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The TRAM is a multiphase set of computer programs. Each program except for the sorting steps is described by a user's guide and programmer's guide. This document is the Programmer's Guide. The programmer's guide is intended to be a supplement to the user's guide thereby saving unnecessary repetition except where the repetition is useful for understanding the material.

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(Over)
The purpose of Phase 1 is to assemble most of the data and to check it for consistency and completeness. The result of Phase 1 is normally a tape which is passed to Phase 2. Phase 2 makes further checks on linkages and network integrity. Phase 2 prepares lists of names, student demands, trainee source lists and resource lists. Phase 3 resolves the trainee demands into classes and determines the amount of resources used by simulating the training system. The output of Phase 3 consists of source and lag records which indicate the occurrence of trainee matriculation, lags due to lack of resources, and an unused resources file. Phase 4 computes the amount of resources used by comparing the unused and original resources, and then prepares an economic analysis of the run. Phase 5 processes the trainee source and lag records and writes a report on these uses.

TROLIE is a quick-look version of Phases 1, 2 and 3 of TRAM which can be used for less detailed analysis.
PREFACE

This document is one of several technical memoranda which have been delivered to the B-1 Systems Project Office (B-1 SPO) in performance of the Systems Approach to Training (SAT) Task under Contract Number F33657-75-C-0021. Each of the separate SAT documents is listed below. Additional copies may be requested from: B-1 Systems Project Office, Data Configuration Division, Wright-Patterson Air Force Base, Ohio.

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SUMMARY

The TRAM is a multiphase set of computer programs. The following figure is the overall flow diagram which depicts each program within TRAM and the data sets associated with it. Each program except for the sorting steps is described by a user's guide and programmer's guide. This document is the Programmer's Guide.

The programmer's guide is intended to be a supplement to the user's guide thereby saving unnecessary repetition except where the repetition is useful for understanding the material.

The purpose of Phase 1 is to assemble most of the data and to check it for consistency and completeness. The result of Phase 1 is normally a tape which is passed to Phase 2. Phase 2 makes further checks on linkages and network integrity. Phase 2 prepares lists of names, student demands, trainee source lists and resource lists. Phase 3 resolves the trainee demands into classes and determines the amount of resources used by simulating the training system. The output of Phase 3 consists of source and lag records which indicate the occurrence of trainee matriculation, lags due to lack of resources, and an unused resources file. Phase 4 computes the amount of resources used by comparing the unused and original resources, and then prepares an economic analysis of the run. Phase 5 processes the trainee source and lag records and writes a report on these uses.

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Section 1.1
INTRODUCTION

The purpose of phase 1 is to read the user inputs and convert them to the internal format required for phase 2. It also tests the inputs for validity and provides the necessary outputs to document the run.

The manual is intended to aid the programmer in the operation and modification of the computer program by supplementing the users' guide.
Section 1.2
PROGRAM DESCRIPTION

Phase 1 performs the following functions:

- reads the input cards and prints them
- checks all values for validity
- prints formatted tables of the inputs
- replaces user assigned names with an internal ID number
- plots a course block diagram
- sorts the data records and writes them onto unit 10 for phase 2.

Phase 1 initializes certain common areas with data contained on its initialization file (unit 9). The values on this file are considered program constants, rather than inputs, and any changes to them are usually accompanied with program modifications. See Section 10 for a description of this file.

The values from each input card are printed as they are read. Also, each numeric value is tested against a range of acceptable values to see if it is valid. If it is not, a diagnostic message is printed, which will appear immediately after the card on the input card listing.

The inputs are stored in data blocks that are held in a single large array. The blocks of each type are chained together by pointers to form a sequential file. For a detailed description of this system, see the description of common FILE (in Section 1.7), and then the internal data block descriptions (Section 1.8).

After all inputs have been read, they may be optionally re-printed in formatted tables. The purpose of this printout is to show all the inputs in an easily readable form.
The next processing performed is to generate a table of all user assigned names, and to replace all references to these names with internal ID numbers. Some of the subroutines that do this are table driven. That is, they locate where names are defined, and where they are referenced by the use of tables read from the initialization file. It is during this processing that undefined or multiply defined names are detected and flagged.

If no errors have been detected up to this point, the course block diagram is plotted (optional). Additional error messages are printed if the processing blocks are not in the proper order for plotting.

Next, a subroutine is called to complete the information in the CCTS, PMT group, and PMT data blocks. This consists of filling in the airbase number and the time, which are obtained from the airbase event that is specified by the block.

The final processing performed in phase 1 is to sort the input data and write it to file 10 for input to phase 2.
Section 1.3
DESCRIPTION OF INPUTS

The input cards for the TRAM model have fixed format fields, and a separate card is provided for each different type of information. Coding forms for each of these input cards, along with a detailed description of the input variables, can be found in the Users' Guide. The following paragraphs give a more general description of the inputs.

All cards have a card name field, which is used to identify the card type. Although the different card types contain different information, most of them conform to a standard field layout. This consists of the card name field in columns 1-10, followed by two ten-column character data fields and ten five-column numeric data fields. All numeric data are read in integer format. Variables whose values can take on non-integral values are read with an implied decimal point. These values are converted internally, using the position of the implied decimal point shown on the coding forms. Character data are left justified and numeric data are right justified.

Cards that do not conform to the standard field layout (TASK, RUB, RUDB), must be preceded by a set header card. This card identifies the type of cards that are to follow. Note that these non-standard cards have a blank card name field, since the card type is identified by the header card. Each set is terminated by a SETEND card.

Some input cards require additional continuation cards. Such cards have parameters to give the number of each type of card that is to follow it. The formats for these additional cards are shown on the same coding form as the header card so that they may be easily coded in the proper sequence. Note that these continuation cards also have blank card name fields, since the card type is identified by the header card.

In general, these cards, or groups of cards, can be coded in any order. The only exception to this is the course and the processing block cards. The processing blocks for each course must follow the course card. Also, the processing blocks within a course must start with the graduation block and proceed
towards matriculation. This is because the position of each processing block is
given as an offset from the block connected to it on the right. If there is more
than one block to the right, as in the case of fan-outs, the first one encountered
is the one used as the reference position.

The input deck must be ended with an end card, which consists of the
word "END" punched in the first field.
Section 1.4
DESCRIPTION OF OUTPUTS

Input Card Listing

This listing shows the values exactly as they are read from each card. Field numbers are marked across the top of the page for reference by error messages. These fields correspond to five card columns. Character data are spread across two such fields, and would be referred to by the number of the second field. Also, card sequence numbers are printed for later reference by error messages. This listing is always printed.

Formatted Input Tables

These tables duplicate the information shown by the input card listing, but present it in a conveniently readable form. All variables are identified by column titles, and the meanings of integer codes are printed rather than the codes themselves. Also, these values will show the results of any input conversion that was done. The user may suppress this listing by use of the input routine control card.

Course Block Diagram

This plot shows the structure of the courses by displaying each processing block in the course as a rectangle, with the flow of students shown by connecting lines from one processing block to the next. Inside each rectangle, the block number, block name, synchronize-correlate reference (if any), and task names are shown. The course name is plotted above each graduation block. The input routine control card specifies if this plot is to be produced.
Section 1.5
SUBPROGRAM DESCRIPTIONS

This section contains the descriptions of the individual subroutines that comprise phase 1 of the TRAM program. The description for each subprogram consists of a statement of the purpose of the routine, the calling sequence, a description of its parameters, the method used, and a list of the subprograms required. A high level flowchart, which shows the logical decision points and the processing accomplished, is also included for each of the major subprograms.
PHASE1 MAIN PROGRAM

PURPOSE
- To perform the following functions
- Read the TAN input cards and print them
- Check values for validity
- Print formatted tables of the inputs
- Replace user assigned names with internal ID numbers
- Plot the course block diagram
- Sort the inputs and write them to unit 16 for Phase 2

REFERENCES
See TAN users guide and TAN programmers manual

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
READI8
INPUT
ITABLE
NAME1
NAME2
PROC1
PROC2
FIXABE
SORT
OUTPUT
IPLLOT
PHASE 1 MAIN PROGRAM

PHASE 1

READ AND STORE INITIALIZATION FILE (READTB)

READ AND STORE TRAM CARD INPUTS (INPUT)

IS PRINT SWITCH ON?

NO

PRINT FORMATTED TABLES OF THE INPUTS (TBL)

REPLACE FUNCTION NAMES WITH THEIR INTEGER CODES (ITABLE)

CONSTRUCT TABLE OF DATA BLOCK NAMES (NAME1)

REPLACE REFERENCES TO DATA BLOCK NAMES WITH INDEX IN TABLE (NAME2)

STOP

CONSTRUCT TABLE OF PROCESSING BLOCK NAMES AND NUMBERS (PROCBI)

REPLACE PROCESSING BLOCK REFERENCES WITH INDEX IN TABLE (PROCBI2)

HAVE ANY ERRORS BEEN DETECTED?

NO

YES

ERROR STOP

IS PLOT SWITCH ON?

NO

YES

PLOT THE COURSE BLOCK DIAGRAM (ILOT)

COMPLETE CCTS AND PMT BLOCKS FROM INFORMATION IN THE ASSOCIATED AIRBASE EVENT (FIXABE)

SORT DATA BLOCKS (SORT)

OUTPUT FILE 10 FOR TRAM STEP 2 (OUTPUT)

STOP
LOCKD

PURPOSE
TO INITIALIZE COMMON AREAS FOR INPUT ROUTINES
SUBROUTINE READTB

PURPOSE
TO READ THE PHASE 1 INITIALIZATION FILE

CALLING SEQUENCE
CALL READTB

DESCRIPTION OF PARAMETERS
NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

*
SUBROUTINE READTB

READ TB

READ CARD NAMES AND ASSOCIATED DATA BLOCK NUMBERS (/ICNAME/)

READ FUNCTION NAMES (/TABLES/)

READ INPUT CARD DESCRIPTIONS (/UDIN/)

READ DATA BLOCK DESCRIPTIONS (/DBD/)

RETURN
SUBROUTINE INPUT

PURPOSE
TO READ THE INPUT CARDS AND STORE THEM

CALLING SEQUENCE
CALL INPUT (IERROR)

DESCRIPTION OF PARAMETERS
OUTPUT
IERROR - NUMBER OF ERRORS FOUND

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
READC
LOOKUP
PRINTC
TEST
RPT
STORE
SHIFTR
ENDCOR
ADDC
TRANSFR
SUBROUTINE INPUT

1. **INPUT**
2. **READ NEXT INPUT CARD (READC)**
3. **'END' CARD?**
   - **YES**
     - **FILL IN THE POINTER TO THE LAST PROC BLOCK IN THE LAST COURSE (ENDCOR)**
     - **RETURN**
   - **NO**
     - **LOOK UP CARD NAME (LOOKUP)**
     - **PRINT THE CARD (PRINTC)**
     - **TEST NUMERIC VALUES FOR VALIDITY (TEST)**
     - **VALID?**
       - **NO**
         - **PRINT ERROR MESSAGE**
       - **YES**
         - **BRANCH TO SEPARATE ROUTINE FOR EACH CARD TYPE**
         - **STORE THE DATA, READ ADDITIONAL CARDS IF REQUIRED**

**DETAILED FLOW FOR EACH ROUTINE IS SHOWN ON FOLLOWING PAGES**
SUBROUTINE INPUT – CONTINUED
SUBROUTINE INPUT – CONTINUED
SUBROUTINE INPUT – CONTINUED
READ, PRINT, AND TEST THE TASK DATA CARD (RPT)

STORE THE TASK BLOCK (STORE)

HAVE ALL TASKS BEEN PROCESSED?

YES

TASK CARD

NO

SUBROUTINE INPUT — CONTINUED
READ, PRINT, AND TEST THE RUB DATA CARD (RPT)

FIGURE OUT HOW MANY RUB NAMES WERE SPECIFIED

STORE THE DATA BLOCK (STORE)

HAVE ALL RUB'S BEEN PROCESSED?

YES

A

SUBROUTINE INPUT – CONTINUED
READ, PRINT, AND TEST THE RUBD DATA CARD (RPT)

WERE GROUPING AND TIMING FUNCTIONS SPECIFIED?

REFERENCE IS TO A SOURCE NAME

BLANK OUT THE SOURCE NAME FIELD

REFERENCE IS TO A SOURCE NAME

MOVE THE NAME FROM THE RESOURCE FIELD TO THE SOURCE FIELD

BLANK OUT THE RESOURCE NAME FIELD

STORE THE DATA BLOCK (STORE)

HAVE ALL RUBD'S BEEN PROCESSED?

YES

A
AIRBASE EVENT

STORE THE DATA BLOCK (STORE)

A

CCTS CARD

STORE THE DATA BLOCK (STORE)

A

SUBROUTINE INPUT — CONTINUED
PMT CARD

INCREMENT PMT NUMBER (TO BE STORED WITH BOTH PMT GROUP, AND PMT COURSE BLOCKS)

STORE THE PMT GROUP BLOCK (STORE)

READ, PRINT, AND TEST THE PMT COURSE CARD (RPT)

STORE THE PMT COURSE BLOCK (STORE)

HAVE ALL PMT COURSE CARDS BEEN PROCESSED?

NO

YES

SUBROUTINE INPUT – CONTINUED
SUBROUTINE SHIFTR

PURPOSE
TO REPACK THE ARRAY OF VALUES READ FROM INPUT CARDS IN ORDER
TO ELIMINATE WASTED STORAGE OCCUPIED BY UNUSED CHARACTER
FIELDS AT THE BEGINNING OF THE CARD

CALLING SEQUENCE
CALL SHIFTR (IP, N1, N2)

DESCRIPTION OF PARAMETERS
INPUT
N1 - NUMBER OF CHARACTER FIELDS WHICH ARE USED
N2 - NUMBER OF UNUSED CHARACTER FIELDS WHICH FOLLOW THE
FIRST N1 USED FIELDS

INPUT-OUTPUT
IP - ARRAY OF PARAMETERS READ FROM A DATA CARD BY
SUBROUTINE READC

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE ENDCOR

PURPOSE
TO SET THE PROCESSING BLOCK POINTERS IN THE TRAINING COURSE BLOCK, AFTER ALL PROCESSING BLOCKS FOR THE COURSE HAVE BEEN READ

CALLING SEQUENCE
CALL ENDCOR (IERR)

DESCRIPTION OF PARAMETERS

IERR - ERROR FLAG, SET WHEN COURSE CONTAINS NO PROCESSING BLOCKS

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

CC***************ENDCOR******************
SUBROUTINE ENDCOR

ENDCOR

SET THE SECOND POINTER IN THE LAST COURSE BLOCK TO POINT TO THE LAST PROC BLOCK READ

HAVE ANY PROC BLOCKS BEEN READ SINCE THE LAST COURSE CARD?

PRINT ERROR MESSAGE

SET BOTH POINTERS TO ZERO

RETURN
SUBROUTINE READC

PURPOSE
TO READ AN INPUT CARD

CALLING SEQUENCE
CALL READC (ICARD, IPARMS)

DESCRIPTION OF PARAMETERS
INPUT
ICARD - CARD ID NUMBER OF CARD TO BE READ, OR
ZERO TO READ AN UNKNOWN CARD IN STANDARD FORMAT

OUTPUT
IPARMS - ARRAY OF UP TO 13 VALUES READ FROM THE CARD

REMARKS
THIS SUBROUTINE DETERMINES THE NUMBER OF PARAMETERS TO BE
READ, AND THEIR FORMAT FROM COMMON /DDIN/
SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE PRINTC

PURPOSE
TO PRINT THE INPUT CARD LISTING

CALLING SEQUENCE
CALL PRINTC (ICARD, ISEQ, IPARMS)

DESCRIPTION OF PARAMETERS

INPUTS
ICARD - CARD NUMBER OF THE CARD TO BE PRINTED,
ZERO IF NOT KNOWN
ISEQ  - CARD SEQUENCE NUMBER
IPARMS - ARRAY OF VALUES THAT WERE READ FROM THE CARD

REMARKS
THIS SUBROUTINE USES COMMON /UDIN/ TO DETERMINE THE NUMBER
OF DATA FIELDS ON THE CARD, AND HOW MANY OF THEM ARE CHARACTER
DATA.
2 OUTPUT LINES ARE COUNTED, AND TITLES ARE PRINTED AT THE TOP
OF EACH PAGE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

*
SUBROUTINE TEST

PURPOSE
TO TEST ALL NUMERIC INPUT VALUES TO SEE IF THEY ARE WITHIN
THE RANGE OF ACCEPTABLE VALUES

CALLING SEQUENCE
CALL TEST (ICARD, IARRAY, IERR)

DESCRIPTION OF PARAMETERS
INPUT
ICARD - CARD NUMBER FROM WHICH THE VALUES WERE READ
IARRAY - ARRAY OF VALUES THAT WERE READ FROM THE CARD

OUTPUT
IERR - NUMBER OF ERRORS DETECTED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

************************SUBROUTINE TEST**************************
SUBROUTINE STORE

PURPOSE

TO STORE A BLOCK OF INPUT DATA

CALLING SEQUENCE

CALL STORE (IBLK, NWDS, ISEQ, IP, IADDR)

DESCRIPTION OF PARAMETERS

INPUT

IBLK - BLOCK NUMBER
NWDS - NUMBER OF WORDS IN THE DATA BLOCK
ISEQ - CARD SEQUENCE NUMBER TO BE ASSOCIATED WITH THIS BLOCK
IP - ARRAY OF DATA WORDS TO BE STORED

OUTPUT

IADDR - POINTER TO LOCATION IN COMMON /IFILE/ WHERE THE DATA WAS STORED (IF LESS THAN 1, NOT ENOUGH SPACE WAS AVAILABLE IN /IFILE/ )

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED

ADCREC
TRNSFR
SUBROUTINE RPT

PURPOSE
TO READ AN INPUT CARD, PRINT IT, AND TEST THE NUMERIC FIELDS FOR VALIDITY

CALLING SEQUENCE
CALL RPT (ICARD, ISEQ, IP, IERR)

DESCRIPTION OF PARAMETERS

INPUT
ICARD - CARD TYPE TO BE READ

INPUT-OUTPUT
ISEQ - CARD SEQUENCE NUMBER, INCREMENTED BY EACH CALL

OUTPUT
IP - ARRAY OF VALUES READ FROM THE CARD
IERR - NUMBER OF ERRORS DETECTED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
READC
PRINTC
TEST
SUBROUTINE ADDREC

PURPOSE
TO ADD A RECORD TO A FILE IN COMMON AREA /IFILE/

CALLING SEQUENCE
CALL ADDREC (INDEX, NWDS, IADDR)

DESCRIPTION OF PARAMETERS

INPUT
INDEX - INDEX NUMBER OF THE FILE TO WHICH THE RECORD IS TO
       ADDED
NWDS  - NUMBER OF WORDS IN THE RECORD

OUTPUT
IADDR - ADDRESS OF THE DATA AREA OF THE NEW RECORD
(SUBSCRIPT IN IFILE ARRAY) SET TO ZERO IF ERROR
OCCURS

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE


INCREMENT THE NUMBER OF RECORDS IN THIS FILE

SET END POINTER FOR THIS FILE TO THE NEW RECORD

SET THE FORWARD POINTER IN THE LAST RECORD TO THE NEW RECORD

SET THE BACKWARD POINTER IN THE NEW RECORD TO THE LAST RECORD

SET THE FORWARD POINTER IN THE NEW RECORD TO ZERO

SET THE FORWARD POINTER IN THE NEW RECORD TO ZERO

FILL IN THE NUMBER OF WORDS FIELD IN THE NEW RECORD

INCREMENT THE NEXT AVAILABLE ADDRESS

RETURN THE ADDRESS OF THE DATA PORTION OF THE NEW RECORD

RETURN

SOFTWARE SUBROUTINE ADDREC
**SUBROUTINE GETREC**

**PURPOSE**
To locate the next sequential record in a file.

**CALLING SEQUENCE**
CALL GETREC (INDEX, IREC, NWDS, IADDR, IEOF)

**DESCRIPTION OF PARAMETERS**

**INPUT**
INDEX - file index number for initialization call or zero to locate the next record in the file specified in the last initialization call.

**OUTPUT**
IREC - record number.
NWDS - number of words in the record.
IADDR - address (subscript in file array) of data.
IEOF - end of file flag.

**SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED**
NONE.

CC************************************************************************************************************
SUBROUTINE GETREC

GETREC

IS FILE NUMBER GREATER THAN ZERO?
YES → SET POINTER TO FIRST RECORD IN THE FILE → RETURN

NO

IS POINTER LESS THAN 1?
YES → TURN ON END OF FILE FLAG → RETURN

NO

SET ADDRESS TO DATA PORTION OF THE RECORD

RETRIEVE RECORD NUMBER

RETRIEVE LENGTH OF THE RECORD

SET POINTER TO THE NEXT RECORD IN THE FILE

TURN OFF END OF FILE SWITCH

RETURN
SUBROUTINE TRANSFR

PURPOSE
TO TRANSFER AN ARRAY FROM ONE LOCATION TO ANOTHER

CALLING SEQUENCE
CALL TRANSFR (I1, I2, NWDS)

DESCRIPTION OF PARAMETERS
I1 - ARRAY TO BE MOVED
I2 - ARRAY TO WHICH I1 IS TO BE MOVED
NWDS - NUMBER OF ELEMENTS TO BE MOVED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

CC**************************************************************************************************************************************
SUBROUTINE TBL

PURPOSE
TO PRINT THE FORMATTED TABLES OF THE INPUTS

CALLING SEQUENCE
CALL TBL

DESCRIPTION OF PARAMETERS
NONE

METHOD
THIS SUBROUTINE CALLS A SEPARATE SUBROUTINE TO PRINT EACH OF
THE DATA TABLES

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
TBL2
TBL3
TBL4
TBL5
TBL6
TBL7
TBL8
TBL9
TBL10
TBL12
TBL13
TBL14
SUBROUTINE TBL2

PURPOSE

TO PRINT THE TABLE OF AIRBASE INVENTORIES

SUBROUTINE TBL3

PURPOSE

TO PRINT THE TABLE OF THE RESOURCE INVENTORIES

SUBROUTINE TBL4

PURPOSE

TO PRINT THE TABLE OF THE SOURCE CARDS

SUBROUTINE TBL5

PURPOSE

TO PRINT THE TABLE OF AIRCRAFT DELIVERY INPUTS

CC******************************************************************************************* TBL2 **************************************************************************************
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*******************************************************************************************

CC******************************************************************************************* TBL3 **************************************************************************************
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*******************************************************************************************

CC******************************************************************************************* TBL4 **************************************************************************************
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*******************************************************************************************

CC******************************************************************************************* TBL5 **************************************************************************************
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*                                                                                             *
CC*******************************************************************************************
SUBROUTINE TBL6

TO PRINT THE TABLE OF COURSE BLOCKS

SUBROUTINE TBL7

TO PRINT THE TABLE OF THE PROCESSING BLOCKS

SUBROUTINE TBL8

TO PRINT THE TABLE OF TASK BLOCKS

SUBROUTINE TBL9

TO PRINT THE TABLE OF RESOURCE UTILIZATION BLOCKS
SUBROUTINE TBL10

PURPOSE
TO PRINT THE TABLE OF RESOURCE UTILIZATION DESCRIPTION BLOCKS

SUBROUTINE TBL12

PURPOSE
TO PRINT THE TABLE OF AIRBASE EVENT CARDS

SUBROUTINE TBL13

PURPOSE
TO PRINT THE TABLE OF CCTS CARDS

SUBROUTINE TBL14

PURPOSE
TO PRINT THE TABLE OF PMT CARDS
SUBROUTINE PTYPE

PURPOSE
TO DECODE THE PERSONNEL TYPE CODE AND RETURN A CHARACTER
ARRAY OF THE TYPES SPECIFIED BY THE CODE. THE PERSONNEL
TYPE CODE IS A 4-BIT INTEGER NUMBER, WITH EACH BIT USED
TO INDICATE A PERSONNEL TYPE AS FOLLOWS (GOING FROM
LEFT TO RIGHT)

CALLING SEQUENCE:
CALL PTYPE (ICODE, IARRAY)

DESCRIPTION OF PARAMETERS

INPUT
ICODE - PERSONNEL TYPE CODE

OUTPUT
IARRAY - ARRAY OF PERSONNEL TYPE NAMES SPECIFIED BY ICODE
SUBROUTINE ITABLE

PURPOSE
TO REPLACE CHARACTER INPUT PARAMETERS WITH ITS INTEGER CODE.
ERROR MESSAGES ARE PRINTED FOR VALUES NOT FOUND IN THE TABLES.

CALLING SEQUENCE
CALL ITABLE (IERR)

DESCRIPTION OF PARAMETERS
OUTPUT
IERR - NUMBER OF ERRORS ENCOUNTERED

METHOD
THIS SUBROUTINE USES COMMON /DBD/ TO LOCATE THESE PARAMETERS
AND TO FIND OUT WHICH TABLE THEY ARE TO BE LOOKED UP IN

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
REPLC1
SUBROUTINE ITABLE

1. **ITABLE**
2. **INITIALIZE LOOP FOR ALL DATA BLOCK TYPES**
3. **LOCATE BLOCK DESCRIPTION FOR THE NEXT BLOCK TYPE**
4. **INITIALIZE LOOP THRU THE BLOCK DESCRIPTION FOR THIS BLOCK TYPE**
5. **GET THE NEXT DESCRIPTOR CODE FOR THIS BLOCK**
6. **IS TABLE LOOKUP REQUIRED?**
   - **YES**
   - **REPLACE THE NAME WITH ITS INDEX FOR ALL BLOCKS OF THIS TYPE (REPLC1)**
   - **NO**
7. **HAS LAST CODE BEEN CHECKED?**
   - **YES**
   - **RETURN**
8. **NO**
9. **HAS LAST BLOCK TYPE BEEN PROCESSED?**
   - **YES**
   - **RETURN**
10. **NO**

**COMPUTE OFFSET WITHIN THE DATA BLOCK**
SUBROUTINE NAME1

PURPOSE
To make a table of the names of all named data blocks, and to replace the character name in the data block with the index of the name in the table.

CALLING SEQUENCE
CALL NAME1 (IP, INUM, ITBL, NBL, IERR)

DESCRIPTION OF PARAMETERS
INPUT-OUTPUT
NTBL - Number of elements in ITBL array (gives number of elements available at entry, and number of elements used at exit)

OUTPUT
IP - Pointer to start of name table for each data block
INUM - Number of entries in name table for each data block
ITBL - Name tables (contains original character names)
IERR - Number of errors encountered

METHOD
This subroutine uses COMMON /LIBD/ to determine which data blocks are named, and to locate the position of the name within the block.

SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
LOOKUP

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SUBROUTINE NAME1
**SUBROUTINE NAME2**

**PURPOSE**
TO REPLACE ALL BLOCK NAME REFERENCES WITH THEIR INTEGER CODES

**CALLING SEQUENCE**
CALL NAME2 (IP, INUM, ITBL, IERR)

**DESCRIPTION OF PARAMETERS**

**INPUT**
- **IP** - ARRAY OF POINTERS TO FIRST ELEMENT OF NAME TABLE FOR EACH DATA BLOCK
- **INUM** - ARRAY GIVING NUMBER OF ENTRIES IN NAME TABLE FOR EACH DATA BLOCK
- **ITBL** - NAME TABLE

**OUTPUT**
- **IERR** - NUMBER OF ERRORS DETECTED

**METHOD**
THIS SUBROUTINE USES COMMON /DBD/ TO LOCATE BLOCK NAME REFERENCES IN THE FIXED PORTION OF DATA BLOCKS. THE POSITION OF NAME REFERENCES IN VARIABLE LENGTH PORTION OF DATA BLOCKS IS HARD CODED (THIS OCCURS IN PROCBLOCK AND RUB)

**SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED**
- REPLC1
- REPLC2

**REFERENCES**
IN THE FIXED PORTION OF DATA BLOCKS. THE POSITION OF NAME REFERENCES IN VARIABLE LENGTH PORTION OF DATA BLOCKS IS HARD CODED (THIS OCCURS IN PROCBLOCK AND RUB)
SUBROUTINE NAME2

1. **NAME 2**
2. **INITIALIZE LOOP FOR ALL DATA BLOCK TYPES**
3. **LOCATE BLOCK DESCRIPTION FOR THE NEXT BLOCK TYPE**
4. **INITIALIZE LOOP THRU THE BLOCK DESCRIPTION**
5. **GET THE NEXT DESCRIPTOR CODE**
6. **IS THIS A REFERENCE TO A DATA BLOCK NAME?**
   - **YES**
     - **REPLACE THE NAME WITH ITS INDEX, FOR ALL BLOCKS OF THIS TYPE (REPLC1)**
   - **NO**
     - **IS THIS THE LAST CODE?**
       - **YES**
         - **RETURN**
       - **NO**
         - **IS THIS THE LAST DATA BLOCK TYPE?**
           - **YES**
             - **REPLACE TASK REFERENCES IN PROC BLOCKS (REPLC2)**
           - **NO**
             - **REPLACE RUB’S REFERENCES IN RUB’S (REPLC2)**
SUBROUTINE REPLC1

PURPOSE
TO REPLACE A BLOCK NAME REFERENCE WITH ITS INTEGER CODE IN
ALL DATA BLOCKS OF A GIVEN TYPE. THIS ROUTINE IS ONLY FOR
REFERENCES IN THE FIXED PORTION OF VARIABLE LENGTH DATA BLOCKS.

CALLING SEQUENCE
CALL REPLC1 (IBLK, IOFF, ITBL, NTBL, INDOFF, ICODE, IERR)

DESCRIPTION OF PARAMETERS

INPUT
IBLK - DATA BLOCK NUMBER
IOFF - OFFSET OF REFERENCE IN THE DATA BLOCK
ITBL - NAME TABLE
NTBL - NUMBER OF ELEMENTS IN ITBL
INDOFF - OFFSET TO BE ADDED TO THE INDEX OF A NAME IN THE
Table IN ORDER TO GET ITS INTEGER CODE
ICODE - 1 IF THE NAMES ARE INTEGER DATA
         2 IF THE NAMES ARE CHARACTER DATA
         3 IF CHARACTER DATA AND BLANKS ARE ALLOWED

OUTPUT
IERR - NUMBER OF ERRORS DETECTED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
LOOKUP
SUBROUTINE REPLC1

REPLC1

A

RETRIEVE THE NEXT BLOCK OF THE SPECIFIED TYPE (GETREC)

END OF FILE?

YES

RETURN

NO

MUST THIS NAME ALWAYS BE PRESENT?

NO

IS THE NAME FIELD BLANK?

YES

REPLACE THE NAME REFERENCE WITH ZERO

A

YES

LOOK UP THE NAME REFERENCE IN THE TABLE (LOOKUP)

WAS IT IN THE TABLE?

NO

YES

REPLACE THE NAME REFERENCE WITH ITS INDEX IN THE TABLE

A

PRINT AN ERROR MESSAGE

A
SUBROUTINE REPLC2

PURPOSE
TO REPLACE A BLOCK NAME REFERENCE WITH ITS INTEGER CODE IN
ALL DATA BLOCKS OF A GIVEN TYPE. THIS ROUTINE IS ONLY FOR
REFERENCES IN THE VARIABLE PORTION OF VARIABLE LENGTH DATA
BLOCKS.

CALLING SEQUENCE
CALL REPLC2 (IBLK, IOFF1, IDX, NDX, N, IOFF2, ITBL, NTBL, INDOFF,
ICODE, IERR)

DESCRIPTION OF PARAMETERS
INPUT
IBLK - DATA BLOCK NUMBER
IOFF1 - OFFSET WITHIN THE DATA BLOCK TO THE WORDS GIVING THE
NUMBER OF ENTRIES IN EACH VARIABLE LENGTH ITEM
IDX1 - ARRAY WHICH GIVES THE NUMBER OF WORDS IN EACH ENTRY
OF EACH VARIABLE LENGTH ITEM
NDX - NUMBER OF VARIABLE LENGTH ITEMS IN THE DATA BLOCK
N - THE NUMBER OF THE ITEM IN WHICH THE REPLACEMENT IS
TO BE DONE
IOFF2 - THE OFFSET WITHIN THE ITEM OF THE WORD CONTAINING
THE REFERENCES TO BE REPLACED
ITBL - NAME TABLE
NTBL - NUMBER OF NAMES IN ITBL
INDOFF - OFFSET TO BE ADDED TO A NAMES INDEX IN THE NAME TABLE
TO GET ITS INTEGER CODE
ICODE - 2 IF NAMES ARE CHARACTER DATA
1 IF NAMES ARE INTEGER DATA

OUTPUT
IERR - NUMBER OF ERRORS DETECTED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
LOOKUP

CC-------------------------------------------------------------------------------------
SUBROUTINE REPLC2

A

RETRIEVE THE NEXT BLOCK OF THE SPECIFIED TYPE (GETREC)

END OF FILE?

YES

RETURN

NO

RETRIEVE THE NUMBER OF REFERENCES IN THIS BLOCK

COMPUTE THE POSITION OF THE FIRST REFERENCE TO BE REPLACED

B

LOOK UP THE NAME REFERENCE IN THE TABLE (LOOKUP)

WAS IT IN THE TABLE?

NO

PRINT AN ERROR MESSAGE

YES

REPLACE THE NAME WITH ITS INDEX IN THE TABLE

HAVE ALL REFERENCES IN THIS BLOCK BEEN PROCESSED?

NO

INCREMENT INDEX TO NEXT REFERENCE TO BE REPLACED

YES

A
SUBROUTINE PROCBI

PURPOSE
TO CONSTRUCT A TABLE OF PROCESSING BLOCK NAMES AND NUMBERS
ASSIGNED BY THE USER

CALLING SEQUENCE
CALL PROCBI (IP1, INUM, NAME, NUMBER, IERR)

DESCRIPTION OF PARAMETERS
OUTPUT
IP1 - POINTER TO START OF NAME AND NUMBER TABLES FOR EACH
       COURSE
INUM - NUMBER OF ENTRIES IN NAME AND NUMBER TABLES FOR
       EACH COURSE
NAME - TABLE OF NAMES FOR EACH PROCESSING BLOCK
NUMBER - TABLE OF USER ASSIGNED NUMBERS FOR EACH PROCESSING
         BLOCK
IERR - NUMBER OF ERRORS DETECTED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
LOCKUP
CONSTRUCT A TABLE OF THE FIRST AND LAST PROC BLOCK IN EACH COURSE

SET COURSE INDEX TO ONE

INITIALIZE LOOP FOR ALL PROCESSING BLOCKS

GET THE NEXT PROCESSING BLOCK (GETREC)

END OF FILE?

YES

RETURN

NO

IS THE BLOCK NUMBER ALREADY DEFINED WITHIN THIS COURSE?

YES

PRINT ERROR MESSAGE

NO

ADD ENTRY TO BLOCK NAME NUMBER TABLE

REPLACE BLOCK NUMBER WITH ITS INDEX IN THE TABLE

WAS THIS LAST PROC BLOCK WITHIN CURRENT COURSE?

YES

INCREMENT COURSE INDEX AND START NEW TABLE

NO

SUBROUTINE PROCB1
PROCEDURE PROCB2

PURPOSE
TO REPLACE ALL BLOCK NUMBER REFERENCES WITH THEIR INTERNAL ID NUMBERS

CALLING SEQUENCE
CALL PROCB2 (IP1, INUM, NAME, NUMBER, IERR)

DESCRIPTION OF PARAMETERS
INPUT
IP1 - POINTER TO NAME AND NUMBER TABLE FOR EACH COURSE
INUM - NUMBER OF ENTRIES IN TABLE FOR EACH COURSE
NAME - PROCESSING BLOCK NAME TABLE
NUMBER - PROCESSING BLOCK NUMBER TABLE
OUTPUT
IERR - NUMBER OF ERRORS DETECTED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
LOOKUP

SUBROUTINE PROCB2

*
SUBROUTINE PROCB2

PROCEDURE

END OF FILE?

IS THERE A SYNC CORR REFERENCE?

LOOK UP THE BLOCK NUMBER IN THE TABLE FOR THE SPECIFIED COURSE

WAS IT THERE?

REPLACE BLOCK NUMBER WITH ITS INDEX IN THE TABLE

PRINT ERROR MESSAGE

REPLACE BLOCK NUMBER WITH INDEX IN THE TABLE FOR CURRENT COURSE

IS IT THERE?

PRINT ERROR MESSAGE

WAS THIS THE LAST TRANSFER SPECIFIED?

WAS IT THE LAST ONE IN THE CURRENT COURSE?

INCREMENT COURSE INDEX TO THE NEXT COURSE

INITIALIZE LOOP FOR ALL PROC BLOCKS

GET NEXT PROC BLOCK (GETREC)

END OF FILE?

RETURN

INITIALIZE LOOP THRU TRANSFERS FOR THIS PROC BLOCK

GET THE NEXT TRANSFER BLOCK NUMBER

LOOK UP THE BLOCK NUMBER IN THE TABLE FOR CURRENT COURSE

IS IT THERE?

PRINT ERROR MESSAGE

REPLACE BLOCK NUMBER WITH INDEX IN THE TABLE

INCREASE COURSE INDEX TO THE NEXT COURSE

A

B

A

B
SUBROUTINE ILOT

PURPOSe
TO PRODUCE THE CALCUMP PLOT OF THE COURSES

CALLING SEQUENCE
CALL ILOT (IPN,NUMN,NTBL, IPB,NUMB,NAME,NUMBER)

DESCRIPTION OF PARAMETERS
IPN,NUMN,NTBL - DATA BLOCK NAME TABLE (SEE SUBROUTINE NAME1)
IPB,NUMB,NAME,NUMBER - PROCESSING BLOCK NAME AND NUMBER TABLE (SEE SUBROUTINE PROCB1)

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
PLOTB
PLOT
SYMBOL
GETREC
EFPLot

SUBROUTINE ILOT
SUBROUTINE IPlot

ALLOCATE WORK SPACE FOR SUBROUTINE PLOTB

INITIALIZE LOOP THRU ALL COURSES

PLOT THE COURSE NAME

INITIALIZE LOOP THRU ALL PROCESSING BLOCKS IN THE COURSE

RETRIEVE THE PROC BLOCK INFO

PLOT THE PROCESSING BLOCK (PLOTB)

ARE THERE MORE BLOCKS IN THIS COURSE?

YES

NO

ARE THERE MORE COURSES?

YES

NO

CLOSE THE PLOTTER (EFPLOT)

RETURN
SUBROUTINE PLOTX

PURPOSE
TO MOVE THE PEN TO A NEW POSITION AND INTERCEPT PLOT CALLS
WHICH CAUSE PEN TRAVEL FARTHER THAN TEN FEET. WHEN THIS
OCCURS, THE PEN MOVEMENT IS BROKEN UP INTO SMALLER MOVES.
TEN FEET IS THE MAXIMUM TRAVEL ALLOWED IN A SINGLE CALL TO
THE CALSSPAN VERSION OF SUBROUTINE PLOT.

CALLING SEQUENCE
CALL PLOTX (X, Y)

DESCRIPTION OF PARAMETERS
X  - X POSITION TO WHICH PEN IS TO BE MOVED
Y  - Y POSITION TO WHICH PEN IS TO BE MOVED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
PLOT

PLTX
SUBROUTINE PLOTB

PURPOSE
TO PLOT THE PROCESSING BLOCKS AND CONNECT THEM WITH ARROWS TO SHOW THE FLOW

CALLING SEQUENCE
CALL PLOTB (XYIN, IBLKIN, NUMIN, MAXIN,
XYOUT, IBLKOT, NUMOUT, MAXOUT, ICODE,
X, Y, IBLKNU, INAME, NTASKS, ITASKS, NTRAN, ITRAN,
1SYNC, 1CSYNC, 1BSYNC)

DESCRIPTION OF PARAMETERS

WORK AREAS

**** IN TABLE ****
XYIN - ARRAY DIMENSIONED (MAXIN, 2), USED TO STORE THE COORDINATES OF THE POINTS WHICH NEED ARROWS POINTING INTO THEM
IBLKIN - ARRAY DIMENSIONED (MAXIN), USED TO STORE THE BLOCK NUMBER FROM WHICH EACH UNRESOLVED TRANSFER IS TO COME FROM
NUMIN - NUMBER OF ENTRIES IN XYIN AND IBLKIN ARRAYS
MAXIN - MAXIMUM NUMBER OF ENTRIES IN XYIN AND IBLKIN ARRAYS

**** OUT TABLE ****
XYOUT - ARRAY DIMENSIONED (MAXOUT, 2), USED TO STORE THE COORDINATES OF THE START OF THE OUTGOING ARROWS FROM EACH PROCESSING BLOCK
IBLKOT - ARRAY DIMENSIONED (MAXOUT), USED TO STORE BLOCK NUMBERS OF ENTRIES IN XYOUT ARRAY
NUMOUT - NUMBER OF ENTRIES IN THE XYOUT AND IBLKOT ARRAYS
MAXOUT - MAXIMUM NUMBER OF ENTRIES IN XYOUT ARRAY

INPUT PARAMETERS
ICODE - 1 INITIALIZE FOR A NEW COURSE
2 CONTINUE WORKING ON THE SAME COURSE
X - X COORDINATE OF LOWER LEFT CORNER OF BOX
Y - Y COORDINATE OF LOWER LEFT CORNER OF BOX
IBLKNU - BLOCK NUMBER
INAME - BLOCK NAME
NTASKS - NUMBER OF TASKS IN THE BLOCK
ITASKS - ARRAY OF TASK NAMES
NTRAN - NUMBER OF TRANSFERS INTO THE BLOCK
ITRAN - ARRAY OF BLOCK NUMBERS FROM WHICH EACH TRANSFER TAKES PLACE
1SYNC - SYNC CODE (C-NO SYNC, 1-SYNC TO, 2-CORRELATE WITH)
1CSYNC - SYNC COURSE NAME
1BSYNC - SYNC BLOCK NUMBER

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
PLOT
SYMBOL
NUMBER
ARROW
LOOKUP

SUBROUTINES AND FUNCTION SUBPROGRAMS USED

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SUBROUTINE PLOTB

60
SUBROUTINE PLOTB — CONTINUED

1. Plot the box and the info inside it.
2. Initialize loop on all transfers for this block.
3. Is the transfer block # in the out table?
   - Yes: Draw the arrow coming into the box.
   - No: More room in the in table?
     - Yes: Add entry to in table.
     - No: Print error message.
4. Any more transfers?
   - Yes: Back to step 3.
   - No: Return.
SUBROUTINE ARROW

PURPOSE
   TO DRAW AN ARROW FOR SUBROUTINE PLOTB

CALLING SEQUENCE
   CALL ARROW (X1, Y1, X2, Y2)

DESCRIPTION OF PARAMETERS

   INPUT
   X1 - X COORDINATE OF START OF ARROW
   Y1 - Y COORDINATE OF START OF ARROW
   X2 - X COORDINATE OF END POINT
   Y2 - Y COORDINATE OF END POINT

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
   PLOT

SUBROUTINE ARROW
SUBROUTINE FIXABE

PURPOSE
TO ADD THE AIRBASE NUMBER AND TIME (FROM THE ASSOCIATED AIRBASE EVENT RECORD) TO THE CCTS RECORDS, PMT GROUP RECORDS, AND THE PMT RECORDS

CALLING SEQUENCE
CALL FIXABE

DESCRIPTION OF PARAMETERS
NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
SUBROUTINE FIXABE

1. SORT THE 3 FILES ON AIRBASE EVENT NO.
2. SET POINTERS TO THE FIRST RECORD OF EACH FILE
3. GET NEXT AIRBASE EVENT RECORD (GETREC)
4. END OF FILE?
   - YES: RETURN
   - NO: A
5. ARE THERE MORE CCTS RECORDS?
   - YES: IS ABE # GREATER THAN CURRENT ONE?
     - NO: ADD THE INFO TO CCTS RECORD FROM ABE RECORD
     - YES: UPDATE POINTER TO NEXT CCTS RECORD
   - NO: B
6. ARE THERE MORE PMT GROUP RECORDS?
   - YES: IS ABE # CURRENT ONE?
     - NO: ADD THE INFO TO PMT GROUP RECORD FROM ABE RECORD
     - YES: UPDATE THE POINTER TO THE NEXT PMT GROUP RECORD
   - NO: C
7. ARE THERE MORE PMT RECORDS?
   - YES: IS ABE # CURRENT ONE?
     - NO: ADD THE INFO TO PMT RECORD FROM ABE RECORD
     - YES: UPDATE THE POINTER TO THE NEXT PMT RECORD
   - NO: D
SUBROUTINE FIXPRO

PURPOSE
TO REPLACE THE SYNC TYPE IN THE PROCESSING BLOCKS WITH THE
COURSE NUMBER TO WHICH THE BLOCK BELONGS. THIS IS DONE
FOR USE BY PHASE 3

CALLING SEQUENCE
CALL FIXPRO (IP1, INUM)

DESCRIPTION OF PARAMETERS
IP1 - ARRAY OF POINTERS TO THE FIRST PROC BLOCK IN EACH
COURSE
INUM - NUMBER OF PROCESSING BLOCKS IN EACH COURSE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
SUBROUTINE SORT

PURPOSE
TO SORT THE DATA BLOCKS SO THAT THEY ARE IN THE PROPER SEQUENCE FOR STEP 2 OF TRAM MODUL

CALLING SEQUENCE
CALL SORT

DESCRIPTION OF PARAMETERS
NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
ISORT
SUBROUTINE SORT

SORT

SORT AIRBASE EVENTS BY AB NUMBER, TIME (ISORT)

SORT CCTS RECORDS BY AB NUMBER, TIME (ISORT)

SORT PMT GROUP RECORDS BY AB NUMBER, TIME (ISORT)

SORT PMT RECORD BY AB NUMBER, TIME (ISORT)

SORT DELIVERY RECORDS BY AB NUMBER, TIME (ISORT)

SORT SOURCES BY SOURCE NUMBER (ISORT)

SORT RESOURCES BY RESOURCE NUMBER (ISORT)

RETURN
SUBROUTINE ISORT

PURPOSE
TO SORT THE RECORDS OF A GIVEN FILE IN COMMON /FILE/ INTO ASCENDING SEQUENCE

CALLING SEQUENCE
CALL ISORT (INDEX, IWORD)

DESCRIPTION OF PARAMETERS
INPUT
INDEX = FILE NUMBER TO BE SORTED
IWORD = WORD NUMBER WITHIN THE RECORDS ON WHICH TO SORT

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE ISORT

A

IS NUMBER OF 
RECORDS LESS 
THAN TWO?

NO

RETURN

YES

ARE FIRST TWO 
RECORDS IN 
SEQUENCE?

NO

SWAP FIRST 
TWO RECORDS

NO

RESET P TO POINT 
TO THE RECORD BEFORE 
THE CURRENT

NO

INSERT RECORD P3 
BEFORE THE FIRST 
RECORD

YES

RESET P3 TO POINT 
TO THE RECORD WHICH 
NOW Follows RECORD 
P2

A

STORE TEST VALUE 
(KEY FROM RECORD 
P3)

IS KEY IN RECORD 
P ≤ THE TEST VALUE?

YES

DOES 
P − P2 = 0?

A

A

NO

SET P POINTER TO 
SAME VALUE AS 
P2

A

RESET P3 TO THE 
RECORD WHICH 
NOW Follows RECORD 
P2

SET P2 TO Value 
OF P3

A

INSERT RECORD P3 
AFTER RECORD P

A

YES

RESET P3 TO THE 
NEXT SEQUENTIAL 
RECORD

A

SET PI TO POINT 
TO THE FIRST 
RECORD IN THE 
FILE

SET P2 TO POINT 
TO THE SECOND 
RECORD IN THE 
FILE

SET P3 TO POINT 
TO THE THIRD 
RECORD IN THE 
FILE
SUBROUTINE OUTPUT

PURPOSE
TO WRITE THE INPUT DATA ONTO THE FILE FOR TRAM STEP 2

CALLING SEQUENCE
CALL OUTPUT (IPN,NUMN,NTBL, IPB,NUMB,NAME,NUMBER)

DESCRIPTION OF PARAMETERS
INPUT
IPN,NUMN,NTBL - DATA BLOCK NAME TABLE (SEE SUBROUTINE NAME1)
INPUT-OUTPUT
IPB,NUMB,NAME,NUMBER - PROCESSING BLOCK NAME AND NUMBER
NOTE - PROCESSING BLOCK NAME TABLE IS DESTROYED BY
THE PROCESS OF CONVERTING PROCESSING BLOCK
NUMBER TABLE TO CHARACTER FORMAT FOR OUTPUT

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
GETREC
WRITE

SUBROUTINE OUTPUT
SUBROUTINE OUTPUT

OUTPUT

WRITE NAME TABLES TO UNIT 10

WRITE ALL STORED DATA BLOCKS OF EACH TYPE TO UNIT 10

RETURN
SUBROUTINE WRITE

PURPOSE
TO WRITE OUT AN ARRAY FOR SUBROUTINE OUTPUT

CALLING SEQUENCE
CALL WRITE (LU, IARRAY, NWDS)

DESCRIPTION OF PARAMETERS
INPUT
LU - FORTRAN LOGICAL UNIT NUMBER
IARRAY - DATA ARRAY
NWDS - NUMBER OF WORDS IN IARRAY

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE LOOKUP

PURPOSE
TO LOOK UP A VALUE IN A TABLE AND RETURN ITS POSITION

CALLING SEQUENCE
CALL LOOKUP (IVAL, IARRAY, N, ICODE, INDEX)

DESCRIPTION OF PARAMETERS

INPUT
IVAL - VALUE TO BE SEARCHED FOR
IARRAY - TABLE OF VALUES TO BE SEARCHED FOR
N - NUMBER OF ENTRIES IN IARRAY
ICODE - 1 - DATA VALUES OCCUPY ONE WORD
        2 - DATA VALUES OCCUPY THREE WORDS, USED FOR 10 CHARACTER FIELDS ON IBM COMPUTER (REQUIRES IVAL(3), IARRAY(3,N))

OUTPUT
INDEX - INDEX OF THE VALUE IN THE TABLE, ZERO IF THE VALUE IS NOT FOUND

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE


In the table on the following pages, the column headings show the subroutine names that do the calling, and the row headings give the subroutine names that are called.
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Section 1.7
COMMON VARIABLE DEFINITIONS

The tables on the following pages define the meaning of each variable contained in each of the common blocks used by this program.
COMMON /FILE/ - INTERNAL STORAGE FOR DATA BLOCKS

VARIABLE DESCRIPTION

MAXFILE * MAXIMUM NUMBER OF BLOCK TYPES WHICH CAN BE STORED
ISTRT(I) * POINTER TO THE FIRST BLOCK STORED OF EACH TYPE
IEND(I) * POINTER TO THE LAST BLOCK STORED OF EACH TYPE
NRECS(I) * NUMBER OF BLOCKS CURRENTLY STORED FOR EACH TYPE
MAXADR * DIMENSION OF VARIABLE IFILE
NEXTAD * POINTER TO THE NEXT AVAILABLE LOCATION IN THE IFILE ARRAY
IFILE(I) * STORAGE AREA FOR THE DATA BLOCKS. EACH BLOCK HAS THE
      * FOLLOWING FORMAT
      * WORD NUMBER  DESCRIPTION
      * 1  POINTER TO THE NEXT BLOCK
      * 2  POINTER TO THE LAST BLOCK
      * 3  NUMBER OF WORDS IN THIS BLOCK
      * 4  DATA WORDS
      *
      * 3+NWDS

******************************************************************************
* COMMON /TABLES/ - FUNCTION NAME LOOKUP TABLES

* VARIABLE                  DESCRIPTION

* NTBLSD  NUMBER OF TABLES
* ITBLS(3,I,J) FUNCTION NAME LOOKUP TABLES
* SUBSCRIPT    DESCRIPTION
*    1   ALLOWS 3 WORDS PER TEN CHARACTER NAME
*    2   INDEX OF EACH ENTRY IN A TABLE
*    3   NOTE - THE FIRST ENTRY (ITBLS(1,1,J)) GIVES THE
*            NUMBER OF NAMES, AND THE REST OF THE ENTRIES
*            CONTAIN THE NAMES
*    3   INDEX OF TABLE NUMBER

******************************************************************************

85
**COMMON /ICNAME/ - CARD NAME TABLE**

**VARIABLE**    **DESCRIPTION**

**NAMES**       **NUMBER OF CARD TYPES**
**INAMES(3,J)**  **CARD NAME OF EACH CARD TYPE**
   *(3 WORDS PER 10 CHARACTER NAME, BLANK FOR THOSE CARDS WHICH ARE IDENTIFIED BY A HEADER CARD)*
**IBKNO(J)**     **INTERNAL DATA BLOCK NUMBER ASSOCIATED WITH EACH INPUT CARD**
**COMMON /ODIN/ - INPUT DATA CARD DESCRIPTION TABLE**

**VARIABLE**

- **N1(J)**: Number of character data fields contained on each card type (includes card name field)
- **N2(J)**: Number of numeric parameters contained on each card type
- **IRNG1(I,J)**: Lower bound of acceptance range for each numeric value on each card type
- **IRNG2(I,J)**: Upper bound of acceptance range for each numeric value on each card type

---

87
COMMON /DBD/ - INTERNAL DATA BLOCK DESCRIPTION TABLE

VARIABLE DESCRIPTION

NBLKS NUMBER OF DATA BLOCKS
ID1(I) POINTER TO START OF DATA BLOCK DESCRIPTION (IN IFMT ARRAY)
FOR EACH DATA BLOCK
ID2(I) NUMBER OF WORDS OF DESCRIPTION FOR EACH DATA BLOCK
IFMT(J) DATA BLOCK DESCRIPTION CODES:
THE FOLLOWING CODES ARE CURRENTLY BEING USED

CODE MEANING
-N DATA WORD CONTAINS THE NUMBER OF ENTRIES OF VARIABLE
LENGTH DATA TO FOLLOW. N GIVES THE NUMBER OF DATA
WORDS PER ENTRY, AND THE NEXT N CODES DESCRIBE THE
ENTRIES
0 NO DATA, OR A CONTINUATION
1 INTEGER
4 FLOATING POINT
8 CHARACTER DATA
9 DATA BLOCK NAME (MUST BE UNIQUE)
10 DATA BLOCK NAME (MAY NOT BE UNIQUE)
11-30 BLOCK NAME REFERENCE
CODE MINUS 10 GIVES THE BLOCK NUMBER
31-50 BLOCK NAME REFERENCE (MAY BE BLANK)
CODE MINUS 30 GIVES THE BLOCK NUMBER
51-60 FUNCTION NAME
CODE MINUS 50 GIVES TABLE NUMBER
61-70 FUNCTION NAME (MAY BE BLANK)
CODE MINUS 60 GIVES TABLE NUMBER
Section 1.8
INTERNAL DATA BLOCK DESCRIPTIONS

The tables on the following pages define the contents of each of the data blocks used to store the TRAM inputs in phase 1. These data blocks are stored in common area /FILE/. The format code associated with each data word is used by the program to determine what data are contained in that word. See the description of common block /DBD/ for the definition of these codes.
DATA BLOCK NUMBER 1 - CONTROL PARAMETERS (NOT CURRENTLY USED)

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</tr>
<tr>
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<td>4</td>
<td>PERCENT COPILOTS RECOVERABLE AS PILOTS</td>
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<td>NUMBER OF CALENDAR UNITS/YEAR</td>
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| 3   |         | NOT USED             |
| 4   | 10     | RESOURCE NAME        |
| 5   | 0      |                       |
| 6   | 0      |                       |
| 7   | 51     | GENERATING FUNCTION NAME |
| 8   | 0      |                       |
| 9   | 0      |                       |
| 10  | 1      | START DATE           |
| 11  | 1      | END DATE             |
| 12  | -1     | NUMBER OF PARAMETERS  |
| -   | 1      | PARAMETERS            |</p>
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DATA BLOCK NUMBER 4 - SOURCE

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*
* WORD * FORMAT * DESCRIPTION
* CODE * *
* *
* 1 * CARD SEQUENCE NUMBER
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* 3 * NOT USED
* 4 * 8 * PROC BLOCK NAME
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* 6 * 0 *
* 7 * 36 * SYNC COURSE NAME
* 8 * 0 *
* 9 * 0 *
* 10 * 1 * SYNC BLOCK NO
* 11 * 1 * SYNC CODE
* 12 * 1 * BLOCK NUMBER
* 13 * 1 * DURATION
* 14 * 4 * X
* 15 * 4 * Y
* 16 * 1 * PRIORITY
* 17 * -3 * NUMBER TRANSFERS
* 18 * -3 * NUMBER TASKS
* - * 1 * BLOCK NUMBER TRANSFERRED FROM
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* - * 4 * RATIO
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Section 1.9

COMMON VARIABLE CROSS REFERENCE TABLE

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CROSS REFERENCE USAGE CODES

A  ARGUMENT
   THE SYMBOL IS A VARIABLE OR FUNCTION NAME WHICH APPEARS IN AN
   ARGUMENT LIST OF A CALL, SUBROUTINE, FUNCTION, OR ENTRY STATEMENT.

D  DATA INITIALIZATION
   THE SYMBOL IS A VARIABLE WHICH IS INITIALIZED IN A DATA OR TYPE
   SPECIFICATION STATEMENT SUCH AS A COMPLEX SPECIFICATION STATEMENT.

F  FETCH A VALUE
   THE SYMBOL IS A:
   1. VARIABLE WHOSE MOST RECENTLY ASSIGNED VALUE IS ACCESSED
      BUT NOT CHANGED.
   2. FUNCTION NAME OR ARGUMENT OF A FUNCTION WHICH APPEARS ON
      THE RIGHT SIDE OF AN EQUAL SIGN IN AN ASSIGNMENT
      STATEMENT OR APPEARS IN AN IF STATEMENT TEST.
   3. DUMMY ARGUMENT IN A STATEMENT FUNCTION DEFINITION.

S  STORE A VALUE
   THE SYMBOL IS A:
   1. VARIABLE WHOSE VALUE IS REPLACED BY ANOTHER VALUE.
   2. FUNCTION NAME WHICH APPEARS ON THE LEFT SIDE OF AN EQUAL
      SIGN IN AN ASSIGNMENT STATEMENT.
   3. NAME OF A STATEMENT FUNCTION IN THE DEFINITION OF THAT
      FUNCTION.

C  COMMON
   THE SYMBOL IS A VARIABLE WHICH APPEARS IN A COMMON STATEMENT OR IS
   THE NAME OF A LABELED COMMON BLOCK.

E  EQUIVALENCE
   THE SYMBOL IS A VARIABLE WHICH APPEARS IN AN EQUIVALENCE STATEMENT.

T  TYPE SPECIFICATION
   THE SYMBOL IS A VARIABLE WHICH APPEARS IN A:
   1. TYPE SPECIFICATION STATEMENT AND IS NOT INITIALIZED IN
      THAT STATEMENT.
   2. DIMENSION OR EXTERNAL STATEMENT.

N  ENTRY POINT
   THE SYMBOL IS AN ENTRY POINT DEFINED BY AN ENTRY STATEMENT IN A
   SUBROUTINE OR FUNCTION.

X  EXTERNAL REFERENCE
   THE SYMBOL IS A SUBROUTINE OR ENTRY NAME WHICH APPEARS IN A CALL
   STATEMENT.
Section 1.10
INITIALIZATION FILE

This file is read by subroutine READTB from FORTRAN logical unit 9. It is a formatted file that contains card images, and is used to initialize the following common blocks: ICNAME, TABLES, DDIN, and DBD. Normally, any changes to the values on this file would be accompanied with program modifications.

Four tables are contained on this file, one to initialize each common block. The contents of each of these tables are summarized below. For a detailed description of the values on this file, refer to the descriptions of the common blocks that they initialize. A listing of this file will be provided with the program listings.

TABLE 1 (Initializes common ICNAME)
This table contains the card names, which are used to identify the input cards, and the internal block numbers for the data contained on those cards.

TABLE 2 (Initializes common TABLES)
This table contains the function names to be coded on the input cards.

TABLE 3 (Initializes common DDIN)
This table contains a description of each input card. This includes the number of character fields on the card, the number of numeric fields, and the range of acceptable values for each numeric field.

TABLE 4 (Initializes common DBD)
This table contains a description of the internal data blocks used to store the inputs. This description is used by the program to locate and replace character name references with the proper integer code.
Section 1.11
OUTPUT FILE DESCRIPTION

The following tables show the contents of the output file from TRAM phase 1. This is an unformatted file that is written onto FORTRAN logical unit 10 for passage to phase 2. The first table summarizes the records that are contained on the file, and their order. Other tables follow, which give a detailed description of those records that contain more than one item.
UNIT TEN FILE DESCRIPTION

THIS UNFORMATTED (BINARY) FILE CONTAINS THE FOLLOWING RECORDS

- NUMBER OF AIR BASES
- AIR BASE NAMES
- NUMBER OF COURSES
- COURSE NAMES
- NUMBER OF GENERATING FUNCTIONS
- GENERATING FUNCTION NAMES
- NUMBER OF PROCESSING BLOCKS
- PROCESSING BLOCK NAMES
- NUMBER OF PROCESSING BLOCKS
- PROCESSING BLOCK NUMBERS
- NUMBER OF RESOURCES
- RESOURCE NAMES
- NUMBER OF RESOURCE UTILIZATION BLOCKS
- RESOURCE UTILIZATION BLOCK NAMES
- NUMBER OF RESOURCE UTILIZATION DESCRIPTION BLOCKS
- RESOURCE UTILIZATION DESCRIPTION BLOCK NAMES
- NUMBER OF RESOURCE UTILIZATION GROUPING FUNCTIONS
- RESOURCE UTILIZATION GROUPING FUNCTION NAMES
- NUMBER OF RESOURCE UTILIZATION TIMING FUNCTIONS
- RESOURCE UTILIZATION TIMING FUNCTION NAMES
- NUMBER OF SOURCES
- SOURCE NAMES
- NUMBER OF TASK BLOCKS
- TASK BLOCK NAMES
- NUMBER OF TASK FUNCTIONS
- TASK FUNCTION NAMES

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<tr>
<td>9.</td>
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* **WORD** * **DESCRIPTION** *

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* WORD * DESCRIPTION *

* * *

*************** CCTS RECORDS ***************

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2 * TIME *
3 * COURSE NUMBER *
4 * PERSONNEL TYPE *
5 * RATIO *

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*******************************************************************************
*******************************************************************************
* WORD * DESCRIPTION
*******************************************************************************
* 1 * RESOURCE NUMBER
* 2 * START TIME
* 3 * END TIME
* 4 * GENERATING FUNCTION NUMBER
* 5 * NUMBER OF PARAMETERS (UP TO 5)
* 6 * PARAMETER 1
* 7 * PARAMETER 2
* 8 * PARAMETER 3
* 9 * PARAMETER 4
* 10 * PARAMETER 5
*******************************************************************************
Section 1.12
PHASE 1 ERROR MESSAGES

ADVERSE CARD IS OUT OF SEQUENCE

A card which requires a header card to precede it, was encountered before the header card. (From INPUT)

ERROR AT CARD NUMBER XX, BLOCK NUMBER SYNCHRONIZED TO IS INVALID - YY

A processing block card specifies a synchronize or correlate reference to another block number which does not exist in the specified course. The card sequence number of the error is given by XX, and the invalid block number is given by YY. (From PROCB2)

ERROR AT CARD NUMBER XX, INVALID TRANSFER BLOCK NUMBER - YY

The processing block specified by card number XX specifies a transfer from a processing block which was never defined within that course. The invalid block number is given by YY. (From PROCB2)

ERROR IN SUBROUTINE IPLOT - INSUFFICIENT STORAGE AVAILABLE TO DO BLOCK DIAGRAM PLOT

The quantity of inputs was great enough so that there is not enough storage left for the plot routines work areas. The program will continue, but no plot will be produced. (From IPLOT)

ERROR IN SUBROUTINE PLOTB - BLOCK NUMBER XX WAS ENCOUNTERED BEFORE ANY BLOCK SPECIFYING A TRANSFER FROM IT

The processing blocks are out of sequence. The position of each processing block is specified as an offset from the block to the right of it (toward graduation). Therefore, each time a processing block is specified, another block must have already specified a transfer from it. (From PLOTB)
ERROR IN SUBROUTINE PLOTH -  INSUFFICIENT WORKING STORAGE AVAILABLE - FLOW ARROWS WILL BE OMITTED

The course is structured so that many processing blocks specify transfers from block numbers which are not defined. This message is printed when the plot routine runs out of room to store the references until they are defined. Usually the processing blocks can be specified in a different order to reduce the number of such references, but if no, the program will have to be recompiled to make storage available. (From PLOTH)

ERROR ON CARD NUMBER XX, BLOCK NUMBER YY HAS BEEN PREVIOUSLY DEFINED

Two processing blocks with the same number have been defined within the same course. (From PROCB1)

ERROR ON CARD NUMBER XX, DATA BLOCK NAME PREVIOUSLY DEFINED - YY

Card number XX attempts to define a data block with the name YY, but the same name has already been used for another block. (From NAME1)

ERROR ON CARD NUMBER XX, INVALID REFERENCE - YY

The card has referenced another data block which was never defined. The undefined block name or processing block number is given by YY. (From REPLC1, REPLC2)

INSUFFICIENT STORAGE AVAILABLE FOR INPUTS

The amount of input data is greater than the amount the program can store. The program will have to be re-compiled with more storage made available to it. (From INPUT)

INSUFFICIENT STORAGE AVAILABLE TO CONSTRUCT BLOCK NAME TABLE

The quantity of input data is large enough so that there is not enough storage available to do the cross referencing of data block names. The program will have to be re-compiled to make more storage available. (From NAME1, MAIN)
INVALID CARD NAME ON ABOVE CARD

This message appears in the input card listing. The card printed immediately above the message has a card name which is not recognized by the program (card name field is columns 1-10.) (From INPUT)

INVALID VALUE IN FIELD NUMBER XX

The card printed immediately above this error message contains a numeric value which is outside the range allowed for that value. The field number XX, refers to the field number marking at the top of the input card listing. (From TEST)

RESOURCE NAME MUST NOT BE BLANK

The RUDP card which is printed above this error message does not have a resource name specified. (From INPUT)
Section 2.0
TRAM PHASE 2

This section provides flowcharts, record formats, common block description, subroutine description and a symbol cross reference for Phase 2. This information is intended to supplement the description included in Technical Memorandum SAT-5, TRAM User's Manual with which the reader is assumed to be familiar.
Section 2.1
FLOWCHARTS
STEP 2

FMTNAM
READ + FORMAT NAMES

PRCOUR
PROCESS COURSE DESCRIPTIONS

ARBASE
CALCULATE PERSONNEL REQUIRED

RESSOR
GENERATE RESOURCE AND SOURCE FILES

STOP
FMTNAM

CYCLE THRU ALL TYPES OF NAMES

DONE?

YES

PASS NAMES TO PHASE 3 AND RESOURCE NAMES TO PHASE 4

NO

READ NUMBER OF NAMES AND NAMES

STORE NAMES IN POOL OF NAMES

RETURN

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PROC

READS ALL DATA NEEDED TO DEFINE COURSES

PRPROC

CHANGES TASK AND PROC BLOCK NUMBERS IN PROC BLOCKS TO POINTERS

PRTASK

CHANGES RUB BLOCK NUMBERS IN RUB BLOCKS TO POINTERS

PRRUB

CHANGES RUB AND RUDB BLOCK NUMBERS IN RUDB BLOCKS TO POINTERS

GRADBK

FINDS GRADUATION BLOCKS FOR EACH COURSE

TSSYN

TEST THAT SYN AND CORR LOOPS FORM A CIRCULAR LIST

PROCCLP

TESTS THAT TRACKS DO NOT FORM A CIRCULAR LIST

RUDCLP

TESTS THAT RUBB AND RUB COMBINATIONS DO NOT FORM A CIRCULAR STRUCTURE

SORTCLK

SORTS LEFT LINKS IN PROC BLOCKS BY PRIORITY

CORSOT

PASSES COURSE DESCRIPTIONS TO PHASE 3

STOP 2000

ANY ERRORS OCCURRED?

YES

RETURN

NO
READ AND STORE COURSE BLOCKS
READ AND STORE PROC BLOCKS
READ AND STORE TASK BLOCKS
READ AND STORE RUB BLOCKS
READ AND STORE RUDB BLOCKS
RETURN
PRTASK

CYCLE THRU ALL TASK BLOCKS

ALL TASK BLOCKS PROCESSED?

YES

RETURN

NO

SUBSTITUTE RUB POINTER FOR RUB NUMBER
PRRUDB

CYCLE THRU ALL RUB BLOCKS

ALL RUB BLOCKS PROCESSED?

YES

RETURN

NO

SUBSTITUTE RUB POINTER FOR RUB NUMBER

SUBSTITUTE RUB BLOCK POINTER FOR RUB BLOCK NUMBER
GRADBK

CYCLE THRU ALL PROC BLOCKS

ALL PROC BLOCKS PROCESSED?

YES

RETURN

NO

NO RIGHT LINK IN THIS PROC BLOCK?

YES

ASSIGN GRADUATION BLOCK TO COURSE

NO

DO NUMBER OF GRADUATION BLOCKS AND COURSES AGREE?

YES

RETURN

NO

GIVE ERROR MESSAGE

RETURN
TSSYN

CYCLE THRU ALL PROC BLOCKS

ALL PROC BLOCKS PROCESSED?

YES

RETURN

NO

PROC BLOCK MEMBER OF A SYN OR CORR LOOP

YES

LOOP CONTAINS MORE THAN ONE BLOCK

NO

GIVE ERROR MESSAGE

YES

MOVE TO NEXT BLOCK IN LOOP

YES

LOOP COMPLETED?

NO

GIVE ERROR MESSAGE

YES

IS THERE ANOTHER BLOCK IN THE LOOP?

NO

IS LOOP TOO LONG?

YES

NO
SORTLK

CYCLE THRU ALL PROC BLOCKS

ALL PROC BLOCKS PROCESSED?

YES

RETURN

NO

SORT LEFT POINTERS, PRIORITY AND PERCENTAGES BY PRIORITY
CORSOT

WRITE COURSE DESCRIPTIONS FOR PHASE 3

RETURN
ARBASE

CORTIM
CALCULATE THE LONGEST DURATION OF ANY TRACK IN EACH COURSE

ABIN
READ AIR BASE PARAMETERS

CYCLE THRU ALL AIR BASES

RECOVR
CALCULATE COPILOTS RECOVERABLE

PRTCRS
PRINT REPORT CONTAINING STUDENTS/COURSE/YEAR

ALL AIR BASES PROCESSED?

YES

DiSTAC
DISTRIBUTE AIRCRAFT OVER AIR BASE BUCKETS

DISTCW
DISTRIBUTE CREW MEMBERS OVER AIR BASE BUCKETS

MNCREW
CALCULATE MINIMUM CREW FOR EACH BUCKET

CCTS
CALCULATE CCTS DEMANDS

PMT
CALCULATE PMT DEMANDS

NO

ANY ERRORS?

YES

STOP 2000
RETURN

NO
CORTIM

CYCLE THRU ALL GRADUATION BLOCKS

ALL GRADUATION BLOCKS PROCESSED?

YES RETURN

NO MAXTRK

CALCULATE THE LONGEST DURATION OF ANY TRACK IN THE COURSE WITH THIS GRADUATION BLOCK
MaxTrk

Cycle thru all tracks of this course

All tracks processed?

Yes: return longest track duration

No: calculate track duration by summing the duration of each proc block in track
ABIN

READ CONTROL PARAMETERS

READ AIR BASE INVENTORY PARAMETERS

READ AIR BASE EVENT PARAMETERS

READ CCTS PARAMETERS

READ PMT PARAMETER

AIR BASE DELIVERY PARAMETERS

INITIALIZE VARIABLES AND CONSTANTS

RETURN
DISTAC

CYCLE THRU ALL DELIVERY PARAMETERS FOR THIS AIR BASE

ALL DELIVERIES PROCESSED?

YES → RETURN

NO → ADD NUMBER OF PLANES DELIVERED TO THE CORRESPONDING BUCKETS
DISTCW
HISTORY CARDS HAVE NOT BEEN IMPLEMENTED
RETURN
MNCREW

CYCLE THRU EVENTS FOR THIS AIR BASE

ALL EVENTS PROCESSED?

USE CREW RATIO AND DISTRIBUTION OF AIRCRAFT TO CALCULATE MINIMUM CREW

RETURN
Cycle thru air base buckets

All buckets processed? Yes → Return

No → Cycle thru personnel types

All personnel types processed? Yes →

No → Calculate # attritted, # replace, and # additional personnel required

Cycle thru CCTS parameters for courses for this air base, bucket and personnel type

All CCTS courses processed? Yes →

No → Generate demands for this personnel type and from this CCTS course
CALCULATE HOURS IN EXCESSING OF ALERT REQUIREMENTS FOR EACH PERSONNEL TYPE

CYCLE THRU PERSONNEL TYPE

ALL PERSONNEL TYPE PROCESSED?

YES

Determine number of people to be trained per bucket and amount of time lost

CYCLE THRU ALL PMT COURSES FOR THIS PERSONNEL TYPE

YES

ALL PMT GROUPS PROCESSED?

YES

RETURN

NO

CREATE PMT DEMANDS FOR EACH BUCKET IN PERIOD

REDUCE THE NUMBER OF HOURS AVAILABLE FOR PMT TRAINING
RECOVR

CYCLE THRU AIR BASE BUCKETS

ALL BUCKETS PROCESSED?

CREATE COPILOT SOURCE FROM THE NUMBER OF COPILOTS RECOVERABLE FOR THIS BUCKET

RETURN
WRITE THE NUMBER OF STUDENTS/YEAR/COURSE
SOURIN

READ SOURCE CARDS

DETERMINE THE NUMBER OF UNIQUE SOURCES

DETERMINE BUCKET SIZE FOR EACH SOURCE

PASS BUCKET SIZES TO STEP 3

RETURN
RESRIA

READ RESOURCE CARDS

DETERMINE THE NUMBER OF UNIQUE RESOURCES

DETERMINE BUCKET SIZE FOR EACH RESOURCE

PASS BUCKET SIZES TO STEPS 3 AND 4

RETURN
GENSOR

CYCLE THRU EACH SOURCE

ALL SOURCES PROCESSED?

YES

RETURN

NO

CYCLE THRU ALL BUCKETS FOR THIS SOURCE

ALL SOURCES PROCESSED?

YES

NO

INITIALLY A QUANTITY OF ZERO FOR THIS SOURCE AND BUCKET IS AVAILABLE

CYCLE THRU ALL SOURCE CARDS FOR THIS SOURCE

ALL SOURCE CARDS PROCESSED?

YES

WRITE QUANTITY OF THIS SOURCE FOR THIS BUCKET

NO

ACCUMULATE THE QUANTITY OF THIS RESOURCE FROM THE QUANTITY SPECIFIED ON THIS SOURCE CARD FOR THIS BUCKET
GENRES

CYCLE THRU EACH RESOURCE

ALL RESOURCES PROCESSED?

RETURN

NO

CYCLE THRU ALL BUCKETS FOR THIS RESOURCE

ALL BUCKETS PROCESSED?

INITIALLY A QUANTITY OF ZERO FOR THIS RESOURCE AND BUCKET IS AVAILABLE

CYCLE THRU ALL RESOURCE CARDS FOR THIS RESOURCE

WRITE QUANTITY OF THIS RESOURCE FOR THIS BUCKET

NO

ALL RESOURCE CARDS PROCESSED?

YES

ACCUMULATE THE QUANTITY OF THIS RESOURCE FROM THE QUANTITY SPECIFIED ON THIS RESOURCE CARD FOR THIS BUCKET

NO
DETERMINE TYPE OF NUMBER TO BE RETURNED

DETERMINE NUMBER USING NAME

RETURN
NAME

DETERMINE TYPE OF NAME REQUIRED

DETERMINE NAME USING CODE NUMBER

RETURN
Section 2.2
DESCRIPTIONS OF RECORDS AND VARIABLES
USED IN COMMONS
**FIGURE C.1**

<table>
<thead>
<tr>
<th>WORD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEMAND RECORD</strong></td>
<td></td>
</tr>
<tr>
<td><strong>WORD</strong></td>
<td><strong>DESCRIPTION</strong></td>
</tr>
<tr>
<td>1</td>
<td>TIME</td>
</tr>
<tr>
<td>2</td>
<td>QUANTITY</td>
</tr>
<tr>
<td>3</td>
<td>TYPE OF PERSONNEL</td>
</tr>
<tr>
<td>4</td>
<td>COURSE NUMBER</td>
</tr>
<tr>
<td>5</td>
<td>DEMAND NUMBER = AIR BASE NUMBER * 1000 + BUCKET NO.</td>
</tr>
<tr>
<td>6</td>
<td>DEMAND TYPE</td>
</tr>
<tr>
<td></td>
<td>1-CCTS BECAUSE OF DELIVERIES</td>
</tr>
<tr>
<td></td>
<td>2-CCTS BECAUSE OF ATTRITION</td>
</tr>
<tr>
<td></td>
<td>3-PMT</td>
</tr>
</tbody>
</table>
**FIGURE C.2**

<table>
<thead>
<tr>
<th>S O U R C E</th>
<th>R E C O R D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W O R D</strong></td>
<td><strong>D E S C R I P T I O N</strong></td>
</tr>
<tr>
<td>1</td>
<td>TIME</td>
</tr>
<tr>
<td>2</td>
<td>SOURCE NUMBER</td>
</tr>
<tr>
<td>3</td>
<td>QUANTITY</td>
</tr>
</tbody>
</table>

---

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**RESOURCE RECORD**

<table>
<thead>
<tr>
<th>WORD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TIME</td>
</tr>
<tr>
<td>2</td>
<td>RESOURCE NUMBER</td>
</tr>
<tr>
<td>3</td>
<td>QUANTITY</td>
</tr>
</tbody>
</table>
**FIGURE D.1**

**COMMON BLOCK - NAM**

**VARIABLE DESCRIPTION**

* ITYPE(I) * TYPE OF NAME
* IFIRST(I) * INDEX TO WHERE FIRST NAME OF TYPE I IS LOCATED
* NUM(I) * NUMBER OF NAMES OF TYPE I
* NAMES(I,J) * POOL OF NAMES
* IUNIT * UNIT NAMES ARE READ ON
* JUNIT * UNIT NAMES ARE WRITTEN ONTO
* MAXNUM * MAXIMUM NUMBER OF NAMES
* NTYPE * NUMBER OF NAME TYPES

*******************************************************************************
**COMMON BLOCK - DUMMY (COURSES)**

* VARIABLE DESCRIPTION *

* NCOURS  * NUMBER OF COURSES  *
* MXCOUR  * MAXIMUM NUMBER OF COURSES *
* IGRAD(I)  * GRADUATION BLOCK FOR COURSE I *
* ICTYPE(I)  * TYPE OF COURSE I *
* IPTYPE(I)  * PERSONNEL TYPE FOR COURSE I *
* IPRIOR(I)  * PRIORITY OF COURSE I *
* MXSIZE(I)  * MAXIMUM SIZE OF COURSE I *
* IPERIOD(I)  * PERIOD OF COURSE I *
* IEGRAD(I)  * EARLIEST GRADUATION DATE FOR COURSE I *
* IBLOCK(I)  * LOCATION OF FIRST PROC, TASK, RUB, AND RUBD BLOCK *
* NBLOCK(I)  * NUMBER OF PROC, TASK, RUB, AND RUBD BLOCKS *
* LBKIN(I)  * LENGTH OF EACH BLOCK TYPE AS READ FROM STEP1 *
* LBKOUT(I)  * LENGTH OF EACH BLOCK TYPE AS PASSED TO STEP3 *
* IAVAL(I)  * POINTS TO NEXT AVAILABLE WORD IN STORAGE POOL *
* NWORDS  * NUMBER OF WORDS REMAINING IN STORAGE POOL *
* IWORDS(I)  * POOL OF STORAGE FOR BLOCKS *
* ERROR  * TRUE IFF AN ERROR OCCURRED *

* COMMON BLOCK - DUMMY (COURSES) *
**COMMON BLOCK - DUMMY (AIR BASES)**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAB</td>
<td>MAXIMUM NUMBER OF AIR BASES</td>
</tr>
<tr>
<td>MABH</td>
<td>MAXIMUM NUMBER OF HISTORY CARDS</td>
</tr>
<tr>
<td>MABE</td>
<td>MAXIMUM NUMBER OF AIR BASE EVENTS</td>
</tr>
<tr>
<td>MABC</td>
<td>MAXIMUM NUMBER OF CCTS COURSES</td>
</tr>
<tr>
<td>MABP</td>
<td>MAXIMUM NUMBER OF PMT GROUPS</td>
</tr>
<tr>
<td>MABPC</td>
<td>MAXIMUM NUMBER OF PMT COURSES</td>
</tr>
<tr>
<td>MABD</td>
<td>MAXIMUM NUMBER OF DELIVERY CARDS</td>
</tr>
<tr>
<td>MBUCKT</td>
<td>MAXIMUM NUMBER OF AIR BASE BUCKETS</td>
</tr>
<tr>
<td>PPATTR</td>
<td>% PILOTS ATTRITION PER BUCKET</td>
</tr>
<tr>
<td>CPATTR</td>
<td>% COPILOTS ATTRITION PER BUCKET</td>
</tr>
<tr>
<td>OPATTR</td>
<td>% USO ATTRITION PER BUCKET</td>
</tr>
<tr>
<td>DPATTR</td>
<td>% DSOS ATTRITION PER BUCKET</td>
</tr>
<tr>
<td>IPATTD</td>
<td>PILOTS ATTRITION DELAY TIME</td>
</tr>
<tr>
<td>ICATTD</td>
<td>COPILOTS ATTRITION DELAY TIME</td>
</tr>
<tr>
<td>IDATTD</td>
<td>USO ATTRITION DELAY TIME</td>
</tr>
<tr>
<td>IDATTD</td>
<td>DSOS ATTRITION DELAY TIME</td>
</tr>
<tr>
<td>PCRECY</td>
<td>% COPILOTS RECOVERABLE</td>
</tr>
<tr>
<td>IGYR</td>
<td>CALENDAR UNITS PER YEAR</td>
</tr>
<tr>
<td>IBUCKET</td>
<td>CALENDAR UNITS PER BUCKET</td>
</tr>
<tr>
<td>WKSBKT</td>
<td>WEEKS PER BUCKET</td>
</tr>
<tr>
<td>HRSCU</td>
<td>HOURS PER CALENDAR UNIT</td>
</tr>
<tr>
<td>HRBUCK</td>
<td>HOURS PER BUCKET</td>
</tr>
<tr>
<td>MXBUCK</td>
<td>BUCKET ASSOCIATED WITH MAXIMUM SIMULATION TIME</td>
</tr>
<tr>
<td>NAB</td>
<td>NUMBER OF AIR BASES</td>
</tr>
<tr>
<td>INVA(I)</td>
<td>INITIAL AIR CRAFT INVENTORY FOR AIR BASE I</td>
</tr>
<tr>
<td>INVP(I)</td>
<td>INITIAL PILOT INVENTORY FOR AIR BASE I</td>
</tr>
<tr>
<td>INVG(I)</td>
<td>INITIAL COPILOT INVENTORY FOR AIR BASE I</td>
</tr>
<tr>
<td>INVO(I)</td>
<td>INITIAL DSO INVENTORY FOR AIR BASE I</td>
</tr>
<tr>
<td>INVD(I)</td>
<td>INITIAL DSO INVENTORY FOR AIR BASE I</td>
</tr>
<tr>
<td>NABH</td>
<td>NUMBER OF AIR BASE HISTORY CARDS</td>
</tr>
<tr>
<td>NABE</td>
<td>NUMBER OF AIR BASE EVENTS</td>
</tr>
<tr>
<td>IABE1(I)</td>
<td>INDEX OF FIRST AIR BASE EVENT FOR AIR BASE I</td>
</tr>
<tr>
<td>IABEN(I)</td>
<td>NUMBER OF AIR BASE EVENTS FOR AIR BASE I</td>
</tr>
<tr>
<td>IDATEE(I)</td>
<td>DATE OF AIR BASE EVENT (IN BUCKETS)</td>
</tr>
<tr>
<td>CREWR(I)</td>
<td>CREW RATIO FOR AIR BASE EVENT</td>
</tr>
<tr>
<td>ALETRR(I)</td>
<td>ALERT RATIO FOR AIR BASE EVENT</td>
</tr>
<tr>
<td>HRCRBK(I)</td>
<td>HOURS/CREW/BUCKET FOR AIR BASE EVENT</td>
</tr>
<tr>
<td>NABC</td>
<td>NUMBER OF CCTS COURSES</td>
</tr>
<tr>
<td>IABC1(I)</td>
<td>INDEX OF FIRST CCTS FOR AIR BASE I</td>
</tr>
<tr>
<td>IABCN(I)</td>
<td>NUMBER OF CCTS FOR AIR BASE I</td>
</tr>
<tr>
<td>IDATEC(I)</td>
<td>DATE OF CCTS (IN BUCKETS)</td>
</tr>
<tr>
<td>ICOURC(I)</td>
<td>COURSE NUMBER</td>
</tr>
<tr>
<td>IPERC(I)</td>
<td>PERSONNEL TYPE</td>
</tr>
<tr>
<td>PCC(I)</td>
<td>PERCENTAGE OF PEOPLE TO COME FROM THIS COURSE</td>
</tr>
</tbody>
</table>
**Figure D.3 (continued)**

**COMMON BLOCK - DUMMY (AIR BASES)**

**VARIABLE DESCRIPTION**

* NABP   * number of PMT groups
* IABP1(I)  * index of first PMT group for air base I
* IABPN(I)  * number of first PMT group for air base I
* IDATEP(I)  * date of PMT group (in buckets)
* IPMT(I)  * PMT number
* IPEROD(I)  * PMT period
* IABPC  * number of PMT courses
* IABPC1(I)  * index of first PMT courses for air base I
* IABPCN(I)  * number of PMT courses for air base I
* IDATPC(I)  * date of PMT course (in buckets)
* JPMT(I)  * number of PMT for PMT course
* ICOURPC(I)  * course number
* IPERTP(I)  * personnel type for PMT course
* PCPC(I)  * per cent of personnel to go to this PMT course
* ITL(I)  * time delay due to travel for PMT course
* NABD  * number of air craft deliveries
* IABD1(I)  * index of first delivery for air base I
* IABDN(I)  * number of delivery cards for air base I
* IDATED(I)  * date of delivery
* IQANTD(I)  * quantity delivered
* P(I)  * number of pilots for bucket I
* C(I)  * number of copilots for bucket I
* O(I)  * number of OSOS for bucket I
* D(I)  * number of DSOS for bucket I
* IAC(I)  * number of air craft for bucket I
* CREW(I)  * minimum number of crews for bucket I
* PH(I)  * pilot hours available for PMT for bucket I
* CH(I)  * copilot hours available for PMT for bucket I
* DH(I)  * OSC hours available for PMT for bucket I
* DH1(I)  * DSO hours available for PMT for bucket I
* CRECY(I)  * copilots recoverable for bucket I
* IAB  * number of air base being processed
* ERROR  * true IFF error occurred
* NOPRNT  * true IFF option report is not to be printed
* STUDS(I,J)  * # of students sent to course J during year I
* NCORS  * total number of courses
* NYEARS  * number of years of simulation time
**COMMON BLOCK - CONTROL (STEP2)**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MXTIME</td>
<td>MAXIMUM SIMULATION TIME</td>
</tr>
</tbody>
</table>
**COMMON BLOCK - RECOVERY**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICRECT</td>
<td># Calendar units copilots are available</td>
</tr>
<tr>
<td>ICBUCK</td>
<td># of buckets recovered copilots are available</td>
</tr>
</tbody>
</table>
**COMMON BLOCK - MAXLEN**

**VARIABLE DESCRIPTION**

* MAXTIM(1) * DURATION OF LONGEST TRACK IN COURSE 1
**COMMON BLOCK - RESURS**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRES1(I)</td>
<td>INDEX TO FIRST RESOURCE CARD FOR RESOURCE I</td>
</tr>
<tr>
<td>NRES(I)</td>
<td>NUMBER OF RESOURCE CARDS FOR RESOURCE I</td>
</tr>
<tr>
<td>IFUNC(I)</td>
<td>GENERATING FUNCTION</td>
</tr>
<tr>
<td>IT1(I)</td>
<td>BEGINNING OF RESOURCE AVAILABILITY</td>
</tr>
<tr>
<td>ITN(I)</td>
<td>END OF RESOURCE AVAILABILITY</td>
</tr>
<tr>
<td>NPARM(I)</td>
<td>NUMBER OF PARAMETERS</td>
</tr>
<tr>
<td>IPARM1(I)</td>
<td>PARAMETER1</td>
</tr>
<tr>
<td>IPARM2(I)</td>
<td>PARAMETER2</td>
</tr>
<tr>
<td>IPARM3(I)</td>
<td>PARAMETER3</td>
</tr>
<tr>
<td>IPARM4(I)</td>
<td>PARAMETER4</td>
</tr>
<tr>
<td>IPARM5(I)</td>
<td>PARAMETER5</td>
</tr>
<tr>
<td>LBUCKT(I)</td>
<td>BUCKET SIZE</td>
</tr>
<tr>
<td>NRESR</td>
<td>TOTAL NUMBER OF RESOURCES</td>
</tr>
<tr>
<td>MXRES</td>
<td>MAXIMUM NUMBER OF RESOURCES</td>
</tr>
<tr>
<td>MXRESC</td>
<td>MAXIMUM NUMBER OF RESOURCE CARDS</td>
</tr>
<tr>
<td>ERROR</td>
<td>TRUE IFF AN ERROR OCCURRED</td>
</tr>
</tbody>
</table>

**ERROR**
FIGURE D.8

*******************************************************************************
*   COMMON BLOCK - SOURCE  
*******************************************************************************

* VARIABLE * DESCRIPTION *
*******************************************************************************
*
* ISOR(I) * INDEX TO FIRST SOURCE CARD FOR SOURCE I *
* NSOR(I) * NUMBER OF SOURCE CARDS FOR SOURCE I *
* IFUNC(I) * GENERATING FUNCTION *
* IT1(I)  * BEGINNING OF SOURCE AVAILABILITY *
* ITN(I)  * END OF SOURCE AVAILABILITY *
* NPARM(I) * NUMBER OF PARAMETERS *
* IPARM1(I) * PARAMETER1 *
* IPARM2(I) * PARAMETER2 *
* IPARM3(I) * PARAMETER3 *
* IPARM4(I) * PARAMETER4 *
* IPARM5(I) * PARAMETER5 *
* LBUCKT(I) * BUCKET SIZE *
* NSOUR  * TOTAL NUMBER OF SOURCES *
* MXSOR  * MAXIMUM NUMBER OF SOURCES *
* MXSORC * MAXIMUM NUMBER OF SOURCE CARDS *
* ERROR  * TRUE IFF AN ERROR OCCURRED *
*******************************************************************************
**FIGURE D.9**

```
** COMMON BLOCK - CONTRL (STEP3) **

** VARIABLE **  ** DESCRIPTION **

** ICLOCK **  ** SIMULATION TIME WHEN CLOCKS WAS LAST CALLED **
```
COMMON BLOCK - RES

VARIABLE DESCRIPTION

NRES NUMBER OF RESOURCES
IBUCKT(I) RESOURCE BUCKET SIZES
**COMMON BLOCK - RSOURC**

* **VAriable** * **DescripTion** *

* IAVAIL * points to first available cell *
* NAVAIL * number of available cells *
* MAVAIL * minimum of cells to be reserved for future adds *
* ITIME(I) * time in cell I *
* IQANT(I) * quantity in cell I *
* LINK(I) * link in cell I *
* IFIRST(I) * points to beginning of list for resource I *
* ILAST(I) * points to end of list for resource I *
* ITIMEL(I) * earliest time in core for resource I *
* ITIMEH(I) * latest time in core for resource I
**COMMON BLOCK - SOR**

**VARIABLE** | **DESCRIPTION**
--- | ---
NSOR | NUMBER OF SOURCES
IBUCKT(I) | SOURCE BUCKET SIZES
ICU(I) | LENGTH OF TIME SOURCE IS AVAILABLE (CU)
**FIGURE D.13**

```plaintext
**COMMON BLOCK - SOURCE**

**VARIABLE** | **DESCRIPTION**
--- | ---
IAVAIL | POINTS TO FIRST AVAILABLE CELL
NAVAIL | NUMBER OF AVAILABLE CELLS
MAVAIL | MINIMUM OF CELLS TO BE RESERVED FOR FUTURE ADDS
ITIME(I) | TIME IN CELL I
IQUANT(I) | QUANTITY IN CELL I
LINK(I) | LINK IN CELL I
IFIRST(I) | POINTS TO BEGINNING OF LIST FOR SOURCE I
ILAST(I) | POINTS TO END OF LIST FOR SOURCE I
ITIMEL(I) | EARLIEST TIME IN CELL FOR SOURCE I
ITIMEH(I) | LATEST TIME IN CELL FOR SOURCE I
```
FILE D.14

*******************************************************************************
* COMMON BLOCK - CBLK
*******************************************************************************
* VARIABLE DESCRIPTION
*******************************************************************************
* NCOURS * NUMBER OF COURSES
* IGRAD(I) * GRADUATION BLOCK FOR COURSE I
* ICURS(I) * TYPE OF COURSE I
* IPTYPE(I) * PERSONNEL TYPE FOR COURSE I
* IPRIOR(I) * PRIORITY OF COURSE I
* MNSIZE(I) * MAXIMUM SIZE OF COURSE I
* IPERIOD(I) * PERIOD OF COURSE I
* IGRAD(I) * EARLIEST GRADUATION DATE FOR COURSE I
*******************************************************************************
**COMMON BLOCK - BLKS**

**VARIABLE DESCRIPTION**

*IBLOCK(I)* LOCATION OF FIRST PROC, TASK, RUB, AND RUBB BLOCK
*NBLOCK(I)* NUMBER OF PROC, TASK, RUB, AND RUBB BLOCKS
*LBLOCK(I)* LENGTH OF PROC, TASK, RUB, AND RUBB BLOCKS
*IWORD(I)* POOL OF STORAGE CONTAINING ALL BLOCKS
**COMMON BLOCK - STACK**

**VARIABLE**

**DESCRIPTION**

* NSTACK     * NUMBER OF ITEMS IN STACK
* MSTACK     * MAXIMUM NUMBER OF ITEMS A STACK HOLDS
* ISTACK     * STACK
* JSTACK     * STACK
Section 2.3
DESCRIPTIONS OF ROUTINES
SUBROUTINE AFIN

PURPOSE
READ AIR BASE PARAMETERS AND Initializes VARIABLES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSAN CORPORATION
2 MAY 1975
SUBROUTINE ARBASE

PURPOSE
CONTROLS THE FLOW BETWEEN SUBROUTINES THAT PROCESS
AIRBASE INFORMATION.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
CORTIM - CALCULATES DURATION OF LONGEST TRACK IN EACH COURSE
CMIN - READS ALL AIRBASE PARAMETERS
DISTAC - CALCULATES DISTRIBUTION OF AIR CRAFT
DISTCW - CALCULATES DISTRIBUTION OF CREW MEMBERS
MNCREW - DETERMINES MINIMUM CREW
CCTS - CALCULATES GRADUATION REQUIREMENTS
PMT - CALCULATES PMT COURSE DEMANDS
RECOVR - GENERATES SOURCE OF RECOVERABLE COPILOTS
PRTCRS - PRINTS REPORT CONTAINING STUDENTS/COURSE/YEAR

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
5 MAY 1975
***************  BLKNAM  ***********************

BLOCK DATA

PURPOSE
INITIALIZED VARIABLE NEEDED WHEN INPUTTING NAMES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975

***************  BLKNAM  ***********************
SUBROUTINE BLKIN

PURPOSE
READS THE BLOCKS NEEDED TO DEFINE COURSES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE BLOCK

PURPOSE
RETURNS THE CONTENTS OF A BLOCK

CALLING SEQUENCE
CALL BLOCK(IADDR,IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IADDR - POINTS AT BLOCK WHOSE CONTENTS IS DESIRED.

* EXPLICIT OUTPUT *
IARRAY - CONTENTS OF BLOCK ARE PLACED IN THIS ARRAY.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE CCTS

PURPOSE
DETERMINES DEMANDS DUE TO DELIVERY OF AIR CRAFT AND
ATTRITION.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NAME - FINDS THE ALPHANUMERIC NAME OF AIR BASE

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
30 APRIL 1975

********************************************* CCTS *********************************************
SUBROUTINE CLOCK

PURPOSE
UPDATES CLOCK TIME AND UPDATES SOURCE AND RESOURCE TABLES

CALLING SEQUENCE
CALL CLOCK(ITIME)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
ITIME - TIME TO BE ASSIGNED TO CLOCK

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
RDNAME - INPUTS NAME TABLES
BLKIN - INPUTS SOURCES
INTRES - INITIALIZES RESOURCE TABLES
INTSOR - INITIALIZES SOURCE TABLES
UPDRES - UPDATES RESOURCE TABLES
UPDSOR - UPDATES SOURCE TABLES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
SUBROUTINE CORSIN

PURPOSE
READS ALL BLOCKS NEEDED TO DEFINE COURSES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
SUBROUTINE CORSOT

PURPOSE
WRITE THE BLOCKS NEEDED TO DEFINE COURSES FOR STEPS.

AUTHOR/PROGRAMMER
JOHN R. MEGIN
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE CORTIM

PURPOSE
CALCULATES THE DURATION OF THE LONGEST TRACK IN EACH COURSE.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
MAXTROK - CALCULATES THE DURATION OF THE LONGEST TRACK
IN A PARTICULAR COURSE

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSHPAN CORPORATION
6 MAY 1975
SUBROUTINE DISTAC

PURPOSE
DETERMINE THE DISTRIBUTION OF AIR CRAFT FROM THE
INITIAL INVENTORIES AND DELIVERIES FOR A GIVEN AIR BASE.

AUTHOR/PROGRAMMER
JOHN K. MLNIG
CALSPAN CORPORATION
30 APRIL 1975
SUBROUTINE LISTCW

PURPOSE
Determine the initial distribution of crews for a given air base from time history cards

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
I MAY 1975
SUBROUTINE FMTNAM

PURPOSE
READS NAMES IN STEP2 AND WRITES OUT FOR STEP3.

AUTHOR/PROGRAMMER
JOHN R. MLN1C
CALSPAN CORPORATION
22 APRIL 1975
**** SUBROUTINE GENSOR

PURPOSE
APPLIES GENERATING FUNCTION TO SOURCES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
GENRES

SUBROUTINE GENRES

PURPOSE
APPLIES GENERATING FUNCTION TO RESOURCES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
SUBROUTINE GETRES

PURPOSE
READS QUANTITY OF A GIVEN RESOURCE FOR A GIVEN PERIOD.

CALLING SEQUENCE
CALL GETRES(IRES, IT1IN, IT2IN, IT1OUT, IT2OUT, IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IRES - RESOURCE NUMBER
IT1IN - BEGINNING OF TIME INTERVAL REQUESTED
IT2IN - END OF TIME INTERVAL REQUESTED

* EXPLICIT OUTPUT *
IT1OUT - BEGINNING OF TIME INTERVAL RETURNED
IT2OUT - END OF TIME INTERVAL RETURNED
IARRAY - ARRAY OF QUANTITIES RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975

******************************************************************************
SUBROUTINE GETSOR

PURPOSE
READS QUANTITY OF A GIVEN SOURCE FOR A GIVEN PERIOD.

CALLING SEQUENCE
CALL GETSOR(ISOR, IT1IN, IT2IN, IT1OUT, IT2OUT, IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
ISOR - SOURCE NUMBER
IT1IN - BEGINNING OF TIME INTERVAL REQUESTED
IT2IN - END OF TIME INTERVAL REQUESTED

* EXPLICIT OUTPUT *
IT1OUT - BEGINNING OF TIME INTERVAL RETURNED
IT2OUT - END OF TIME INTERVAL RETURNED
IARRAY - ARRAY OF QUANTITIES RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
SUBROUTINE GRADBK

PURPOSE
ASSIGNS PROC BLOCKS WITHOUT RIGHT POINTERS AS GRADUATION BLOCKS FOR EACH COURSE.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE INTRES

PURPOSE
INITIALIZE RESOURCE TABLES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
SUBROUTINE INTSOR

PURPOSE
INITIALIZE SOURCE TABLES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
FUNCTION MAXTKK

PURPOSE
CALCULATES THE DURATION OF THE LONGEST TRACK IN A COURSE

CALLING SEQUENCE
MAXTKK(IPTR)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IPTR - POINTS AT GRADUATION PROC BLOCK

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE MNCREW

PURPOSE
DETERMINES MINIMUM CREW DISTRIBUTION TO BE MAINTAINED
FOR A GIVEN AIR BASE.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
30 APRIL 1975
SUBROUTINE NAME

PURPOSE
RETURN A NAME FOR CALL NUMBER.

CALLING SEQUENCE
CALL NML ( IAPRV , NUMBER , INAME )

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IAPRV - ALPHANUMERIC NAME OF THE TYPE OF NAME BEING LOOKED UP
NUMBER - CODE NUMBER OF NAME BEING LOOKED UP

* EXPLICIT OUTPUT *
INAME - ALPHANUMERIC NAME BEING RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
SUBROUTINE NUMBBER

PURPOSE
RETURNs A CODE NUMBER FOR A NAME.

CALLING SEQUENCE
CALL NUMBER(IAPRV, NUMB, NAME)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IAPRV - ALPHANUMERIC NAME OF THE TYPE OF CODE BEING LOOKED UP
NAME - ALPHANUMERIC NAME BEING LOOKED UP

* EXPLICIT OUTPUT *
NUMB - CODE NUMBER RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
SUBROUTINE PMT

PURPOSE
CREATES PMT DEMANDS AND DETERMINES WHETHER PMT IS FEASIBLE

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
2 MAY 1975
SUBROUTINE PRCOUR

PURPOSE
CONTROLS THE FLOW BETWEEN PROGRAMS THAT INPUT, REFORMAT, EXAMINE, AND OUTPUT BLOCKS THAT DEFINE COURSES.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
CORSIN - READS ALL BLOCKS NEEDED TO DEFINE COURSES.
PPROC - CHANGES PROC AND TASK BLOCK NUMBERS INTO POINTERS IN PROC BLOCKS.
PRTASK - CHANGES RUB NUMBERS INTO POINTERS IN TASK BLOCKS.
PRRUB - CHANGES RUBB NUMBERS INTO POINTERS IN RUB BLOCKS.
PRRUDB - CHANGES RUB AND RUBB NUMBERS INTO POINTER IN RUDB BLOCKS.
GRADBK - FINDS GRADUATION BLOCKS FOR EACH COURSE
TSSYN - TEST THAT THE SYNCHRONIZED PROC BLOCKS FOR A CIRCULAR LIST.
PROCLP - TEST THAT PROC BLOCKS TERMINATE
RUDCLP - TEST RUB AND RUDB COMBINATIONS
SORTLK - IN PROC BLOCKS Sorts LEFT LINKS BY PRIORTY
CORSOT - WRITES ALL BLOCKS NEEDED TO DEFINE COURSE IN STEP3.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE PROCLP

PURPOSE
TEST THAT EACH TRACK IN A COURSE IS SHORTER THAN A
PREDETERMINED MAXIMUM LENGTH.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
SUBROUTINE PRPROC

PURPOSE
SUBSTITUTES POINTERS FOR PROC BLOCK NUMBERS AND TASK NUMBERS;
SUPPLIES RIGHT PROC BLOCK POINTERS IN PROC BLOCKS.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
23 APRIL 1976
SUBROUTINE PRRUB

PURPOSE
SUBSTITUTES POINTERS FOR RUDB NUMBERS IN RUB BLOCKS.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
23 APRIL 1975
SUBROUTINE PRRUDB

PURPOSE

SUBSTITUTES POINTERS FOR RUB AND RUDB NUMBERS IN RUDB BLOCKS.

AUTHOR/PROGRAMMER

JOHN R. MENIG

CALSPAN CORPORATION

23 APRIL 1975
* CMISSION*********** *************** PRTASK ***************
* C*
* C* SUBROUTINE PRTASK
* C*
* C* PURPOSE
* C* SUBSTITUTES POINTERS FOR KUB NUMBERS IN TASK BLOCKS.
* C*
* C* AUTHOR/PROGRAMMER
* C* JOHN R. MEN1G
* C* CALSPAN CORPORATION
* C* 23 APRIL 1975
* C*
SUBROUTINE PRICKS

PURPOSE
PRINTS THE NUMBER OF STUDENTS/COURSE/YEAR

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NAME - FINDS THE ALPHANUMERIC NAME OF COURSES

AUTHOR/PROGRAMMER
JOHN R. MENIC
CALSPLAN CORPORATION
22 MAY 1975
SUBROUTINE PUTRES

PURPOSE
WRITES QUANTITY OF A GIVEN RESOURCE FOR A GIVEN PERIOD

CALLING SEQUENCE
CALL PUTRES(IRES,IT1,IT2,IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IRES       - RESOURCE NUMBER
IT1        - BEGINNING OF INTERVAL
IT2        - END OF INTERVAL

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
29 APRIL 1975
SUBROUTINE PUTSOR

PURPOSE
WRTES QUANTITY OF A GIVEN SOURCE FOR A GIVEN PERIOD.

CALLING SEQUENCE
CALL PUTSOR(ISOR,IT1,IT2,IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
ISOR - SOURCE NUMBER
IT1 - BEGINNING OF INTERVAL
IT2 - END OF INTERVAL

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
29 APRIL 1975
SUBROUTINE RDNAME

PURPOSE
READS NAMES IN STEP 3

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
SUBROUTINE RECOVR

PURPOSE
CREATE COPilot SOURCES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
2 MAY 1975
SUBROUTINE RESRIN

PURPOSE
READ RESOURCES, TEST RESOURCES FOR ERRORS, AND DETERMINE BUCKET SIZES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
25 APRIL 1975
SUBROUTINE RESSOR

PURPOSE

CONTROLS FLOW BETWEEN ROUTINES THAT PROCESS RESOURCES AND SOURCES IN STEP2.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED

GENRES - GENERATES RESOURCES FROM RESOURCE CARDS
GENSOR - GENERATES SOURCES FROM SOURCE CARDS
RESIN - READS RESOURCE CARDS
SOURIN - READS SOURCE CARDS

AUTHOR/PROGRAMMER

JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
**SUBROUTINE RUDBLP**

* PURPOSE
  TEST THAT THE DEPTH OF RUDB AND RUG COMBINATIONS ARE LESS THAN A PREDETERMINED MAXIMUM

* AUTHOR/PROGRAMMER
  JOHN R. MENIG
  CALSPAN CORPORATION
  25 APRIL 1975
SUBROUTINE SORTLK

PURPOSE
SORTS LEFT LINKS BY ASCENDING PRIORITIES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
15 MAY 1975
SUBROUTINE SOURIN

PURPOSE
READS SOURCES, TESTS SOURCES FOR ERRORS, AND DETERMINES BUCKET SIZES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
25 APRIL 1975
MAIN PROGRAM STEP2

PURPOSE
CALLS ROUTINES TO INPUT NAMES, RECONSTRUCT COURSE BLOCKS,
CALCULATE AIR BASE DEMANDS, GENERATE RESOURCES, AND
GENERATE SOURCES.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
FMTNAM - INPUTS NAMES
PRCOUR - RECONSTRUCTS COURSES
ARBASE - CALCULATES AIR BASE DEMANDS
RESSOR - GENERATES RESOURCES AND SOURCES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
6 MAY 1975
SUBROUTINE TSSYN

PURPOSE
TESTS THAT PROC BLOCKS THAT ARE SYNCHRONIZED FORM A CIRCULAR LIST CONTAINING MORE THAN ONE BLOCK BUT LESS THAN A PREDETERMINED MAXIMUM NUMBER OF BLOCKS.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
23 APRIL 1975
SUBROUTINE UPURES

PURPOSE
UPDATES RESOURCE LISTS WHEN CLOCK TIME HAS CHANGED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
SUBROUTINE UPDSOR

PURPOSE
UPDATES SORCE LISTS WHEN CLOCK TIME HAS CHANGED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
Section 2.4
CROSS REFERENCE TABLES FOR ROUTINES AND VARIABLES
USED IN COMMONS
CROSS REFERENCE USAGE CODES

A
ARGUMENT

THE SYMBOL IS A VARIABLE OR FUNCTION NAME WHICH APPEARS IN AN
ARGUMENT LIST OF A CALL, SUBROUTINE, FUNCTION, OR ENTRY STATEMENT.

D
DATA INITIALIZATION

THE SYMBOL IS A VARIABLE WHICH IS INITIALIZED IN A DATA OR TYPE
SPECIFICATION STATEMENT SUCH AS A COMPLEX SPECIFICATION STATEMENT.

F
FETCH A VALUE

THE SYMBOL IS A:
1. VARIABLE WHOSE MOST RECENTLY ASSIGNED VALUE IS ACCESSED
   BUT NOT CHANGED.
2. FUNCTION NAME OR ARGUMENT OF A FUNCTION WHICH APPEARS ON
   THE RIGHT SIDE OF AN EQUAL SIGN IN AN ASSIGNMENT
   STATEMENT OR APPEARS IN AN IF STATEMENT TEST.
3. DUMMY ARGUMENT IN A STATEMENT FUNCTION DEFINITION.

S
STORE A VALUE

THE SYMBOL IS A:
1. VARIABLE WHOSE VALUE IS REPLACED BY ANOTHER VALUE.
2. FUNCTION NAME WHICH APPEARS ON THE LEFT SIDE OF AN EQUAL
   SIGN IN AN ASSIGNMENT STATEMENT.
3. NAME OF A STATEMENT FUNCTION IN THE DEFINITION OF THAT
   FUNCTION.

C
COMMON

THE SYMBOL IS A VARIABLE WHICH APPEARS IN A COMMON STATEMENT OR IS
THE NAME OF A LABELED COMMON BLOCK.

E
EQUIVALENT

THE SYMBOL IS A VARIABLE WHICH APPEARS IN AN EQUIVALENCE STATEMENT.

T
TYPE SPECIFICATION

THE SYMBOL IS A VARIABLE WHICH APPEARS IN A:
1. TYPE SPECIFICATION STATEMENT AND IS NOT INITIALIZED IN
   THAT STATEMENT.
2. DIMENSION OR EXTERNAL STATEMENT.

N
ENTRY POINT

THE SYMBOL IS AN ENTRY POINT DEFINED BY AN ENTRY STATEMENT IN A
SUBROUTINE OR FUNCTION.

X
EXTERNAL REFERENCE

THE SYMBOL IS A SUBROUTINE OR ENTRY NAME WHICH APPEARS IN A CALL
STATEMENT.
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Note: The table above represents a summary of routine reference entries with columns for different entries and rows for various identifiers (e.g., PMT, PRDRC, PRDSR). The columns and rows are not labeled, indicating placeholders for specific data entries.
Section 3.0
TRAM PHASE 3

3.1 Introduction

The purpose of this section is to supplement the data in Technical Memorandum SAT-5, TRAM User's Guide with respect to Phase 3 of TRAM. This Programmer's Guide consists of a description of the data management system used in Phase 3, a listing of the input and output data sets, subroutine description and flow diagrams, cross reference tables and block descriptions.

In addition to the description of the data management system, the reader should note the capability for varying the dimensions of Phase 3 as described in Section 7.

3.1.1 Data Management

Because of the dynamic data flow in the Phase 3 TRAM Program, the standard FORTRAN array and indexing structures are inadequate in terms of core utilization and computational efficiency.

Most of the information used by the program is grouped into blocks of data that are organized using singly linked lists. The formats of the different blocks used are presented in Section 3.7. This method makes it possible to add and delete blocks to the lists without a need for periodic reorganization.

The procblocks, task blocks, resource utilization blocks (RUBs) and resource utilization description blocks (RUDBs) share a common pool of storage in common BLKS and are accessed directly by their addresses. Subroutine BLOCK is used to copy any of these blocks into local storage.

3.2 Description Of Inputs

The inputs consist of a limited number of cards described in SAT-5, TRAM User's Guide and the following data sets:
Training Demand Records

Training demand records (Figure 3.1) are written out by the Phase 2 TRAM program on either tape or disk. They are 6 words long and written without using a format statement.

Before use in Phase 3 of TRAM, the training demand records are sorted on time in decreasing order.

Resource Inventories

The resource inventory records (Figure 3.2) are written out by the Phase 2 TRAM program on either disk or tape. They are 3 words long and written without using a format statement.

The resource records are sorted in decreasing order by time.

Trainee Inventories

The source records (Figure 3.3) describe the trainee inventories. These records are written by the Phase 2 TRAM program on either disk or tape. They are 3 words long and are written without using a format statement.

The source records are sorted in decreasing order by time.

Description Of Training Program

The Training Program (also referred to as courses) is described by means of Procblocs, Task Blocks, Resource Utilization Blocks and Resource Utilization Description Blocks. The detailed formats of these data blocks are given in Section 3.7.

These blocks are read into core from FORTRAN Unit 20 when the CLOCK subroutine is invoked for the first time. The addresses of the first procbloc for each course (the Graduation Block) are stored in array IADPBL in common CBLK. Each procbloc points to the procbloc(s) lying to the left and right of it and to the tasks associated with it. Task blocks point to RUBs and RUBs.
**TRAINING DEMAND RECORD**

<table>
<thead>
<tr>
<th>WORD DESCRIPTION</th>
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<tbody>
<tr>
<td><strong>1</strong> TIME</td>
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<tr>
<td><strong>2</strong> QUANTITY (FLOATING POINT NUMBER OF TRAINEES).</td>
</tr>
<tr>
<td><strong>3</strong> TYPE OF PERSONNEL. 1- PILOTS</td>
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<tr>
<td><strong>4</strong> COURSE NUMBER</td>
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<td><strong>5</strong> DEMAND NUMBER = AIR BASE NUMBER * 1000 + BUCKET NO.</td>
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<td><strong>6</strong> DEMAND TYPE. 1-CCTS BECAUSE OF DELIVERIES.</td>
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Figure 3.2

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<th>RESOURCE RECORD</th>
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</table>

* **WORD** * DESCRIPTION *

* 1  * TIME *
* 2  * RESOURCE NUMBER *
* 3  * QUANTITY *

*******************************************************************************

263
Figure 3.3

***SOURCE RECORD***

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<th>DESCRIPTION</th>
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<tbody>
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<td>TIME</td>
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</tr>
<tr>
<td>SOURCE NUMBER</td>
<td>2</td>
</tr>
<tr>
<td>QUANTITY</td>
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</table>

***SOURCE RECORD***
in turn point to the RUDBs. This linked structure permits quick access (using subroutine BLOCK) to information required for performing the different functions of the program (i.e., Class Transfer Tasks, Resource Utilization Tasks, etc.)

Class blocks, stored in common CLASSB, are created for each new class of students entering a course at the graduation block and for every time that an existing class is split among different tracks. Class blocks are deleted from the list whenever a procblock without a left branch is executed. Subroutine NEWCLS creates class blocks and subroutine REMCLS deletes them.

Predetermined transfer blocks, stored in common PTBC, are created by subroutine FRMPTB when a source allocation task (SCATSA) is executed. The pointer to the first PTB is placed in the class block. After a PTB is used to control a class transfer at a node, it is deleted and the space it used is released by subroutine REMPTB. The pointer in the class block is updated to point to the next PTB.

Look-up and updates of resource and source inventories are done by using subroutines GETRES, PUTRES, GETSOR and PUTSOR. Resource and source inventories are stored on tape or disk. When subroutine clock is called for the first time, the buffers allocated to the inventories are filled with data starting at the simulation clock time and extending as far back as space permits. Every time that the subroutine clock is called, inventory records for times greater than the simulation clock time are written out on tape or disk, and the core thus made available is used to read in resource and source inventories for an earlier time.
3.3 Description Of Outputs

The outputs of the Phase 3 TRAM program consist of:

1. Echo of inputs.
2. Resource inventories remaining after training demands have been satisfied.
3. Trainee (Source) inventories remaining after training demands have been satisfied.
4. Lag records.
5. Source allocation records.
6. Warning and error and normal end messages.

Items 2-5 are described below. Items 1 and 6 are described in detail in SAT-5.

**Resource Inventories**

The output resource inventory records are identical in form to the input resource inventory records (Figure 3.2).

The input inventory minus the output inventory for any given time interval is the amount of the resource consumed during that time to satisfy the training requirements.

**Source Inventories**

The output source inventory records are identical in form to the input source inventory records (Figure 3.3).

The input inventory minus the output inventory for any time interval is the number of trainees from that particular source actually assigned to the training program during that time interval.
Lag Records

The lag records (Figure 3.4) are written out on tape or disk by the Phase 3 TRAM program whenever a class has to be lagged.

Note - Processing in TRAM 3 is done in reverse time order (i.e. last PROCBLOC of a course is done first, first PROCBLOC is done last.) Thus when a class is lagged, the net effect is to force something to occur at an earlier date.
Figure 3.4

```
* LAG RECORD
*
* WORD DESCRIPTION
*
* *****************************************************
* 1 1
* 2 CLASS ADDRESS
* 3 CURRENT CLASS TIME (TIME AT WHICH LAG STARTS).
* 4 COURSE NUMBER
* 5 PROCBLOCK NUMBER
* 6 TASK NUMBER
* 7 0
* 8 0
* 9 DURATION OF CURRENT PROCBLOCK.
* 10 LAG DURATION
* 11 LAG REASON. 1- RESOURCE ALLOCATION FAILURE.
*                  6- SYNCHRONIZATION FAILURE.
*                  7- CORRELATION FAILURE.
* 12 ID. OF SCARCE RESOURCE. (APPLICABLE ONLY IF WORD
*                  11 IS A 1)
* 13 UNIQUE CLASS NUMBER.
* *****************************************************
```
Source Allocation Records

The source allocation records (Figure 3.5) are written out on tape or disk by the Phase 3 TRAM program each time a class of students is matriculated in a course.

A potential discrepancy can arise between the matriculation date established by subroutine SCATSA and the actual matriculation date.

SCATSA assigns classes to sources on the basis of track priorities, allocation proportions and availability of trainees. Once the assignments are made, the classes will follow the established tracks. However, if lags occur due to resource unavailability or synchronization or correlation failure, a class may reach the matriculation block at an earlier time than predicted by SCATSA.

The source allocation records are written when the class reaches the matriculation procblock and the 'GETSOURCE' task is executed.

The large time interval used for trainee inventories should serve to minimize this possible problem.
**SOURCE ALLOCATION RECORD**

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<td>2</td>
<td>CLASS ADDRESS</td>
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<td>3</td>
<td>CURRENT CLASS TIME (NOT INCLUDING DURATION OF PROCBLOCK).</td>
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<td>4</td>
<td>COURSE NUMBER</td>
</tr>
<tr>
<td>5</td>
<td>PROCBLOCK NUMBER.</td>
</tr>
<tr>
<td>6</td>
<td>TASK NUMBER.</td>
</tr>
<tr>
<td>7</td>
<td>SOURCE NUMBER.</td>
</tr>
<tr>
<td>8</td>
<td>NUMBER OF TRAINEES.</td>
</tr>
<tr>
<td>9</td>
<td>DURATION OF CURRENT PROCBLOCK.</td>
</tr>
<tr>
<td>10</td>
<td>GRADUATION DATE.</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>UNIQUE CLASS NUMBER</td>
</tr>
</tbody>
</table>

*Figure 3.5*
3.4 Subprogram Descriptions

This section contains the descriptions of the individual subroutines that comprise Phase 3 of the TRAM program. The description for each subprogram consists of a statement of the purpose of the routine, the calling sequence, a description of its parameters (if any), the method used, a list of the subprograms required and the name of the programmer. A high level flowchart, which shows the logical decision points and the processing accomplished, is also included for most subprograms.
* PURPOSE
*  UTILITY ROUTINE FOR STORING TRAINING DEMAND INFORMATION
*  IN A LINKED LIST.
* CALLING SEQUENCE
* CALL ADDTDQ(NCOURSE, NUMT, IDATE, IDGRAD, ITTYPE, IDTYPE)
* DESCRIPTION OF PARAMETERS
* NCOURSE  NUMBER OF COURSE TO WHICH THESE TRAINEES
* SHOULD BE SENT.
* NUMT  NUMBER OF TRAINEES IN THIS TRAINING
* DEMAND RECORD.
* IDATE  TRAINING DEMAND DATE.
* IDGRAD  GRADUATION ID. GENERATED BY STEP 2. NOT USED.
* ITTYPE  TRAINEE TYPE. 1.- PILOTS 2.- COPILOTS 3.- OSO 4.- DSO
* IDTYPE  TRAINING DEMAND TYPE. 1.- CCTS-DELIVERY. 2.- CCTS-ATTRITION. 3.- PMT
* PROGRAMMER
* GEORGE GAIDASZ
* CALSPAN
* MAY 1975

******************************************************************************
******************************************************************************
ADDTDQ

START

GET POINTERS TO FIRST AND LAST ELEMENTS OF TRAINING DEMAND QUEUE

GET ADDRESS OF FREE SPACE

COPY TRAINING DEMAND RECORD

IS THIS THE FIRST ENTRY

YES

UPDATE POINTERS TO START AND END OF LIST

NO

UPDATE LINK AND POINTER TO END OF LIST

END

273
**PURPOSE**

TO SELECT FROM A SET OF EQUAL PRIORITY TRACKS THE NUMBER OF TRAINEES THAT HAVE NOT BEEN ALLOCATED YET.

**CALLING SEQUENCE**

CALL ALLOCA(N, LIST, ICURRT, NUMSTD, NASGND)

**DESCRIPTION OF PARAMETERS**

**INPUT**

- **N**
  NUMBER OF ELEMENTS IN LIST.
- **LIST()**
  POINTERS TO TRACKS OF EQUAL PRIORITY TO WHICH WE WISH TO ASSIGN THIS CLASS.
- **ICURRT**
  CURRENT SIMULATION TIME.
- **NUMSTD**
  NUMBER OF STUDENTS IN THE CLASS BEING PROCESSED.

**I / O**

- **NASGND**
  NUMBER OF STUDENTS ALLOCATED SO FAR.

**SUBROUTINES USED**

ALLOC

**PROGRAMMER**

G. GAIDASZ
CALSPAN
AUG 1975
ALLOCA

START

LOOP ON SELECTED TRACKS

HAVE ALL TRACKS BEEN DONE?

YES

INDICATE ALLOCATION FAILURE

END

NO

TRY TO ALLOCATE ALL UNALLOCATED STUDENTS IN THE CLASS

ALLOC

UPDATE NUMBER OF STUDENTS ACTUALLY ALLOCATED

HAVE ALL STUDENTS BEEN ALLOCATED?

NO

YES

END
BEGIN ALLOC

PURPOSE
ALLOCATION MINIMUM OF DESIRED AND AVAILABLE NUMBER OF
STUDENTS AT A GIVEN SOURCE AT A SPECIFIC PERIOD IN TIME.

CALLING SEQUENCE
CALL ALLOC(NSORCE, IGSTME, NSTUDS, NSTUDA)

DESCRIPTION OF PARAMETERS

* INPUT *

NSORCE NUMBER OF SOURCE
IGSTME TIME AT WHICH SOURCE IS REQUIRED
NSTUDS NUMBER OF STUDENTS WE WOULD LIKE TO
MATRICULATE

* OUTPUT *

NSTUDA NUMBER OF STUDENTS ACTUALLY ASSIGNED TO SOURCE

SUBROUTINES USED
GETSOR
PUTSOR

REMARKS
A SINGLE ELEMENT OF THE SOURCE INVENTORY IS LOOKED UP.
THE CELL SIZE (TIME PERIOD) FOR SOURCE INVENTORIES IS
LARGE COMPARED TO COURSE DURATION, SO THAT A PROXIMITY
SEARCH WOULD BE INAPPROPRIATE.

PROGRAMMER
G. GAIDASZ
CALSPAN
AUG 1975

END ALLOC
ALLOC

START

GET SOURCE INVENTORY

ANY ERRORS DETECTED?

ERROR

ENOUGH SOURCE AVAILABLE TO SATISFY DEMAND?

ALLOCATE DESIRED QUANTITY

ALLOCATE QUANTITY AVAILABLE

SET SOURCE INVENTORY TO ZERO

PUT SOURCE INVENTORY

END
**ALLOCD**

**PURPOSE**
To select from a set of equal priority tracks, the number of trainees specified by the transfer proportions.

**CALLING SEQUENCE**
```
call allocd(n,list,icurrt,numstd,sumpct,nasgnd)
```

**DESCRIPTION OF PARAMETERS**

* **INPUT** *

  - `N`
    - Number of elements in list.
  - `LIST()`
    - Pointers to tracks of equal priority to which we wish to assign this class.
  - `ICURRT`
    - Current simulation time.
  - `NUMSTD`
    - Number of students in the class being processed.
  - `SUMPCT`
    - Summation of percentages — used to normalize.
  - `NASGND`

* **I/O** *

  - `NASGND`
    - Number of students allocated to sources.

**SUBROUTINES USED**
```
alloc
```

**PROGRAMMER**
G. GAIDASZ
CALSPAN
AUG 1975
ALLOCD

START

LOOP ON SELECTED TRACKS

HAVE ALL TRACKS BEEN DONE?

YES → INDICATE ALLOCATION FAILURE → END

NO → COMPUTE DESIRED ALLOCATION FOR THIS TRACK FROM PROCBLOC PROPORTION SPECS

ALLOC

UPDATE NUMBER OF STUDENTS ACTUALLY ALLOCATED

HAVE ALL STUDENTS BEEN ALLOCATED?

NO → END

YES → END

279
**ASCLS**

**PURPOSE**
CREATE A LIST OF ALL CLASSES WITH THE SAME GRADUATION ID NUMBER WAITING TO ENTER A SPECIFIED PROCBLOCK.
LIST CONTAINS POINTERS TO ARRAYS OF CURRENT CLASSES. NOT CLASS ADDRESSES.

**CALLING SEQUENCE**

CALL ASCLS(IPROCB,IDGRAD,NCLS,IACLS)

**DESCRIPTION OF PARAMETERS**

* **INPUT** *

IPROCB       ADDRESS OF PROCBLOCK
IDGRAD       CREW NUMBER (GRADUATION ID).

* **IMPLICIT INPUT** *

COMMON COLS

* **OUTPUT** *

NCLS       NO. OF CLASSES FOUND THAT MATCH THE PROCBLOCK NUMBER AND THE GRADUATION ID.
IACLS()      LIST OF POINTERS TO CLASSES IN COMMON CCLS.

**PROGRAMMER**

G. GAIDASZ
CALSPAN
MAY 1975
ASCLS

START

INITIALIZE LIST OF CLASSES

LOOP ON CURRENT CLASSES

ARE ALL CLASSES DONE?

YES END

NO

DOES PROCBLOC MATCH?

YES

NO

DOES CREW ID MATCH?

YES

UPDATE LIST OF CLASSES WAITING TO ENTER A SPECIFIED PROCBLOC, AND HAVING SPECIFIC CREW #

NO
CC************************ ASCLSS **************************************************
CC* PURPOSE
CC* CREATE A LIST OF ALL CLASSES WAITING TO ENTER A SPECIFIED
CC* PROCBLOCK.
CC* LIST CONTAINS POINTERS TO ARRAYS OF CURRENT CLASSES.
CC* NOT CLASS ADDRESSES.
CC*
CC* CALLING SEQUENCE
CC* CALL ASCLSS(IPROCB,NCLS,IACLs)
CC*
CC* DESCRIPTION OF PARAMETERS
CC* * INPUT *
CC* IPROCB ADDRESS OF PROCBLOCK
CC* * IMPLICIT INPUT *
CC* COMMON CCLS
CC* * OUTPUT *
CC* NCLS NUMBER OF CLASSES ASSOCIATED WITH PROCBLOCK
CC* AT IPROCB
CC* IACLs() LIST OF CLASSES ASSOCIATED WITH PROCBLOCK
CC* AT IPROCB
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC*************************************************
ASCLSS

START

INITIALIZE LIST OF CLASSES

LOOP ON CURRENT CLASSES

ARE ALL CLASSES DONE?

YES END

NO

DOES PROCBLOC MATCH?

YES UPDATE LIST OF CLASSES WAITING TO ENTER A SPECIFIED PROCBLOC

NO
SUBROUTINE BLOCK

PURPOSE
RETURNS THE CONTENTS OF A BLOCK

CALLING SEQUENCE
CALL BLOCK(IADDR, IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IADDR - POINTS AT BLOCK WHOSE CONTENTS IS DESIRED.

* EXPLICIT OUTPUT *
IARRAY - CONTENTS OF BLOCK ARE PLACED IN THIS ARRAY.

AUTHOR/PROGRAMMER
JOHN R. MENTG
CALSPAN CORPORATION
24 APRIL 1975
C***************************************** BLKNAM **********************************
C* BLOCK DATA
C* PURPOSE
C* INITIALIZES VARIABLE NEEDED WHEN INPUTTING NAMES.
C* AUTHOR/PROGRAMMER
C* JOHN R. MENIG
C* CALSPAN CORPORATION
C* 22 APRIL 1975
SUBROUTINE BLKIN

PURPOSE
READS THE BLOCKS NEEDED TO DEFINE COURSES.

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
24 APRIL 1975
BLKIN

READ COURSE PROC, TASK, RUB AND RUDB BLOCKS

RETURN
PURPOSE

TO CALCULATE THE QUANTITY OF RESOURCE REQUIRED BY A CLASS DOING A TASK AS A FUNCTION OF TIME.

CALLING SEQUENCE

CALL CALQ(NSTUDS,NRUTF,NRUGF,IQTYU,IQTYP,NBI,
1       NBO,IQTY,ITOTQ)

DESCRIPTION OF PARAMETERS

* INPUT *

NSTUDS NUMBER OF STUDENTS IN THE CLASS
NRUTF NUMBER OF THE RESOURCE UTILIZATION TIMING FUNCTION.  2- ARBITRARY
3- UNIFORM
NRUGF NUMBER OF THE RESOURCE UTILIZATION GROUPING FUNCTION.  1- CLASS
2- QTY OF PRIMARY CONSUMED.
3- INDIVIDUAL.
IQTYU UNITS OF CONSUMPTION PER UNIT USER.
IQTYP QUANTITY OF PRIMARY CONSUMED
NBI NUMBER OF BUCKETS FROM WHICH RESOURCE CAN BE EXTRACTED.

* OUTPUT *

NBO NUMBER OF BUCKETS OVER WHICH RESOURCE CONSUMPTION WILL BE SPREAD.
IQTY() ARRAY CONTAINING THE AMOUNTS OF THE CONTEMPLATED RESOURCE CONSUMPTION. (IN REVERSED TIME SEQUENCE).
ITOTQ TOTAL QUANTITY OF PLANNED RESOURCE UTILIZATION.

PROGRAMMER

GEORGE GAIDASZ
CALSPAN
MAY 1975

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CALQ

START

INITIALIZATION

TQT. QUANTITY = UNIT QTY
QUANTITY OF PRIMARY

GROUP

WHAT IS THE GROUPING FUNCTION?

CLASS

TQT. QUANTITY = UNIT QTY

IND

TQT. QUANTITY = UNIT QTY
# OF STUDENTS

WHAT IS THE TIMING FUNCTION?

ARB

SET FIRST BUCKET TO TOTAL QUANTITY

UNIFORM

COMPUTE AVERAGE QUANTITY AND ASSIGN TO EACH BUCKET

SPREAD ODD QUANTITIES OVER BUCKETS

END
PURPOSE
TO PRINT A CLASS BLOCK

PROGRAMMER

CALLING SEQUENCE

CALL CBLOCK(IADRS,IBLOCK)

DESCRIPTION OF PARAMETERS

IADRS   ADDRESS OF CLASS BLOCK
IBLOCK  FIRST WORD OF CLASS BLOCK

G. GAIDASZ
CALSPAN
MAY 1975
CBLOCK

START

PRINT CLASS BLOCK

END
CC****************************** CLASCG *******************************
CC*
CC* PURPOSE
CC* TO FORM CLASSES FOR CREWS AND EXTRAS.
CC* (THIS ROUTINE IS A COMPANION TO GRADF AND ASSUMES THAT
CC* CREWS CAN BE FORMED WITHOUT REGARD TO THE DESTINATION
CC* AIR BASE OF THE INDIVIDUAL CREW MEMBERS).
CC*
CC*
CC* CALLING SEQUENCE
CC*
CC* CALL CLASCG
CC*
CC*
CC* REMARKS
CC* THIS ROUTINE LOOPS THRU ALL THE COURSES IN EACH COURSE GROUP
CC* AND FINDS THE SMALLEST DEMAND.
CC* IF THE DEMAND IS SUFFICIENT THEN CREW GROUPS ARE FORMED.
CC* THE SIZE OF THE CREW IS EQUAL TO THE INTEGERIZED VALUE OF
CC* THE SMALLEST DEMAND. EXTRAS CLASSES ARE FORMED FROM THE
CC* REMAINING DEMANDS.
CC* IF THE SMALLEST DEMAND IS LESS THAN ONE THEN THE PROGRAM
CC* EITHER CREATES EXTRAS CLASSES (IOPTCG EQ 0) OR SAVES THE
CC* DEMANDS FOR THE NEXT GRADUATION.
CC*
CC* SUBROUTINES USED
CC* MLTCLS
CC*
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC****************************** CLASCG *******************************
START

LOOP ON COURSE GROUPS

ARE ALL COURSE GROUPS DONE?

NO

LOOP ON COURSES WITHIN GROUP

ARE ALL COURSES DONE?

NO

SAVE SIZE OF SMALLEST CLASS IN THE COURSE GROUP

YES

WAIT

WHAT IS USER OPTION? FORM EXTRAS OR WAIT

FORM EXTRAS

NO

CAN ANY CREWS BE FORMED?

YES

FORM CLASSES FOR COMPLETE CREWS

FORM CLASSES FOR EXTRAS

END
SUBROUTINE CLOCK

PURPOSE
UPDATES CLOCK TIME AND UPDATES SOURCE AND RESOURCE TABLES

CALLING SEQUENCE
CALL CLOCK(ITIME)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
ITIME - TIME TO BE ASSIGNED TO CLOCK

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
RDNAME - INPUTS NAME TABLES
BLKIN - INPUTS SOURCES
INTRES - Initializes RESOURCE TABLES
INTSOK - Initializes SOURCE TABLES
UPDRES - UPDATES RESOURCE TABLES
UPDSOR - UPDATES SOURCE TABLES

AUTHOR/PROGRAMMER
JOHN R. MENIC
CALSPAN CORPORATION
28 APRIL 1975
CC************************************************************************** CLSDMP**************************************************************************

CC* PURPOSE TO PRINT A DUMP OF THE CLASS STORAGE.
CC* CALLING SEQUENCE
CC* CALL CLSDMP(IADRS)
CC* DESCRIPTION OF PARAMETERS
CC* IADRS ADDRESS OF CLASS AT WHICH TROUBLE OCCURRED.
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* MAY 1975

CC**************************************************************************
CLSDMP

START

PRINT A DUMP OF THE CLASS STORAGE

END
**PURPOSE**

To correlate the execution of a number of Procblocs.

**CALLING SEQUENCE**

CALL CORR(MINTME)

**DESCRIPTION OF PARAMETERS**

* OUTPUT *

MINTME: Time to which classes will be lagged if correlation is impossible at this time.

* IMPLICIT OUTPUT *

IEXTRA: Is set to 1 if extra tasks are to be executed.

IFAIL: Is set to 1 if correlation cannot be accomplished.

NOCLS: Number of classes to be synchronized in execution or lagged.

INDXCI: List of classes to be synchronized in execution or lagged.

**REMARKS**

Correlation means that some students are present in each one of the courses linked by the correlation specification. If correlation cannot be achieved, the classes are lagged up to a maximum time MAXLAG. Once a class has been lagged for MAXLAG time, it will execute the extras tasks if it cannot be correlated immediately.

**SUBROUTINES USED**

CLSDMP
PBLOCK
ASCLS
SYNCT
BLOCK
ASCLSS

**PROGRAMMER**

G. Gaidasz

**CALSPAN**

MAY 1975
START

INITIALIZATION
SAVE ID AND
SCHEDULED
EXECUTION TIME
OF FIRST CLASS

BRING IN
PROCBLIC
ASSOCIATED WITH
FIRST CLASS
SAVE PROCBLIC ID
SAVE # OF STUDENTS

IS THERE
A CORRELATION
LINK?

YES

BRING CORRELATED
PROCBLIC
INTO LOCAL
STORAGE

GET LIST OF
CLASSES WITH
THE ID. ID
OF FIRST CLASS,
ASSOC. WITH
THIS PROCBLIC

ERROR

# OF
ASSOCIATED
CLASSES

> 1

GET LIST OF
ANY CLASSES
ASSOCIATED WITH
CURRENT
PROCBLIC

# OF
ASSOCIATED
CLASSES

+ 0

UPDATE #
OF STUDENTS
IN COURSE
LIST

ERROR

+ 1

SAVE # OF
STUDENTS IN
COURSE

SAVE MINIMUM
SCHEDULED
EXECUTION TIME

DID CORRELATION
LINK POINT
TO FIRST
PROCBLIC?

YES

ARE
SOME STUDENTS
IN EACH OF
THE COURSES?

NO

IS MIN.
TIME EQUAL
TO CURRENT
TIME?

NO

SYNC

END

YES

LOOP ON
COURSES AND
MARK AS EXTRA
THOSE WHOSE
CURRENT LAG
TIME EXCEEDS
THE LIMIT

LAG REMAINING
CLASSES TO
NEXT SCHEDULED
EXECUTION TIME

END

LAG REMAINING
CLASSES TO
NEXT SCHEDULED
EXECUTION TIME
PURPOSE
DETERMINE HOW LONG A TIME LAG IS NECESSARY TO REACH A PERIOD IN TIME WHEN A SPECIFIED RESOURCE IS AVAILABLE.

CALLING SEQUENCE
CALL DETLAG(IRES,NEEDQ,LAGTME)

DESCRIPTION OF PARAMETERS
IRES NUMBER OF THE RESOURCE FOR WHICH THE DEMAND COULD NOT BE SATISFIED AT THIS TIME
NEEDQ QUANTITY OF RESOURCE NEEDED.
LAGTME TIME TO WHICH CLASS(ES) SHOULD BE LAGGED.

REMARKS
WHEN A DEMAND FOR RESOURCES CAN NOT BE SATISFIED DURING THE ACTIVE TIME INTERVAL, THREE PROCESSING OPTIONS ARE AVAILABLE:
1. STOP THE RUN.
2. INDICATE THE SHORTAGE AND CONTINUE.
3. LAG THE CLASS TO A TIME PERIOD WHEN THE RESOURCES NEEDED ARE AVAILABLE.
THIS ROUTINE TRIES TO DETERMINE THE LATEST TIME WHEN A RESOURCE IS AVAILABLE.
DETLAG BRINGS IN A FIXED NUMBER OF BUCKETS OF THE INVENTORY OF THE SCARCE RESOURCE INTO LOCAL STORAGE. THIS INVENTORY IS EXAMINED IN GROUPS OF BUCKETS CORRESPONDING TO THE PROCBLOC INTERVAL. IF ANY PERIOD WITHIN THE TIME INTERVAL CONSIDERED HAS ENOUGH RESOURCE AVAILABLE TO SATISFY THE DEMAND, THE CLASS (OR CLASSES) ARE LAGGED TO THE END-TIME OF THAT PERIOD. OTHERWISE THE CLASSES ARE LAGGED TO THE START OF THE ‘LOOK-BACK’ PERIOD.
NOTES.— THE LOOK-BACK IS DONE FOR ONE CLASS-RESOURCE COMBINATION, WITHOUT MEMORY OF OTHER RESOURCE USERS.

SUBROUTINES USED
GETRES

PROGRAMMER
G. GAIDASZ
CALSPAN
AUG 1975
START

COMPUTE TIME 'N' RESOURCE BUCKETS FROM NOW

BRING IN RESOURCE INVENTORY FOR N BUCKETS

CALCULATE LIMITS OF POSSIBLE INTERVALS

LOOP OVER INTERVALS

ARE ALL INTERVALS DONE?

YES

SET LAG TIME TO START OF PERIOD

END

NO

ADD UP QUANTITY AVAILABLE OVER INTERVAL

ENOUGH AVAILABLE TO SATISFY DEMAND?

NO

YES

SET LAG TIME TO END OF INTERVAL

END
**PURPOSE**

TRANSFER A CLASS FROM ONE PROCBLOC TO THE NEXT PROCBLOC.

**CALLING SEQUENCE**

CALL DTRNSF

**REMARKS**

WHEN A CLASS ENTERS DTRNSF IT MEANS THAT ALL TASKS FOR
THE ACTIVE PROCBLOC HAVE BEEN SUCCESSFULLY COMPLETED.
THE CLASS PRIORITY IS RESTORED TO EQUAL THE COURSE
PRIORITY, AND THE NEXT-BREAK TIME IS UPDATED IF APPROPRIATE.

IF THE PROCBLOC IN WHICH THE CLASS IS LOCATED HAS ONLY
ONE LEFT BRANCH THEN THE CLASS PARAMETERS ARE UPDATED IN
PLACE.

IF THE PROCBLOC HAS NO BRANCHES, THEN THE CLASSBLOCK IS
REMOVED FROM STORAGE BY ROUTINE REMCLS

IF THE PROCBLOC HAS MORE THAN ONE BRANCH THEN SUBROUTINE
SPLIT IS INVOKED TO EFFECT THE TRANSFER.

**SUBROUTINES USED**

- BLOCK
- PBLock
- SPLIT
- PUTCLS
- CBLOCK
- REMCLS

**PROGRAMMER**

GEORGE GAIADASZ
CALSPAN
MAY 1975

---

UliIIix:

U******************************* DTRNSF ********************************

PURPOSE

TRANSFER A CLASS FROM ONE PROCBLOC TO THE NEXT PROCBLOC.

CALLING SEQUENCE

CALL DTRNSF

REMARKS

WHEN A CLASS ENTERS DTRNSF IT MEANS THAT ALL TASKS FOR
THE ACTIVE PROCBLOC HAVE BEEN SUCCESSFULLY COMPLETED.
THE CLASS PRIORITY IS RESTORED TO EQUAL THE COURSE
PRIORITY, AND THE NEXT-BREAK TIME IS UPDATED IF APPROPRIATE.

IF THE PROCBLOC IN WHICH THE CLASS IS LOCATED HAS ONLY
ONE LEFT BRANCH THEN THE CLASS PARAMETERS ARE UPDATED IN
PLACE.

IF THE PROCBLOC HAS NO BRANCHES, THEN THE CLASSBLOCK IS
REMOVED FROM STORAGE BY ROUTINE REMCLS

IF THE PROCBLOC HAS MORE THAN ONE BRANCH THEN SUBROUTINE
SPLIT IS INVOKED TO EFFECT THE TRANSFER.

SUBROUTINES USED

- BLOCK
- PBLock
- SPLIT
- PUTCLS
- CBLOCK
- REMCLS

PROGRAMMER

GEORGE GAIADASZ
CALSPAN
MAY 1975
UPDATE PROBLOC ADRS AND EXECUTION TIME IN CLASS BLOCK

HOW MANY LEFT BRANCHES DOES ASSOCIATED PROBLOC HAVE?

1

REMOVE CLASS BLOCK FROM PROCESSING

0

> 1

SPLIT

START

END
ERROR

PURPOSE
TO PRINT ERROR MESSAGES.

CALLING SEQUENCE
CALL ERROR(N,NAME)

DESCRIPTION OF PARAMETERS

N: ERROR NUMBER
NAME(2): NAME OF SUBROUTINE IN WHICH ERROR OCCURRED.

PROGRAMMER
G. GAIDASZ
CALSPAN
AUG 1975
ERROR

START

PRINT
NUMBERED
ERROR
MESSAGE

END
CC************************************************************************** EXECT**************************************************************************
CC*
CC* PURPOSE
   TO EXECUTE THE TASKS DESCRIBED IN THE TASK LIST.
CC*
CC* CALLING SEQUENCE
CC*   CALL EXECT
CC*
CC* REMARKS
CC*
CC* THIS ROUTINE CONTROLS THE EXECUTIONS OF THE TASKS WITHIN
CC* PROCBLOCKS BY CLASSES. AFTER INITIALIZATION, EXECT INVOKES
CC* SUBROUTINE LSTASK TO ARRANGE THE TASKS IN PROPER ORDER
CC* AND SUPPLY THE NECESSARY PROGRAM SUPPLIED TASKS (I.E. UPDATE, *
CC* DTRNSF). THEN EXECT LOOPS THRU THE TASKS AND INVOKES THE
CC* PROPER ROUTINES TO PERFORM THE TASK. NOTE THAT SYNC AND
CC* CORR CHANGE THE LIST OF TASKS SO THAT THE LOOP MUST BE
CC* RESTARTED.
CC* IF A TASK FAILS THREE OPTIONS ARE AVAILABLE TO THE USER.
CC* THE OPTIONS ARE STOP, IGNORE OR LAG THE CLASSES.
CC*
CC* SUBROUTINES USED
CC* CORR
CC* DTRNSF
CC* RESUSE
CC* INITR
CC* GETCLS
CC* SCATSA
CC* SYNC
CC* PLIST
CC* TBLOCK
CC* LAG
CC* BLOCK
CC* CBLOCK
CC* UPDATE
CC*
CC* PROGRAMMER
CC* GEORGE GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC**************************************************************************
EXECT

START

IFAIL = 0
INITR

IS CLASS ACTIVE?

YES

ARE THERE ANY TASKS TO DO?

NO

END

YES

LOOP ON TASKS

ARE ALL TASKS DONE?

NO

SELECT PROPER MODULE FOR DOING TASK

EXECUTE TASK

RESULT

FAIL

OPTION?

LAG

LAG CLASS(ES)

END

OK

STOP

IGNORE

STOP
PURPOSE
CREATE CLASS BLOCKS FROM THE TRAINING DEMAND INFORMATION
STORED BY 'FORMQ'.

CALLING SEQUENCE
CALL FORMC

REMARKS
THIS ROUTINE EXTRACTS FROM THE TRAINING DEMAND QUEUE
THE RECORDS NECESSARY TO COMPUTE THE GRADUATION
REQUIREMENTS FOR EACH COURSE. THE STORAGE OCCUPIED BY
THE TRAINING DEMANDS IS RETURNED TO FREE SPACE.
SUBROUTINES GRADF AND CLASCG ARE USED TO FORM THE
CLASSES

SUBROUTINES USED
CLASCG
FRETDB
GETTDB
GRADF

PROGRAMMER
GEORGE GAIDASZ
CALSPAN
MAY 1975

308
FORMC

START

LOOP THRU ALL COURSES

ARE ALL COURSES DONE?

SET COUNT OF TRAINING DEMANDS TO ZERO

GET A TRAINING DEMAND REC UPDATE COUNTER

IS QUEUE EMPTY?

IS DEMAND TIME GRADUATION DATE?

FREE DEMAND BLOCK

WERE THERE ANY TRAINING DEMANDS FOR COURSE?

YES

NO

YES

END

CLASCG

YES

NO

GRADF
CC********** FORMQ **********
CC* PURPOSE
CC* READ IN TRAINING-DEMAND RECORDS GENERATED BY TRAM2 FOR
CC* A PERIOD OF TIME TO MEET CURRENT GRADUATION SCHEDULES
CC* FOR ALL COURSES AND FORM INDIVIDUAL TRAINING DEMAND QUEUES
CC* FOR EACH COURSE
CC*
CC* CALLING SEQUENCE
CC* CALL FORMQ
CC*
CC* REMARKS
CC* TRAINING DEMAND RECORDS ARE READ ONLY TO THE TIME OF THE
CC* LATEST GRADUATION AMONG THE COURSES.
CC* THE RECORDS ARE STORED IN A ONE-DIMENSIONAL LINKED LIST.
CC*
CC* SUBROUTINES USED
CC* ADDTDQ
CC*
CC* PROGRAMMER
CC* GEORGE GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC*
START

NORMAL
TRAINING DEMAND FILE STATUS

EOF
END

FIRST TIME

READ A TRAINING DEMAND RECORD — SET STATUS TO NORMAL

YES
IS RECORD TIME > SIMULATION END TIME ?

NO
LOOP ON COURSES

ARE ALL COURSES DONE ?

YES
PLACE DEMAND IN QUEUE FOR COURSE

NO
CALCULATE CURRENT & PREVIOUS GRAD. DATES FOR COURSE

SAVE EARLIEST GRADUATION DATE

READ A TRAINING DEMAND RECORD

END OF FILE ?

NO
SET FILE STATUS TO EOF

YES
END

311
CC****************************** FRETDB ******************************
CC#
CC# PURPOSE
CC# UTILITY ROUTINE FOR FREEING STORAGE NO LONGER USED BY
CC# TRAINING DEMAND RECORDS IN A LINKED LIST.
CC#
CC# CALLING SEQUENCE
CC#
CC# CALL FRETDB(NCORSE)
CC#
CC# DESCRIPTION OF PARAMETERS
CC#
CC# NCORSE NUMBER OF COURSE FOR WHICH THE CORE OCCUPIED
CC# BY THE FIRST TRAINING DEMAND RECORD WILL
CC# BE RETURNED TO FREE SPACE.
CC#
CC# PROGRAMMER
CC# GEORGE GAIDASZ
CC# CALSPAN
CC# MAY 1975
CC#
CC****************************** FRETDB ******************************
FRETDB

START

GET ADDRESS OF FIRST TRAINING DEMAND FOR GIVEN COURSE

MAKE NEXT TRAINING DEMAND THE FIRST

IS THE CURRENT FIRST DEMAND NULL?

RETURN SPACE OF FIRST DEMAND TO FREE STORAGE

UPDATE POINTER TO FREE STORAGE

END

YES

SET ADRS OF LAST TRAINING DEMAND FOR COURSE TO 0

NO
**Purpose**

To create the predetermined transfer blocks for a class.

**Calling Sequence**

CALL FRMPTB(L1,L2)

**Description of Parameters**

* INPUT *

L1 Pointer to first TDB for course.

L2 Pointer to last TDB for course.

**Subroutines Used**

PUTPTB

**Remarks**

Processing in this routine consists of creating a PTB for the PROCBLoc from which SCATSA was called.

This PTB indicates how many students will be going thru each backward branch. The node chains from the track descriptor blocks are followed for each branch, and PTBs are created for each node in the tracks leading to the selected sources.

**Programmer**

G. GAIDASZ

CALSPAN

AUG 1975
START

CREATE A NULL PTB
UPDATE CLASS BLOCK LINK TO PTB

LOOP ON PERTINENT TRACKS

ARE ALL TRACKS DONE?

IS CORRECT PROCLOC ASSOCIATED WITH TRACK?

ARE ANY STUDENTS ASSIGNED TO THIS TRACK?

UPDATE NUMBER OF STUDENTS GOING THRU THIS BRANCH
SAVE PTB ADRS

IS THERE A NEXT NODE?

CREATE A NULL PTB UPDATE PTB LINK

UPDATE NUMBER OF STUDENTS GOING THRU THIS BRANCH
SAVE PTB ADRS

END
**PURPOSE**

TO GENERATE A SET OF TRACK DESCRIPTR BLOCKS FOR EACH COURSE.

**CALLING SEQUENCE**

CALL GENTDB(ISRCE1,IDUMP)

**DESCRIPTION OF PARAMETERS**

* INPUT *

ISRCE1    POINTER TO FIRST SOURCE FOR THIS COURSE.

(NOSRCS POINTS TO THE LAST SOURCE).

IDUMP     DIAGNOSTIC DUMP SWITCH. (1-PRINT DIAGS.)

**SUBROUTINES CALLED**

BLOCK

PBLOCK

**REMARKS**

GENTDB IS CALLED ONCE FOR EACH COURSE. ISRCE1 POINTS TO THE FIRST SOURCE FOR THE COURSE, NOSRCS IN COMMON SORDSC POINTS TO THE LAST SOURCE FOR THE COURSE. THE ROUTINE STARTS AT EACH SOURCE AND USING THE FORWARD POINTERS STEPS THRU THE PROCBLOCKS UNTIL A NODE IS FOUND. (PROCBLCK WITH MORE THAN ONE BACKWARD POINTER). CUMULATIVE TIME OF THE PROCBLOCKS, FROM THE SOURCE TO THE NODE (INCLUSIVE) IS CALCULATED AS ARE THE CUMULATIVE PRIORITIES AND PERCENTAGES (PRESENT ONLY AT NODES).

A DESCRIPTION OF EACH NODE OF EVERY TRACK IS STORED IN THE ARRAYS OF COMMON RLTDBC. EACH TRACK DESCRIPTOR BLOCK POINTS TO THE PRECEEDING NODE OF THE SAME TRACK.

VARIABLE NSRCE POINTS TO THE SOURCE DESCRIPTION IN COMMON BLOCK SORDSC.

NOTE.—TRACK DESCRIPTOR BLOCKS ARE CREATED ONLY FOR COURSES THAT CONTAIN MORE THAN 1 TRACK.

**PROGRAMMER**

G. GAIDASZ

CALSPLAN

AUG 1975
GENTDB

START

LOOP ON SOURCES

ARE ALL SOURCES PROCESSED?

YES

ENO

NO

INITIALIZE TRACK DESCRIPTOR RECORD

BRING IN SOURCE PROCBLOC INTO CORE

IS THIS THE GRADUATION BLOC?

YES

ERROR STOP

NO

HOW MANY FORWARD BRANCHES IN PROCBLOC?

>1

ERROR STOP

= 1

BRING IN NEXT PROCBLOC UPDATE TIME DURATION

HOW MANY BACKWARD POINTERS?

= 0

ERROR STOP

>1

SELECT THE BACKWARD POINTER THAT MATCHES THE PREVIOUS PROCBLOC

COMPLETE TRACK DESCRIPTOR RECORD
CC****************************** GETCLS **************************************
CC*
CC* PURPOSE
CC* TO MOVE A VARIABLE NUMBER OF WORDS FROM A CLASS BLOCK
CC* INTO LOCAL STORAGE
CC*
CC* CALLING SEQUENCE
CC* CALL GETCLS(INDEX,IA,N)
CC*
CC* DESCRIPTION OF PARAMETERS
CC*
CC* * INPUT *
CC* INDEX ADDRESS OF THE CLASS BLOCK
CC* N NUMBER OF WORDS TO BE MOVED TO LOCAL STORAGE
CC*
CC* * OUTPUT *
CC* IA() N WORDS OF CLASS BLOCK
CC*
CC* PROGRAMMER
CC* GEORGE GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC******************************
GETCLS

START

REDUCE ADDRESS OF CLASS BY ONE

LOOP ON NUMBER OF WORDS

ALL DONE?

YES → END

NO → INCREASE ADDRESS OF CLASS BY ONE

COPY ADDRESSED WORD INTO TEMP. STORAGE

319
GETPTB

PURPOSE
TO BRING IN A PREDETERMINED TRANSFER BLOCK INTO LOCAL

CALLING SEQUENCE
CALL GETPTB(IADRS,IA)

DESCRIPTION OF PARAMETERS

* INPUT *
IADRS    ADDRESS OF PTB

* OUTPUT *
IA()     TEN WORDS OF PTB

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
GETPTB

START

DECREMENT
ADRS OF
PTB BY 1

LOOP ON
WORDS OF PTB

END

YES

END

NO

INCREMENT
ADRESS
BY 1

COPY WORD
FROM PTB
INTO TEMP.
STORAGE

321
SUBROUTINE GETRES

PURPOSE
READS QUANTITY OF A GIVEN RESOURCE FOR A GIVEN PERIOD.

CALLING SEQUENCE
CALL GETRES(IRES,IT1IN,IT2IN,IT1OUT,IT2OUT,IARRAY)

DESCRIPTION OF PARAMETERS
* EXPLICIT INPUT *
IRES - RESOURCE NUMBER
IT1IN - BEGINNING OF TIME INTERVAL REQUESTED
IT2IN - END OF TIME INTERVAL REQUESTED

* EXPLICIT OUTPUT *
IT1OUT - BEGINNING OF TIME INTERVAL RETURNED
IT2OUT - END OF TIME INTERVAL RETURNED
IARRAY - ARRAY OF QUANTITIES RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975

C***********************************************************************
PLACE QUANTITY FROM CELL INTO ARRAY TO BE RETURNED

GETRES

CALCULATE THE INTERVAL TO BE RETURNED BASED ON THE INTERVAL REQUESTED AND AMOUNT IN CORE

CYCLE THRU BUCKETS TO BE RETURNED

ALL BUCKETS PROCESSED?

NO

PLACE A QUANTITY OF 0 IN THE ARRAY TO BE RETURNED

YES

RETURN

YES

BUCKET ON LIST?

NO

PLACE QUANTITY FROM CELL INTO ARRAY TO BE RETURNED
SUBROUTINE GETSOR

PURPOSE
READS QUANTITY OF A GIVEN SOURCE FOR A GIVEN PERIOD.

CALLING SEQUENCE
CALL GETSOR(ISOR, IT1IN, IT2IN, IT1OUT, IT2OUT, IARRAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
ISOR - SOURCE NUMBER
IT1IN - BEGINNING OF TIME INTERVAL REQUESTED
IT2IN - END OF TIME INTERVAL REQUESTED

* EXPLICIT OUTPUT *
IT1OUT - BEGINNING OF TIME INTERVAL RETURNED
IT2OUT - END OF TIME INTERVAL RETURNED
IARRAY - ARRAY OF QUANTITIES RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975

C*************************************************************
GETSOR

CALCULATE THE INTERVAL TO BE RETURNED BASED ON THE INTERVAL REQUESTED AND AMOUNT IN CORE

CYCLE THRU BUCKETS TO BE RETURNED

ALL BUCKETS Processed?

NO

PLACE QUANTITY FROM CELL INTO ARRAY TO BE RETURNED

YES

RETURN

NO

YES

BUCKET ON LIST?

NO

PLACE A QUANTITY OF 0 IN THE ARRAY TO BE RETURNED
PURPOSE
UTILITY ROUTINE TO ACCESS TRAINING DEMAND INFORMATION STORED IN A LINKED LIST.

CALLING SEQUENCE
CALL GETTDB(NCORSE,IPOINT,NUMT,IDATE,IDGRAD,ITTYPE,IDTYPE)

DESCRIPTION OF PARAMETERS

* INPUT *
NCORSE COURSE NUMBER FOR WHICH NEXT AVAILABLE TRAINING DEMAND IS REQUIRED.

* OUTPUT *
IPOINT ADDRESS OF NEXT AVAILABLE TRAINING DEMAND RECORD. 0 IF NONE REMAIN.
NUMT NUMBER OF STUDENTS. (FLOATING POINT VALUE)
IDATE DEMAND DATE
IDGRAD GRADUATION ID. (SET TO ZERO IN ADDTDQ)
ITTYPE TRAINEE TYPE (PILOT, COPilot, Oso, Dso)
IDTYPE REASON FOR DEMAND. (CCTS DUE TO DELIVERY, CCTS DUE TO ATTRITION, PMT)

PROGRAMMER
GEORGE GAIDASZ
CALSPAN
MAY 1975
GETTDB

START

IS QUEUE FOR COURSE EMPTY?

YES

SET POINTER TO ZERO

END

NO

SET POINTER TO FIRST TRAINING DEMAND FOR COURSE

EXTRACT TRAINING DEMAND RECORD

END
CC***************************** GRADF *****************************
CC* PURPOSE
CC* TO ACCUMULATE THE TRAINING DEMANDS FOR A COURSE.
CC*
CC* REMARKS
CC* THIS ROUTINE IS USED ONLY WHEN CREWS CAN BE FORMED
CC* WITHOUT REGARD TO THE DESTINATION AIR BASE.
CC*
CC* CALLING SEQUENCE
CC* CALL GRADF(NCOURSE)
CC*
CC* DESCRIPTION OF PARAMETERS
CC*
CC* NCourse NUMBER OF COURSE FOR WHICH TRAINING DEMAND
CC* RECORDS ARE TO BE ACCUMULATED.
CC*
CC*
CC* PROGRAMMER
CC* G. GAIĐASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC*****************************
START

WERE THERE ANY TRAINING DEMANDS FOR THIS COURSE?

NO → END

YES → LOOP ON TRAINING DEMANDS FOR COURSE

ARE ALL TRAINING DEMANDS DONE?

YES → END

NO → ADD UP THE TRAINING DEMANDS

ADD UP THE TRAINING DEMANDS

LOOP ON TRAINING DEMANDS FOR COURSE

ARE ALL TRAINING DEMANDS DONE?

END

START
CC************** INIT **************
CC*  PURPOSE
CC*      1. READ IN EXECUTION AND OUTPUT CONTROL PARAMETERS.
CC*      2. INITIALIZE WORKING STORAGE AND POINTERS.
CC*      3. CREATE TRACK DESCRIPTOR RECORDS
CC*
CC*  CALLING SEQUENCE
CC*       CALL INIT
CC*
CC*  REMARKS
CC*      THE ROUTINE MUST BE PROCESSED BY THE VARY PROGRAM BEFORE
CC*      COMPILATION BECAUSE IT CONTAINS VARIABLES THAT DEFINE THE
CC*      SIZE OF THE ARRAYS.
CC*
CC*  SUBROUTINES USED
CC*       TRACKD
CC*
CC*  PROGRAMMER
CC*      GEORGE GAIDASZ
CC*      CALSPAN
CC*      MAY 1975
CC*
INIT

START

READ IN EXECUTION CONTROL PARAMETERS

READ IN THE OUTPUT CONTROL PARAMETERS

INITIALIZE CLOCK
TRAINING DEMAND FILE STATUS & WORKING VARIABLES

INITIALIZE COURSES
TRAIN-DEMAND QUEUES CLASS BLOCKS

READ IN COURSE GROUPING

INITIALIZE STORAGE FOR PREDETERMINED TRANSFER BLOCKS

TRACKD

END
Purpose

Initialize working storage for tentative resource allocation calculations.

Calling sequence

Call INITR

Programmer

G. Gaidasz

CalSPAN

May 1975
INITIALIZE
LIST OF
ADDRESSES OF
RESOURCES
IN LOCAL
STORAGE

START

END

INITIALIZE
POINTER
TO NEXT
AVAILABLE
SPACE OF LOCAL
STORAGE
SUBROUTINE INTRES

PURPOSE
INITIALIZE RESOURCE TABLES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
READ RESOURCE BUCKET SIZES

CREATE AN AVAILABLE SPACE LIST

CREATE EMPTY LISTS FOR EACH RESOURCE

RETURN
SUBROUTINE INTSOR

PURPOSE
INITIALIZE SOURCE TABLES

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
26 APRIL 1975

C*******************************************
INTSOR

READ SOURCE BUCKET SIZES

CREATE AN AVAILABLE SPACE LIST

CREATE EMPTY LISTS FOR EACH SOURCE

RETURN
PURPOSE
TO DELAY PROCESSING OF A SET OF CLASSES UNTIL A SPECIFIED TIME.

CALLING SEQUENCE
CALL LAG(NOCLS,INDXC,ITIME,ITFNCT,ITASKA,IPBDUR,IDFRES)

DESCRIPTION OF PARAMETERS

NOCLS NUMBER OF CLASSES TO BE LAGGED.
INDXC() LIST OF CLASSES TO BE LAGGED.
ITIME TIME TO WHICH CLASSES WILL BE LAGGED.
ITFNCT FUNCTION OF THE TASK THAT CAUSED THE LAG.
ITASKA ADDRESS OF THE TASK THAT CAUSED THE LAG.
IPBDUR DURATION OF THE PROCBLOC.
IDFRES NUMBER OF THE RESOURCE CAUSING THE LAG.
(0 IF LAG IS DUE TO SYNC OR CORR)

SUBROUTINES USED
BLOCK

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
LAG

START

ARE THERE ANY CLASSES TO LAG?

NO
RETURN

YES

LOOP ON THE LIST OF CLASSES

ARE ALL CLASSES DONE?

YES
RETURN

NO

GET ADDRESSES OF CLASS IN MASS AND LOCAL STORAGE

COMPUTE LAG DURATION

UPDATE CLASS BLOCK

OUTPUT LAG RECORD

339
CC******************************************************************** LSTASK********************************************************************
CC*
CC* PURPOSE
CC* TO CREATE A SEQUENTIAL LIST OF THE TASKS IN A PROCBLOC.
CC* SYNCHRONIZING TASKS ARE PLACED AT THE BEGINNING OF THE
CC* LIST.
CC*
CC* CALLING SEQUENCE
CC* CALL LSTASK
CC*
CC* REMARKS
CC* ONLY 1 OF EACH TYPE OF NON-RESOURCE UTILIZATION TASKS
CC* ARE USED. THE TASKS ARE ARRANGED IN THE FOLLOWING ORDER:
CC* 1. SYNCHRONIZATION OR CORRELATION TASKS.
CC* 2. RESOURCE UTILIZATION TASKS.
CC* 3. UPDATE TASK. (PROVIDED BY PROGRAM).
CC* 4. SOURCE ALLOCATION. (SCATSA)
CC* 5. GRADUATION.
CC* 6. GET SOURCE TASK.
CC* 7. TRANSFER TASK. (PROVIDED BY PROGRAM).
CC*
CC* SUBROUTINES USED
CC* BLOCK
CC* PLIST
CC* PBLOCK
CC* CBLOCK
CC* TBLOCK
CC*
CC* PROGRAMMER
CC* GEORGE GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC********************************************************************
LSTASK

START

BRING PROCBLOC INTO LOCAL STORAGE

INITIALIZE WORKING VARIABLES

LOOP ON TASKS

ARE ALL TASKS DONE?

YES

NO

SAVE TASK IN LIST

IS IT A RESOURCE UTILIZATION TASK?

YES

NO

SAVE TASK BY TYPE IN TEMP. STORAGE (1 PER TYPE)

INSERT TASK AT START OF LIST

INSERT UPDATE TASK AFTER RES. UT. TASKS

INSERT SCATS IF PRESENT

INSERT GRAD TASK IF PRESENT

INSERT SOURCE TASK IF PRESENT

INSERT TRANSFER TASK

END
Cette fonction LSTRAK permet de générer une liste de blocs d'informations sur les étudiants en fonction de leur priorité. Elle est particulièrement utile pour compiler des listes d'étudiants en fonction de leur priorité, en particulier lorsque ces informations sont stockées dans des blocs de données et doivent être traitées de manière optimale.

La fonction LSTRAK est utilisée de la manière suivante :

```
call lstrak(l1, l2, nproc, n, list)
```

où :
- `l1` est le pointeur de l'index du premier bloc de données pour un détourne.
- `l2` est le pointeur de l'index du dernier bloc de données pour un détourne.
- `nproc` est le pointeur de l'adresse du bloc de données pour la classe en cours.
- `n` est le nombre d'éléments dans la liste.
- `list` est le pointeur de la liste de blocs d'informations sur les étudiants.

La fonction est déclarée de la manière suivante :

```
call lstrak(l1, l2, nproc, n, list)
```

Les informations sur les paramètres sont les suivantes :

- **INPUT** :
  - `l1` : pointeur de l'index du premier bloc de données pour un détourne.
  - `l2` : pointeur de l'index du dernier bloc de données pour un détourne.
  - `nproc` : pointeur de l'adresse du bloc de données pour la classe en cours.

- **OUTPUT** :
  - `n` : nombre d'éléments dans la liste.
  - `list` : pointeur de la liste de blocs d'informations sur les étudiants.

La fonction est programmée par G. Gaidasz et est valable pour CALSPAN, datant de août 1975.
LSTRAK

START

INITIALIZE WORKING VARIABLES

LOOP ON ALL TRACKS NOT YET PROCESSED

ARE ALL TRACKS DONE?

GET POINTER TO TRACK FROM SORTED LIST

IS TRACK DESCRIPTOR ASSOCIATED WITH THIS PROCBLOCK?

HAVE ANY TRACK DESCRIPTORS BEEN SELECTED?

SAME PRIORITY?

SAVE INDEX AS STARTING POINT FOR NEXT PRIORITY

SAVE PRIORITY

SAVE TRACK ADDRESS IN LIST

END
CC************************************************************ LSTSRC ***********************************************************
CC* PURPOSE
CC* TO GENERATE A LIST OF ALL THE SOURCES FOR A COURSE.
CC* CALLING SEQUENCE
CC* CALL SRTSRC(IADPB1,IDUMP)
CC* DESCRIPTION OF PARAMETERS
CC* * INPUT *
CC* IADPB1 ADDRESS OF GRADUATION BLOCK FOR COURSE
CC* BEING PROCESSED.
CC* IDUMP DIAGNOSTIC DUMP SWITCH. (1-PRINT DIAGS.)
CC* SUBROUTINES CALLED
CC* BLOCK
CC* PBLOCK
CC* TBLock
CC* WRUB
CC* WRUDB
CC* REMARKS
CC* THIS ROUTINE STARTS AT THE RIGHTMOST (GRADUATION) PROCBLoc
CC* OF A COURSE AND STEPS BACK THRU THE PROCBLocKS (USING THE
CC* BACKWARD POINTERS) UNTIL A PROCBLoc IS REACHED THAT DOES
CC* NOT HAVE ANY BACKWARD POINTERS. THIS PROCBLoc IS ASSUMED
CC* TO BE THE SOURCE BLOCK AND IS CHECKED TO MAKE SURE IT HAS
CC* ONE AND ONLY ONE GETSOURCE TASK ASSOCIATED WITH IT. A
CC* FURTHER CHECK IS THEN MADE TO ASSURE THAT ONLY ONE RUDB
CC* IS DEFINED FOR THE SOURCE AND HAS NO ALTERNATES OR SECONDARY
CC* RUBS. IF ALL CONDITIONS ARE SATISFIED, THE ADDRESSES OF THE
CC* SOURCE PROCBLoc, TASK, RUB AND RUDB AND THE SOURCE NUMBER
CC* ARE SAVED IN ARRAYS IN THE COMMON BLOCK SORDSC.
CC* THIS PROCESS IS REPEATED UNTIL ALL THE SOURCES IN THE
CC* COURSE HAVE BEEN IDENTIFIED.
CC* PROGRAMMER
CC* G.GAIDASZ
CC* CALSPAN
CC* AUG 1975
CC* CC************************************************************
LSTSRC

START

INITIALIZE COUNTERS STORE ADRS OF FIRST PROCBLOC IN WORK ARRAY

HAVE ALL PROC-BLOCKS BEEN PROCESSED?

NO

BRING NEXT PROCBLOC INTO CORE (FROM LIST OF ADDRESSES IN WORK ARRAY)

STORE ADDRESSES OF LEFT BRANCHES IN WORK ARRAY

YES

DOES THIS PROCBLOC HAVE ANY LEFT BRANCHES?

NO

IS THERE 1 AND ONLY 1 'GET SOURCE' TASK IN LIST?

NO

ERROR STOP

YES

SAVE PROC BLOC ADRES TASK ADRS RUB ADRS RUBB ADRS
PURPOSE

FORM MULTIPLE CLASSES FROM THE ACCUMULATED TRAINING DEMANDS ON A COURSE

CALLING SEQUENCE

CALL MLTCLSTOTD,NCORSE,IGRID)

DESCRIPTION OF PARAMETERS

ITOTD NUMBER OF STUDENTS TO BE ASSIGNED TO CLASSES.
NCORSE COURSE NUMBER
IGRID GRADUATION ID. COUNTER.
(IF IGRID=-1, CLASS IS AN EXTRAS CLASS)

SUBROUTINES USED

NEWCLS

PROGRAMMER

GEORGE GAIDASZ
CALSPAN
MAY 1975
ML'TCLS

START

ANY STUDENTS AVAILABLE TO FORM CLASSES?

YES

CALCULATE # OF CLASSES, INTERVAL BETWEEN CLASSES

SET TIME TO SCHEDULED GRADUATION TIME

CALCULATE INTEGER CLASS SIZE

NEWCLS

UPDATE # OF STUDENTS ALREADY ASSIGNED

HAVE ALL STUDENTS BEEN ASSIGNED?

YES

END

NO

CALCULATE GRAD. TIME FOR NEXT CLASS

DOES CALCULATED TIME PRECEDE PREV. GRAD. DATE?

YES

NO

END

347
SUBROUTINE NAME

PURPOSE
RETURN A NAME FOR CODE NUMBER.

CALLING SEQUENCE
CALL NAME(IAPRV, NUMBER, INAME)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IAPRV - ALPHANUMERIC NAME OF THE TYPE OF NAME BEING LOOKED UP
* AB* - AIR BASE NAME
* C* - COURSE NAME
* GF* - GRADUATION FUNCTION NAME
* PB* - PROC BLOCK NAME
* PBN* - PROC BLOCK NUMBER
* R* - RESOURCE NAME
* RUB* - RUB NAME
* RUB* - RUBB NAME
* RUGF* - RESOURCE UTILIZATION FUNCTION NAME
* RUTF* - RESOURCE UTILIZATION TIMING FUNCTION
* S* - SOURCE NAME
* Tb* - TASK BLOCK NAME
* Tf* - TASK FUNCTION NAME

NUMBER - CODE NUMBER OF NAME BEING LOOKED UP

* EXPLICIT OUTPUT *
INAME - ALPHANUMERIC NAME BEING RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
NAME

DETERMINE TYPE OF NAME REQUESTED

DETERMINE NAME USING CODE NUMBER

RETURN
PPS

CC**************************************************************************
CC* PURPOSE
CC* TO NEGATE TEMPORARY UPDATES OF RESOURCE INVENTORIES.
CC* WHEN A PRIMARY IS SATISFIED BUT A SECONDARY CANNOT
CC* BE SATISFIED).
CC*
CC* CALLING SEQUENCE
CC* CALL NEGUSE
CC*
CC* DESCRIPTION OF PARAMETERS
CC* AS DESCRIBED IN SVRUS1 AND SVRUS2
CC*
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* AUG 1975
CC*
CC**************************************************************************
NEGUSE

START

LOOP ON LIST OF RESOURCES USED

ARE ALL RESOURCES PROCESSED?

YES

RESET INDICES

NO

LOOK UP TEMPORARY RESOURCE INVENTORY

ANY ERRORS DETECTED?

YES

STOP

NO

LOOP ON BUCKETS AND ADD RES. USED TO TEMPORARY INVENTORY

END
CC************************************************************************** NEWCLS**************************************************************************
CC*
CC* PURPOSE
CC* TO GENERATE A CLASS BLOCK.
CC*
CC*
CC* CALLING SEQUENCE
CC* CALL NEWCLS(NSTDS,NCORSE,IGDTE,IGRID)
CC*
CC* DESCRIPTION OF PARAMETERS
CC*
CC* NSTDS NUMBER OF STUDENTS IN CLASS.
CC* NCORSE COURSE NUMBER
CC* IGDTE GRADUATION DATE
CC* IGRID GRADUATION ID COUNTER
CC* (IF IGRID=1, CLASS IS AN EXTRAS CLASS)
CC*
CC* SUBROUTINES USED
CC* CLSDMP
CC*
CC* PROGRAMMER
CC* GEORGE GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC**************************************************************************
INITIALIZE POINTER

UPDATE NUMBER OF CLASSES IN SYSTEM

ENTER CLASS DESCRIPTION INTO CLASS BLOCK

UPDATE POINTER

IS THIS THE FIRST CLASS?

NO

UPDATE NUMBER OF CLASSES IN SYSTEM

YES

START

END
SUBROUTINE NUMBER

PURPOSE
RETURNS A CODE NUMBER FOR A NAME.

CALLING SEQUENCE
CALL NUMBER(IAPRV,NUMB,NAME)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
IAPRV - ALPHANUMERIC NAME OF THE TYPE OF CODE BEING LOOKED UP*
'EL' - AIR EASE NAME
'C' - COURSE NAME
'GF' - GRADUATION FUNCTION NAME
'PE' - PROC BLOCK NAME
'PBLKG' - PROC BLOCK NUMBER
'K' - RESOURCE NAME
'RUB' - RUB NAME
'RUDD' - RUBB NAME
'RUGF' - RESOURCE UTILIZATION FUNCTION NAME
'RUTF' - RESOURCE UTILIZATION TIMING FUNCTION
'S' - SOURCE NAME
'BR' - TASK BLOCK NAME
'TF' - TASK SUM FUNCTION NAME
NAME - ALPHANUMERIC NAME BEING LOOKED UP

* EXPLICIT OUTPUT *
NUMB - CODE NUMBER RETURNED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
NUMBER

DETERMINE TYPE OF NUMBER TO BE RETURNED

DETERMINE NUMBER USING NAME

RETURN
PURPOSE
TO PRINT A PROCBLOCK.

CALLING SEQUENCE
CALL PBLLOCK(IADRS,IBLOCK)

DESCRIPTION OF PARAMETERS
IADRS  ADDRESS OF PROCBLOCK
IBLOCK  FIRST WORD OF PROCBLOCK

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
PBLOCK

START

PRINT PROCBLOC

END
PLIST

PURPOSE
TO PRINT THE LIST OF TASKS.

CALLING SEQUENCE
CALL PLIST

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
PLIST

START

PRINT THE LIST OF TASKS

END
**PURPOSE**

SELECT CURRENTLY ACTIVE CLASSES AND SORT IN ORDER BY TIME AND PRIORITY.

**CALLING SEQUENCE**

CALL PREPC

**SUBROUTINES USED**

CLSDMP
SRTCTP

**PROGRAMMER**

GEORGE GAIDASZ
CALSPAN
MAY 1975
PREPC

START

INITIALIZE COUNT OF CURRENT CLASSES

ARE THERE ANY CLASSES?

NO ➔ END

YES ➔ LOOK UP FIRST CLASS

UPDATE TIME OF NEXT BREAK

NO ➔ IS CLASS TIME GREATER THAN NEXT BREAK TIME?

YES ➔ SAVE CLASS DESCRIPTION ESSENTIALS IN SEQUENTIAL ARRAY

GET POINTER TO NEXT CLASS

IS THERE ANOTHER CLASS?

YES ➔ END

NO ➔ HAVE ANY CLASSES BEEN SELECTED?

NO ➔ SET CURRENT TIME TO NEXT BREAK TIME

YES ➔ SOFT SELECTED CLASSES ON TIME AND PRIORITY
CC**************************************** PTBDMP ****************************************
CC* PURPOSE
CC* TO PRINT A DUMP OF THE PREDETERMINED TRANSFER BLOCKS
CC* STORAGE.
CC*
CC* CALLING SEQUENCE
CC* CALL PTBDMP (IADRS)
CC*
CC* DESCRIPTION OF PARAMETERS
CC* IADRS ADDRESS OF BAD PTB
CC*
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC*****************************************
PRINT DUMP OF PREDETERMINED TRANSFER BLOCK STORAGE
PURPOSE
TO REPLACE THE CONTENT OF A CLASS BLOCK IN LINKED STORAGE.

CALLING SEQUENCE
CALL PUTCLS(INDEX,IA,N)

DESCRIPTION OF PARAMETERS
INDEX: ADDRESS OF CLASS BLOCK IN MASS STORAGE.
IA(): LOCAL STORAGE FOR CLASS BLOCK.
N: NUMBER OF WORDS IN PROCBLOC TO BE WRITTEN IN MASS STORAGE.

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
PUTCLS

START

REDUCE ADDRESS OF CLASS BY ONE

LOOP ON NUMBER OF WORDS

ALL DONE?

YES

END

NO

INCREASE ADDRESS OF CLASS BY ONE

COPY WORD INTO CLASS BLOCK

END
PURPOSE:

TO CREATE A PREDETERMINED TRANSFER BLOCK.

CALLING SEQUENCE

CALL PUTPTB(IPROP,NXT,IBLKN)

DESCRIPTION OF PARAMETERS

* INPUT *

IPROP()  NUMBER OF STUDENTS TO BE SENT ALONG EACH ONE

OF THE 5 BRANCHES OF THE PROCBLOCK.

NXT()  ADDRESS OF THE NEXT PTB ALONG THE TRACK.

* OUTPUT *

IBLKN  ADDRESS WHERE PTB WAS STORED.

PROGRAMMER

G. GAIDASZ

CALSPAN

MAY 1975
PUTPTB

START

IS THIS THE FIRST BLOCK?

YES

SET I1 TO ADRS OF NEXT FREE ELEMENT

SET ADRS OF NEXT FREE ELEMENT TO ADRS IN LINK OF FIRST ELEMENT

ERASE LINK IN FIRST ELEMENT

SET POINTER TO FIRST PTB TO I1

SET POINTER TO LAST PTB TO I1

COPY INFORMATION INTO PTB

RETURN ADRRESS OF PTB

END

NO

SET I1 TO ADRS OF NEXT FREE ELEMENT

SET ADRS OF NEXT FREE ELEMENT TO ADRS IN LINK OF CHOSEN BLOCK

UPDATE LINK IN PREVIOUS LAST PTB

ERASE LINK IN NEW PTB

UPDATE POINTER TO LAST PTB
SUBROUTINE PUTCOR

PURPOSE
WRITES QUANTITY OF A GIVEN SOURCE FOR A GIVEN PERIOD.

CALLING SEQUENCE
CALL PUTCOR(ISOR,IT1,IT2,IAPPAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *
ISOR  - SOURCE NUMBER
IT1   - BEGINNING OF INTERVAL
IT2   - END OF INTERVAL

AUTHOR/PROGRAMMER
JOHN K. MENIG
CALSPAN CORPORATION
29 APRIL 1975
PUTSOR

IS SOURCE IN CORE FOR TIME PERIOD REQUESTED?

NO

GIVE ERROR MESSAGE

STOP 3000

YES

CYCLE THRU ALL BUCKETS IN THIS TIME INTERVAL

ALL BUCKETS PROCESSED?

YES

RETURN

NO

QUANTITY TO BE STORED 0?

YES

IS THERE A CELL FOR THIS BUCKET IN SOURCE LIST?

NO

CHANGE QUANTITY STORED IN CELL

YES

IS THERE A CELL FOR THIS BUCKET IN SOURCE LIST?

NO

INSERT A CELL FOR THIS BUCKET AND QUANTITY IN LIST

1

1
SUBROUTINE PUTRES

PURPOSE

WRITES QUANTITY OF A GIVEN RESOURCE FOR A GIVEN PERIOD

CALLING SEQUENCE

CALL PUTRES(IRES,IT1,IT2,IAKPAY)

DESCRIPTION OF PARAMETERS

* EXPLICIT INPUT *

IRES  - RESOURCE NUMBER

IT1   - BEGINNING OF INTERVAL

IT2   - END OF INTERVAL

AUTHOR/PROGRAMMER

JOHN R. MENIC

CALSPAN CORPORATION

29 APRIL 1975
PUTRES

Is resource in core for time period requested?

NO

Give error message

STOP 3000

YES

Cycle thru all buckets in this time interval

All buckets processed?

YES

RETURN

NO

Is there a cell for this bucket in resource list?

YES

Delete cell

NO

Change quantity stored in cell

Is there a cell for this bucket in resource list?

YES

Insert a cell for this bucket and quantity in list

NO

YES

NO

1

1

1

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SUBROUTINE RDNAME

PURPOSE
READS NAMES IN STEP3

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
22 APRIL 1975
* PURPOSE
  TO FREE THE STORAGE SPACE OCCUPIED BY A CLASS BLOCK.

* CALLING SEQUENCE
  CALL REMCLS(IADRS)

* DESCRIPTION OF PARAMETERS
  IADRS ADDRESS OF CLASS TO BE REMOVED FROM STORAGE.

* SUBROUTINES USED
  CLSDMP

* PROGRAMMER
  G. Gaidasz
  CALSPAN
  MAY 1975
P PURPOSE
TO FREE THE STORAGE OCCUPIED BY A PREDETERMINED TRANSFER BLOCK.

CALLING SEQUENCE
CALL REMPTB(IADRS)

DESCRIPTION OF PARAMETERS
IADRS ADDRESS OF PTB TO BE REMOVED FROM STORAGE.

SUBROUTINES USED
PTBDMP

PROGRAMMER
G. GAIDASZ

CALSPAN
MAY 1975
REMPTB

START

UPDATE POINTER TO FIRST PTB

IS IT THE FIRST BLOCK?

YES

LINK TO FREE SPACE

NO

UPDATE POINTER TO FREE SPACE

SET 11 TO ADRS OF FIRST PTB

IS THE NEXT PTB THE ONE WE ARE LOOKING FOR?

YES

UPDATE LINK

NO

IS THIS THE END OF THE LIST?

YES

ERROR

NO

SET 11 TO ADRS OF NEXT PTB

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

NO

SET POINTER TO LAST PTB TO 11

YES

UPDATE PTB COUNT

END

1

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?

YES

UPDATE PTB COUNT

END

1

UPDATE LINK

REMOVE PTB

RETURN CORE TO FREE SPACE

WAS IT THE LAST PTB?
PURPOSE
BRING RESOURCE INVENTORY INTO LOCAL STORAGE.

CALLING SEQUENCE
CALL RESINV(IRRESNO, LITIM1, LITIM2, ITIME1, ITIME2)

DESCRIPTION OF PARAMETERS

* INPUT *
IRRESNO RESOURCE NUMBER.
LITIM1 LOWER LIMIT OF TIME FOR WHICH THIS RESOURCE IS NEEDED BY ANY OF THE CURRENT TASKS.
LITIM2 UPPER LIMIT OF TIME FOR WHICH THIS RESOURCE IS NEEDED BY ANY OF THE CURRENT TASKS.
ITIME1 LOWER LIMIT OF TIME FOR WHICH THIS RESOURCE IS NEEDED BY ACTIVE TASK.
ITIME2 UPPER LIMIT OF TIME FOR WHICH THIS RESOURCE IS NEEDED BY ACTIVE TASK.

* OUTPUTS VIA COMMON RES *
IT1() THEORETICAL BUCKET NUMBER OF BUCKET CORRESPONDING TO LITIM1. (ASSUMING RES. INVENTORY STARTS AT TIME=1).
IT2() THEORETICAL BUCKET NUMBER OF BUCKET CORRESPONDING TO LITIM2.
IA1 THEORETICAL BUCKET NUMBER OF BUCKET CORRESPONDING TO ITIME1.
IA2 THEORETICAL BUCKET NUMBER OF BUCKET CORRESPONDING TO ITIME2.
INDX1 POINTER TO ELEMENT IN ARRAY INVRES THAT CORRESPONDS TO THE 'HIGH-TIME' BUCKET OF THE DESIRED RES. INVENTORY.
INDX2 POINTER TO ELEMENT IN ARRAY INVRES THAT CORRESPONDS TO THE 'LOW-TIME' BUCKET OF THE DESIRED RES. INVENTORY.
NB1 NUMBER OF RESOURCE BUCKETS REQUIRED TO COVER THE ACTIVE PROCESSES.

SUBROUTINES USED
GETRES

CONTINUED

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RESINV - CONTINUED

REMARKS
A LIST OF TASKS WHICH MUST BE EXECUTED SIMULTANEOUSLY
IS CREATED BY EITHER LSTASK OR SYNCT, EXCEPT PROCESSES
THE TASKS IN THE LIST ONE AT A TIME. IN THE CASE OF
RESOURCE UTILIZATION TASKS, EITHER ALL OR NONE GET DONE.
FOR THIS REASON THE INVENTORIES OF THE RESOURCES REQUIRED
ARE PLACED IN A TEMPORARY STORAGE AREA UNTIL THE DECISION
TO MAKE A PERMANENT UPDATE CAN BE MADE. WHEN THE LIST OF
TASKS IS CREATED THE MAXIMUM TIME EXTENT OF THE TASKS IS
SAVED IN ORDER TO ASSURE THAT THE RESOURCE INVENTORY
BRING INTO LOCAL STORAGE INCLUDES ALL THE TIME PERIODS
THAT MAY BE REQUIRED.
SUBROUTINE RESINV CHECKS TO SEE WHETHER THE RESOURCE BEING
PROCESSED IS ALREADY IN LOCAL STORAGE, AND IF NOT CALL
SUB. GETRES TO FETCH IT. THEN IT CALCULATES THE POINTERS
TO THE BUCKETS REQUIRED BY THE CURRENT TASK, TAKING INTO
CONSIDERATION THE TIME-ORDER REVERSAL OF THE WORKING
INVENTORY ARRAY

PROGRAMMER
G. GAIDASZ
CALSPLAN
MAY 1975

379
RESINV

START

IS RESOURCE ALREADY IN CORE?

YES END

NO

BRING RESOURCE INVENTORY INTO LOCAL STORAGE

ANY ERRORS DETECTED?

YES STOP

NO

UPDATE POINTERS FOR TEMPORARY INVENTORY

CALCULATE INDICES FOR AVAILABLE AND REQUIRED BUCKETS

CORRECT INDICES FOR TIME REVERSAL

END
CC*************** RESUSE **********************
CC*
CC* PURPOSE
CC* TO CALCULATE THE RESOURCES USED BY A CLASS PERFORMING A
CC* TASK.
CC*
CC* CALLING SEQUENCE
CC* CALL RESUSE(IFRES,LAGTME)
CC*
CC* DESCRIPTION OF PARAMETERS
CC*
CC* * OUTPUTS *
CC* IFRES NUMBER OF RESOURCE CAUSING ALLOCATION
CC* FAILURE.
CC* LAGTME TIME TO WHICH CLASS(ES) MUST BE LAGGED.
CC*
CC* THE ABOVE PARAMETERS HAVE MEANING ONLY IF 'IFAIL'
CC* IN COMMON ECB IS NOT ZERO.
CC*
CC* SUBROUTINES CALLED
CC* RESINV
CC* CALQ
CC* RUSER
CC* SVKUSE
CC* NEGUSE
CC* UPDATE
CC* DETLAG
CC* BLOCK
CC* WRUB
CC* WRUDB
CC*
CC* REMARKS
CC* RESOURCE UTILIZATION BY A CLASS PERFORMING A TASK IS
CC* DEFINED BY THE RESOURCE UTILIZATION BLOCK (RUB)
CC* ASSOCIATED WITH THE TASK. THE RUB CONTAINS A LIST OF
CC* POINTERS TO RESOURCE UTILIZATION DESCRIPTION BLOCKS (RUDES).
CC* EACH RUDB DEFINES THE RESOURCE INVOLVED, WHETHER RESOURCE
CC* CONSUMPTION IS DONE BY INDIVIDUALS, BY THE CLASS OR IS A
CC* FUNCTION OF THE UTILIZATION OF THE PRIMARY RESOURCE.
CC* THE RUDB ALSO DESCRIBES HOW THE RESOURCE IS CONSUMED AS
CC* A FUNCTION OF TIME (ARBITRARY OR UNIFORM) AND WHETHER
CC* SECONDARY AND/OR ALTERNATE RESOURCES EXIST.
CC* THE CURRENT CODE PERMITS ONE LEVEL OF SECONDARY RESOURCES.
CC* BOTH PRIMARY AND SECONDARY RESOURCES ARE ALLOWED TO HAVE
CC* ANY NUMBER OF ALTERNATE RESOURCES.
CC* WHEN A DEMAND FOR A RESOURCE CANNOT BE SATISFIED AND
CC* ALTERNATE RESOURCES DO NOT EXIST, THREE USER SELECTED
CC* OPTIONS CAN BE EXERCIZED: 1.- STOP THE RUN, 2.- CONTINUE
CC* THE RUN AFTER INDICATING THE RESOURCE SHORTAGE. 3.- LAG
CC* THE CLASS TO A PERIOD IN TIME WHEN THE MISSING OR SCARCE
CC* RESOURCE IS AVAILABLE.
CC*
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* AUG 1975
CC**********************************************
RESUSE

START

BRING RUB FOR TASK INTO LOCAL STORAGE

LOOP ON RUBS

ARE ALL RUBS DONE?

YES

RETURN

NO

BRING RUB INTO LOCAL STORAGE

RESINV CALO RUBER

IS THERE AN ALTERNATE RUB?

YES

STOP

OPTION

IGNORE

NO

NEGATE ALL TEMPORARY UPDATES

YES

DETLAC

RETURN

NO

OPTION

STOP

NO

DOES PRIMARY RESOURCE HAVE AN ALTERNATE?

YES

OPTION

IGNORE

NO

IS THERE AN ALTERNATE?

YES

BRING IN RUB FOR ALTERNATE

NO

RESINV CALO RUBER

SAVE RESOURCE UTILIZATION

YES

IS THIS A COMPOSITE RESOURCE?

YES

NO

ARE ALL SECONDARY RUBS DONE?

YES

NO

BRING SECONDARY RUB INTO LOCAL STORAGE

SAVE RESOURCE UTILIZATION
**************************************************************************
RUSER**************************************************************************

CC* PURPOSE
CC* ALLOCATE RESOURCES FROM INVENTORY TO MEET CALCULATED
CC* CONSUMPTION.
CC*
CC* CALLING SEQUENCE
CC* CALL RUSER(IQTY,NB,INVRES,I1,I2,ITOTQ,ICODE)
CC*
CC* DESCRIPTION OF PARAMETERS
CC*
CC* * INPUT *
CC* IQTY() ARRAY CONTAINING THE RESOURCE QUANTITIES
CC* THAT SHOULD BE CONSUMED IN EACH BUCKET.
CC* NB NUMBER OF ENTRIES IN IQTY.
CC* INVRES() RESOURCE INVENTORY ARRAY.
CC* I1 INDEX OF FIRST PERTINENT ENTRY IN INVRES.
CC* I2 INDEX OF LAST PERTINENT ENTRY IN INVRES.
CC* ITOTQ TOTAL QUANTITY OF RESOURCE REQUIRED TO
CC* SATISFY CURRENT DEMAND.
CC*
CC* * OUTPUT *
CC* ICODE IF 0, ALLOCATION WAS SUCCESSFUL.
CC* IF 1, ALLOCATION WAS UNSUCCESSFUL.
CC*
CC* PROGRAMMER
CC* GEORGE GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
**************************************************************************
RUSER

START

INITIALIZATION
SAVE QTY AVAILABLE IN WORK ARRAY

IS THERE ENOUGH RESOURCE AVAILABLE TO SATISFY DEMAND

NO
SET RETURN CODE
END

YES

USE ENOUGH RESOURCE TO SATISFY REMAINING REQUIREMENTS

ERROR STOP

USE UP AVAILABLE QUANTITY

LOOP THRU BUCKETS

ARE REQUIREMENTS SATISFIED?

NO
LOOP THRU BUCKETS

YES

ALL BUCKETS DONE?

NO
LOOP THRU BUCKETS

YES

USE UP SPECIFIED QUANTITY

END

ARE ALL BUCKETS DONE?

NO
ERROR STOP

USE UP AVAILABLE QUANTITY

IS THERE ENOUGH IN INVENTORY TO SATISFY REMAINING QUANTITY?

NO

USE UP AVAILABLE QUANTITY
PC************** SCATSA ***************

PC* PURPOSE
PC* TO SELECT THE TRAINEE SOURCES FOR A CLASS.
PC* SELECTION IS BASED UPON.
PC* 1. ESTIMATED DURATION OF COURSE.
PC* 2. SOURCE AVAILABILITY AT REQUIRED TIME.
PC* 3. TRANSFER PERCENTAGES AND PRIORITIES SPECIFIED
PC* FOR THE COURSE.

PC* CALLING SEQUENCE
PC* CALL SCATSA
PC* SUBROUTINES USED
PC* LSTRAK
PC* ALLOCD
PC* ALLOCA
PC* FRMPTB
PC* PUTCLS

PC* REMARKS
PC* SCATSA USES THE TRACK DESCRIPTOR BLOCKS CREATED BY TRACKD
PC* TO LOOK UP SOURCE AVAILABILITY FOR THE TRACKS OF THE COURSE.
PC* THE TRACK DESCRIPTOR BLOCKS FOR EACH COURSE ARE SORTED
PC* IN DESCENDING ORDER OF CUMULATIVE PRIORITY BY TRACKD.
PC* IN SCATSA SUBROUTINE LSTRAK IS USED TO EXTRACT THE POINTERS
PC* TO A GROUP OF SOURCES THAT HAVE EQUAL PRIORITY.
PC* SUBROUTINE ALLOCD IS THEN USED TO TRY TO ALLOCATE THE
PC* PROPER NUMBER OF TRAINEES TO EACH TRACK AS SPECIFIED
PC* BY THE TRANSFER PROPORTIONS SPECIFIED FOR THE COURSE.
PC* IF ALL TRAINEES IN THE CLASS HAVE BEEN ALLOCATED BY
PC* TRACKD, SUBROUTINE FRMPTB IS INVOKED.
PC* IF THE DESIRED PROPORTIONING COULD NOT BE SATISFIED BY
PC* ALLOCD THEN SUBROUTINE ALLOCA IS CALLED. ALLOCA LOOPS
PC* ON THE SAME PRIORITY TRACKS AS ALLOCD, BUT IT ALLOCATES
PC* AS MANY STUDENTS AS POSSIBLE TO THE TRACKS THAT HAVE ANY
PC* REMAINING SOURCE INVENTORY.
PC* IF THE CLASS CANNOT BE ALLOCATED TO THE SOURCES OF THIS
PC* PRIORITY GROUP, THEN THE PROCESS IS REPEATED USING THE
PC* SET OF NEXT LOWER PRIORITY TRACKS.
PC* AFTER ALL TRAINEES HAVE BEEN ALLOCATED TO THEIR RESPECTIVE
PC* SOURCES, SUBROUTINE FRMPTB IS INVOKED.
PC* THE PURPOSE OF FRMPTB IS TO CREATE THE PREDETERMINED
PC* TRANSFER BLOCKS (PTBS) FOR THE CLASS BEING PROCESSED.
PC* THE PTBS FORM A TREE STRUCTURE THAT ORIGINATES AT THE
PC* PROCBLOC FROM WHICH SCATSA WAS INVOKED AND HAS A LINKED
PC* ELEMENT FOR EACH NODE OF THE TRACKS TO THE LEFT OF IT.
PC* THE PTB INDICATES HOW MANY STUDENTS SHOULD TAKE EACH ONE
PC* OF THE FIVE POSSIBLE BRANCHES AT EACH NODE AND A POINTER
PC* TO THE NEXT NODE (IF ANY) ALONG EACH ONE OF THE FIVE
PC* BRANCHES.

PC* PROGRAMMER
PC* G. GAIDASZ
PC* CALSPAN
PC* AUG 1975

PC***********************************************************************
START

SET LIMITS
OF SEARCH
FOR RL-TRACK
DESCRIPTORS
FOR THIS COURSE

INITIALIZE
WORKING
VARIABLES
CALCULATE SOURCE
ALLOCATION TIME

GET LIST OF
TRACKS OF
SAME PRIORITY
ASSOCIATED
WITH THIS
PROCBLCK

ARE
THERE
ANY ELEMENTS
IN THIS
LIST?

NO
ERROR

YES

ALLOCD

HAVE
ALL
STUDENTS BEEN
ALLOCATED?

YES

NO

ALLOCA

HAVE
ALL STUDENTS BEEN
ALLOCATED?

YES
FRMPTB

NO

EMD
PURPOSE
TO SPLIT A CLASS INTO MULTIPLE CLASSES.
IF SUB. SCATSA HAS BEEN ALREADY EXECUTED FOR THIS CLASS,
THEN THE PREDETERMINED TRANSFER PROPORTIONS WILL BE USED,
OTHERWISE THE PROCBLUC TRANSFER PROPORTIONS WILL BE USED.

CALLING SEQUENCE
CALL SPLIT

REMARKS
IF SCATSA HAS NOT BEEN EXECUTED FOR THIS TRACK, SPLIT CALCULATES THE NUMBER OF STUDENTS THAT SHOULD BE SENT ALONG EACH BRANCH FROM THE PROPORTIONS SPECIFIED FOR EACH LEFT BRANCH OF THE ACTIVE PROCBLUC.
IF SCATSA HAS BEEN EXECUTED FOR THIS TRACK THEN THE NUMBER OF STUDENTS TO BE SENT ALONG EACH BRANCH IS TAKEN FROM THE APPROPRIATE PTB.
AFTER THE CLASS HAS BEEN SPLIT INTO THE DESIRED PROPORTIONS, NEW CLASSES ARE CREATED FROM EACH OF THE NEW GROUPS AND THE OLD CLASS IS RELEASED. THE UNIQUE CLASS NUMBER IS ASSIGNED TO EACH OF THE NEW CLASSES AND THE CORRECT PTB ADDRESS IS ENTERED. IF APPROPRIATE

SUBROUTINES USED
CBLOCK
REMCLLS
GETPTB
WPTB
NEWCLLS

PROGRAMMER
GEORGE GAIDASZ
CALSPAN
MAY 1975
UTILITY ROUTINE TO SORT CLASSES IN ORDER BY GRADUATION DATE AND PRIORITY.

CALLING SEQUENCE

CALL SRTCTP(IT1, IT2, N, IA)

DESCRIPTION OF PARAMETERS

IT1()       ARRAY OF MAJOR KEYS.
IT2()       ARRAY OF MINOR KEYS.
N           NUMBER OF ELEMENTS TO BE SORTED.
IA()        ARRAY OF POSITION POINTERS TO SORTED RECORDS.

REMARKS

METHOD IS AN INDEX BUBBLE SORT.

PROGRAMMER

GEORGE GAIDASZ
CALSPAN
MAY 1975
START

ARE THERE ANY ELEMENTS TO SORT?

NO END

YES

SET K = 0

K = K + 1

K > N ?

YES END

NO

SAVE FIELDS AT K & K1

SAVE K

F1 > F2

COMPARE MAJOR KEY

F2 = F1

COMPARE MINOR KEYS

F2 < F1

REVERSE POSITION OF FIELDS 1 & 2

STEP BACK THRU LIST OF ELEMENTS

F1 > F2

COMPARE MAJOR KEY

F2 > F1

COMPARE MINOR KEYS

F1 < F2

SET K TO SAVED VALUE

390
PURPOSE

to do an index sort on the track descriptor blocks for a course. the sort is in descending order on priority.

CALLING SEQUENCE

call srttdb(i1,i2,cumpty,itdbst)

description of parameters

* input *

i1 pointer to first element to be sorted.

i2 pointer to last element to be sorted.

cumpty() sort field.

* i/o *

itdbst() index of sorted elements

remarks

method is an index bubble sort.

programmer

g. gaidasz

calspan

aug 1975
SRTTDB

START

GENERATE LIST OF INDICES

NO. OF POINTS

< 1

END

INDEX BUBBLE SORT IN DESCENDING ORDER ON PRIORITY

> 1

END

END

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CC******************************************************************** SVRUS1 ********************************************************************
CC* PURPOSE
CC* SAVE PERTINENT INVENTORY OF THE RESOURCE BEING PROCESSED.
CC* CALLING SEQUENCE
CC* CALL SVRUS1
CC* DESCRIPTION OF PARAMETERS.
CC* * IMPLICIT INPUT VIA COMMON *
CC* INDX1 POINTER TO ELEMENT IN ARRAY INVRES THAT
CC* CORRESPONDS TO THE FIRST BUCKET THAT MAY
CC* BE USED BY THE CURRENT CLASS.
CC* INDX2 POINTER TO ELEMENT IN ARRAY INVRES THAT
CC* CORRESPONDS TO THE LAST BUCKET THAT MAY
CC* BE USED BY THE CURRENT CLASS.
CC* NSAVE NUMBER OF RESOURCE INVENTORIES SAVED UP
CC* TO NOW.
CC* ISAVE TOTAL NUMBER OF BUCKETS SAVED UP TO NOW.
CC* * IMPLICIT OUTPUT VIA COMMON *
CC* IAD11() SAVED VALUE OF INDX1
CC* IAD12() SAVED VALUE OF INDX2
CC* IADS1() POINTER TO FIRST ELEMENT SAVED IN IAUSED.
CC* IAUSED() SAVED RESOURCE INVENTORIES.
CC* REMARKS
CC* THIS ROUTINE SAVES THE PERTINENT RESOURCE INVENTORY BEFORE
CC* THE CURRENT UPDATES ARE MADE. SVRUS2 IS LATER CALLED IF
CC* NECESSARY TO CALCULATE THE ACTUAL CONSUMPTION.
CC* PROGRAMMER
CC* G. GAIDASZ
CC* AUG 1975
CC* CALSPAN
CC********************************************************************
SVRUS1

START

UPDATE POINTER (TENTATIVELY)

SAVE ADDRESSES IN INVENTORY ARRAY AND STORAGE ARRAY

LOOP ON BUCKETS TO BE SAVED

ARE ALL BUCKETS DONE?

YES END

NO

SAVE CURRENT INVENTORY

394
PURPOSE

CALCULATE ACTUAL USAGE OF CURRENT RESOURCE BY SUBTRACTING CURRENT INVENTORY FROM PREVIOUS INVENTORY.

CALLING SEQUENCE

CALL SVRUS2

DESCRIPTION OF PARAMETERS.

SAME AS IN SVRUS1, EXCEPT THAT IAUED() IS UPDATED TO INDICATE CONSUMPTION BY SUBTRACTING THE CURRENT INVENTORY FROM IT

REMARKS

SVRUS2 IS ONLY INVOKED FOR SATISFIED PRIMARY COMPOSITE RESOURCES AND THEIR ASSOCIATED SECONDARIES. RESTORATION OF OTHER RESOURCES (IN CASE OF RESOURCE ALLOCATION FAILURE) IS HANDLED BY NOT CALLING UPDATE.

PROGRAMMER

G. GAIDASZ

CALSPAN

AUG 1975
SVRUS2

START

UPDATE COUNTER OF RESOURCES SAVED

LOOP ON BUCKETS TO BE SAVED

ALL BUCKETS DONE?

YES → END

NO → SAVE AMOUNT USED (PREVIOUS-CURRENT INVENTORY)

END
**Purpose**

To force simultaneous processing (synchronization) of a list of procblocks.

**Calling Sequence**

```
CALL SYNC(HINTME)
```

**Description of Parameters**

* **OUTPUT**

  * **MINTME**
    Time to which classes will be lagged if synchronization is impossible at this time.

  * **IMPLICIT OUTPUT**

  * **IFAIL**
    Is set to 1 if synchronization cannot be accomplished.

  * **NOCLS**
    Number of classes to be synchronized in execution or lagged.

  * **INDX($)**
    List of classes to be synchronized in execution or lagged.

**Remarks**

Synchronization requires that classes with the same graduation ID be in the correct procblock(s) of each of the courses linked by the synchronization loop. If classes have been split then the number of students (with the same graduation ID) in each course (summed over the tracks) must agree.

**Subroutines Used**

* PBLOCK
* ASCLS
* SYNCT
* BLOCK
* CLSDMP
*...

**Programmer**

* GEORGE GAIASZ
* CALSPAN
* MAY 1975
SYNC

START

INITIALIZATION
SAVE ID. AND
EXECUTION TIME
OF FIRST CLASS

BRING IN
PROCBLOCK
ASSOCIATED
WITH FIRST CLASS
SAVE PROCBLOCK
ID

SAVE # OF
STUDENTS
IN COURSE

IS
THERE
A SYNC
LINK?

NO
ERROR

YES

BRING IN
SYNCHRONIZED
PROCBLOCK

GET LIST
OF CLASSES
ASSOCIATED
WITH PROCBLOCK
ASCCLS

ERROR

# OF
ASSOCIATED
CLASSES?

>1

=2

=3

SAVE # OF
STUDENTS IN
COURSE
SAVE MINIMUM
SCHEDULED EXECUTION
TIME

LAG CLASSES
TO NEXT
SCHEDULED EXECUTION
TIME

END

DO
ALL
SYNC
COURSES HAVE
THE SAME
NUMBER
OF STUDS?

YES
SYNCT

END

NO

DOES
SYNC
LINKPOINT
TO FIRST
PROCBLOCK?

YES

NO
**PURPOSE**

TO PLACE ALL TASKS THAT MUST BE PERFORMED SIMULTANEOUSLY IN A LIST.

**CALLING SEQUENCE**

CALL SYNCT(NOCLS,INDXC)

**DESCRIPTION OF PARAMETERS**

- **NOCLS**: NUMBER OF CLASSES IN INDXC.
- **INDXC()**: LIST OF POINTERS TO CLASSES IN THE CURRENT CLASSES ARRAYS, WHOSE TASKS ARE TO BE SYNCHRONIZED.

**REMARKS**

THE TASKS ARE ARRANGED IN THE FOLLOWING ORDER:

1. RESOURCE UTILIZATION TASKS.
2. UPDATE TASK. (PROVIDED BY PROGRAM)
3. OTHER TASKS.
4. TRANSFER TASKS (PROVIDED BY PROGRAM).

**SUBROUTINES USED**

- PLIST
- PBLOCK
- BLOCK
- GETCLS
- TBLOCK

**PROGRAMMER**

G. GAITA

CALSPAN

MAY 1975
SYNCT

START

INITIALIZE WORKING VARIABLES

1

LOOP ON CLASSES

ARE ALL CLASSES DONE?

YES

INSERT UPDATE TASK AFTER RES UTILIZATION TASKS

NO

BRING PROCBLOC ASSOCIATED WITH CLASS INTO LOCAL STORAGE

MERGE CLASS TASKS BEHIND COMMON TASKS

E:O

LOOP ON TASKS

ARE ALL TASKS DONE?

YES

INSERT DEFAULT TRANSFER IF NONE WAS SPECIFIED

1

NO

BRING TASK BLOCK INTO LOCAL STORAGE

IS IT A SYNC CORR OR GRAD TASK?

YES

SAVE TASK IN TEMPORARY STORAGE

IS IT A SCATS TASK?

YES

NO

SAVE RESOURCE UTILIZATION TASK CLASS SIZE DURATION CLASS ID

NO

HAS THERE BEEN A TRANSFER TASK?

YES

IS IT A RESOURCE UTILIZATION TASK?

YES

NO
PURPOSE
TO PRINT A TASK BLOCK

CALLING SEQUENCE
CALL TBLOCK(IADRS,IBLOCK)

DESCRIPTION OF PARAMETERS
IADRS            ADDRESS OF TASK BLOCK.
IBLOCK            FIRST WORD OF TASK BLOCK.

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
PURPOSE

TO CREATE THE TRACK DESCRIPTOR BLOCKS FOR EACH COURSE.

CALLING SEQUENCE

CALL TRACKD

REMARKS

THE CREATION OF THE TRACK DESCRIPTOR BLOCKS, WHICH ARE
USED BY SUBROUTINE SCATS to choose trainee sources
ACCORDING TO THE PRIORITY AND PROPORTIONS SPECIFIED IN
THE COURSE DESCRIPTION, IS ACCOMPLISHED IN THREE STEPS.

1. A RIGHT TO LEFT SCAN IS DONE OF THE PROCBLOCS IN
EACH COURSE. THE RESULT OF THIS OPERATION IS A
LIST OF SOURCES FOR EACH COURSE.

2. EACH SOURCE PRODUCED BY STEP 1 SERVES AS A STARTING
POINT FOR A LEFT TO RIGHT SCAN OF THE TRACK DEFINED
BY THE SOURCE.
AS THE PROCBLOCS OF A TRACK ARE PROCESSED A COUNT
IS KEPT OF THE TOTAL DURATION OF THE TRACK.
PROPORTIONS SPECIFIED ALONG THE TRACK ARE MULTIPLIED
TOGETHER TO PRODUCE THE RESULTING PROPORTION AT EACH
NODE (PROCBLOC WITH MORE THAN ONE LEFT BRANCH). THE
PRIORITY OF EACH TRACK IS CALCULATED BY ADDING THE
CURRENT PRIORITY TO THE PREVIOUS PRIORITY DIVIDED BY
A HUNDRED.
A TRACK DESCRIPTOR BLOCK IS CREATED FOR EACH NODE
ALONG A TRACK. EACH NODE POINTS TO THE NODE THAT
PRECEDES IT.

3. THE FINAL STEP (SRTTDB) IS A LINK SORT IN DECREASING
ORDER BY PRIORITY OF THE TRACK DESCRIPTOR BLOCKS
FOR EACH COURSE.

SUBROUTINES CALLED

LSTSRC
GENTDB
SRTTDB
WRLTDB

PROGRAMMER

G. GAIDASZ
CALSPAN
AUG 1975
TRACKD

START

INITIALIZE COUNTERS

LOOP ON COURSES

ALL COURSES DONE?

YES

SAVE POINTER TO LAST TDB

END

NO

SAVE POINTER TO FIRST TRACK DESCRIPTOR BLOCK FOR COURSE

LSTSRC

GENTDB

SRTTDB
TRAM3

PURPOSE
PROVIDE OVER-ALL CONTROL LOGIC FOR THE CALCULATION OF
RESOURCES USED BY Classes of students going through
USER DEFINED COURSES.

REMARKS
TRAM3 PROVIDES THE BASIC CYCLING LOOP OF THE PROGRAM.
AFTER INITIALIZATION IS DONE, THE PROGRAM READS TRAINING
DEMANDS TO CALCULATE THE NUMBER OF TRAINEES THAT SHOULD
BE GRADUATED.
FROM THE TRAINING DEMANDS CLASSES ARE STORED IN MASS
STORAGE. SUBROUTINE PREPC IS USED TO SELECT THE CLASSES
THAT SHOULD BE ACTIVE FOR THE CURRENT SIMULATION TIME.
THE PROGRAM THEN LOOPS OVER THESE ACTIVE CLASSES, SELECTING
AND EXECUTING THE TASKS SPECIFIED BY THE PERTINENT
PROC BANK.

SUBROUTINES USED
INIT
FORMQ
PREPC
TRMNTE
CLOCK
CBLOCK
EXECT
GETCLS
LSTASK
FORMC

PROGRAMMER
GEORGE GAIDASZ
CALSANN
MAY 1975

CC*****************************
START

INIT

FORMQ
FORMC
PREP

ARE THERE ANY CLASSES TO PROCESS?

YES
UPDATE CLOCK

NO

HAVE ALL TRAINING DEMANDS BEEN PROCESSED?

YES
TRMNTE

NO

LOOP ON CLASSES

ARE ALL CURRENT CLASSES PROCESSED?

YES

NO

IS CLASS ACTIVE?

YES
BRING CLASS BLOCK INTO LOCAL STORAGE MAKE LIST OF TASKS

NO

EXECUT

END
CC**********************************************************************
CC PURPOSE
CC INDICATE TERMINATION OF TRAM-3 EXECUTION.
CC
CC CALLING SEQUENCE
CC CALL TRMNTE
CC
CC PROGRAMMER
CC G.GAIDASZ
CC CALSPAN
CC MAY 1975
CC
CC**********************************************************************
UPDATE

PURPOSE
UPDATE RESOURCE INVENTORIES TO REFLECT THE CONSUMPTION BY THE CURRENT TASK OR GROUP OF SYNCHRONIZED TASKS.

CALLING SEQUENCE
CALL UPDATE

SUBROUTINES USED
PUTRES

PROGRAMMER
G. GAIĐASZ
CALSPAN
AUG 1975

409
UPDATE

START

LOOP OVER RESOURCES

ARE ALL RESOURCES DONE?

YES
END

NO

IS THIS RESOURCE IN CORE?

NO

SET UP RESOURCE UPDATE TIME

PUT RESOURCE INTO CENTRAL STORAGE

YES

410
SUBROUTINE UPDRES

PURPOSE
UPDATES RESOURCE LISTS WHEN CLOCK TIME HAS CHANGED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
26 APRIL 1975
SUBROUTINE UPDSOR

PURPOSE
UPDATES SURGE LISTS WHEN CLOCK TIME HAS CHANGED

AUTHOR/PROGRAMMER
JOHN R. MENIG
CALSPAN CORPORATION
28 APRIL 1975
PURPOSE
TO PRINT A PREDETERMINED TRANSFER BLOCK.

CALLING SEQUENCE
CALL WPTB(IC,IP,N,NXT)

DESCRIPTION OF PARAMETERS

IC
ADDRESS OF CLASS ASSOCIATED WITH PTB.

IP
ADDRESS OF PROCBLOC ASSOCIATED WITH PTB.

N
NUMBER OF STUDENTS TO BE SENT ALONG EACH
OF THE 5 BRANCHES OF THE PTB.

NXT
ADRESSES OF THE NEXT PTBS ALONG EACH OF
THE 5 BRANCHES.

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
WPTB

START

PRINT A PREDETERMINED TRANSFER BLOCK

END
* PURPOSE
  TO PRINT A RL-TRACK DESCRIPTOR BLOCK.

* CALLING SEQUENCE
  CALL WRLTDB(I)

* DESCRIPTION OF PARAMETERS
  I       INDEX OF TRACK DESCRIPTOR BLOCK TO BE PRINTED

* PROGRAMMER
  G. GAIDASZ
  CALSPAN
  MAY 1975
WRLTDB

START

PRINT A RL-TRACK DESCRIPTOR BLOCK

END
PURPOSE
TO PRINT A RESOURCE UTILIZATION BLOCK

CALLING SEQUENCE
CALL WRUB(IADRS,IBLOCK)

DESCRIPTION OF PARAMETERS
IADRS       ADDRESS OF RUB.
IBLOCK()    FIRST WORD OF RUB.

PROGRAMMER
G. GAIDASZ
CALSPAN
MAY 1975
CC********************************************************************** WRUDB**********************************************************************
CC* PURPOSE
CC* TO PRINT A RESOURCE UTILIZATION DESCRIPTION BLOCK.
CC* CALLING SEQUENCE
CC* CALL WRUDB(IADRS,IBLOCK)
CC* DESCRIPTION OF PARAMETERS
CC* IADRS ADDRESS OF RUDB.
CC* IBLOCK FIRST WORD OF RUDB.
CC* PROGRAMMER
CC* G. GAIDASZ
CC* CALSPAN
CC* MAY 1975
CC*
CC**********************************************************************
WRUDB

START

PRINT A RESOURCE UTILIZATION DESCRIPTION BLOCK

END
### Cross Reference Table

In the table on the following pages, the column headings show the subroutine names that do the calling, and the row heading give the names of the subroutines called.
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<td>UPDATE CLSDMP</td>
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<tr>
<td>WPTB</td>
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<tr>
<td>WRLTDB</td>
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<tr>
<td>WRUB</td>
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<tr>
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</tr>
<tr>
<td>ROUTINE</td>
<td>USAGESUMMARY</td>
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<td>MLLDB</td>
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<td>WRUB</td>
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</tr>
<tr>
<td>WRUDB</td>
<td></td>
</tr>
</tbody>
</table>

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3.6 **Common Variable Definitions**

The tables on the following pages define the meaning of each variable contained in each of the common blocks used by this program.
ROUTINES CONTROLLED BY

IFLOW AND IDUMP

NOTE.-- IFLOW CONTROLS THE PRINTING OF SUBROUTINE FLOW MESSAGES IN KEY ROUTINES.
IF IFLOW=1, MESSAGE IS PRINTED AT ENTRY TO SUBROUTINE.
IF IFLOW=0, MESSAGES ARE NOT PRINTED.

IDUMP CONTROLS THE PRINTING OF DIAGNOSTIC MESSAGES DURING THE EXECUTION OF KEY ROUTINES.
IF IDUMP=1, DIAGNOSTIC MESSAGES ARE PRINTED.
IF IDUMP=0, MESSAGES ARE NOT PRINTED.

WORD ROUTINES AFFECTED

<table>
<thead>
<tr>
<th>*</th>
<th>FORMQ</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>8</td>
<td>LSTASK</td>
</tr>
<tr>
<td>9</td>
<td>LSTSRG, GENTDB, TRACKD</td>
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<tr>
<td>10</td>
<td>DTRNSF</td>
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<tr>
<td>11</td>
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<td>TRACKD</td>
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<tr>
<td>50</td>
<td>MAIN</td>
</tr>
</tbody>
</table>

*********************************************
**COMMON BLOCK - BLKS**

**VARIABLE**

**DESCRIPTION**

- **IBLOCK(4)**
  - **IBLOCK(1)** - ADDRESS OF FIRST PROCBLOCK
  - **IBLOCK(2)** - ADDRESS OF FIRST TASK BLOCK
  - **IBLOCK(3)** - ADDRESS OF FIRST RESOURCE
  - **IBLOCK(4)** - UTILIZATION BLOCK (RUB)
- **NBLOCK(4)**
  - **NBLOCK(1)** - NUMBER OF PROCBLOCKS
  - **NBLOCK(2)** - NUMBER OF TASK BLOCKS
  - **NBLOCK(3)** - NUMBER OF RUBS
  - **NBLOCK(4)** - NUMBER OF RUBBS
- **LBLOCK(4)**
  - **LBLOCK(1)** - LENGTH OF PROCBLOCK - 3
  - **LBLOCK(2)** - LENGTH OF TASK BLOCK - 11
  - **LBLOCK(3)** - LENGTH OF RUB - 9
  - **LBLOCK(4)** - LENGTH OF RUBB - 8
- **IWORD( )** - POOL OF STORAGE

**POOL OF STORAGE.**
### COMMON BLOCK - CBLK

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCOURS</td>
<td>NUMBER OF COURSES IN CURRENT RUN.</td>
</tr>
<tr>
<td>IADPB1(I)</td>
<td>ADDRESS OF GRADUATION PROCBLK FOR COURSE I.</td>
</tr>
<tr>
<td>ICTYPE(I)</td>
<td>COURSE TYPE. 1-CCTS</td>
</tr>
<tr>
<td></td>
<td>2-PMT</td>
</tr>
<tr>
<td>IPTYPE(I)</td>
<td>PERSONNEL TYPE. 1-PILOTS</td>
</tr>
<tr>
<td></td>
<td>2-COPILOTS</td>
</tr>
<tr>
<td></td>
<td>3-DSO</td>
</tr>
<tr>
<td></td>
<td>4-DSO</td>
</tr>
<tr>
<td>ICPRTY(I)</td>
<td>COURSE PRIORITY.</td>
</tr>
<tr>
<td>MAXCLS(I)</td>
<td>MAXIMUM CLASS SIZE.</td>
</tr>
<tr>
<td>IGINTR(I)</td>
<td>TIME INTERVAL BETWEEN GRADUATIONS.</td>
</tr>
<tr>
<td>IGRDT1(I)</td>
<td>TIME OF EARLIEST GRADUATION PERMITTED</td>
</tr>
<tr>
<td>IGRDT2(I)</td>
<td>TIME OF CURRENT (LATEST) GRADUATION.</td>
</tr>
<tr>
<td>IPGRDT1(I)</td>
<td>TIME OF PREVIOUS (SMALLER TIME) GRADUATION.</td>
</tr>
<tr>
<td>NDXTD1(I)</td>
<td>POINTER TO FIRST ELEMENT IN TRAINING DEMAND QUEUE (COMMON CTDQ) FOR COURSE I.</td>
</tr>
<tr>
<td>NDXTDL1(I)</td>
<td>POINTER TO LAST ELEMENT IN TRAINING DEMAND QUEUE (COMMON CTDQ) FOR COURSE I.</td>
</tr>
<tr>
<td>NDXND1(I)</td>
<td>ADDRESS OF FIRST NODE FOR COURSE. (NOT USED).</td>
</tr>
<tr>
<td>FRCTN1(I)</td>
<td>NUMBER OF STUDENTS ACCUMULATED FROM TRAINING DEMANDS QUEUE THAT MUST BE PLACED IN CLASSES.</td>
</tr>
</tbody>
</table>

**NOTE:** INDEX I REFERS TO COURSE NUMBER.

---

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**COMMON BLOCK - CCLS**

**VARIABLE DESCRIPTION**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NACLs</td>
<td>NUMBER OF CLASSES CURRENTLY ACTIVE.</td>
</tr>
<tr>
<td>IADRC(I)</td>
<td>ADDRESS OF CLASS I.</td>
</tr>
<tr>
<td>ICTME(I)</td>
<td>TIME FOR PROCESSING CLASS I.</td>
</tr>
<tr>
<td>ICPRT(I)</td>
<td>PRIORITY OF CLASS I.</td>
</tr>
<tr>
<td>IACTIVE(I)</td>
<td>CLASS STATUS. 0-ACTIVE, 1-INACTIVE.</td>
</tr>
<tr>
<td>NOPB(I)</td>
<td>ADDRESS OF PROCBLOC ASSOCIATED WITH CLASS I.</td>
</tr>
<tr>
<td>IGID(I)</td>
<td>CREW IDENTIFICATION NUMBER.</td>
</tr>
</tbody>
</table>
| ISORT( )  | SORTED LIST OF INDICES FOR ACTIVE CLASSES.  
|           | SORT IS ON TIME AND PRIORITY IN DESCENDING ORDER. (ISORT(1) CONTAINS INDEX OF CLASS 
|           | WITH HIGHEST SCHEDULED EXECUTION TIME AND HIGHEST PRIORITY.)               |
| IDUNER(I) | UNIQUE CLASS NUMBER ASSIGNED BY STEP 3 OF TRAM.                             |
| LACG(I)   | DURATION OF CURRENT LAG FOR CLASS I.                                        |
**COMMON BLOCK - CLASSB**

**VARIABLE**  
**DESCRIPTION**

- **IFRSTC**  
  * Pointer to first element in linked list.
- **ILASTC**  
  * Pointer to last element in linked list.
- **NXTFRE**  
  * Pointer to next unused location.
- **LIMITC**  
  * Dimension limit.
- **ICBSZE**  
  * Number of words in a class block.
- **ICBSZI**  
  = ICBSZE - 1
- **ICLASS( )**  
  * Linked list storage area for class blocks.
  * See description of class blocks (fig 8.1)
  * For definition of parameters.

---

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**COMMON BLOCK - CLSR**

**VARIABLE**  **DESCRIPTION**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NXCLS</td>
<td>ADDRESS OF CURRENTLY ACTIVE CLASS.</td>
</tr>
<tr>
<td>NUMCRS</td>
<td>COURSE NUMBER.</td>
</tr>
<tr>
<td>NOSTDS</td>
<td>NUMBER OF STUDENTS.</td>
</tr>
<tr>
<td>IPRTYC</td>
<td>CLASS PRIORITY.</td>
</tr>
<tr>
<td>ICLSTM</td>
<td>TIME OF NEXT SCHEDULED EVENT FOR CLASS.</td>
</tr>
<tr>
<td>NPROCDB</td>
<td>ADDRESS OF PROCBLOC FOR CLASS.</td>
</tr>
<tr>
<td>ISTATS</td>
<td>CLASS STATUS. 0-ACTIVE.</td>
</tr>
<tr>
<td></td>
<td>1-INACTIVE.</td>
</tr>
<tr>
<td>IPREDT</td>
<td>ADDRESS OF NEXT PREDETERMINED TRANSFER BLOCK FOR CLASS.</td>
</tr>
<tr>
<td>IDGRAD</td>
<td>CREW IDENTIFICATION NUMBER.</td>
</tr>
<tr>
<td>NUMGRD</td>
<td>ADDRESS OF GRADUATION PROCBLOC.</td>
</tr>
<tr>
<td>IDITGR</td>
<td>GRADUATION DATE.</td>
</tr>
<tr>
<td>ICI</td>
<td>POINTER TO CLASS IN LIST OF CURRENT CLASSES.</td>
</tr>
<tr>
<td>IDIUR</td>
<td>UNIQUE CLASS NUMBER.</td>
</tr>
<tr>
<td>LAGT</td>
<td>DURATION OF CURRENT LAG (IN C.U.S)</td>
</tr>
<tr>
<td>LRSON</td>
<td>REASON FOR CURRENT LAG. 1-RESOURCE MISSING.</td>
</tr>
<tr>
<td></td>
<td>6-SYNCHRONIZATION FAILURE*</td>
</tr>
<tr>
<td></td>
<td>7-CORRELATION FAILURE.</td>
</tr>
<tr>
<td>ICLSAD</td>
<td>ADDRESS OF CLASS IN MASS STORAGE.</td>
</tr>
<tr>
<td>ICRSPY</td>
<td>COURSE PRIORITY.</td>
</tr>
<tr>
<td>ISORCN</td>
<td>SOURCE NUMBER FOR CLASS.</td>
</tr>
<tr>
<td>LAGTOT</td>
<td>TOTAL TIME CLASS HAS BEEN LAGGED.</td>
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### COMMON BLOCK - CLST

#### VARIABLE DESCRIPTION

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Description</th>
</tr>
</thead>
</table>
| INDXC(I)   | Pointers to classes (in common CCLS) that are currently in procblocks linked together by a
|            | synchronization or correlation loop.                                         |
| IACLS(I)   | Work area. Pointers to classes associated with a specific procblock.         |
| IPBLK(I)   | Work area. Course number of Ith course in sync. loop.                       |
| NSTUDS(I)  | Work area. Number of students in Ith course of sync. loop.                  |
| NOCLS     | Number of classes in INDXC.                                                 |
COMMON BLOCK - CONTRL

* VARIABLE * DESCRIPTION

* ICLK * CLOCK TIME AT WHICH LAST UPDATE OF SOURCES
* AND RESOURCES WAS DONE.

*
************ COMMON BLOCK - CRSGRP ************

* VARIABLE DESCRIPTION *

* NCGRPS  NUMBER OF COURSE GROUPS.
* IUPTCG   NOT USED.
* NUMCRU   NEXT AVAILABLE CREW NUMBER - 1.
* NCING(I) NUMBER OF COURSES IN GROUP I.
* ICING(J,I) NUMBER OF JTH COURSE IN GROUP I.

************
**COMMON BLOCK - CTDQ**

**VARIABLE DESCRIPTION**

* IIFREE * POINTER TO NEXT AVAILABLE LOCATION
* LIMIT1 * DIMENSION LIMIT FOR ARRAY ICORE.
* ICORE() * LINKED LIST STORAGE FOR TRAINING DEMANDS
* (SEE FIGURE 8.2 FOR DESCRIPTION OF
* TRAINING DEMAND BLOCKS)
**COMMON BLOCK - ECB**

**VARIABLE DESCRIPTION**

* ITIMES * START TIME OF SIMULATION.  
* ITIMEE * END TIME OF SIMULATION.  
* ITIMEC * CURRENT TIME OF SIMULATION.  
* NXTBRK * TIME OF NEXT SCHEDULED EVENT.  
* MINGRD * TIME OF EARLIEST CURRENT GRADUATION.  
* ITEVNT * TIME OF LATEST PREVIOUS GRADUATION.  
* NCRSES * NUMBER OF COURSES.  
* NCLSES * TOTAL NUMBER OF CLASSES CURRENTLY IN SYSTEM.  
* IDRS * DEMAND RECORD STATUS. 1- FIRST TIME  
* * 2- NORMAL  
* 3- E-0.0  
* NOTDRS * NUMBER OF TRAINING DEMAND RECORDS READ.  
* ITRNRU * FORTRAN UNIT NUMBER FOR READING TRAINING  
* * DEMAND RECORDS.  
* * ITRANW * NOT USED  
* * IFAIL * IF =0, TASK EXECUTION SUCCEEDED.  
* * IF =1, TASK EXECUTION FAILED.  
* * KEOF * NOT USED  
* * IFAIL1 * NOT USED  
* * IFAIL2 * NOT USED  
* * IOPTF * PROCESSING OPTION IN CASE OF RESOURCE ALLOCATION  
* * FAILURE. 0- STOP  
* * 1- IGNORE AND CONTINUE  
* * 2- LAG  
* * IOPTF1 * NOT USED.  
* * IOPTF2 * NOT USED  
* * MAXLAG * MAXIMUM LENGTH OF TIME A CLASS CAN BE LAGGED  
* * BEFORE IT STARTS EXECUTING THE EXTRAS TASKS  
* * IF IT CANNOT BE CORRELATED IMMEDIATELY.  
* IEXTRA * IF SET TO 1 (BY CORR) INDICATES THAT THE  
* * EXTRAS TASKS SHOULD BE EXECUTED.  
* * IFLOW(50) * SWITCHES TO CONTROL PRINTING OF PROGRAM FLOW  
* * INFORMATION. 0-NO PRINT, 1-PRINT.  
* * (SEE TABLE 7.1 FOR DETAILS)  
* * IDUMP(50) * SWITCHES TO CONTROL PRINTING OF DIAGNOSTICS  
* * DURING PROGRAM EXECUTION. 0-NO PRINT, 1-PRINT.  
* * (SEE TABLE 7.1 FOR DETAILS)  
* * ICORSE( ) * NOT USED.
### COMMON BLOCK - PB

#### VARIABLE DESCRIPTION

- **IPROC**: Procblock number.
- **IBTYPE**: 1
- **IDURAT**: Duration of procblock, (in calendar units)
- **IPRTY**: Priority of procblock.
- **ISYNCT**: Course number.
- **IDSYNB**: Address of next procblock in synchronization or correlation loop. 0 if procblock is not synchronized or correlated with any other procblocks.
- **NLBRNC**: Number of left branches in procblock.
- **LBRNCH(1,1)**: Address of next procblock along branch 1.
- **LBRNCH(2,1)**: Transfer priority of 1th branch.
- **LBRNCH(3,1)**: Transfer proportion along branch 1.
- **NTASKS**: Number of tasks.
- **ITASK(J)**: Address of Jth task.
- **NRBRNC**: Number of right branches in procblock.
- **IRBRNC(K)**: Address of next procblock along the Kth branch. (in a left to right direction)
COMMON BLOCK - PTB

* VARIABLE * DESCRIPTION

* PROP(5) * PROPORTIONS FOR 5 LEFT BRANCHES OF
* PROCBLOC.
* NEXTPT(5) * ADRESSES OF NEXT PTBS ALONG EACH OF THE
* 5 BRANCHES.
* IPROP(10) * FIRST 10 WORDS OF ACTIVE PTB.
* IPROP(1-5) CONTAIN THE NUMBER OF
* STUDENTS TO BE SENT ALONG EACH BRANCH.
* IPROP(6-10) CONTAIN THE ADRESSES OF THE
* NEXT PTBS ALONG EACH OF THE FIVE BRANCHES.
```

COMMON BLOCK - PTBC

* VARIABLE * DESCRIPTION

* I1PTB * POINTER TO FIRST PREDETERMINED TRANSFER BLOCK. *
* ILPTB * POINTER TO LAST PREDETERMINED TRANSFER BLOCK. *
* NXTFPT * POINTER TO NEXT AVAILABLE LOCATION FOR STORING *
  * PTBS. *
* LIMPTB * DIMENSION LIMIT FOR PTB STORAGE ARRAY. *
* ISZEPT * SIZE OF PTB RECORD (11) *
* ISZ1PT * = ISZEPT - 1 = 10 *
* ICORPT( ) * LINKED LIST STORAGE AREA FOR PTBS *
  * (FOR DETAILED DESCRIPTION OF PREDETERMINED *
  * TRANSFER BLOCK SEE COMMON BLOCK PTB). *

```
**COMMON BLOCK - RES**

**VARIABLE** | **DESCRIPTION**
---|---
NRESCR | NUMBER OF RESOURCES CURRENTLY IN LOCAL STORAGE.
IBUCKT(I) | BUCKET SIZE FOR RESOURCE I.
INCORE(I) | IF =0 RESOURCE I IS NOT IN LOCAL STORAGE.
           | =1 RESOURCE I IS IN LOCAL STORAGE
LOTIM1(I) | START TIME FOR LOCAL INVENTORY OF RESOURCE I.
LOTIM2(I) | END TIME FOR LOCAL INVENTORY OF RESOURCE I.
NBUCKET(I) | NUMBER OF BUCKETS OF RESOURCE I IN LOCAL STORAGE.
IT1(I) | BUCKET NUMBER CORRESPONDING TO LITIM1. (ASSUMES RES. INVENTORY STARTS AT TIME=1)
IT2(I) | BUCKET NUMBER CORRESPONDING TO LITIM2. (FOR ITH RESOURCE)
NXT | NEXT AVAILABLE LOCATION IN ARRAY INVRES.
LIMNXT | DIMENSION LIMIT FOR ARRAY INVRES.
IA1 | THEORETICAL NUMBER OF BUCKET CORRESPONDING TO ITIME1. (WORK VARIABLE FOR CURR. RESOURCE)
IA2 | THEORETICAL NUMBER OF BUCKET CORRESPONDING TO ITIME2. (WORK VARIABLE FOR CURRENT RESOURCE).
INDX1 | POINTER TO ELEMENT IN ARRAY INVRES THAT CORRESPONDS TO THE 'HIGH-TIME' BUCKET OF THE DESIRED RES. INVENTORY.
INDX2 | POINTER TO ELEMENT IN ARRAY INVRES THAT CORRESPONDS TO THE 'LOW-TIME' BUCKET OF THE DESIRED RESOURCE INVENTORY.
NBI | NUMBER OF RESOURCE BUCKETS REQUIRED TO COVER THE ACTIVE PROCBLOC.
LIMRES | DIMENSION LIMIT FOR ARRAY INVRES.
INVRES(I) | TEMPORARY STORAGE AREA FOR INVENTORIES OF CURRENTLY ACTIVE RESOURCES.
LIMNS | DIMENSION LIMIT FOR ARRAYS IADII, IADII2 AND IADII3.
LIMIS | DIMENSION LIMIT FOR ARRAY IAUED.
NSAVE | NUMBER OF RESOURCES WHOSE CONSUMPTION HAS BEEN STORED IN ARRAY IAUED.
ISAVE | NUMBER OF BUCKETS USED TO STORE TEMPORARY UPDATE OF RESOURCE UTILIZATION.
IADII(J) | SAVED VALUE OF INDX1. (POINTER TO 'HIGH-TIME' BUCKET IN INVRES).
IADII2(J) | SAVED VALUE OF INDX2. (POINTER TO 'LOW-TIME' BUCKET IN INVRES).
IADSII(J) | POINTER TO FIRST ELEMENT SAVED IN IAUED. (CORRESPONDS TO IADII1)
IAUEDK(K) | SAVED RESOURCE INVENTORIES.

**NOTE:** J VARIES FROM 1 TO NSAVE.

**NOTE:** K VARIES FROM I TO ISAVE.
**COMMON BLOCK - RLTDDBC**

**VARIABLE DESCRIPTION**

**NTDBRL** NUMBER OF RIGHT-TO-LEFT TRACK DESCRIPTOR BLOCKS.

**ITRK1(J)** POINTER TO FIRST TRACK DESCRIPTOR BLOCK FOR COURSE J. (NOTE.-A DUMMY ENTRY IS MADE FOR THE LAST+1 COURSE.

**NXTNDA(I)** POINTER TO NEXT NODE (TDB) ALONG THIS TRACK. (IN A RIGHT TO LEFT DIRECTION).


**CUMPCT(I)** CUMULATIVE TRANSFER PROPORTION FROM SOURCE TO CURRENT NODE. OBTAINED BY MULTIPLYING THE SPECIFIED PROPORTIONS ALONG THE TRACK.

**CUMPTY(I)** CUMULATIVE PRIORITY OF TRACK AT THIS NODE. (=CURRENT PRIORITY + PREVIOUS PRIORITY / 100., APPLIED RECURSIVELY.)

**NLFTB(I)** NUMBER OF LEFT BRANCH IN PROCBLOC.

**NSRCECI(I)** POINTER TO SOURCE DESCRIPTION. (COMMON SORDSC)

**NUMBLK(I)** NUMBER OF PROCBLOC ASSOCIATED WITH THIS NODE.

**ITDBST( )** LIST OF SORTED POINTERS TO TDBS. (SORT IS IN DESCENDING ORDER ON PRIORITY BY COURSE).

**NUMSTA(I)** NUMBER OF STUDENTS ASSIGNED TO THIS NODE. (CALCULATED FOR EACH CLASS BY SCATSA).
**COMMON BLOCK - RUB**

* VARIABLE * DESCRIPTION

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBLOCN</td>
<td>RUB NUMBER (PRIMARY)</td>
</tr>
<tr>
<td>IBLKT</td>
<td>3</td>
</tr>
<tr>
<td>NRUDBS</td>
<td>NUMBER OF RUDBS USED BY PRIMARY RUB.</td>
</tr>
<tr>
<td>IARUDB(I)</td>
<td>ADDRESS OF ITH RUDB. (PRIMARY)</td>
</tr>
<tr>
<td>JBLOCN</td>
<td>NUMBER OF SECONDARY RUB.</td>
</tr>
<tr>
<td>JBLKT</td>
<td>3</td>
</tr>
<tr>
<td>MRUDBS</td>
<td>NUMBER OF RUDBS USED BY SECONDARY RUB.</td>
</tr>
<tr>
<td>JARUDB(I)</td>
<td>ADDRESS OF ITH SECONDARY RUDB.</td>
</tr>
</tbody>
</table>
**COMMON BLOCK - RUDB**

**VARIABLE DESCRIPTION**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTBN</td>
<td>NUMBER OF CURRENT PRIMARY RUDB.</td>
</tr>
<tr>
<td>IBTYPE</td>
<td>4</td>
</tr>
<tr>
<td>IRESNO</td>
<td>NUMBER OF RESOURCE DESCRIBED BY RUDB.</td>
</tr>
<tr>
<td>IRUGF</td>
<td>NUMBER OF RESOURCE UTILIZATION GROUPING FUNCTION.*</td>
</tr>
<tr>
<td></td>
<td>1.- CLASS.</td>
</tr>
<tr>
<td></td>
<td>3.- INDIVIDUAL.</td>
</tr>
<tr>
<td>IRUTF</td>
<td>NUMBER OF RESOURCE UTILIZATION TIMING FUNCTION.</td>
</tr>
<tr>
<td></td>
<td>2.- UNIFORM</td>
</tr>
<tr>
<td></td>
<td>3.- ARBITRARY.</td>
</tr>
<tr>
<td>NXTRUB</td>
<td>ADDRESS OF SECONDARY RUDB.</td>
</tr>
<tr>
<td>IALTR</td>
<td>ADDRESS OF ALTERNATE RUDB.</td>
</tr>
<tr>
<td>ICONSU</td>
<td>UNITS OF CONSUMPTION PER UNIT USER.</td>
</tr>
<tr>
<td>JNTBN</td>
<td>NUMBER OF CURRENT SECONDARY RUDB.</td>
</tr>
<tr>
<td>JBTYPE</td>
<td>4</td>
</tr>
<tr>
<td>JRESNO</td>
<td>NUMBER OF RESOURCE DESCRIBED BY RUDB.</td>
</tr>
<tr>
<td>JRUGF</td>
<td>NUMBER OF RESOURCE UTILIZATION GROUPING FUNCTION.*</td>
</tr>
<tr>
<td></td>
<td>1.- CLASS</td>
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* * *
*************** COMMON BLOCK - SORDSC ***************

**VARIABLE** DESCRIPTION

* NOSRCS * NUMBER OF SOURCES (AS DEFINED BY COURSE TRACKS)
* ISRCPB(I) * ADDRESS OF PROCBLCC (AT SOURCE)
* ISTASK(I) * ADDRESS OF GETSOURCE TASK
* ISRRUB(I) * ADDRESS OF RUB
* ISRUDBI(I) * ADDRESS OF RUDB
* ISORNN(I) * SOURCE NUMBER

**NOTE.** I LOOPS OVER ALL TRACKS.
**COMMON BLOCK - TB**

**VARIABLE** | **DESCRIPTION**
---|---
IBLKN | NUMBER OF TASK BLOCK.
IBLKT1 | 2
ITSKFN | TASK FUNCTION NUMBER.
ITSKPT | TASK TYPE.
IARUB | ADDRESS OF ASSOCIATED RUB.
NPARMS | NUMBER OF PARAMETERS ASSOCIATED WITH TASK.
IPARM(I) | ITH PARAMETER
ITIME1 | START TIME FOR THIS TASK
ITIME2 | END TIME FOR THIS TASK
LITIM1 | EARLIEST START TIME FOR ALL TASKS IN THE CURRENTLY ACTIVE TASK LIST.
LITIM2 | LATEST START TIME FOR ALL TASKS IN THE CURRENTLY ACTIVE TASK LIST.
ICLSZE | CLASS SIZE ASSOCIATED WITH THIS TASK.
**COMMON BLOCK - TDR**

**VARIABLE** | **DESCRIPTION**
---|---
ITDATE | TIME OF TRAINING DEMAND
STUDNO | NUMBER OF STUDENTS DEMANDED.
ITTYPE | TRAINEE TYPE. 1-PILOT
 | 2-COPILOT
 | 3-DSO
 | 4-OSO
ICRSN | COURSE NUMBER.
IDGRAD | NOT USED. (GRADUATION ID GENERATED BY STEP 2).
IDTYPE | DEMAND TYPE. 1- CCTS DUE TO DELIVERIES.
 | 2- CCTS DUE TO ATTRITION.
 | 3- PMT
**COMMON BLOCK - TLIST**

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<td>NTSKS</td>
<td>NUMBER OF TASKS IN LIST.</td>
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<td>TASK ADDRESS.</td>
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<td>ICLSID(I)</td>
<td>POINTER TO CLASS IN LIST OF CURRENT CLASSES.</td>
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<tr>
<td>ICOMID(I)</td>
<td>IF = 0, THEN TASK I IS A CLASS TASK.</td>
</tr>
<tr>
<td></td>
<td>IF = 1, THEN TASK I IS A COMMON TASK.</td>
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<td>KTIME1(I)</td>
<td>START TIME FOR TASK I.</td>
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<tr>
<td>KTIME2(I)</td>
<td>END TIME FOR TASK I. (TIMES ARE ONLY</td>
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<td>LTIME2</td>
<td>MAXIMUM OF KTIME2 ENTRIES.</td>
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* COMMON BLOCK - WORKB
*
******************************************************************************
* VARIABLE DESCRIPTION
******************************************************************************
* *
* IPBLOC(34) * WORK AREA FOR STORING A PROCBLOC.*
* * (SEE FIG 8.3 FOR DETAILED DESCRIPTION
* * OF PROCBLOC).*
* IWTASK(12) * WORK AREA FOR STORING A TASK BLOCK.*
* * (SEE FIG 8.4 FOR DETAILED DESCRIPTION
* * OF TASK BLOCK).*
* IADRSB( ) * NOT USED.*
* *
******************************************************************************

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<td>2-COPILOTS</td>
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<td>JDTYPE(I)</td>
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<td>DIMENSION LIMIT FOR TRAINING DEMANDS FOR ONE COURSE.</td>
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3.7 Internal Data Block Description

The tables on the following pages define the contents of each of the data blocks used by the Phase 3 TRAM program.
### CLASS BLOCK

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<td>NUMBER OF STUDENTS IN CLASS.</td>
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<td>3</td>
<td>CLASS PRIORITY.</td>
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<td>4</td>
<td>TIME OF NEXT SCHEDULED EVENT FOR CLASS.</td>
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<td>5</td>
<td>ADDRESS OF NEXT ACTIVE PROCBLOC FOR CLASS.</td>
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<td>6</td>
<td>CLASS STATUS. 0-ACTIVE.</td>
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<td>7</td>
<td>ADDRESS OF NEXT PREDETERMINED TRANSFER BLOCK FOR CLASS.</td>
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<td>8</td>
<td>CREW IDENTIFICATION NUMBER.</td>
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<td>ADDRESS OF GRADUATION PROCBLOC.</td>
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<td>GRADUATION DATE.</td>
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<td>POINTER TO CLASS IN LIST OF CURRENT CLASSES.</td>
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<td>UNIQUE CLASS NUMBER.</td>
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<tr>
<td>13</td>
<td>DURATION OF CURRENT LAG.</td>
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<tr>
<td>14</td>
<td>REASON FOR CURRENT LAG. 1-RESOURCE MISSING.</td>
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<td>6-SYNC. FAILURE.</td>
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<tr>
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<td>7-CORR. FAILURE.</td>
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<td>ADDRESS OF CLASS IN MASS STORAGE.</td>
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<td>COURSE PRIORITY.</td>
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<td>SOURCE NUMBER FOR CLASS. (NOT USED).</td>
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<td>TOTAL TIME CLASS HAS BEEN LAGGED.</td>
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<td>LINK TO NEXT CLASS BLOCK.</td>
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TRAINING DEMAND BLOCK

WORD   DESCRIPTION

1   NUMBER OF STUDENTS.
2   DEMAND TIME
3   0
4   TRAINEE TYPE
5   DEMAND TYPE
6   POINTER TO NEXT DEMAND FOR COURSE.

NOTE.- NDXTD(i) IN COMMON CBLK CONTAINS A
       POINTER TO THE FIRST TRAINING DEMAND
       FOR THE iTH COURSE.
       NDXTD(i) IN COMMON CBLK CONTAINS A
       POINTER TO THE LAST TRAINING DEMAND
       FOR THE iTH COURSE.
**PROCESSING BLOCK**

**WORD DESCRIPTION**

1. INTERNAL BLOCK NUMBER.
2. BLOCK TYPE (1-PROC6LOC)
3. DURATION.
4. BLOCK PRIORITY
5. SYNCHRONIZATION TYPE.
6. NUMBER OF PROC6LOC SYNCHRONIZED WITH.
7. NUMBER OF LEFT BRANCHES.
8. LEFT BRANCH POINTER 1
9. PRIORIDADE 1
10. PERCENTAGE 1
11. LEFT BRANCH POINTER 2
12. PRIORIDADE 2
13. PERCENTAGE 2
14. LEFT BRANCH POINTER 3
15. PRIORIDADE 3
16. PERCENTAGE 3
17. LEFT BRANCH POINTER 4
18. PRIORIDADE 4
19. PERCENTAGE 4
20. LEFT BRANCH POINTER 5
21. PRIORIDADE 5
22. PERCENTAGE 5
23. NUMBER OF TASKS
24. POINTER TO TASK 1
25. POINTER TO TASK 2
26. POINTER TO TASK 3
27. POINTER TO TASK 4
28. POINTER TO TASK 5
29. NUMBER OF RIGHT BRANCHES
30. RIGHT BRANCH POINTER 1
31. RIGHT BRANCH POINTER 2
32. RIGHT BRANCH POINTER 3
33. RIGHT BRANCH POINTER 4
34. RIGHT BRANCH POINTER 5
### TASK BLOCK

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<td>BLOCK TYPE. (2-TASK BLOCK)</td>
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<td>TASK FUNCTION NUMBER. (NUMBER OF ROUTINE INVOKED)</td>
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<td>POINTER TO RESOURCE UTILIZATION BLOCK.</td>
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<td>NUMBER OF PARAMETERS</td>
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*RESOURCE UTILIZATION BLOCK*

*WORD DESCRIPTION*

1 INTERNAL BLOCK NUMBER.
2 BLOCK TYPE (3-RUB)
3 NUMBER OF RESOURCE UTILIZATION DESCRIPTION BLOCKS.
4 POINTER TO RUDB 1
5 POINTER TO RUDB 2
9 POINTER TO RUDB 6
REIOURCE UTIUIZATION DESCRIPTION BLOCK

* WORD DESCRIPTION

1 * INTERNAL BLOCK NUMBER
2 * BLOCK TYPE. (4-RUDB)
3 * RESOURCE NUMBER
4 * RESOURCE UTILIZATION GROUPING FUNCTION NUMBER.
5 * RESOURCE UTILIZATION TIMING FUNCTION NUMBER.
6 * POINTER TO NEXT RUB. (FOR COMPOSITE RESOURCES)
7 * POINTER TO ALTERNATE RUDB.
8 * UNITS OF CONSUMPTION / UNIT USER.
3.8 Common Variable Cross Reference Table

The tables on the following pages show how each subroutine uses each common variable. The subroutine names are printed across the top of the table, and the variable names down the left side.
CROSS REFERENCE USAGE CODES

A  ARGUMENT
THE SYMBOL IS A VARIABLE OR FUNCTION NAME WHICH APPEARS IN AN
ARGUMENT LIST OF A CALL, SUBROUTINE, FUNCTION, OR ENTRY STATEMENT.

D  DATA INITIALIZATION
THE SYMBOL IS A VARIABLE WHICH IS INITIALIZED IN A DATA OR TYPE
SPECIFICATION STATEMENT SUCH AS A COMPLEX SPECIFICATION STATEMENT.

F  FETCH A VALUE
THE SYMBOL IS A:
1. VARIABLE WHOSE MOST RECENTLY ASSIGNED VALUE IS ACCEDED
   BUT NOT CHANGED.
2. FUNCTION NAME OR ARGUMENT OF A FUNCTION WHICH APPEARS ON
   THE RIGHT SIDE OF AN EQUAL SIGN IN AN ASSIGNMENT
   STATEMENT OR APPEARS IN AN IF STATEMENT TEST.
3. DUMMY ARGUMENT IN A STATEMENT FUNCTION DEFINITION.

S  STORE A VALUE
THE SYMBOL IS A:
1. VARIABLE WHOSE VALUE IS REPLACED BY ANOTHER VALUE.
2. FUNCTION NAME WHICH APPEARS ON THE LEFT SIDE OF AN EQUAL
   SIGN IN AN ASSIGNMENT STATEMENT.
3. NAME OF A STATEMENT FUNCTION IN THE DEFINITION OF THAT
   FUNCTION.

C  COMMON
THE SYMBOL IS A VARIABLE WHICH APPEARS IN A COMMON STATEMENT OR IS
THE NAME OF A LABELED COMMON BLOCK.

E  EQUIVALENCE
THE SYMBOL IS A VARIABLE WHICH APPEARS IN AN EQUIVALENCE STATEMENT.

T  TYPE SPECIFICATION
THE SYMBOL IS A VARIABLE WHICH APPEARS IN A:
1. TYPE SPECIFICATION STATEMENT AND IS NOT INITIALIZED IN
   THAT STATEMENT.
2. DIMENSION OR EXTERNAL STATEMENT.

N  ENTRY POINT
THE SYMBOL IS AN ENTRY POINT DEFINED BY AN ENTRY STATEMENT IN A
SUBROUTINE OR FUNCTION.

X  EXTERNAL REFERENCE
THE SYMBOL IS A SUBROUTINE OR ENTRY NAME WHICH APPEARS IN A CALL
STATEMENT.
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<th>TYPE</th>
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Section 4.0
PHASE 4 PROGRAMMER'S GUIDE

Section 4.1
INTRODUCTION

The purpose of Phase 4 is to report the resource usage of the training system and to compute the associated costs.

This manual is intended to aid the programmer in the operation and modification of the computer program. It is assumed that the reader of this manual is already familiar with the contents of Technical Memorandum SAT-5, TRAM User's Guide.
Section 4.2
PROGRAM DESCRIPTION

The first processing performed by phase 4 is to read the card inputs and print them. The primary resources defined by the card inputs are then matched with the primary resources passed from phase 2 via file 24. The bucket sizes from that file complete the primary resource specifications from the card inputs. There must be a one to one correspondence between the resources from phase 2 and for those for phase 4. The secondary resources defined for phase 4 are completely independent of the other TRAM job steps.

The program then starts reading the use records from unit 40. The data from these records are stored in two separate common areas. One is for the periodic report, and the other is for the yearly report. Also, a plot bucket record is written to unit 51 for each primary resource that is to be plotted. The contents of these records will be discussed later. The program continues reading and processing the use records until the time for the next report, or the end of the run is reached.

The periodic report is produced at the specified frequency. This report consists of a printout of the information stored in the periodic report common variables. After the report is printed, the common area is cleared out for the next report. Note that this report is completely independent of the yearly report, and can be produced at any specified frequency.

The yearly report not only summarizes the resource usage, but also includes the costs associated with that usage. These costs are computed at the end of each year and stored for the final cost summary. A separate yearly report is printed for primary and secondary resources. At this time, RGU plot data are stored for those resources that are to be plotted. In addition, a plot bucket record is written for secondary resources (the bucket size for all secondary resources is one year.)

When the end of the run is reached, a final periodic and yearly report are printed, even if these reports would not normally be due at this time. The final cost summary is then printed. This report shows the costs that were incurred in each category for each year. They are shown in both current dollar
values and in inflated values. If RT&E costs have been incurred in years prior to the start of the run, they will be shown in year zero and negative years.

The final processing that is done is to produce the use plots. The data for these plots have been stored throughout the run. RGU data, which consists of time, number of RGUs on hand, and actual use available, have been stored in common /RGU/. The two temporary files contain the rest of the required information. These are the plot bucket files that were referred to earlier. Their records contain the time, use, and maximum use available for the resources. The data contained on these files are retrieved and combined with the RGU data to produce the plots. Note that for secondary resources, the maximum use available is the same as the actual use available, since there is no maximum use restriction on secondary resources.
Section 4.3
SUBPROGRAM DESCRIPTIONS

This section contains the descriptions of the individual subprograms that comprise phase 4 of the TRAM program. The description for each subprogram consists of a statement of the purpose of the routine, the calling sequence, a description of its parameters, the method used, and a list of the subprograms required. A high level flowchart, which shows the logical decision points and the processing accomplished, is also included for each of the major subprograms.
PHASE 4

PURPOSE

TO REPORT THE TIME HISTORY OF TRAINING RESOURCE USAGE WHICH WAS PASSED FROM PHASE 3, AND COMPUTE THE COSTS ASSOCIATED WITH THE TRAINING SYSTEM

REFERENCES

TRAM USERS GUIDE AND TRAM PROGRAMMERS GUIDE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED

INIT
PRINT1
PRINT2
PRINT3
REPT1
REPT2
WPLOTB
SUMRY
FPLOT
PHASE 4 MAIN PROGRAM

1. Read inputs and initialize unit.
2. Print the inputs.
3. Read a use record from file 40.
4. If record time before start time?
   a. Yes --> go to a
   b. No --> go to step 5.
5. If record time after end time?
   a. Yes --> do the periodic report (REPRT1), increment the year number, do the yearly report (REPRT2), do the final cost summary (SUMRY), do the use plots (FPLOT), stop.
   b. No --> time for next periodic report?
      a. Yes --> do the periodic report (REPRT1).
      b. No --> time for next yearly report?
         a. Yes --> increment the year number, do the yearly report (REPRT2).
         b. No --> add use to the periodic tables, add use to the yearly tables, write the plot bucket record, go to a.
THIS INVOLVES THE FOLLOWING:

1. Read Parameters Card
2. Read Primary Resource Definitions Passed From Step 3
3. Read Primary and Secondary Resource Data From Cards
4. Set Resource Usage Counts and Cost Summaries to Zero
5. Set Up Time of First Periodic and Yearly Reports

CALLING SEQUENCE

CALL INIT

DESCRIPTION OF PARAMETERS

NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED

CLEAR
LOOKUP
LOOK2
SUBROUTINE INIT

READ AND PRINT THE PARAMETER CARD

READ THE # OF PR'S FROM FILE 24

READ THE PR NAMES FROM FILE 24

READ THE NUMBER OF CALENDAR UNITS PER YEAR FROM FILE 24

READ THE BUCKET SIZES FROM FILE 24
PRINT THE END CARD

LOOP THRU ALL PR'S

HAS THIS PR BEEN DEFINED BY THE CARD INPUTS?

HAS LAST PR BEEN CHECKED?

INCREMENT INDEX TO THE NEXT PR

PRINT ERROR MESSAGE

SUBROUTINE INIT – CONTINUED
SUBROUTINE INIT – CONTINUED
SUBROUTINE CLEAR

PURPOSE
TO CLEAR AN ARRAY TO ZERO

CALLING SEQUENCE
CALL CLEAR (IARRAY, NWDS)

DESCRIPTION OF PARAMETERS
IARRAY - ARRAY TO BE CLEARED
NWDS - NUMBER OF ELEMENTS IN IARRAY TO BE CLEARED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
CC************* BLOCKD *************
CC* BLOCK DATA
CC* PURPOSE
CC* TO INITIALIZE COMMON AREAS FOR TRAM STEP 4
CC*
CC**********************
SUBROUTINE LOOK2

PURPOSE
TO LOOK UP A VALUE IN A TABLE AND RETURN ITS POSITION. THE
TABLE CONSISTS OF THOSE ELEMENTS IN A TWO DIMENSIONAL ARRAY
WHICH HAVE A CERTAIN FIXED FIRST SUBSCRIPT.

CALLING SEQUENCE
CALL LOOK2 (IVAL, IARRAY, N1, N2, N1FIX, ICODE, INDEX)

DESCRIPTION OF PARAMETERS
INPUT
IVAL - VALUE TO BE SEARCHED FOR
IARRAY - TABLE OF VALUES
N1 - DIMENSION OF FIRST SUBSCRIPT OF IARRAY
N2 - DIMENSION OF SECOND SUBSCRIPT OF IARRAY
N1FIX - FIRST SUBSCRIPT OF VALUES IN IARRAY TO BE SEARCHED
ICODE - DATA TYPE
1 INTEGER
2 CHARACTER

OUTPUT
INDEX - POSITION (SECOND SUBSCRIPT) OF THE VALUE IN THE
TABLE (ZERO IF NOT FOUND)

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

CC*********** LOOK2 ***********
SUBROUTINE PRINT1

PURPOSE
TO PRINT THE INPUT PARAMETERS FOR TRAM STEP 4

CALLING SEQUENCE
CALL PRINT1

DESCRIPTION OF PARAMETERS
NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE PRINT2

PURPOSE
   TO PRINT A TABLE OF THE PRIMARY RESOURCE DEFINITIONS

CALLING SEQUENCE
   CALL PRINT2

DESCRIPTION OF PARAMETERS
   NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
   NONE

*
SUBROUTINE PRINT3

PURPOSE
TO PRINT A TABLE OF THE SECONDARY RESOURCE DEFINITIONS

CALLING SEQUENCE
CALL PRINT3

DESCRIPTION OF PARAMETERS
NONE

*
SUBROUTINE REPT1

PURPOSE
   TO PRINT THE PERIODIC REPORT

CALLING SEQUENCE
   CALL REPT1

DESCRIPTION OF PARAMETERS
   NONE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
   CLEAR
SUBROUTINE REPR1
SUBROUTINE REPRT2

PURPOSE
TO COMPUTE THE COSTS INCURRED BY THE RESOURCE USAGE DURING THE YEAR AND TO PRINT THE YEARLY SUMMARY REPORT

CALLING SEQUENCE
CALL REPRT2 (IYEAR)

DESCRIPTION OF PARAMETERS
INPUT
IYEAR - YEAR NUMBER OF THIS REPORT

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
CLEAR
PRYEAR
SRYEAR
SUBROUTINE REPRT2

DO PRIMARY RESOURCES YEARLY REPORT (PR YEAR)

DO SECONDARY RESOURCES YEARLY REPORT (SR YEAR)

CLEAR THE YEARLY REPORT ARRAYS

SET UP NEXT YEARLY REPORT TIME

RETURN
SUBROUTINE PRYEAR

PURPOSE
TO DO THE YEARLY REPORT FOR THE PRIMARY RESOURCES

CALLING SEQUENCE
CALL PRYEAR (IYEAR)

DESCRIPTION OF PARAMETERS
INPUT
IYEAR - YEAR NUMBER

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
IICOST
RGCOST
PRINT4
RDTE
WGRU
SUBROUTINE PRYEAR
SUBROUTINE PRINT4

PURPOSE
TO PRINT THE PRIMARY RESOURCE YEARLY REPORT FOR SUBROUTINE PRYEAR

CALLING SEQUENCE
CALL PRINT4 (I, IYEAR, IVAL)

DESCRIPTION OF PARAMETERS

INPUT
I - NUMBER OF THE PRIMARY RESOURCE WHICH THIS CALL IS FOR, OR ZERO TO INITIALIZE A NEW REPORT
IYEAR - YEAR NUMBER
IVAL - ARRAY OF VALUES FOR THE PRIMARY RESOURCE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

SUBROUTINE PRINT4

**********
SUBROUTINE SRYEAR

PURPOSE
TO DO THE YEARLY REPORT FOR THE SECONDARY RESOURCES

CALLING SEQUENCE
CALL SRYEAR (IYEAR)

DESCRIPTION OF PARAMETERS
INPUT
IYEAR  - YEAR NUMBER

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
IICOST
RCOST
PRINT5
RDTE
WRGU
WPLOTB
SUBROUTINE SR YEAR

A

SR YEAR

LOOP ON ALL SECONDARY RESOURCES

COMPUTE THE AMOUNT OF THIS SR WHICH WAS USED

COMPUTE THE NUMBER OF RGU'S REQUIRED FOR THIS SR

COMPUTE THE NUMBER OF RGU'S PURCHASED

IS THIS SR TRANSFERRABLE?

CURRENT NUMBER OF RGU'S = MAX [PAST NUMBER, NUMBER REQUIRED THIS YEAR]

SET CURRENT NUMBER OF RGU'S TO THE NUMBER REQUIRED THIS YEAR

IS THIS THE FIRST TIME RGU'S HAVE BEEN PURCHASED FOR THIS SR?

ADD RDTE COST

B

ADD OTHER COSTS FOR THIS SR

WRITE THE REPORT ON THIS SR

STORE THE RGU PLOT DATA FOR THIS SR

WRITE THE PLOT BUCKET RECORD FOR THIS SR

HAVE ALL SR'S BEEN PROCESSED?

INCREMENT INDEX TO NEXT SR

RETURN

561
SUBROUTINE PRINTS

PURPOSE
TO PRINT THE SECONDARY RESOURCE YEARLY REPORT FOR SUBROUTINE SRYEAR

CALLING SEQUENCE
CALL PRINTS (I,IYEAR,IVAL)

DESCRIPTION OF PARAMETERS
INPUT
I - NUMBER OF THE SECONDARY RESOURCE WHICH THIS CALL IS FOR, OR ZERO TO INITIALIZE A NEW REPORT
IYEAR - YEAR NUMBER
IVAL - ARRAY OF VALUES FOR THE SECONDARY RESOURCE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
**SUBROUTINE ROTE**

**PURPOSE**
To add the ROTE cost to the cost summary. ROTE cost is spread out over the N years preceding the current year.

**CALLING SEQUENCE**
CALL ROTE (IYEAR, ICOST, N)

**DESCRIPTION OF PARAMETERS**

**INPUT**

- IYEAR - YEAR NUMBER OF THE CURRENT YEAR
- ICOST - ROTE COST TO BE SPREAD OVER N YEARS
- N - NUMBER OF YEARS OVER WHICH ICOST IS TO BE INCURRED

**SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED**
NONE
SUBROUTINE IICOST

PURPOSE
   TO COMPUTE THE COST ASSOCIATED WITH THE PURCHASE OF RESOURCE
   GENERATOR UNITS

CALLING SEQUENCE
   CALL IICOST (II, NRGUP, NRGUH, ICOST)

DESCRIPTION OF PARAMETERS
   INPUT
      II     - INITIAL INVESTMENT COST PER RGU
      NRGUP  - NUMBER OF RGUS PURCHASED
      NRGUH  - NUMBER OF RGUS ALREADY ON HAND
   OUTPUT
      ICOST  - INITIAL INVESTMENT COST

METHOD
   SUBROUTINE RGCOST IS CALLED TO COMPUTE THE COST AS FOLLOWS
   1 IF II .LT. 0
      COST = NRGUP * IABS(II)
   2 IF II .GT. 0
      COST = C2 - C1
   C2 = N * II * RL ** LOG2(N)
   C1 = NRGUH * II * RL ** LOG2(NRGUH)
   N = NRGUH + NRGUP
   RL = LEARNING RATE FROM PARAMETER CARD

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
   RGCOST
SUBROUTINE RGCOST

PURPOSE
TO COMPUTE THE COST ASSOCIATED WITH HAVING RESOURCE
GENERATOR UNITS ON HAND

CALLING SEQUENCE
CALL RGCOST (II, NRGU, ICOST)

DESCRIPTION OF PARAMETERS
   INPUT
       II     - COST PER RGU (NEGATIVE TO PREVENT LEARNING RATE
               FROM BEING APPLIED)
       NRGU   - NUMBER OF RESOURCE GENERATOR UNITS

   OUTPUT
       ICOST   - COST

METHOD
IF II .LT. 0
   COST = NRGU * IABS(II)
IF II .GT. 0
   COST = NRGU * II * RL ** LOG2(NRGU)
   RL = LEARNING RATE FROM PARAMETER CARD

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE

CC*************** RGCOST ***************
SUBROUTINE SUMRY

PURPOSE
TO PRINT THE FINAL COST SUMMARY REPORT

CALLING SEQUENCE
CALL SUMRY (NYEARS)

DESCRIPTION OF PARAMETERS
INPUT
NYEARS - NUMBER OF YEARS BEING SUMMARIZED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
PRINT6
SUBROUTINE SUMRY

PRINT THE REPORT TITLE

PRINT REPORT LINES FOR ANY ROTE COSTS IN NEGATIVE YEARS

LOOP THRU THE YEARS

CALCULATE THE INFLATION FACTOR FOR THIS YEAR'S COSTS

SUM THE COSTS FOR THIS YEAR

PRINT REPORT OF COSTS FOR THIS YEAR

ADD EACH COST TO THE GRAND TOTAL

HAVE ALL YEARS BEEN PROCESSED?

WRITE GRAND TOTALS OF ALL COSTS

INCREMENT INDEX TO NEXT YEAR

RETURN
SUBROUTINE PRINT6

PURPOSE
To print the final cost summary report for subroutine SUMRY

CALLING SEQUENCE
CALL PRINT6 (ISW, IYEAR, IRTDE, II, IRI, IOM)

DESCRIPTION OF PARAMETERS
INPUT
ISW - Control variable
LESS THAN ZERO TO INITIALIZE THE REPORT
ZERO TO PRINT FINAL TOTALS
GREATER THAN ZERO TO PRINT SUMMARY FOR A SINGLE YEAR
IYEAR - YEAR NUMBER
IRTDE - RTDE COST FOR THE YEAR
II - INITIAL INVESTMENT COST FOR THE YEAR
IRI - RECURING INVESTMENT COST FOR THE YEAR
IOM - OPERATIONS AND MAINTENANCE COST FOR THE YEAR

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE WRGU

PURPOSE
    TO STORE THE RGU PLOT DATA IN COMMON /RGU/

CALLING SEQUENCE
    CALL WRGU (IRES, IYEAR, NRGU, IAA)

DESCRIPTION OF PARAMETERS

   INPUT
     IRES - PRIMARY RESOURCE NUMBER, OR THE NEGATIVE OF THE
            SECONDARY RESOURCE NUMBER
     IYEAR - YEAR NUMBER
     NRGU - NUMBER OF RESOURCE GENERATING UNITS ON HAND
     IAA  - ACTUAL NUMBER OF USE UNITS AVAILABLE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
    NONE
SUBROUTINE WPLOTB

PURPOSE
TO WRITE OUT A PLOT BUCKET RECORD TO THE PRIMARY RESOURCE FILE OR TO THE SECONDARY RESOURCE FILE

CALLING SEQUENCE
CALL WPLOTB (IRES, ITIME, IUSE, IMA)

DESCRIPTION OF PARAMETERS

INPUT
IRES - PRIMARY RESOURCE NUMBER, OR THE NEGATIVE OF THE SECONDARY RESOURCE NUMBER
ITIME - BUCKET END TIME IN CALENDAR UNITS
IUSE - NUMBER OF UNITS OF THE RESOURCE USED DURING THE BUCKET
IMA - MAXIMUM NUMBER OF USE UNITS AVAILABLE FOR THE RESOURCE DURING THE BUCKET

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE FPLOT

PURPOSE
TO RETRIEVER THE PLOT DATA FOR EACH RESOURCE THAT IS TO BE
PLOTTED AND CALL SUBROUTINE PLOTU TO DO THE PLOTS

CALLING SEQUENCE
CALL FPLOT (IYEAR)

DESCRIPTION OF PARAMETERS
INPUT
IYEAR - NUMBER OF YEARS IN THE RUN

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
PLOTU
EFPLOT
SUBROUTINE FPLOT

FPLOT

LOOP THRU ALL PRIMARY RESOURCES

A

IS THE PLOT SWITCH ON FOR THIS PR?

B

YES

REWIND THE PR PLOT BUCKET FILE

C

NO

READ A RECORD FROM THE PLOT BUCKET FILE

EOF?

D

YES

RETRIEVE THE RGU DATA FOR THIS PR

DO THE USE PLOT

B

NO

IS THIS RECORD FOR THE CURRENT PR?

HAVE ALL PR'S BEEN PROCESSED?

YES

STOR THE PLOT DATA FOR THE PLOT

INCREMENT INDEX TO THE NEXT PR

NO

D

C

A

B

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SUBROUTINE FPLT — CONTINUED

LOOP THRU ALL SECONDARY RESOURCES

IS THE PLOT SWITCH ON FOR THIS SR?

REWIND THE SR PLOT BUCKET FILE

READ A RECORD FROM THE PLOT BUCKET FILE

EOF?

IS THIS RECORD FOR THE CURRENT SR?

STORE THE PLOT DATA FOR THIS SR

RETRIEVE THE RGU DATA FOR THIS SR

DO THE USE PLOT

HAVE ALL SR'S BEEN PROCESSED?

INCREMENT INDEX TO THE NEXT SR

RETURN

INDEX TO THE NEXT SR
SUBROUTINE LOOKUP

PURPOSE
TO LOOK UP A VALUE IN A TABLE AND RETURN ITS POSITION

CALLING SEQUENCE
CALL LOOKUP (IVAL, IARRAY, N, ICODE, INDEX)

DESCRIPTION OF PARAMETERS
INPUT
IVAL - VALUE TO BE SEARCHED FOR
IARRAY- TABLE OF VALUES TO BE SEARCHED FOR
N - NUMBER OF ENTRIES IN IARRAY
ICODE - 1 - DATA VALUES OCCUPY ONE WORD
        2 - DATA VALUES OCCUPY THREE WORDS, USED FOR 1C
CHARACTER FIELDS ON IBM COMPUTER
(REQUIRES IVAL(3), IARRAY(3,N))

OUTPUT
INDEX - INDEX OF THE VALUE IN THE TABLE, ZERO IF THE VALUE
IS NOT FOUND

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE PLOTU

PURPOSE
TO PLOT THE RESOURCE USE PLOTS

CALLING SEQUENCE
CALL PLOTU (XMA, USE, TIME1, NPTS1, AA, RGUS, TIME2, NPTS2, NAME)

DESCRIPTION OF PARAMETERS
XMA - MAXIMUM USE AVAILABLE PER BUCKET ARRAY
USE - USE PER BUCKET ARRAY
TIME1 - END TIME OF BUCKET FOR EACH VALUE OF XMA AND USE
NPTS1 - NUMBER OF ELEMENTS IN XMA, USE, AND TIME1 ARRAYS
AA - ACTUAL USE AVAILABLE PER YEAR ARRAY
RGUS - NUMBER OF RGUS ARRAY
TIME2 - YEAR NUMBER ASSOCIATED WITH EACH AA AND RGUS VALUE
NPTS2 - NUMBER OF ELEMENTS IN AA, RGUS, AND TIME2 ARRAYS
NAME - TEN CHARACTER NAME OF RESOURCE

EACH OF THE DATA ARRAYS (XMA, USE, TIME1, AA, RGUS, TIME2) HAVE
AS THEIR FIRST POINT, THE VALUE FOR THE BEGINNING OF THE
FIRST BUCKET. THE REST OF THE VALUES ARE FOR THE END OF EACH
BUCKET. THEREFORE, THE NUMBER OF POINTS EQUAIS THE NUMBER
OF BUCKETS PLUS ONE.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
SCALE1
SCALE2
STEPFN
MAXMIN
LABELX
PLOT
SYMBOL
AXIS
SUBROUTINE MAXMIN

PURPOSE
To find the maximum and minimum value in an array

CALLING SEQUENCE
CALL MAXMIN (XARRAY, NPTS, XMIN, XMAX)

DESCRIPTION OF PARAMETERS
INPUT
XARRAY - ARRAY OF VALUES
NPTS - NUMBER OF VALUES

OUTPUT
XMIN - MINIMUM VALUE IN XARRAY
XMAX - MAXIMUM VALUE IN XARRAY

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE SCALE1

PURPOSE
TO COMPUTE THE SCALE FACTORS FOR AN ARRAY OF VALUES, BASED
ON THE PLOT DIMENSIONS. THIS IS AN ISOLATION ROUTINE TO
PROVIDE COMPATIBILITY BETWEEN THE CALSPAN SCALE SUBROUTINE
AND THE STANDARD CALCOMP SCALE SUBROUTINE.

CALLING SEQUENCE
CALL SCALE1 (XARRAY, NPTS, SIZE, XMIN, DX)

DESCRIPTION OF PARAMETERS

INPUT
XARRAY - ARRAY OF VALUES FOR WHICH A SCALE IS TO BE COMPUTED
NPTS  - NUMBER OF ELEMENTS IN XARRAY
SIZE  - LENGTH IN FLOATING POINT INCHES AVAILABLE FOR
        PLOTTING THE ARRAY

OUTPUT
XMIN  - VALUE OF FIRST ANNOTATION ON THE AXIS
DX    - SCALE FACTOR (NUMBER OF UNITS PER INCH OF PLOT)

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
MAXMIN
SCALE
SUBROUTINE SCALE2

PURPOSE
   TO CONVERT AN ARRAY OF VALUES INTO PLOTTER INCHES

CALLING SEQUENCE
   CALL SCALE2 (XARRAY, NPTS, XMIN, DX)

DESCRIPTION OF PARAMETERS
   INPUT-OUTPUT
      XARRAY - ARRAY OF VALUES TO BE CONVERTED
   INPUT
      NPTS   - NUMBER OF ELEMENTS IN XARRAY
      XMIN   - MINIMUM VALUE ON PLOT AXIS
      DX     - PLOT AXIS INCREMENT (UNITS PER INCH)

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
   NONE

*******************************************************************************
SUBROUTINE STEPFN

PURPOSE
TO PLOT A STEP FUNCTION

CALLING SEQUENCE
CALL STEPFN (XARRAY, YARRAY, NPTS)

DESCRIPTION OF PARAMETERS
INPUT
XARRAY - X VALUES OF THE POINTS DEFINING THE STEP FUNCTION
(IN PLOTTER INCHES)
YARRAY - Y VALUES OF THE POINTS DEFINING THE STEP FUNCTION
(IN PLOTTER INCHES)
NPTS - NUMBER OF ELEMENTS IN XARRAY AND YARRAY

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
PLOT
SUBROUTINE LABELX

PURPOSE
TO LABEL A LINE DRAWN BY SUBROUTINE STEPFX. THE X POSITION
OF THE LABEL IS SPECIFIED, AND THE Y POSITION IS COMPUTED
SO THAT IT WILL BE ON THE LINE.

CALLING SEQUENCE
CALL LABELX (X, Y, NPTS, XL, LBL, NC, CHRSIZE)

DESCRIPTION OF PARAMETERS
INPUT
X - X COORDINATES
Y - Y COORDINATES
NPTS - NUMBER OF ELEMENTS IN X AND Y
XL - X POSITION OF LABEL
LBL - LABEL
NC - NUMBER OF CHARACTERS IN LABEL
CHRSIZE - CHARACTER SIZE

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
SYMBOL

CC*****************************************************************************************
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Section 4.4

SUBROUTINE CROSS REFERENCE TABLE

In the table on the following pages, the column headings show the subroutine names that do the calling, and the row headings give the subroutine names that are called.
CROSS REFERENCE USAGE CODES

A  ARGUMENT
THE SYMBOL IS A VARIABLE OR FUNCTION NAME WHICH APPEARS IN AN
ARGUMENT LIST OF A CALL, SUBROUTINE, FUNCTION, OR ENTRY STATEMENT.

D  DATA INITIALIZATION
THE SYMBOL IS A VARIABLE WHICH IS INITIALIZED IN A DATA OR TYPE
SPECIFICATION STATEMENT SUCH AS A COMPLEX SPECIFICATION STATEMENT.

F  FETCH A VALUE
THE SYMBOL IS A:
1. VARIABLE WHOSE MOST RECENTLY ASSIGNED VALUE IS ACCESSED
   BUT NOT CHANGED.
2. FUNCTION NAME OR ARGUMENT OF A FUNCTION WHICH APPEARS ON
   THE RIGHT SIDE OF AN EQUAL SIGN IN AN ASSIGNMENT
   STATEMENT OR APPEARS IN AN IF STATEMENT TEST.
3. DUMMY ARGUMENT IN A STATEMENT FUNCTION DEFINITION.

S  STORE A VALUE
THE SYMBOL IS A:
1. VARIABLE WHOSE VALUE IS REPLACED BY ANOTHER VALUE.
2. FUNCTION NAME WHICH APPEARS ON THE LEFT SIDE OF AN EQUAL
   SIGN IN AN ASSIGNMENT STATEMENT.
3. NAME OF A STATEMENT FUNCTION IN THE DEFINITION OF THAT
   FUNCTION.

C  COMMON
THE SYMBOL IS A VARIABLE WHICH APPEARS IN A COMMON STATEMENT OR IS
THE NAME OF A LABELED COMMON FLOCK.

E  EQUIVALENCE
THE SYMBOL IS A VARIABLE WHICH APPEARS IN AN EQUIVALENCE STATEMENT.

T  TYPE SPECIFICATION
THE SYMBOL IS A VARIABLE WHICH APPEARS IN A:
1. TYPE SPECIFICATION STATEMENT AND IS NOT INITIALIZED IN
   THAT STATEMENT.
2. DIMENSION OR EXTERNAL STATEMENT.

N  ENTRY POINT
THE SYMBOL IS AN ENTRY POINT DEFINED BY AN ENTRY STATEMENT IN A
SUBROUTINE OR FUNCTION.

X  EXTERNAL REFERENCE
THE SYMBOL IS A SUBROUTINE OR ENTRY NAME WHICH APPEARS IN A CALL
STATEMENT.
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<th>SYMBOL</th>
<th>CROSS REFERENCE SUMMARY</th>
<th>PHASE 4</th>
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Section 4.5

COMMON VARIABLE DEFINITIONS

The tables on the following pages define the meaning of each variable contained in each of the common blocks used by this program.
**COMMON /RESRCE/ - PART 1  
PRIMARY RESOURCE DATA**

**VARIABLE**  **DESCRIPTION**

**KPR(18,J)**  **PRIMARY RESOURCE DATA (18 WORDS PER PR, SECOND SUBSCRIPT**  
**IS INDEXED BY PR NUMBER)**

**WORD**  **CONTENTS**

1  **POINTER TO FIRST SRC USED BY THIS PR**  
     *(SUBSCRIPT IN KSRCL ARRAY)*
2  **POINTER TO LAST SRC USED BY THIS PR**  
     *(SUBSCRIPT IN KSRCL ARRAY)*
3  **OR ZERO IF NO SRC IS USED**
4  **NUMBER OF USE UNITS WHICH AN RGU FOR THIS PR CAN**  
     **PRODUCE PER YEAR**
5  **RDTE COST (DOLLARS)**
6  **RDTE PERIOD (YEARS)**
7  **INITIAL INVESTMENT COST PER RGU (DOLLARS)**
8  **RECURRING INVESTMENT COST PER RGU (DOLLARS)**
9  **RECURRING INVESTMENT COST PER YEAR (DOLLARS)**
10  **OPERATIONS AND MAINTENANCE COST PER RGU (DOLLARS)**
11  **OPERATIONS AND MAINTENANCE COST PER UNIT OF USE (DOLLARS)**
12  **PLOT SWITCH**
13  **TRANSFERRABLE SWITCH**
14  **BUCKET SIZE (CUS)**
15  **FIRST TIME USE SWITCH**
16  **CURRENT NUMBER OF RGUS REQUIRED FOR THIS PR**
17  **PR NAME (FIRST 4 CHARACTERS)**
18  **PR NAME (SECOND 4 CHARACTERS)**
19  **PR NAME (LAST 2 CHARACTERS)**

**NPR**  **NUMBER OF PRIMARY RESOURCES IN THE KPR ARRAY**

**MPR**  **MAXIMUM NUMBER OF PRIMARY RESOURCES WHICH CAN BE DEFINED**

*(DIMENSION OF SECOND SUBSCRIPT OF KPR ARRAY)*
**COMMON /RESRC/ - PART 2**

**SECONDARY RESOURCE COMPONENT USAGE LIST**

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<td>SRC USAGE DATA FOR PRIMARY RESOURCES (5 WORDS PER SRC, EACH PR DEFINITION GIVES THE J INDEX FOR THE FIRST AND LAST SRC WHICH IT USES)</td>
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<tr>
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<tr>
<td>1</td>
<td>UNITS OF USE PER RGU FOR THE PR</td>
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<td>UNITS OF USE PER UNIT OF PR USE</td>
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<td>POINTER TO SRC NAME IN KSRC ARRAY</td>
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<td>4</td>
<td>(INITIALLY CONTAINS FIRST 4 CHARACTERS OF SRC NAME)</td>
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<tr>
<td>5</td>
<td>SECOND 4 CHARACTERS OF SRC NAME</td>
</tr>
<tr>
<td>6</td>
<td>LAST TWO CHARACTERS OF SRC NAME</td>
</tr>
</tbody>
</table>

**NSRCL** | NUMBER OF ENTRIES IN KSRCL ARRAY |
**MSRCL** | MAXIMUM NUMBER OF ENTRIES WHICH CAN BE STORED IN THE KSRCL ARRAY |
| | (DIMENSION OF SECOND SUBSCRIPT) |
COMMON /RESRC/ - PART 3
SECONDARY RESOURCE DATA

* VARIABLE * DESCRIPTION

* KSR(17,J)* SECONDARY RESOURCE DATA (17 WORDS PER SR, SECOND SUBSCRIPT IS
* INDEXED BY SR NUMBER)

* WORD * CONTENTS

* 1 * POINTER TO FIRST COMPONENT OF THIS SR
* (SUBSCRIPT IN KSRC ARRAY)
* 2 * POINTER TO LAST COMPONENT OF THIS SR
* (SUBSCRIPT IN KSRC ARRAY)
* 3 * NUMBER OF USE UNITS WHICH AN RGU FOR THIS SR CAN
* PRODUCE PER YEAR
* 4 * RDTE COST (DOLLARS)
* 5 * RDTE PERIOD (YEARS)
* 6 * INITIAL INVESTMENT COST PER RGU (DOLLARS)
* 7 * RECURRING INVESTMENT COST PER RGU (DOLLARS)
* 8 * RECURRING INVESTMENT COST PER YEAR (DOLLARS)
* 9 * OPERATIONS AND MAINTENANCE COST PER RGU (DOLLARS)
* 10 * OPERATIONS AND MAINTENANCE COST PER UNIT OF USE (DOLLARS)
* 11 * PLOT SWITCH
* 12 * TRANSFERRABLE SWITCH
* 13 * FIRST TIME USE SWITCH
* 14 * CURRENT NUMBER OF RGUS REQUIRED FOR THIS SR
* 15 * SR NAME - FIRST FOUR CHARACTERS
* 16 * SR NAME - SECOND FOUR CHARACTERS
* 17 * SR NAME - LAST TWO CHARACTERS

* NSR * NUMBER OF SECONDARY RESOURCES IN THE KSR ARRAY
* MSR * MAXIMUM NUMBER OF SECONDARY RESOURCES WHICH CAN BE DEFINED
* (DIMENSION OF SECOND SUBSCRIPT OF KSR ARRAY)

******************************************************************
NUMBER OF SECONDARY RESOURCES IN THE KSR ARRAY
MAXIMUM NUMBER OF SECONDARY RESOURCES WHICH CAN BE DEFINED
(DIMENSION OF SECOND SUBSCRIPT OF KSR ARRAY)
******************************************************************
COMMON /RESRCE/ - PART 4
SECONDARY RESOURCE COMPONENTS

* VARIABLE * DESCRIPTION

KSRC(3,J) * SECONDARY RESOURCE COMPONENT NAMES
* (3 WORDS PER 10 CHARACTER NAME)
NSRC * NUMBER OF SRC NAMES IN THE KSRC ARRAY
MSRC * MAXIMUM NUMBER OF SRCS WHICH CAN BE DEFINED
* (DIMENSION OF SECOND SUBSCRIPT OF KSRC ARRAY)

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**COMMON /RESRC/ - PART 5**
RESOURCE USAGE TABLES

**VARIABLE** | **DESCRIPTION**
--- | ---

| **KPRP(J)** | PR USE DATA FOR PERIODIC REPORT |
| (SECOND SUBSCRIPT MUST BE DIMENSIONED AT THE MAXIMUM NUMBER OF PRIMARY RESOURCES ALLOWED, WHICH IS GIVEN BY VARIABLE MPR) |
| 1 | PEAK USE PER BUCKET |
| 2 | NUMBER OF BUCKETS DURING WHICH THIS RESOURCE WAS USED |
| 3 | TOTAL USE |

| **KPRY(J)** | PR USE DATA FOR YEARLY REPORT |
| (J DIMENSION MUST BE THE SAME AS THAT OF KPRP ARRAY) |
| 1 | PEAK USE PER BUCKET |
| 2 | NUMBER OF BUCKETS DURING WHICH THIS RESOURCE WAS USED |
| 3 | TOTAL USE |

| **KSRCY(K)** | SRC USE DATA FOR THE YEARLY REPORT |
| (MUST BE DIMENSIONED AT THE MAXIMUM NUMBER OF SECONDARY RESOURCE COMPONENTS ALLOWED, WHICH IS GIVEN BY VARIABLE MSRC) |
| EACH ELEMENT CONTAINS THE TOTAL USE FOR THAT SRC DURING THE YEAR |
COMMON /RESRCE/ - PART 6
FINAL COST SUMMARY

VARIABLE * DESCRIPTION

* KFINAL(4,J) * TOTAL COST FOR EACH CATEGORY IN EACH YEAR
  * 1 RDTE COST
  * 2 INITIAL INVESTMENT COST
  * 3 RECURRING INVESTMENT COST
  * 4 OPERATIONS AND MAINTENANCE COST

* NYEAR * NUMBER OF YEARS FOR WHICH COST DATA HAS BEEN STORED IN THE
  * KFINAL ARRAY
* MYEAR * MAXIMUM NUMBER OF YEARS ALLOWED
* (DIMENSION OF SECOND SUBSCRIPT OF KFINAL)
* IRDTE(K) * RDTE COST TABLE FOR NEGATIVE YEARS
  * IRDTE(1) WOULD CONTAIN THE RDTE COST FOR YEAR ZERO
  * IRDTE(2) WOULD CONTAIN THE RDTE COST FOR YEAR -1
* MRDTE * DIMENSION OF IRDTE ARRAY
**COMMON /PARMS/**

**VARIABLE**  **DESCRIPTION**

* ISTART  * START TIME FOR PHASE 4 TO START GENERATING REPORTS  
* IEND    * END TIME FOR PHASE 4 REPORTS  
* IPERD   * TIME INTERVAL BETWEEN PERIODIC REPORTS  
* RATE    * INFLATION RATE (RATIO - .1 = 10 PERCENT)  
* ICUS    * NUMBER OF CALENDAR UNITS PER YEAR  
* NEXTP   * TIME OF NEXT PERIODIC REPORT  
* NEXTY   * TIME OF NEXT YEARLY REPORT  

---

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**COMMON /RGU/
COMMON TO HOLD RGU PLOT DATA

**VARIABLE**  **DESCRIPTION**

* NRGU1(I,J)  NUMBER OF RGUS ON HAND FOR EACH PRIMARY RESOURCE DURING EACH YEAR
* IAA1(I,J)  ACTUAL USE AVAILABLE FOR EACH PRIMARY RESOURCE DURING EACH YEAR
* NRGU2(I,J)  NUMBER OF RGUS ON HAND FOR EACH SECONDARY RESOURCE DURING EACH YEAR
* IAA2(I,J)  ACTUAL USE AVAILABLE FOR EACH SECONDARY RESOURCE DURING EACH YEAR

* FOR ALL OF THE ABOVE ARRAYS
  * I SUBSCRIPT IS INDEXED ON YEAR NUMBER
  * J SUBSCRIPT IS INDEXED ON RESOURCE NUMBER

---

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Section 4.6

COMMON VARIABLE CROSS REFERENCE TABLE

The table on the following pages shows how each subroutine uses each common variable. The subroutine names are printed across the top of the table, and the variable names down the left side.
Section 4.7
TEMPORARY FILES

Two temporary files are created for the purposes of sorting data for plotting. The following figures describe the records on these files.
FILE 51 DESCRIPTION
PRIMARY RESOURCE PLOT BUCKET FILE

This unformatted (binary) file contains records of the following format:

<table>
<thead>
<tr>
<th>WORD</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRIMARY RESOURCE NUMBER</td>
</tr>
<tr>
<td>2</td>
<td>BUCKET END TIME (CUS)</td>
</tr>
<tr>
<td>3</td>
<td>NUMBER OF UNITS OF THE RESOURCE USED DURING THIS BUCKET</td>
</tr>
<tr>
<td>4</td>
<td>MAXIMUM NUMBER OF UNITS OF THE RESOURCE AVAILABLE DURING THIS BUCKET</td>
</tr>
</tbody>
</table>
FILE 52 DESCRIPTION
SECONDARY RESOURCE PLOT BUCKET FILE

THIS UNFORMATTED (BINARY) FILE CONTAINS RECORDS OF THE FOLLOWING FORMAT

WORD CONTENTS

1 SECONDARY RESOURCE NUMBER
2 END TIME OF THIS YEAR IN CALENDAR UNITS
3 NUMBER OF UNITS OF THE RESOURCE USED DURING THIS YEAR
4 MAXIMUM NUMBER OF UNITS OF THE RESOURCE AVAILABLE DURING THIS YEAR
   (NOTE - THIS IS THE SAME AS ACTUAL AVAILABLE FOR SR)
Section 5.0
PHASE 5 PROGRAMMER'S GUIDE

INTRODUCTION

The purpose of Phase 5 of TRAM is to report on the usage of trainees and on the time lags that occur in the training system.

This manual is intended to aid the programmer in the operation and modification of the computer program. It is assumed that the reader of this manual is already familiar with the contents of Technical Memorandum SAT-5, TRAM User's Guide.
Section 5.2
PROGRAM DESCRIPTION

Phase 5 reads the time ordered records from the source/lag file and stores a summary of these events in two separate areas, one for the periodic reports, and the other for the yearly reports. These reports are produced at the specified intervals from this stored information. When the end time that was specified on the parameter card is reached, the program outputs a set of final reports to cover the period from the last yearly report to the end of the run.
Section 5.3
SUBPROGRAM DESCRIPTIONS

This section contains the descriptions of the individual subprogram’s that comprise phase 5 of the TRAM program. The description for each subprogram consists of a statement of the purpose of the routine, the calling sequence, a description of its parameters, the method used, and a list of the subprograms required. A high level flowchart, which shows the logical decision points and the processing accomplished, is also included for each of the major subprograms.

Two subroutines (RDNAME and NAME) are not shown here, but are documented in the phase 3 programmers’ guide.
PHASE5

SUBROUTINE PHASES

PURPOSE
TO OUTPUT THE LAG REPORTS AND THE SOURCE REPORTS FROM THE
RESULTS OF PHASE3.

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
RDNAME
CLEAR
REPT1
REPT2

CC**********************************************************
PHASE 5 MAIN PROGRAM

READ DATA BLOCK NAMES FROM FILE 20
ALLOCATE SPACE FOR REPORT ARRAYS
READ CONTROL CARD
READ NEXT RECORD FROM UNIT 31
IS RECORD TIME GREATER THAN START TIME?
YES
IS IT TIME FOR NEXT PERIODIC REPORT?
YES
PRINT THE PERIODIC LAG REPORT
PRINT THE PERIODIC SOURCE REPORT
ZERO OUT THE PERIODIC REPORT ARRAYS
COMPUTE TIME OF NEXT PERIODIC REPORT
NO
IS IT TIME FOR NEXT YEARLY REPORT?
YES
PRINT THE YEARLY LAG REPORT
PRINT THE YEARLY SOURCE REPORT
ZERO OUT THE YEARLY REPORT ARRAYS
COMPUTE TIME OF NEXT YEARLY REPORT
NO

B

IS TIME GREATER THAN END TIME?
YES
PRINT THE FINAL SUMMARY REPORTS
NO
SOURCE
WHICH TYPE RECORD WAS READ?
LAG
ENTER LAG DATA IN REPORT ARRAYS
ENTER SOURCE DATA IN REPORT ARRAYS
STOP

A
SUBROUTINE CLEAR

PURPOSE
TO CLEAR AN ARRAY TO ZERO

CALLING SEQUENCE
CALL CLEAR (IARRAY, NWDS)

DESCRIPTION OF PARAMETERS
IARRAY - ARRAY TO BE CLEARED
NWDS - NUMBER OF ELEMENTS IN IARRAY TO BE CLEARED

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
SUBROUTINE REPRT1

PURPOSE
TO PRINT THE LAG REPORT

CALLING SEQUENCE
CALL REPRT1 (ICODE, ISTRT, IEND)

DESCRIPTION OF PARAMETERS
INPUT
ICODE - INDICATES REPORT TYPE
   1 PERIODIC
   2 YEARLY
   3 FINAL SUMMARY
ISTRT - START TIME OF THE REPORT
IEND - END TIME OF THE REPORT

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NAME
SUBROUTINE REPRT2

PURPOSE
TO PRINT THE SOURCE REPORT

CALLING SEQUENCE
CALL REPRT2 (ICODE, ISTRT, IEND)

DESCRIPTION OF PARAMETERS
INPUT
ICODE - INDICATES REPORT TYPE
  1 PERIODIC
  2 YEARLY
  3 FINAL SUMMARY
ISTRT - START TIME OF THE REPORT
IEND - END TIME OF THE REPORT

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NAME
Section 5.4

SUBROUTINE CROSS REFERENCE TABLE

In the table on the following page, the column headings show the names of the subroutines that do the calling, and the row headings give the names of the subroutines that are called.
Section 5.5
COMMON VARIABLE DEFINITIONS

The tables on the following pages define the meaning of each variable contained in each of the common blocks used by this program.
**COMMON /LAG/ - DATA FOR LAG REPORTS**

**VARIABLE**  **DESCRIPTION**

- **IPL1**  **BASE POINTER TO LAG DATA FOR COURSES**
- **NL1**  **NUMBER OF COURSES**
- **IPL2**  **BASE POINTER TO LAG DATA FOR PROCESSING BLOCKS**
- **NL2**  **NUMBER OF PROCESSING BLOCKS**
- **IPL3**  **BASE POINTER TO LAG DATA FOR TASKS**
- **NL3**  **NUMBER OF TASKS**

**ILAG(I,4)**  **LAG DATA - 4 WORDS PER ENTRY**

**MLAG**  **MAXIMUM NUMBER OF ENTRIES WHICH CAN BE STORED IN THE ILAG ARRAY**

<table>
<thead>
<tr>
<th>WORD</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TOTAL LAG TIME DURING THIS PERIOD</td>
</tr>
<tr>
<td>2</td>
<td>TOTAL LAG TIME TO DATE (FOR PERIODIC REPORT)</td>
</tr>
<tr>
<td>3</td>
<td>TOTAL LAG TIME DURING THIS YEAR</td>
</tr>
<tr>
<td>4</td>
<td>TOTAL LAG TIME TO DATE (FOR YEARLY REPORT)</td>
</tr>
</tbody>
</table>

**MLAG**  **DIMENSION OF FIRST SUBSCRIPT**
**COMMON /SOURCE/ - DATA FOR SOURCE REPORTS**

**VARIABLE**  DESCRIPTION

**IPS1**  *BASE POINTER TO SOURCE DATA FOR COURSES*

**NS1**  *NUMBER OF COURSES*

**IPS2**  *BASE POINTER TO SOURCE DATA FOR SOURCES*

**NS2**  *NUMBER OF SOURCES*

**ISRC(i,8)**  *SOURCE DATA - 8 WORDS PER ENTRY*

**WORD**  CONTENTS

1  *NUMBER OF TRAINEES USED DURING THIS PERIOD*

2  *TOTAL TRAINING TIME FOR TRAINEES USED DURING THIS PERIOD*

3  *TOTAL NUMBER OF TRAINEES USED TO DATE*

4  *TOTAL TRAINING TIME TO DATE (FOR PERIODIC REPORT)*

5  *NUMBER OF TRAINEES USED DURING THIS YEAR*

6  *TOTAL TRAINING TIME FOR TRAINEES USED DURING THIS YEAR*

7  *TOTAL NUMBER OF TRAINEES USED TO DATE*

8  *TOTAL TRAINING TIME TO DATE (FOR YEARLY REPORT)*

**MSRCE**  *MAXIMUM NUMBER OF ENTRIES WHICH CAN BE STORED IN ISRC(i,8) ARRAY*

*(DIMENSION OF FIRST SUBSCRIPT)*
Section 5.6
COMMON VARIABLE CROSS REFERENCE TABLE

The table on the following pages shows how each subroutine uses each common variable. The subroutine names are printed across the top of the table, and the variable names down the left side.
CROSS REFERENCE USAGE CODES

A  ARGUMENT
THE SYMBOL IS A VARIABLE OR FUNCTION NAME WHICH APPEARS IN AN ARGUMENT LIST OF A CALL, SUBROUTINE, FUNCTION, OR ENTRY STATEMENT.

D  DATA_INITIALIZATION
THE SYMBOL IS A VARIABLE WHICH IS INITIALIZED IN A DATA OR TYPE SPECIFICATION STATEMENT SUCH AS A COMPLEX SPECIFICATION STATEMENT.

F  FETCH A VALUE
THE SYMBOL IS A:
1. VARIABLE WHOSE MOST RECENTLY ASSIGNED VALUE IS ACCESSED BUT NOT CHANGED.
2. FUNCTION NAME OR ARGUMENT OF A FUNCTION WHICH APPEARS ON THE RIGHT SIDE OF AN EQUAL SIGN IN AN ASSIGNMENT STATEMENT OR APPEARS IN AN IF STATEMENT TEST.
3. DUMMY ARGUMENT IN A STATEMENT FUNCTION DEFINITION.

S  STORE A VALUE
THE SYMBOL IS A:
1. VARIABLE WHOSE VALUE IS REPLACED BY ANOTHER VALUE.
2. FUNCTION NAME WHICH APPEARS ON THE LEFT SIDE OF AN EQUAL SIGN IN AN ASSIGNMENT STATEMENT.
3. NAME OF A STATEMENT FUNCTION IN THE DEFINITION OF THAT FUNCTION.

C  COMMON
THE SYMBOL IS A VARIABLE WHICH APPEARS IN A COMMON STATEMENT OR IS THE NAME OF A LABELED COMMON BLOCK.

E  EQUIVALENCE
THE SYMBOL IS A VARIABLE WHICH APPEARS IN AN EQUIVALENCE STATEMENT.

T  TYPE_SPECIFICATION
THE SYMBOL IS A VARIABLE WHICH APPEARS IN A:
1. TYPE SPECIFICATION STATEMENT AND IS NOT INITIALIZED IN THAT STATEMENT.
2. DIMENSION OR EXTERNAL STATEMENT.

N  ENTRY_POINT
THE SYMBOL IS AN ENTRY POINT DEFINED BY AN ENTRY STATEMENT IN A SUBROUTINE OR FUNCTION.

X  EXTERNAL_REFERENCE
THE SYMBOL IS A SUBROUTINE OR ENTRY NAME WHICH APPEARS IN A CALL STATEMENT.
Section 6.0
MERGE PROGRAM PROGRAMMER'S GUIDE

INTRODUCTION

The purpose of this program is to merge the original resources file from Phase 2 and the unused resources file from Phase 3 into a single resource use file for input to Phase 4.

This manual is intended to aid the programmer in the operation and modification of the computer program.
Section 6.2
PROGRAM DESCRIPTION

The merge program reads matched pairs of records from units 23 and 33, and outputs single records containing the data from the original pair. The records on unit 23 contain the quantity of the resource available during the bucket, and the records on unit 33 contain the quantity remaining at the end of the bucket. Both of these files are sorted by time and resource number, which are used as keys to the merge operation.

The program keeps track of the time at which the next record should be encountered for each resource, based on its bucket size (obtained from unit 24.) This enables any missing records on unit 23 to be detected. A missing record on this file indicates that the resource is no longer available. When this occurs, the program writes a record to the output file with both the quantity available and the quantity remaining set to zero. If the resource becomes available again later, the merge program will continue processing it. A missing record on unit 33 indicates that all of the resource has been used, so the quantity remaining is set to zero and a record is written to the output file.

This merge operation continues until an end of file is encountered on unit 23. An extra record is then written to the output file to signal the end of file to phase 4. This record has all fields set to zero except for the bucket time, which is filled in with a large number.

The merge program consists of a main program, which does not require any subroutines or common blocks. The documentary prologue from this program is shown on the next page, and a high level flowchart is included in the pages following that.
PURPOSE

TO READ THE RESOURCE QUANTITY AVAILABLE FILE FROM TRAM STEP 2
AND THE RESOURCE QUANTITY REMAINING FILE FROM TRAM STEP 3,
AND TO MERGE THEM INTO A SINGLE RESOURCE USE FILE FOR INPUT
TO TRAM STEP 4.

INPUT FILES

1 TRANSFERRED PRIMARY RESOURCES FILE (TPR) - FROM TRAM STEP 2
ON FORTRAN LOGICAL UNIT 24
RECORD 1 - NUMBER OF RESOURCES
2 - RESOURCE NAMES
3 - NUMBER OF CALENDAR UNITS PER YEAR
4 - RESOURCE BUCKET SIZES

2 RESOURCE QUANTITY AVAILABLE FILE - FROM TRAM STEP 2
ON FORTRAN LOGICAL UNIT 23
EACH RECORD CONTAINS THE FOLLOWING
1 TIME
2 RESOURCE NUMBER
3 QUANTITY AVAILABLE
- THESE RECORDS HAVE BEEN SORTED ON TIME AND RESOURCE NUMBER
- RECORDS WILL NOT BE PRESENT FOR TIMES WHEN THE RESOURCE
IS NOT AVAILABLE

3 RESOURCE QUANTITY REMAINING FILE - FROM TRAM STEP 3
ON FORTRAN LOGICAL UNIT 33
EACH RECORD CONTAINS THE FOLLOWING
1 TIME
2 RESOURCE NUMBER
3 QUANTITY REMAINING
- THESE RECORDS HAVE BEEN SORTED ON TIME AND RESOURCE NUMBER
- RECORDS WILL NOT BE PRESENT FOR TIMES WHEN ALL PRESENT
UNITS OF THE RESOURCE HAVE BEEN USED

OUTPUT FILE
RESOURCES USE FILE
ON FORTRAN LOGICAL UNIT 40
EACH RECORD CONTAINS THE FOLLOWING
1 TIME
2 RESOURCE NUMBER
3 MAXIMUM QUANTITY AVAILABLE IN THIS BUCKET
4 QUANTITY REMAINING AT THE END OF THIS BUCKET

SUBROUTINE AND FUNCTION SUBPROGRAMS REQUIRED
NONE
MERGE PROGRAM

READ BUCKET SIZE OF EACH RESOURCE FROM UNIT 24

SET NEXT EXPECTED RESOURCE NUMBER AND TIME TO LARGE NUMBERS

READ NEXT RECORD FROM UNIT 23 (OR USE DATA READ LAST TIME IF READ SWITCH IS SET)

EOF?

YES

IS THIS THE RECORD WE EXPECTED?

NO

YES

UPDATE THE NEXT EXPECTED TIME FOR THIS RESOURCE

READ THE NEXT RECORD FROM UNIT 23 (OR USE DATA READ LAST TIME IF READ SWITCH IS SET)

DOES THIS RECORD MATCH THE OTHER ONE?

YES

FILL IN QUANTITY REMAINING IN THE OUTPUT RECORD

NO

FILL IN THE QUANTITY REMAINING IN THE OUTPUT RECORD

READ RECORD TO UNIT 40 WITH LARGE TIME TO MARK EOF

STOP

FILL IN ZERO QUANTITY REMAINING IN THE OUTPUT RECORD

SET READ SWITCH FOR FILE 33, SO THAT SAME RECORD WILL BE USED NEXT TIME

PRINT ERROR MESSAGE

HALT

MERGE PROGRAM
MERGE PROGRAM – CONTINUED

1. **Does the record come before the one we expected?**
   - **NO**
     - Output a record to unit 40 with zero available - zero remaining for resource we had expected.
   - **YES**
     - **Is the next time of this resource zero?**
       - **NO**
         - Set the read switch for unit 23 so that the same record will be used next time.
       - **YES**
         - Store the next expected time for this new resource.
         - **A**
         - **Halt**
         - **B**
         - **Print error message**
Section 6.3
DESCRIPTION OF INPUTS

The only inputs to the merge program are these binary files passed from the previous TRAM job steps:

- 23 (original resources file from phase 2)
- 24 (resource information from phase 2)
- 33 (unused resources file from phase 3)

A description of each of these files is contained in the programmers guide for the phase which creates it.
Section 6.4
DESCRIPTION OF OUTPUTS

The main output of this program is the binary file written to unit 40 for passage to phase 4. The contents of this file are described in the program's prologue, which is shown in section 2. The only other outputs are the printed error messages, or the "MERGE COMPLETED" message, which is printed to indicate that no errors were detected.
Section 7.0
TROLIE PROGRAMMER'S GUIDE

7.1 Introduction

This guide is intended to supplement the user's guide for TROLIE in Technical Memorandum SAT-5, TRAM User's Guide. TROLIE consists of five parts. The INPUT subroutine reads inputs, documents the inputs and writes the resource name records in Unit 2. The MAIN program computes the resource use and writes the resource use records on Unit 1. Subroutines TAB and WTAB are table writers. TAB has an extra argument for writing column headings. BLOCK DATA clears arrays and introduces some literal data.

7.2 Subroutines

The section which follows contains descriptions of the subprograms, commons and output data sets.

Subroutine INPUT

The inputs are read in accordance with Table 1. As each major set of cards are read, output is created to document their values. Individual deliveries are not documented. A program error stop will occur if array sizes are exceeded (label 100), if a delivery is attempted to an undefined air base (label 100), or if there are an insufficient number of input cards (label 101). Input also writes the resource names record on unit 2 for use in Phase 4 of TRAM.

Subroutine BLOCK DATA

BLOCK DATA contains names for printout purposes and clears arrays used in MAIN. The arrays cleared by BLOCK DATA must be cleared because initial zeros are assumed.

Subroutine WTAB(NDATA, NCOLS, NLINES, COLLAB, LINLAB, T0PLAB, ISHIFT, KD, NAMES) and
Subroutine TAB(NDATA, NCOLS, NLINES, COLLAB, LINLAB, T0PLAB, ISHIFT, KD)

Arguments are:
NDATA a two-dimensional array to be printed out
NCOLS number of columns
NLINES number of lines
WTAB and TAB write tables 50 lines long by 10 columns wide with a row index. WTAB has column headings, TAB has only indices.

MAIN Program

Most of the computation is performed in the MAIN program. MAIN consists of a number of sections identifying the loops over time using the index IY (for year index).

- Loop on 100  This loop computes the training demands
- Loop on 300  This loop writes the results of the 100 loop
- Loop on 200  This loop computes the PMT demands
- Loop on 340  This loop writes the results of the 200 loop
- Loop on 400  This loop selects the source for the CCTS demands

The resource and track use reports are then written.

- Loop on 600  This loop computes the resource use and writes the resource use records in the proper order for Phase 4 of TRAM on Unit 1.

The final step is a listing of the resources used and the generation of the end of file record.

7.3 NOTES

In the loop on Table 100, NNCPY (IY + 1) contains the number of crews currently in the system. On the next pass through the loop, this is used to compute the number of new crews required that year.

The resource use date (IDTCU) is 2 calendar units less than the end of the year. Normally the number of calendar units per year is 1500 so this should not present a problem.
The contents of the commons are indicated in Tables 7.1, 7.2 and 7.3.

Table 7.1

Common REALS -
Real Data Initialized by INPUT and BLOCK DATA

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>Attention Ratio</td>
<td>Input</td>
</tr>
<tr>
<td>CR</td>
<td>Crew Ratio</td>
<td>Input</td>
</tr>
<tr>
<td>PUPR</td>
<td>Copilot Upgrade Ratio</td>
<td>Input</td>
</tr>
<tr>
<td>ANAME(5)</td>
<td>'PLTS'</td>
<td>Block Data</td>
</tr>
<tr>
<td></td>
<td>'CPLT'</td>
<td>Block Data</td>
</tr>
<tr>
<td></td>
<td>'OSO '</td>
<td>Block Data</td>
</tr>
<tr>
<td></td>
<td>'DSO '</td>
<td>Block Data</td>
</tr>
<tr>
<td></td>
<td>'XTRA'</td>
<td>Block Data</td>
</tr>
<tr>
<td>RESNAM(3,80)</td>
<td>Resource Names (3 words each)</td>
<td>Input</td>
</tr>
</tbody>
</table>

Table 7.2

Common ICS -
Integer Constants (All defined in INPUT)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY</td>
<td>Number of Years</td>
</tr>
<tr>
<td>NYO</td>
<td>Date of Year 1</td>
</tr>
<tr>
<td>NB</td>
<td>Number of Bases</td>
</tr>
<tr>
<td>NS</td>
<td>Number of Sources</td>
</tr>
<tr>
<td>NT</td>
<td>Number of Tracks</td>
</tr>
<tr>
<td>NR</td>
<td>Number of Resources</td>
</tr>
<tr>
<td>IDelay</td>
<td>Attrition Delay</td>
</tr>
<tr>
<td>NCU</td>
<td>Number of Calendar Units/Year</td>
</tr>
<tr>
<td>ITAPE</td>
<td>Data Set Flag</td>
</tr>
</tbody>
</table>
Table 7.3
Common INTAR -
Integer Arrays

Except for IDT and ISTAB, all names are of the form XXXPYY where XXX is arbitrary, P per "per" and YY is one or two suffix letters which indicate the dependencies as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>NACPB</td>
<td>No. of aircraft per base year</td>
<td>Main</td>
</tr>
<tr>
<td>NADPB</td>
<td>No. of deliveries per base each year</td>
<td>Input</td>
</tr>
<tr>
<td>NACPB</td>
<td>No. of aircraft in system each year</td>
<td>Main</td>
</tr>
<tr>
<td>NADPB</td>
<td>No. of deliveries each year</td>
<td>Input</td>
</tr>
<tr>
<td>NACPB</td>
<td>No. of crews at each base each year</td>
<td>Main</td>
</tr>
<tr>
<td>NACPB</td>
<td>No. of crews in system each year</td>
<td>Main</td>
</tr>
<tr>
<td>NNCPB</td>
<td>No. of new crews trained each year</td>
<td>Main</td>
</tr>
<tr>
<td>NRCPB</td>
<td>No. of replacement crews trained each year</td>
<td>Main</td>
</tr>
<tr>
<td>NTTDPB</td>
<td>No. of total trainee demands each year</td>
<td>Main</td>
</tr>
<tr>
<td>NXCPLS</td>
<td>No. of extra pairs each year</td>
<td>Main</td>
</tr>
<tr>
<td>ILTID</td>
<td>Lower PMT track list index for each base</td>
<td>Input</td>
</tr>
<tr>
<td>IUTID</td>
<td>Upper PMT track list index for each base</td>
<td>Input</td>
</tr>
<tr>
<td>IDT</td>
<td>Track index list</td>
<td>Input</td>
</tr>
<tr>
<td>NTPTY</td>
<td>No. of trainees in each track each year</td>
<td>Main</td>
</tr>
<tr>
<td>NPPY</td>
<td>No. of preps trained each year</td>
<td>Main</td>
</tr>
<tr>
<td>ISTAB</td>
<td>Source for each CCTS track</td>
<td>Main</td>
</tr>
<tr>
<td>NSPSY</td>
<td>No. of trainees available from each source each year</td>
<td>Input</td>
</tr>
<tr>
<td>IUSPSY</td>
<td>No. of trainees drawn from each source each year</td>
<td>Main</td>
</tr>
<tr>
<td>INSPTY</td>
<td>No. of unit trainees in each track each year</td>
<td>Main</td>
</tr>
<tr>
<td>IRUPRY</td>
<td>Amount of each resources used each year</td>
<td>Main</td>
</tr>
<tr>
<td>IRCPRT</td>
<td>Amount of each resources used by a unit trainee in each track.</td>
<td>Input</td>
</tr>
</tbody>
</table>
7.5 REPORTS

Sample outputs are contained in the programmer's guide. The reports are:

1. Parameters - The first 2 cards
2. Air Base List - Base names, indices, and PMT track lists
3. Delivery List - Years by bases
4. CCTS Track List - Sources index for each CCTS track
5. Source Availability - Trainees available years by sources
6. Resource Use Data - Resources used by unit trainees - tracks by resources
7. CCTS Summary - Yearly A/C deliveries, total A/C deployment, new crews, replacement crews, total crews in the system, pilot upgrades, total full crew training, and extras pairs training
8. Detailed Base Delivery List
9. PMT Track Trainees - Number of PMT unit trainees per track, years by track
10. Source Use Matrix - Use of trainees from each source, years by source
11. Track Use - Trainees taught by years and track
12. Resource Use - Resources used, years by resource.

7.6 DATA SET OUTPUT

Two files are produced.

FORTRAN Unit 1 contains resource use records. The records must be sorted by date and resources number. Each logical record contains:

- Date in CUs
- Resource number
- Resource originally available
- Resource remaining

The resource originally available is nominally 99999 units. A final record with the time 999999 is produced as an end of file record.
FORTRAN Unit 2 is the resource name file. It contains:

Record

1  Number of resources
2  Resource names
3  Number of calendar units per year
4  Bucket size for each resource (=NCU for TROLIE)