL, P$BIT                             *
*  RETURNS:                   None                                       *
*  GLOBAL VARIBLES USED:      SABM$MODE$A, SABM$MODE$B                   *
*  GLOBAL VARIBLES CHANGED:   SABM$MODE$A, SABM$MODE$B                   *
*  MODULES CALLED:            SRVC$TAB$HSKP                              *
*  CALLING MODULES:           ROUTE$IN                                   *
*  AUTHOR:   Mark Weber                                                  *
*  HISTORY:  1.0 Mark Weber -29 AUG 85-original PL/M version.            *
*************************************************************************/
RCV$CMDR:  PROCEDURE(CHANNEL, P$BIT)PUBLIC;

   DECLARE (CHANNEL, P$BIT) BYTE;
   DECLARE (ERR$CHA, ERR$CHB) BYTE;

   IF ((CHANNEL = 1) OR (CHANNEL = 2)) THEN
       DO CASE CHANNEL;
           ;       /*  CASE 0 IS NULL      */
           DO;     /*  CASE 1              */
               CALL SENDSEQ(@TP$75A, LENGTH(TP$75A));
               ERR$CHA = (NT01RX(NT01NS + 4) AND 0FH);
               IF (ERR$CHA AND 01H) THEN SABM$MODE$A = FALSE;
               IF (ERR$CHA AND 02H) THEN SABM$MODE$A = FALSE;
               IF (ERR$CHA AND 04H) THEN SABM$MODE$A = FALSE;
               IF (ERR$CHA AND 08H) THEN SABM$MODE$A = FALSE;
               CALL SRVC$TAB$HSKP(1, I$FRAME$SIZE);
           END;/*  END CASE 1          */
           DO;/*   CASE 2              */
               CALL SENDSEQ(@TP$75B, LENGTH(TP$75B));
               ERR$CHB = (NT02RX(NT02NS + 4) AND 0FH);
               IF (ERR$CHB AND 01H) THEN SABM$MODE$B = FALSE;
               IF (ERR$CHB AND 02H) THEN SABM$MODE$B = FALSE;
               IF (ERR$CHB AND 04H) THEN SABM$MODE$B = FALSE;
               IF (ERR$CHB AND 08H) THEN SABM$MODE$B = FALSE;
               CALL SRVC$TAB$HSKP(2, I$FRAME$SIZE);
           END;/*  END CASE 2          */
       END;    /*  END CASE            */
   ELSE CALL SENDSEQ(@TP$75, LENGTH(TP$75));   /* ERROR IN CHANNEL NUMBER */
END RCV$CMDR;

END LAPB$MODULE;

/****************************** THE END *******************************/
```

3. LAPB1.SRC - Module with LAP B procedures

```
$TITLE('UNID II NETWORK TEST PROGRAM, MODULE LAPB1, 19 NOV 85')
$XREF OPTIMIZE(2)
/*********************************************************************
*  DATE:  19 NOV 85                                                  *
*  VERSION:  1.1                                                     *
*  TITLE:  ISO layer 2 LAP B simulation                              *
*  FILENAME:  LAPB1.SRC                                              *
*  COORDINATOR:  Capt Mark W. Weber                                  *
*  PROJECT:  UNIT II                                                 *
*  OPERATING SYSTEM:  INTEL SYSTEM III/230                           *
*  LANGUAGE:  PL/M 86                                                *
*  USE:  This file requires no includes, but must be linked with LAPB0.OBJ *
*        NETX25.OBJ, PCKT.OBJ, and SMALL.LIB.  The program may be linked   *
*        and located  with the SUBMIT file NETX25.CSD.               *
*  CONTENTS:                                                         *
*            STCTCA - simulates a timer for channel A                *
*            STCTCB - simulates a timer for channel B                *
*            TIME$DELAY$CHA - simulates "time-out" on channel A      *
*            TIME$DELAY$CHB - simulates "time-out" on channel B      *
*            DET$DEST$ONE - determines destinations for channel A    *
*            DET$DEST$TWO - determines destinations for channel B    *
*            DET$DEST$LN  - determines the destinations of local messages *
*            READ$TAB - reads the packets moved to the NTLCTB table  *
*            FIND$IFRAME - determines if more then one  I FRAME is in the *
*                          the transmit table                        *
*  FUNCTION:  Simulates the operation of the SBC 88/45 in the UNID II using *
*            the datalink layer as described by CCITT recommendation X.25. *
*            ISIS calls are used to provide a user interface and to trace *
*            the process flow of the LAP B protocol imployed by the CCITT *
*             X.25 recommendation.                                   *
*  HISTORY:  1.1 Mark Weber - implemented X.25 datalink procedures   *
*            1.0 TRANSLATED 5 APR 84 by C.T. Chrildress              *
*********************************************************************/


LAPB1$MODULE:  DO;

/******************  EXTERNAL PROCEDURES FOR ISIS SYSTEM CALLS *************/


FRAME$PRESENT:  PROCEDURE (CHANNEL) BYTE EXTERNAL;
                DECLARE CHANNEL BYTE;
                END FRAME$PRESENT;

PRINTI:     PROCEDURE (NUM) EXTERNAL;
           DECLARE NUM INTEGER;
           END PRINTI;

DSPLY$FRAME$HDR:  PROCEDURE (CHANNEL) EXTERNAL;
                  DECLARE CHANNEL BYTE;
```

```
                    END DSPLY$FRAME$HDR;

SENDSEQ:             PROCEDURE (MSG, TOTAL) EXTERNAL;
                    DECLARE MSG POINTER, TOTAL WORD;
                    END SENDSEQ;

SRVC$TAB$HSKP:       PROCEDURE (TABLE, FRAME$SIZE) EXTERNAL;
                     DECLARE TABLE BYTE, FRAME$SIZE INTEGER;
                     END SRVC$TAB$HSKP;

DECLARE    CR           LITERALLY '0DH',
       LF           LITERALLY '0AH';
DECLARE CR$LF (2) BYTE DATA (0DH, 0AH);

/****************************** END EXTERNALS ******************************/


DECLARE
        FALSE        LITERALLY '0H', /* USE AS FLAGS TO TEST */
        TRUE         LITERALLY '0FFH', /* BITS FOR BRANCHING */
        CONCTC       LITERALLY '0D5H', /* NETWORK MONITOR CTC PORT ADDRESS */
        CONCMD       LITERALLY '0DFH',
                               /* NETWORK MONITOR USART COMMAND PORT ADDRESS */
        CONDAT       LITERALLY '0DEH',
                               /* NETWORK MONITOR USART DATA PORT ADDRESS */
        NET$RI$DEST$ERR LITERALLY '10', /* NET ROUTE$IN DEST ERROR ENTRY */
        NET$RO$DEST$ERR LITERALLY '11', /* NET ROUTE$OUT DEST ERROR ENTRY */
        PACKET$SIZE     LITERALLY '138', /* PACKET IS 138 BYTE BLOCK */
        PACKETS$IN$TABLE LITERALLY '10', /* # PACKETS IN TABLE */
        PACKET$TABLE$SIZE LITERALLY '1380',
            I$FRAME$SIZE       LITERALLY '140',
        U$FRAME$SIZE       LITERALLY '2',
        S$FRAME$SIZE       LITERALLY '2',
        CMDR$FRAME$SIZE    LITERALLY '5',
        FRAMES$IN$TABLE    LITERALLY '10',
        FRAME$TABLE$SIZE   LITERALLY '1400',
        DATA$SIZE          LITERALLY '128',
        IP$DATA$SIZE       LITERALLY '96',
        TCP$DATA$SIZE      LITERALLY '72';

DECLARE READY              LITERALLY '1',
        DONE               LITERALLY '2';

DECLARE SABM$MODE$A        BYTE EXTERNAL,
        SABM$MODE$B        BYTE EXTERNAL;

        /* NETWORK VARIABLES FOR THIS UNID */

        /* NOTES: 1.  THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
              2.  THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH THIS
            UNID IS LOCATED.
            3.  MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
            ARE CURRENTLY OPERATIONAL.  CC = 0000 IS RESERVED
            FOR THE DELNET MONITOR.
            4.  MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
            CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
            5.  FOR DETAILED INFORMATION ON THE ABOVE, REFER TO
            PHISTER'S THESIS, APPENDIX D.                                   */

DECLARE
   THIS$UNID$NBR LITERALLY '02H',  /* UNIQUE ADDRESS OF THIS UNID */
   THIS$COUNTRY$CODE LITERALLY '01H', /* COUNTRY WHERE THIS UNID RESIDES */
   MAX$COUNTRY$CODE  LITERALLY '01H', /* COUNTRIES CURRENTLY OPERATIONAL */
   MAX$NETWORK$CODE  LITERALLY '03H', /* NUMBER OF UNIDS OPERATIONAL IN CC */


   STAT$NBR   LITERALLY '20',         /* NUMBER OF ENTRIES IN STATUS TABLE */

       /* VARIABLES USED IN N.MAIN$U2 AND N.INSIO$U2 */
   CTCNOA      BYTE EXTERNAL,
                 /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL A */
   CTCNOB      BYTE EXTERNAL,
                /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL B */
   MAXNOA      LITERALLY '2',      /* PREVIOUSLY 64H = 100D */
                /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL A */
   MAXNOB      LITERALLY '2',      /* PREVIOUSLY 64H = 100D */
                /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL B */
   RETRANS$A   BYTE,
               /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   RETRANS$B   BYTE,
               /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$A    LITERALLY '6',
               /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$B    LITERALLY '6';
               /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */

DECLARE BUSYSTATUS LITERALLY '0FFH',
       NMBR$MSK    LITERALLY '07H',
       ESC         LITERALLY '1BH',
       EOT         LITERALLY '04H';
DECLARE ASCII(16)  BYTE EXTERNAL;
DECLARE MSGNUM     BYTE EXTERNAL;
DECLARE OUT$TAB$FULL  BYTE EXTERNAL;
DECLARE I$CNTL      LITERALLY '01H';


   /*********  GLOBAL CONSTANTS USED BY LAP B POCESSES ***************/

/*****************************************************************************/
/* DEFINITIONS FOR THE NETWORK SERIAL INPUT/OUTPUT USARTS          */
```

```
/*************************************************************************/

DECLARE
        BAUD$LSB         BYTE,
       BAUD$MSB          BYTE,
       NUM$BYTES$SENT   INTEGER;

   /* MORE TO BE ADDED LATER */

/*************************************************************************/
/* ADDITIONAL GENERAL DECLARES NEEDED FOR THIS PROGRAM              */
/*************************************************************************/

DECLARE        TIMCHA          BYTE EXTERNAL,
          TIMCHB          BYTE EXTERNAL,
          HSKP$ERR        INTEGER EXTERNAL;
   /* MORE TO BE ADDED LATER */

/*************************************************************************/
/* DATA TABLES USED IN THIS PROGRAM                              */
/*************************************************************************/

DECLARE
        NT01RX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       NT01NS  INTEGER EXTERNAL,
       NT01NE  INTEGER EXTERNAL,
       NT01SZ  INTEGER EXTERNAL,

       NT02RX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       NT02NS  INTEGER EXTERNAL,
       NT02NE  INTEGER EXTERNAL,
       NT02SZ  INTEGER EXTERNAL,

       NT01TX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       TX01NS  INTEGER EXTERNAL,
       TX01NE  INTEGER EXTERNAL,
       TX01SZ  INTEGER EXTERNAL,

       NT02TX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       TX02NS  INTEGER EXTERNAL,
       TX02NE  INTEGER EXTERNAL,
       TX02SZ  INTEGER EXTERNAL,

        I$FRAME$QUE(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
        I$FRAME$QUE$NS INTEGER EXTERNAL,
        I$FRAME$QUE$NE INTEGER EXTERNAL,
        I$FRAME$QUE$SZ INTEGER EXTERNAL,

       LCNTTB(PACKET$TABLE$SIZE)   BYTE EXTERNAL,
       LCNTNS  INTEGER EXTERNAL,
       LCNTNE  INTEGER EXTERNAL,
       LCNTSZ  INTEGER EXTERNAL,

       NTLCTB(PACKET$TABLE$SIZE)   BYTE EXTERNAL,
       NTLCNS  INTEGER EXTERNAL,
       NTLCNE  INTEGER EXTERNAL,
       NTLCSZ  INTEGER EXTERNAL,

       STATTB(STAT$NBR)    BYTE;

DECLARE
   (LSEM$1, LSEM$2, LSEM$3,                          /* LOCAL TO NET SEMAPHORE AND */
   LSEM$4, NSEM$1, NSEM$2) BYTE EXTERNAL,            /* NET TO LOCAL SEMAPHORE */

   (LPTR$1, LSPARE$1, LPTR$2, LSPARE$2,              /* LOC TO NET PACKET PTR */
   LPTR$3, LSPARE$3, LPTR$4, LSPARE$4,               /* LOC TO NET PACKET PTR */
   NPTR$1, NSPARE$1, NPTR$2, NSPARE$2) POINTER EXTERNAL;
                                                     /* NET TO LOC PACKET PTR */


/* MISCELLANEOUS DECLARATIONS  */

DECLARE
       FOREVER BYTE EXTERNAL,
       DESTINATION WORD EXTERNAL,          /* DESTINATION OF A FRAME */
       SEQ$NUM$A   BYTE EXTERNAL,          /* ACKNOWLEDGE VARIABLE DECLARATIONS */
       SEQ$NUM$B   BYTE EXTERNAL,
       SEND$STATE$A    BYTE EXTERNAL,
       SEND$STATE$B    BYTE EXTERNAL,
       RCV$STATE$A     BYTE EXTERNAL,
       RCV$STATE$B     BYTE EXTERNAL;

DECLARE      TP$30(*) BYTE DATA(CR,LF,
'TP$30           DESTINATION OF NT01RX IS NL');
DECLARE      TP$31(*) BYTE DATA(CR,LF,
'TP$31           DESTINATION OF NT01RX IS NN');
DECLARE      TP$32(*) BYTE DATA(CR,LF,
'TP$32           DESTINATION OF NT02RX IS NL');
DECLARE      TP$33(*) BYTE DATA(CR,LF,
'TP$33           DESTINATION OF NT02RX IS NN');
DECLARE      TP$34(*) BYTE DATA(CR,LF,
'TP$34           DESTINATION$UNID >= THIS$UNID$NBR');
DECLARE      TP$35(*) BYTE DATA(CR,LF,
'TP$35           DESTINATION$UNID < THIS$UNID$NBR');
DECLARE      TP$36(*) BYTE DATA(CR,LF,
'TP$36           DESTINATION IS CHANNEL A');
DECLARE      TP$37(*) BYTE DATA(CR,LF,
'TP$37           DESTINATION IS CHANNEL B');
DECLARE        TP$55(*) BYTE DATA(CR,LF,
'TP$55           READING NTLCTB PACKET TO CONOUT');
```

```
/**************************************************************************/
/*******************************************************************
*  DATE:                        30 SEP 84                          *
*  VERSION:                     1.0                                *
*  NAME:                        STCTCA                             *
*  MODULE NUMBER:               9.4.1                              *
*  DESCRIPTION:                 This is a dummy module for the T1 timer *
*             for channel A                                        *
*  PASSED VARIABLES:            None                               *
*  RETURNS:                     None                               *
*  GLOBAL VARIBLES USED:        TIMCHA                             *
*  GLOBAL VARIBLES CHANGED:     TIMCHA                             *
*  MODULES CALLED:              None                               *
*  CALLING MODULES:             None                               *
*  AUTHOR:   C.T. Childress                                        *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M    *
*              version                                             *
*******************************************************************/
STCTCA: PROCEDURE PUBLIC;

   TIMCHA = FALSE;

END STCTCA;

/*******************************************************************
*  DATE:                        30 SEP 85                          *
*  VERSION:                     1.0                                *
*  NAME:                        STCTCB                             *
*  MODULE NUMBER:               9.4.2                              *
*  DESCRIPTION:                 This is a dummy module for the TI timer*
*             for channel B.                                       *
*  PASSED VARIABLES:            None                               *
*  RETURNS:                     None                               *
*  GLOBAL VARIBLES USED:        TIMCHB                             *
*  GLOBAL VARIBLES CHANGED:     TIMCHB                             *
*  MODULES CALLED:              None                               *
*  CALLING MODULES:             None                               *
*  AUTHOR:   T. C. Childress                                       *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M    *
*              version                                             *
*******************************************************************/
STCTCB: PROCEDURE PUBLIC;

   TIMCHB = FALSE;

END STCTCB;

/**************************************************************************
NOTES: 1.  SEE PROCEDURE STCTCA FOR AN EXAMPLE OF CALCULATING THE APPROPRIATE
 TIME DELAY.
```

```
   2.  VARIABLES TOUTCA, CTCNOA, AND MAXNOA ALLOW CHANNEL A TO BE INDEPENDENT
 OF CHANNEL B WHEN CONSIDERING TIME DELAY TO AN ADJACENT UNID.
*****************************************************************************/
/***********************************************************************
*  DATE:                         30 SEP 84                             *
*  VERSION:                      1.0                                   *
*  NAME:                         TIME$DELAY$CHA                        *
*  MODULE NUMBER:                9.4                                   *
*  DESCRIPTION:                  The purpose of this preocedure is to  *
*            produce a time delay to be used between successive        *
*            transmissions out of CH A of I frames when a valid ACK    *
*            has not been received.   The procedure begins by calling*
*            the (assemble routine STCTCA which ititailizes and        *
*             starts the CTC channel #x.  Each time the CTC runs out *
*            its interrupt routine (TOUTCA) increments the global      *
*            variable 'CTCNOA'.  When ever the CTCNOA value is         *
*            greater or equal to the global variable 'MAXNOA', the     *
*            global varible 'TIMCHA is changed to TRUE.                *
*  PASSED VARIABLES:             None                                  *
*  RETURNS:                      None                                  *
*  GLOBAL VARIBLES USED:         STCTCA, TIMCHA, MAXNOA                *
*  GLOBAL VARIBLES CHANGED:      STCTCA, TIMCHA                        *
*  MODULES CALLED:               STCTCA - in module N.INSIO$U2         *
*  CALLING MODULES:              ROUTE$OUT                             *
*  AUTHOR:   C.T. Childress                                            *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                version                                               *
***********************************************************************/
TIME$DELAY$CHA: PROCEDURE PUBLIC REENTRANT;

    IF TIMCHA = TRUE THEN
       CALL STCTCA;     /* IF TIMER IS NOT RUNNING, THEN START IT */
   ELSE
       CTCNOA = CTCNOA + 1;
    IF CTCNOA >= MAXNOA THEN DO;
       TIMCHA = TRUE;
       CTCNOA = 0;
    END;
END TIME$DELAY$CHA;

/***********************************************************************
*  DATE:                         30 SEP 84                             *
*  VERSION:                      1.0                                   *
*  NAME:                         TIME$DELAY$CHB                        *
*  MODULE NUMBER:                9.6                                   *
*  DESCRIPTION:                  The purpose of this preocedure is to  *
*            produce a time delay to be used between successive        *
*            transmissions out of CH B of I frames when a valid ACK    *
*            has not been received.   The procedure begins by calling*
*            the (assemble routine STCTCB which ititailizes and        *
                starts the CTC channel #x.  Each time the CTC runs out *
*              its interrupt routine (TOUTCB) increments the global    *
*              variable 'CTCNOA'.  When ever the CTCNOA value is      *
*              greater or equal to the glogal variable 'MAXNOA', the  *
*              global varible 'TIMCHB is changed to TRUE.             *
*  PASSED VARIABLES:             None                                  *
*  RETURNS:                      None                                  *
*  GLOBAL VARIBLES USED:         STCTCB, TIMCHB, MAXNOB                *
*  GLOBAL VARIBLES CHANGED:      STCTCB, TIMCHB                        *
*  MODULES CALLED:               STCTCB - in module N.INSIO$U2         *
*  CALLING MODULES:              ROUTE$OUT                             *
*  AUTHOR:   C.T. Childress                                            *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M        *
*                version                                               *
***********************************************************************/
TIME$DELAY$CHB: PROCEDURE PUBLIC REENTRANT;

    IF TIMCHB = TRUE THEN
       CALL STCTCB;     /* IF TIMER IS NOT RUNNING, THEN START IT */
   ELSE
       CTCNOB = CTCNOB + 1;
    IF CTCNOB >= MAXNOB THEN DO;
       TIMCHB = TRUE;
       CTCNOB = 0;
    END;
END TIME$DELAY$CHB;


/**********************************************************************
*  DATE:                        28 AUG 85                              *
*  VERSION:                     1.1                                    *
*  NAME:                        DET$DEST$ONE                           *
*  MODULE NUMBER:               8.7                                    *
*  DESCRIPTION:                 This procedrue looks at the first byte of *
*              of the network inout table (NT01RX) srvicing CH A and  *
*              determines if the data frame is destined for this      *
*              particular UNID or some other UNID.  If it goes to     *
*              this UNID, then 'NL' is returned, if to some other     *
*              UNID then 'NN is returend.  Currently all S frames     *
*              return 'NL' as their destination                       *
*  PASSED VARIABLES:            None                                   *
*  RETURNS:                     DESTINATION                            *
*  GLOBAL VARIBLES USED:        NT01RX, NT01NS                         *
*  GLOBAL VARIBLES CHANGED:     None                                   *
*  MODULES CALLED:              None                                   *
*  CALLING MODULES:             ROUTE$IN                               *
*  AUTHOR:   Mark Weber                                                *
*  HISTORY:  1.1 Capt Mark Weber -  adapted module to new network      *
*                header.                                               *
*            1.0 Capt C.T. Childress - original translated PL/M        *
*                 version                                                   *
****************************************************************************/
DET$DEST$ONE: PROCEDURE WORD PUBLIC REENTRANT;
 /*       UNID source and destination network codes are in byte 3  */
    IF (NT01RX (NT01NS + 3) AND 0FH) = THIS$UNID$NBR THEN DO;
       CALL SENDSEQ(@TP$30, LENGTH(TP$30));
       DESTINATION = 'NL';
       END;
    ELSE DO;
       CALL SENDSEQ(@TP$31, LENGTH(TP$31));
       DESTINATION = 'NN';
    END;

    RETURN DESTINATION;
END DET$DEST$ONE;

/****************************************************************************
*  DATE:                         28 AUG 85                                  *
*  VERSION:                      1.1                                        *
*  NAME:                         DET$DEST$TWO                               *
*  MODULE NUMBER:                8.8                                        *
*  DESCRIPTION:                  This procedrue looks at the first byte of *
*                 of the network inout table (NT02RX) srvicing CH B and *
*                 determines if the data frame is destined for this         *
*                 particular UNID or some other UNID.  If it goes to        *
*                 this UNID, then 'NL' is returned, if to some other        *
*                 UNID then 'NN is returend.  Currently all S frames        *
*                 return 'NL' as their destination                          *
*  PASSED VARIABLES:             None                                       *
*  RETURNS:                      DESTINATION                                *
*  GLOBAL VARIBLES USED:         NT02RX, NT02NS                             *
*  GLOBAL VARIBLES CHANGED:      None                                       *
*  MODULES CALLED:               None                                       *
*  CALLING MODULES:              ROUTE$IN                                   *
*  AUTHOR:   Mark Weber                                                     *
*  HISTORY:  1.1 Capt Mark Weber -  adapted module to new network           *
*                 header.                                                   *
*            1.0 Capt C.T. Childress - original translated PL/M             *
*                 version                                                   *
****************************************************************************/
DET$DEST$TWO: PROCEDURE WORD PUBLIC REENTRANT;
  /*  UNID source and desitation network codes are in byte 3   */
    IF (NT02RX (NT02NS + 3) AND 0FH) = THIS$UNID$NBR THEN DO;
       CALL SENDSEQ(@TP$32, LENGTH(TP$32));
       DESTINATION = 'NL';
       END;
    ELSE DO;
       CALL SENDSEQ(@TP$33, LENGTH(TP$33));
       DESTINATION = 'NN';
    END;
    RETURN DESTINATION;
END DET$DEST$TWO;

/*********************************************************************
*  DATE:                           28 AUG 85                          *
*  VERSION:                        1.1                                *
*  NAME:                           DET$DEST$LN                        *
*  MODULE NUMBER:                  8.9                                *
*  DESCRIPTION:                    This module uses a simple alogrithm to *
*              determine the shortest distince between two UNIDs in   *
*              DELNET.  Flow control is not considered in the evalu-  *
*              ation.  The procedure returns a 'CA' if the distance is *
*              shorter going out the right ring (channel A) or 'CB'   *
*              if the distance is shorter going out the left ring     *
*              (channel B).                                           *
*  PASSED VARIABLES:               None                               *
*  RETURNS:                        DESTINATION                        *
*  GLOBAL VARIBLES USED:           LCNTNS, LCNTTB,                    *
*  GLOBAL VARIBLES CHANGED:        None                               *
*  MODULES CALLED:                 SENDSEQ                            *
*  CALLING MODULES:                ROUTE$IN                           *
*  AUTHOR:   Mark Weber                                               *
*  HISTORY:  1.1 Capt Mark Weber - adapted module to new network      *
*                 header.                                             *
*            1.0 C.T. Childress - 30 SEP 85 - original translated PL/M *
*                   version                                           *
*********************************************************************/
DET$DEST$LN: PROCEDURE WORD PUBLIC REENTRANT;

    DECLARE        DESTINATION$UNID    INTEGER,
               DISTANCE$LEFT       INTEGER,
               DISTANCE$RIGHT      INTEGER;

    DESTINATION$UNID = INT(LCNTTB (LCNTNS + 1) AND 0FH);
    IF DESTINATION$UNID >= INT(THIS$UNID$NBR) THEN DO;
       CALL SENDSEQ(@TP$34, LENGTH(TP$34));
       DISTANCE$LEFT = DESTINATION$UNID - INT(THIS$UNID$NBR);
       DISTANCE$RIGHT = INT(THIS$UNID$NBR) + (INT(MAX$NETWORK$CODE) -
              DESTINATION$UNID + 1);
       END;
    ELSE DO;
       CALL SENDSEQ(@TP$35, LENGTH(TP$35));
       DISTANCE$LEFT = INT(THIS$UNID$NBR) +
            (INT(MAX$NETWORK$CODE) - DESTINATION$UNID + 1);
       DISTANCE$RIGHT = DESTINATION$UNID - INT(THIS$UNID$NBR);
    END;
    IF DISTANCE$LEFT >= DISTANCE$RIGHT THEN DO;
       CALL SENDSEQ(@TP$36, LENGTH(TP$36));
       DESTINATION = 'CA';
```

```
         END;
     ELSE DO;
         CALL SENDSEQ(@TP$37, LENGTH(TP$37));
         DESTINATION = 'CB';
     END;
   RETURN DESTINATION;

END DET$DEST$LN;

/**********************************************************************
*  DATE:                              3 SEP 85                        *
*  VERSION:                           1.0                             *
*  NAME:                              READ$TAB                        *
*  MODULE NUMBER:                     9.4                             *
*  DESCRIPTION:                       This procedure reads the test messages*
*            in  the network to local channel table and sends them    *
*            to the system console.  This procedure may be used       *
*            in operational software to monitor the message traffic   *
*            on the SBC 88/45.                                        *
*  PASSED VARIABLES:               None                               *
*  RETURNS:                        None                               *
*  GLOBAL VARIBLES USED:           NTLCNE, NTLCNS, PACKET$SIZE,       *
*                                  TCP$DATA$SIZE                      *
*  GLOBAL VARIBLES CHANGED:        NTLCNE                             *
*  MODULES CALLED:                 SRVC$TAB$HSKP, SEND$SEQ            *
*  CALLING MODULES:                START$INFO$XFER                    *
*  AUTHOR:                                                            *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M       *
*                version                                              *
**********************************************************************/
READ$TAB:  PROCEDURE PUBLIC;

/*         IF NSEM$1 = READY THEN
            DO;
               MOVB(NPTR$1, @NTLCTB(NTLCNE), PACKETSIZE);
               NSEM$1 = DONE;
               CALL LD$TAB$HSKP(5, PACKET$SIZE);
             END; */

       IF ((NTLCNE - NTLCNS) >= PACKET$SIZE) OR (NTLCNS > NTLCNE) THEN DO;
           CALL SENDSEQ(@TP$55, LENGTH(TP$55));
           CALL SENDSEQ(@NTLCTB(NTLCNS + 66), TCP$DATA$SIZE);
           CALL SRVC$TAB$HSKP(5, PACKET$SIZE);
       END;

END    READ$TAB;

/**********************************************************************
*  DATE:                              3 SEP 85                        *
*  VERSION:                        1.0                                  *
*  NAME:                           FIND$I$FRAME                         *
*  MODULE NUMBER:                                                       *
*  DESCRIPTION:                    This procedure finds the first I     *
*              frame in the tables given.  Then the next to service     *
*              pointer for the specified table is placed at the         *
*              location found.  The procedure returns a flag indi-      *
*              cating if an I frame was found.                          *
*  PASSED VARIABLES:           TABLE                                    *
*  RETURNS:                    HAVE$IFRAME                              *
*  GLOBAL VARIBLES USED:       LCNTNE, NTLCTNE, TX01NE, TX02NE, NT01NE  *
*                        NT02NE, FRAME$THERE, HAVE$IFRAME, INDEX        *
*  GLOBAL VARIBLES CHANGED:    LCNTNE, NTCLNE, TX01NE, TX02NE, NT01NE,  *
*                        NT02NE, FRAME$THERE, HAVE$IFRAME, INDEX        *
*  MODULES CALLED:             None                                     *
*  CALLING MODULES:            ROUTE$PACKET                             *
*  AUTHOR:   C.T. Childress 30 SEP 84                                   *
*  HISTORY:  1.0 Capt C.T. Childress - original translated PL/M         *
*                  version                                              *
*************************************************************************/
FIND$IFRAME:   PROCEDURE(TABLE) BYTE PUBLIC REENTRANT;

   DECLARE (TABLE,
           FRAME$THERE,
           HAVE$IFRAME) BYTE;
   DECLARE INDEX   INTEGER;

   FRAME$THERE = TRUE;
   HAVE$IFRAME = FALSE;
   INDEX = 0;

   DO CASE TABLE;

       ;       /* ZERO IS NULL */

       DO;
       DO WHILE FRAME$THERE;

       IF ((TX01NE - TX01NS - INDEX) >= I$FRAME$SIZE) OR
               ((TX01NS + INDEX) > TX01NE) THEN DO;
/******        IF (NT01TX(TX01NS + INDEX + 1) AND I$CNTL) = 0H
               THEN DO;        !* HAVE AN INFORMATION FRAME *!  ******/
               HAVE$IFRAME = TRUE;
               FRAME$THERE = FALSE;
               END;
/*****     ELSE
               HAVE$IFRAME = FALSE;    !* HAVE AN S FRAME *!            *****/
           END;
       ELSE DO;
           HAVE$IFRAME = FALSE;
           FRAME$THERE = FALSE;
       END;

/****      INDEX = INDEX + I$FRAME$SIZE;                            ******/
       END;        /* DO WHILE FRAME$THERE */
       END;    /* CASE TABLE = 1 */

       DO;
       DO WHILE FRAME$THERE;

       IF ((TX02NE - TX02NS - INDEX) >= I$FRAME$SIZE) OR
               ((TX02NS + INDEX) > TX02NE) THEN DO;
/***** IF (NT02TX(TX02NS + INDEX + 1) AND I$CNTL) = 0H
               THEN DO;        !* HAVE AN INFORMATION FRAME *!  *****/
               HAVE$IFRAME = TRUE;
               FRAME$THERE = FALSE;
               END;
/****          ELSE
               HAVE$IFRAME = FALSE;    !* HAVE AN S FRAME *!
           END;                                                    ******/
       ELSE DO;
           HAVE$IFRAME = FALSE;
           FRAME$THERE = FALSE;
       END;

/****  INDEX = INDEX + I$FRAME$SIZE;                          *******/
       END;        /* DO WHILE FRAME$THERE */
       END;    /* CASE TABLE = 2 */

   END;        /* CASE TABLE */
   RETURN HAVE$IFRAME;

END FIND$IFRAME;


END LAPB1$MODULE;
/*******************END MODULE LAPB1.SRC*********************************/
```

4. PCKT.SRC - Module with Packet Layer procedures

```
$TITLE('UNID II NETWORK TEST PROGRAM, MODULE PCKT, 19 NOV 85')
$XREF OPTIMIZE(2)
/*************************************************************************
*                                                                        *
*  DATE:  19 NOV 85                                                      *
*  VERSION:  1.1                                                         *
*  TITLE:  ISO layer 2 LAP B simulation                                  *
*  FILENAME:  PCKT.SRC                                                   *
*  COORDINATOR:  Capt Mark W. Weber                                      *
*  PROJECT:  UNIT II                                                     *
*  OPERATING SYSTEM:  INTEL SYSTEM III/230 UNDER ISIS OS                 *
*  LANGUAGE:  PL/M 86                                                    *
*  USE:  This file requires no includes, but must be linked with LAPB0.OBJ *
*        LAPB1.OBJ, NETX25.OBJ, and SMALL.LIB.  The program may be linked *
*        and located with the SUBMIT file NETX25.CSD.                    *
*  CONTENTS:                                                             *
*            ROUTE$PACKET - checks the destionation byte of the packet   *
*                           header                                       *
*            PACKET$HEADER - non-operative procedure which eloborates on *
*                            the packet header format used by the data link *
*                            simulation.  This procedure defines the entry *
*                            point for further packet layer development  *
*  FUNCTION:  Simulates the operation of the SBC 88/45 in the UNID II using *
*            the datalink layer as described by CCITT recommendation X.25. *
*            ISIS calls are used to provide a user interface and to trace *
*            the process flow of the LAP B protocol imployed by the CCITT *
*             X.25 recommendation. This module provides the packet layer *
*            interface for the X.25 recommendation.  The manipulation of *
*            packet header bytes is accomplished through modules within  *
*            this module.                                                *
*  HISTORY:  1.1 Mark Weber - implemented X.25 semahore useage           *
*            1.0 TRANSLATED 5 APR 84 by C.T. Chrildress                  *
*************************************************************************/


PCKT$MODULE:  DO;

/******************** EXTERNAL PROCEDURES FOR ISIS SYSTEM CALLS *************/


FRAME$PRESENT:  PROCEDURE (CHANNEL) BYTE EXTERNAL;
               DECLARE CHANNEL BYTE;
               END FRAME$PRESENT;

PRINTI:      PROCEDURE (NUM) EXTERNAL;
           DECLARE NUM INTEGER;
           END PRINTI;

DSPLY$FRAME$HDR:  PROCEDURE (CHANNEL) EXTERNAL;
                 DECLARE CHANNEL BYTE;
                 END DSPLY$FRAME$HDR;
```

```
SENDSEQ:          PROCEDURE (MSG, TOTAL) EXTERNAL;
                 DECLARE MSG POINTER, TOTAL WORD;
                 END SENDSEQ;

SRVC$TAB$HSKP:    PROCEDURE (TABLE, FRAME$SIZE) EXTERNAL;
                  DECLARE TABLE BYTE, FRAME$SIZE INTEGER;
                  END SRVC$TAB$HSKP;

LD$TAB$HSKP:      PROCEDURE (TABLE, FRAME$SIZE) EXTERNAL;
                  DECLARE TABLE BYTE, FRAME$SIZE INTEGER;
                  END LD$TAB$HSKP;

FIND$IFRAME:      PROCEDURE (TABLE) BYTE EXTERNAL;
                  DECLARE TABLE BYTE;
                  END FIND$IFRAME;

DET$DEST$LN:      PROCEDURE WORD EXTERNAL;
                  END DET$DEST$LN;


BUILD$IFRAME:     PROCEDURE (TABLE$PTR) EXTERNAL;
                  DECLARE TABLE$PTR WORD;
                  END BUILD$IFRAME;

DECLARE    CR          LITERALLY 'ODH',
       LF          LITERALLY 'OAH';
DECLARE CR$LF (2) BYTE DATA (ODH, OAH);

/***************************** END EXTERNALS ******************************/


DECLARE
       FALSE       LITERALLY 'OH', /* USE AS FLAGS TO TEST */
       TRUE        LITERALLY 'OFFH', /* BITS FOR BRANCHING */
       CONCTC      LITERALLY 'OD5H', /* NETWORK MONITOR CTC PORT ADDRESS */
       CONCMD      LITERALLY 'ODFH',
                         /* NETWORK MONITOR USART COMMAND PORT ADDRESS */
       CONDAT      LITERALLY 'ODEH',
                         /* NETWORK MONITOR USART DATA PORT ADDRESS */
       NET$RI$DEST$ERR LITERALLY '10', /* NET ROUTE$IN DEST ERROR ENTRY */
       NET$RO$DEST$ERR LITERALLY '11', /* NET ROUTE$OUT DEST ERROR ENTRY */
       PACKET$SIZE     LITERALLY '138', /* PACKET IS 138 BYTE BLOCK */
       PACKETS$IN$TABLE LITERALLY '10', /* # PACKETS IN TABLE */
       PACKET$TABLE$SIZE LITERALLY '1380',
          I$FRAME$SIZE      LITERALLY '140',
       U$FRAME$SIZE      LITERALLY '2',
       S$FRAME$SIZE      LITERALLY '2',
       CMDR$FRAME$SIZE   LITERALLY '5',
       FRAMES$IN$TABLE   LITERALLY '10',
       FRAME$TABLE$SIZE  LITERALLY '1400',
        DATA$SIZE           LITERALLY '128',
        IP$DATA$SIZE        LITERALLY '96',
        TCP$DATA$SIZE       LITERALLY '72',
         PACKET$OFFSET       LITERALLY '2',
        READY               LITERALLY '1',
         DONE                LITERALLY '2';


DECLARE  A$ADD               LITERALLY '3',
         B$ADD               LITERALLY '1';

        /* NETWORK VARIABLES FOR THIS UNID */

        /* NOTES: 1.  THIS$UNID$NBR MUST REFLECT WHICH UNID THIS IS.
                2.  THIS$COUNTRY$CODE MUST REFLECT THE AREA TO WHICH THIS
                UNID IS LOCATED.
                3.  MAX$COUNTRY$CODE WILL INDICATE WHICH COUNTRY CODES
                ARE CURRENTLY OPERATIONAL.  CC = 0000 IS RESERVED
                FOR THE DELNET MONITOR.
                4.  MAX$NETWORK$CODE WILL INDICATE HOW MANY UNIDS ARE
                CURRENTLY OPERATIONAL WITHIN A PARTICULAR COUNTRY.
                5.  FOR DETAILED INFORMATION ON THE ABOVE, REFER TO
                PHISTER'S THESIS, APPENDIX D.                              */

DECLARE
   THIS$UNID$NBR LITERALLY '02H',   /* UNIQUE ADDRESS OF THIS UNID */
   THIS$COUNTRY$CODE LITERALLY '01H', /* COUNTRY WHERE THIS UNID RESIDES */
   MAX$COUNTRY$CODE  LITERALLY '01H', /* COUNTRIES CURRENTLY OPERATIONAL */
   MAX$NETWORK$CODE  LITERALLY '03H', /* NUMBER OF UNIDS OPERATIONAL IN CC */


   STAT$NBR   LITERALLY '20',          /* NUMBER OF ENTRIES IN STATUS TABLE */

       /* VARIABLES USED IN N.MAIN$U2 AND N.INSIO$U2 */
   CTCNOA       BYTE EXTERNAL,
                   /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL A */
   CTCNOB       BYTE EXTERNAL,
                  /* PROGRESSIVE NUMBER OF TIME COUNTS FOR NETWORK CHANNEL B */
   MAXNOA       LITERALLY '2',       /* PREVIOUSLY 64H = 100D */
                  /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL A */
   MAXNOB       LITERALLY '2',       /* PREVIOUSLY 64H = 100D */
                  /* MAXIMUM NUMBER OF TIMING  COUNTS FOR NETWORK CHANNEL B */
   RETRANS$A    BYTE,
                /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   RETRANS$B    BYTE,
                /* PROGRESSIVE NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$A    LITERALLY '6',
                /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */
   MAXRETRANS$B    LITERALLY '6';
                /* MAXIMUM NUMBER OF RETRANSMISSIONS OF A FRAME */
```

```
DECLARE BUSYSTATUS LITERALLY '0FFH',
       NMBR$MSK    LITERALLY '07H',
       ESC         LITERALLY '1BH',
       EOT         LITERALLY '04H';
DECLARE ASCII(16)  BYTE EXTERNAL;
DECLARE MSGNUM     BYTE EXTERNAL;
DECLARE OUT$TAB$FULL  BYTE EXTERNAL;
DECLARE I$CNTL      LITERALLY '01H';


/*************************************************************************/
/* ADDITIONAL GENERAL DECLARES NEEDED FOR THIS PROGRAM          */
/*************************************************************************/

DECLARE        TIMCHA          BYTE EXTERNAL,
           TIMCHB          BYTE EXTERNAL,
           HSKP$ERR        INTEGER EXTERNAL;
   /* MORE TO BE ADDED LATER */

/*************************************************************************/
/* DATA TABLES USED IN THIS PROGRAM                        */
/*************************************************************************/

DECLARE
        NT01RX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       NT01NS  INTEGER EXTERNAL,
       NT01NE  INTEGER EXTERNAL,
       NT01SZ  INTEGER EXTERNAL,

       NT02RX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       NT02NS  INTEGER EXTERNAL,
       NT02NE  INTEGER EXTERNAL,
       NT02SZ  INTEGER EXTERNAL,

       NT01TX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       TX01NS  INTEGER EXTERNAL,
       TX01NE  INTEGER EXTERNAL,
       TX01SZ  INTEGER EXTERNAL,

       NT02TX(FRAME$TABLE$SIZE)  BYTE EXTERNAL,
       TX02NS  INTEGER EXTERNAL,
       TX02NE  INTEGER EXTERNAL,
       TX02SZ  INTEGER EXTERNAL,

       LCNTTB(PACKET$TABLE$SIZE)   BYTE EXTERNAL,
       LCNTNS  INTEGER EXTERNAL,
       LCNTNE  INTEGER EXTERNAL,
       LCNTSZ  INTEGER EXTERNAL,

       NTLCTB(PACKET$TABLE$SIZE)   BYTE EXTERNAL,
      NTLCNS  INTEGER EXTERNAL,
      NTLCNE  INTEGER EXTERNAL,
      NTLCSZ  INTEGER EXTERNAL,

      STATTB(STAT$NBR)    BYTE;

DECLARE
   (LSEM$1, LSEM$2, LSEM$3,                      /* LOCAL TO NET SEMAPHORE AND */
   LSEM$4, NSEM$1, NSEM$2) BYTE EXTERNAL,        /* NET TO LOCAL SEMAPHORE */

   (LPTR$1, LSPARE$1, LPTR$2, LSPARE$2,          /* LOC TO NET PACKET PTR */
   LPTR$3, LSPARE$3, LPTR$4, LSPARE$4,           /* LOC TO NET PACKET PTR */
   NPTR$1, NSPARE$1, NPTR$2, NSPARE$2) POINTER EXTERNAL;
                                                 /* NET TO LOC PACKET PTR */


/* MISCELLANEOUS DECLARATIONS  */

DECLARE
      FOREVER BYTE EXTERNAL,
      DESTINATION WORD EXTERNAL,       /* DESTINATION OF A FRAME */
      SEQ$NUM$A   BYTE EXTERNAL,       /* ACKNOWLEDGE VARIABLE DECLARATIONS */
      SEQ$NUM$B   BYTE EXTERNAL,
      SEND$STATE$A    BYTE EXTERNAL,
      SEND$STATE$B    BYTE EXTERNAL,
      RCV$STATE$A     BYTE EXTERNAL,
      RCV$STATE$B     BYTE EXTERNAL,
       SABMMODE$A      BYTE EXTERNAL,
       SABMMODE$B      BYTE EXTERNAL;

/* MESSAGES SENT TO TERMINAL */

DECLARE     TP$23(*) BYTE PUBLIC DATA(CR,LF,
'TP$23          PACKET DESTIONED FOR DATA LINK LAYER');
DECLARE     TP$24(*) BYTE PUBLIC DATA(CR,LF,
'TP$24          INCOMING PACKET DESTINED FOR CHANNEL A');
DECLARE     TP$25(*) BYTE PUBLIC DATA(CR,LF,
'TP$25          INCOMING PACKET DESTINED FOR CHANNEL B');
DECLARE     TP$38(*) BYTE DATA(CR,LF,
'TP$38          BUILDING I FRAME FOR CHANNEL A');
DECLARE     TP$39(*) BYTE DATA(CR,LF,
'TP$39          BUILDING I FRAME FOR CHANNEL B');


/**********************************************************************
*  DATE:                       28 OCT 85                              *
*  VERSION:                    1.0                                    *
*  NAME:                       ROUTE$PACKET                           *
*  MODULE NUMBER:              9.2.11                                 *
*  DESCRIPTION:               This determines if any of the local       *
*           host ports need servicing.  This porcedure is called by     *
*           ROUTE$IN and represents the packet layer interface to       *
*           to ISO reference model network functions.   The present     *
*           algorithm simply checks for a packet in the SBC 544         *
*           receive table simulated by the LCNTTB table and sends       *
*           the packet to one the data link transmit tables.            *
*                         Operational software must use the sema-       *
*           phores developed in Appendix E to poll the four SBC 544     *
*           receive tables for messages to send the data link layer.    *
*           The semaphore algorithm is given below in addition to       *
*           alogrithm actually used.                                    *
*  PASSED VARIABLES:          None                                      *
*  RETURNS:                   None                                      *
*  GLOBAL VARIBLES USED:      SABM$MODE$A, SABM$MODE$B, LSEM$1 (2,3,4)  *
*  GLOBAL VARIBLES CHANGED:   All globals used                          *
*  MODULES CALLED:            SENDSEQ, MOVE$HOST$TO$NET                 *
*  CALLING MODULES:           ROUTE$IN                                  *
*  ALOGRITHM (IMPLEMENTED):                                             *
*                 IF FRAME IN LOCAL TO NETWORK TABLE THEN               *
*                 DO;                                                   *
*                    DETERMIN DESTINATION                               *
*                    IF DESTINATION CHANNEL A THEN                      *
*                       IF OUT BOUND FRAMES NOT I FRAMES                *
*                       DO;                                             *
*                          THEN SEND PACKET TO CHANNEL A TRANSMIT       *
*                          BUILD THE I FRAME FOR THE PACKET             *
*                       END;                                            *
*                    IF DESTINATION CHANNEL B THEN                      *
*                       IF OUT BOUND FRAMES NOT I FRAMES                *
*                       DO;                                             *
*                          THEN SEND PACKET TO CHANNEL A TRANSMIT       *
*                          BUILD THE I FRAME FOR THE PACKET             *
*                       END;                                            *
*                                                                       *
*  ALOGRITHM (OPERATIONAL SOFTWARE):                                    *
*                 IF LSEM$1 is READY then                               *
*                 DO;                                                   *
*                    MOVE$HOST$TO$NET;                                  *
*                    LSEM$1 = DONE;                                     *
*                 END;                                                  *
*                 IF LSEM$2 is READY then                               *
*                 DO;                                                   *
*                    MOVE$HOST$TO$NET;                                  *
*                    LSEM$2 = DONE;                                     *
*                 END;                                                  *
*                 IF LSEM$3 is READY then                               *
*                 DO;                                                   *
*                    MOVE$HOST$TO$NET;                                  *
*                    LSEM$3 = DONE;                                     *
*                   END;                                            *
*                   IF LSEM$4 is READY then                         *
*                   DO:                                             *
*                      MOVE$HOST$TO$NET;                            *
*                      LSEM$4 = DONE;                               *
*                   END;                                            *
*  HISTORY:  1.1 Mark Weber -28 AUG 85-added semaphores             *
*            1.0 C.T. Childress -30 SEP 84- original transnlated PL/M *
*                     version                                       *
********************************************************************/
ROUTE$PACKET:  PROCEDURE PUBLIC;

/*--------------------LOCAL TO NETWORK TABLE PROCESSING-------------------*/
IF ((LCNTNE - LCNTNS) >= PACKET$SIZE) OR (LCNTNS > LCNTNE) THEN
   IF (SABM$MODE$A AND SABM$MODE$B) THEN
   DO;
       CALL SENDSEQ(@TP$23, LENGTH(TP$23));
       DESTINATION = DET$DEST$LN;
       IF DESTINATION = 'CA' THEN DO;     /* PACKET TO CHAN A */
           OUT$TAB$FULL = FIND$IFRAME(1);
           IF (NOT OUT$TAB$FULL) THEN DO;
               CALL SENDSEQ(@TP$24, LENGTH(TP$24));
               CALL BUILD$I$FRAME(1);
               CALL SRVC$TAB$HSKP (6, PACKET$SIZE);
           END;    /* IF NOT OUT$ */
       END;
       IF DESTINATION = 'CB' THEN DO;     /* PACKET TO CHAN B */
           OUT$TAB$FULL = FIND$IFRAME(2);
           IF (NOT OUT$TAB$FULL) THEN DO;
               CALL SENDSEQ(@TP$25, LENGTH(TP$25));
               CALL BUILD$I$FRAME(2);
               CALL SRVC$TAB$HSKP (6, PACKET$SIZE);
           END;    /* IF NOT OUT$ */
       END;
       END;        /* END OF (LCNTNE - LCNTNS) CONDITION */


END ROUTE$PACKET;


END PCKT$MODULE;
/*******************END MODULE PCKT.SRC*******************************/
```

VITA

Mark William Weber was born on 13 November 1956 in Scottsbluff Nebraska. All primary and secondary education was complete in Gering Nebraska. In August 1975 he entered the University of Idaho as a student in the department of Electrical Engineering. In that same year he entered Air Force ROTC. The following year he received a three year scholarship from the Air Force. December 1979, he graduated with a B.S.E.E. and was commissioned a Second Lieutenant in the United States Air Force. In February 1980, he reviewed his first assignment to Keesler AFB, MS for the nine month Communications - Electronics Course. He completed the program in six months and was then assigned to the 1815 Test Squadron (AFCC) at Scott AFB, IL. While at Scott, he completed the Wideband Systems Evaluation Course at the AFCC Systems Evaluation School and was subsequentially assigned as Team Engineer to the Wideband Evaluation Team D. In April 1981, the 1815th Test Squadron was renamed to the 1815th Test and Evaluation Squadron and moved to Wright-Patterson AFB, OH. During his tour with the 1815th Test Squadron, completed overseas evaluations to Greece, Scotland, Japan, Philippines, and Italy. Not long after arriving at Wright-Patterson AFB, Capt Weber became Team Chief for the European Wideband Evaluation Team and remained at that position until reassignment to the Air Force Institute of Technology. His next assignment is OL E, 1842 EEG/CT at Scott AFB IL.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

ADA 164042

REPORT DOCUMENTATION PAGE

REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GE/85D-52	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Engineering 6b. OFFICE SYMBOL *(If applicable)* AFIT/EN	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS *(City, State and ZIP Code)* Air Force Institute of Technology Wright Patterson AFB, OH 45433	7b. ADDRESS *(City, State and ZIP Code)*
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Rome Air Development Ctr 8b. OFFICE SYMBOL *(If applicable)*	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS *(City, State and ZIP Code)* Griffiss AFB NY 13441	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT NO.
11. TITLE *(Include Security Classification)* See Box 19	

12. PERSONAL AUTHOR(S)
See Box 19

TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT *(Yr., Mo., Day)*	15. PAGE COUNT
MS Thesis	FROM ______ TO ______	1985 December	498

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS *(Continue on reverse if necessary and identify by block number)*
FIELD	GROUP	SUB. GR.	Local Area Networks, Network Interface, Protocols, UNID, ISO Reference Model, X.25, X.121, TCP/IP.
09	05		

19. ABSTRACT *(Continue on reverse if necessary and identify by block number)*

Title: DEVELOPMENT AND IMPLEMENTATION OF THE X.25 PROTOCOL FOR THE UNIVERSAL NETWORK INTERFACE DEVICE (UNID) II

Thesis Advisor: Dr. Gary B. Lamont

Author: Mark W. Weber, BS EE, Capt USAF

Approved for public release: IAW AFR 190-1/.
[illegible]
LYNN E. WOLAVER 16 JAN 86
Dean for Research and Professional Development
Air Force Institute of Technology (ATC)
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED [✓] SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Dr. Gary Lamont	22b. TELEPHONE NUMBER *(Include Area Code)* 513-255-3576 22c. OFFICE SYMBOL AFIT/EN

DD FORM 1473, 83 APR EDITION OF 1 JAN 73 IS OBSOLETE. UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

Block 19 (cont)

Abstract

This ~~research effort~~ describes the continued development of an improved Universal Network Interface Device (UNID II). The UNID II's architecture was based on a preliminary design project at the Air Force Institute of Technology. The UNID II contains two main hardware modules; a local module for the network layer software and a network module for the data link layer software and physical layer interface. Each module is an independent single board computer (SBC) residing on an Intel multibus chassis, complete with its own memory (EPROM and RAM), serial link interfaces, and multibus interface. The local module is an *iSBC 544 and the network module is an iSBC 88/45*. The network layer software supports the CCITT X.25, datagram option, protocol and the data link layer software supports the CCITT X.25 LAPB (HDLC) protocol. This report documents the further implementation of the CCITT X.25 protocol in the UNID II design. [illegible]