DETECTION

E77-10101

AND

MAPPING

PACKAGE

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VOLUME 2a:
SOFTWARE
USER
MANUAL
(part 1)

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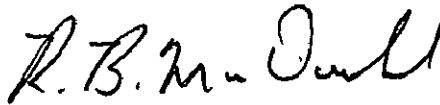
DETECTION AND MAPPING PACKAGE

VOLUME 2a: SOFTWARE USER
MANUAL (part 1)

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16 Abstract

The DAM package is an integrated set of manual procedures, computer programs, and graphic devices designed for efficient production of precisely registered and formatted maps from digital Landsat multispectral scanner (MSS) data. The software can be readily implemented on any Univac 1100 series computer with standard peripheral equipment. This version of the software includes pre-defined spectral limits for use in classifying and mapping surface water.

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PREFACE

Multispectral scanners onboard NASA unmanned Landsat satellites
provide an ideal source of current data for earth resources
applications. The Detection And Mapping (DAM) package was origi-
nally developed at the Johnson Space Center for rapid conversion
of the Landsat digital data into hydrographic maps matching
standard topographic quadrangle series. Recent improvements in
both the manual procedures and computer programs within the DAM
package make it easier to use, faster, and more general purpose.

Documentation and software for the DAM package are available to
all public and private agencies, in accordance with the NASA
policy of encouraging maximum use of remote sensing technology.

Published documentation, of which this is volume 2a, is comprised
of the following volumes·

Volume 1:   General Procedure

Volume 2·   Software User Manual (in two parts)

Volume 3:   Control Network Establishment

These volumes supersede the previous documentation published in
1973.   Software releases prior to version 7602 cannot be used
with the current documentation.

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VOLUME 2a

Section   Page

VOLUME 2b

ACRONYMS

CCT   computer-compatible tape

DAM   Detection And Mapping package

GMT   Greenwich mean time

JSC   Lyndon B. Johnson Space Center

MSS   Multispectral scanner

Pixel   picture element

RMS   root mean square

USGS   United States Geological Survey

UTM   Universal Transverse Mercator

1. INTRODUCTION

The Detection and Mapping (DAM) package is an integrated set
of computer programs, manual procedures, and graphic devices
designed for efficient production of maps from digital Landsat
MSS data. This volume describes the computer programs and how
to operate them. See volume 1 for the function of these pro-
grams in the overall operation of the DAM package.

1.1 LANDSAT MSS DIGITAL DATA

A Landsat scene covers an area of the Earth's surface 100 x 100
nautical miles. Each scene is composed of approximately
7,500,000 digital picture elements (pixels). The scanner co-
ordinates defining the location of a pixel are scan line number
and sample number. Scan lines are numbered from 1 to 2340,
starting at the top of each scene. Samples are numbered from
1 to 3240 (approximately), starting at the left of each scene.

A Landsat scene is divided into four 25-mile wide strips (num-
bered 1 to 4 from the left). The data for all four strips of
the scene are recorded on either 1, 2, or 4 reels of computer
tape, depending on the file structure and recording density.

The DAM package accepts the original Landsat tape format.
Users, therefore, are not required to re-format the data prior
to processing.

1.2 COMPUTER SYSTEM REQUIREMENTS

The computer programs in the DAM package are designed for use
on any UNIVAC 1100 series computer system with the following
minimum characteristics·

- EXEC-8 operating system

- 20,000 words of user core storage

- 2,000,000 words of user mass storage

- 1 tape drive (2 if tapes are to be duplicated)

- 1 card reader

- 1 line printer

- 1 remote terminal (optional)

- 1 pen plotter (optional)

The software is highly modular and contains provisions for easily specifying local hardware and system software characteristics at implementation time. Conversion to other computer systems is possible, but would involve significant reprogramming.

1.3 COMPUTER PROGAMS

The DAM package software is currently organized in 9 main programs. Program names and functions are as follows:

PROGRAM	FUNCTION
ERTS-DUP	Duplicate Landsat MSS data tape
ERTSIDC	Identify scene on Landsat tape
PICTAB	Display and tabulate raw Landsat data
CONTROL	Adjust and diagram control network
CLASSIFY	Transform raw Landsat data
PRTDENS	Display transformed Landsat data
PRTCLASS	Produce line-printer maps
PLTCLASS	Produce pen-plotter maps
STATUS	Monitor computer runs and programs

1.4   PROGRAMMING LANGUAGE

The DAM package contains approximately 200 subroutines. Over
90 percent of the subroutines are written in UNIVAC FORTRAN V,
and the remainder in assembler and EXEC-8 control language.

1.5   USER LANGUAGE

Familiarity with programming languages is not required. Users
communicate with the computer system by means of a few English-
like commands and exec commands.

Exec commands generally request facilities from the executive,
prior to executing a program. They also release facilities
after termination of a program. Those exec commands required
for each program are explained in the section on that program.

Commands communicate with a currently executing program. They
are used to direct program operations and specify the nature
of the output desired. The commands to be used with each pro-
gram are also explained in the section on that program.

1.6   COMPUTER RUN PROCEDURES

The basic unit for work accounting under the UNIVAC EXEC-8
operating system is the run. Before any programs can be
executed, a run must first be initiated, and after the last
program has terminated, the run must be terminated. The fol-
lowing four cards are always required to initiate a DAM package
run (lowercase letters indicate user-supplied information):

```
@RUN accounting-information
@USE DAM.,name-of-program-file
@ASG,A DAM.
@ADD DAM.SETUP
```

The RUN card supplies accounting information, as explained below. The USE card identifies the external name currently used by the operating system for the DAM package program file (consult local installation standards for this name). The ASG card insures that the program file is available on mass storage. The SETUP card prepares the programs for execution.

The following card is always required to terminate a computer run:

```
@FIN
```

Batch runs are initiated by card input at the main computer site (or at a remote batch terminal). Demand runs are initiated by keyboard input at an interactive remote terminal.

1.6.1 BATCH PROCEDURE

The procedure for utilizing the DAM package in batch mode is listed below.

(1) Prepare punch card deck for desired program(s) as follows (lowercase letters indicate user-supplied information):

```
@RUN,priority/NR runid,acct,project,minutes,pages
@USE DAM.,name-of-program-file
@ASG,A DAM.
@ADD DAM.SETUP
(runstream for program-1)
(runstream for program-2)
• • •
(runstream for program-N
@FIN
```

(2)   Submit deck, required Landsat tape(s), and appropriate
      local form(s). The runid is a unique six-character
      identifier for each run. If not unique, error termination
      may result.

Two commonly used characters (@ and:) are absent from most key-
punches. Their multi-punch representations are as follows:

     @ is multi-punch 87
     : is multi-punch 85

1.6.2   DEMAND PROCEDURE

The exact techniques for connecting a terminal to the computer
and logging in are dependent on the operating system, terminal,
and communications equipment. Once logged in, follow the pro-
cedure below, always remembering to end each line with a car-
riage return. (Lowercase letters indicate information supplied
by user.)

To initiate a demand run, enter:

```
@RUN runid,acct,project
@USE DAM.,name-of-program-file
@ASG,A DAM.
@ADD DAM.SETUP
```

At this point, key in the required exec commands and commands
for the program(s) desired. Remember, every line must end with
a carriage return.

At the completion of the demand run enter:

    @FIN

Then follow the local standards for logging off.

2.   (RESERVED FOR FUTURE USE)

3. ERTS-DUP PROGRAM

ERTS-DUP copies an original Landsat MSS tape onto a reel of
blank computer tape. If unrecoverable tape errors occur,
it rewinds both tapes and tries a second time. Once a suc-
cessful copy is made, ERTS-DUP identifies the Landsat scene and
terminates the computer run. For this reason, no other program
may follow ERTS-DUP in the same computer run.

3.1 PREREQUISITES

ERTS-DUP must be used within a separate computer run (normally
batch - - see 1.6). For information on tape staging and manage-
ment, consult local installation standards.

3.2 EXEC COMMANDS

The following exec commands are normally used with ERTS-DUP
(lower case letters indicate user-supplied information):

> @ASG,BOTH tape-file.,U9,reel-number
> This exec command reserves an available 9 track tape
> drive (800 BPI) and requests that the specified reel
> be mounted. Reel numbers are limited to 6 characters
> chosen from the letters A - Z and the numbers 0-9.

> @ADD   DAM.ERTS-DUP
> This form of the @ADD exec command uses a series of
> system processors and programs to copy and verify the
> Landsat tape.

@FREE,S tape-file

This exec command requests that the tape be dismounted, but that the tape drive be retained.

3.3 COMMANDS

There are no commands for ERTS-DUP.

3.4 RUNSTREAM

ERTS-DUP must not be used in the same computer run with any other program. The complete runstream for ERTS-DUP is:

```
@RUN,user-specifications
@USE DAM.,name-of-program-file
@ASG,A DAM
@ADD DAM.SETUP
@ASG,BOTH INN.,U9,original-reel
@ASG,BOTH OUT.,U9,original-reel
@ADD DAM.ERTS-DUP
@FREE,S OLDOUT.
@ASG,BOTH INN.,U9,original reel
@MSG SWAPPING TAPES
@FREE,S OLDINN.
@ASG,BOTH OUT.,U9,blank-reel
@ADD DAM.ERTS-DUP
@FIN
```

4.   ERTSIDC PROGRAM

ERTSIDC prints scene identification information for Landsat MSS
data recorded on computer-compatible tape. This is useful if
tape labels are defaced or missing.

4.1   PREREQUISITES

ERTSIDC must be executed within a computer run, either batch or
demand (See 1.6). For information on tape staging and manage-
ment, consult local installation standards.

4.2   EXEC COMMANDS

The following exec commands are normally employed in executing
ERTSIDC (lowercase letters indicate user-supplied information):

> @ASG,BOTH 3.,U9,reel-number
> This exec command reserves an available 9 track tape
> drive (800 BPI) and requests that the specified reel
> containing Landsat data be mounted. Reel numbers are
> limited to 6 characters chosen from the letters A-Z
> and the numbers 0-9.
>
> @REWIND   3.
> This exec command insures that the tape reel containing
> Landsat data is positioned at the load point.
>
> @XQT   ERTSIDC
> This exec command initiates execution of the ERTSIDC
> program.

@FREE   3.

This exec command is the opposite of the @ASG exec command.
This command requests that the Landsat tape be dismounted
and the tape drive released for use by other computer runs.

4.3 COMMANDS

There are no commands for ERTSIDC.

4.4 RUNSTREAM

The partial runstream required for ERTSIDC is:

    • • •

    @ASG,BOTH 3.,U9,reel-number
    @REWIND 3.
    @XQT   ERTSIDC
    @FREE   3.

    • • •

4.5 SAMPLE RUN

The following portions of a demand terminal run illustrate
typical execution of ERTSIDC to identify a Landsat MSS data
tape. The computer displays a prompt character (>) before each
statement keyed in by the user.

```
>@ASG,BOTH 3 ,U9,X06516
>@REWIND 3
FURPUP 0026-06/11-10 09
```

The above exec commands assign the Landsat tape and position
it at the load point. Once this is complete, initiate execu-
tion of the ERTSIDC program.

```
>@XQT ERTSIDC
MAP27 1 RL71-3 06/11/76 10 13 56 (0,)
END MAP
DATA IGNORED - IN CONTROL MODE
@EOF IGNORED - IN CONTROL MODE
 MBL8A /MBL8A      DAM ERTSIDC(7605)        06/11/76    10 14
 ERTS-1      MSS
 SCENE   1092-16305

 CCT        3 OF 4
 LINES      1 TO 2340 OF 2340
 SAMPLES 1621 TO 2430 OF 3240
 DATE      23 OCT 72
 CENTER    30 2167     96.7500
 NADIP     30 2000     96 6667
 SUN EL    41
 SUN AZ   146
 HDG-YAW  189
 ALT      912
 PITCH.    +0 04
 ROLL      -0 52
 MODE/COR  047 (OCTAL)
```

ERTSIDC prints the above scene and strip identification information from the Landsat MSS tape and then exits.

```
 ***PLEASE @FREE OR @REWIND ERTS TAPE***

 NORMAL TERMINATION      06/11/76    10 14      0 FATAL ERRORS
```

Now @FREE the tape unless it will be needed by subsequent programs in the same computer run.

```
>@FREE 3
READY
```

5.   (RESERVED FOR FUTURE USE)

6. PICTAB PROGRAM

PICTAB reads raw Landsat MSS data from a computer-compatible
tape and produces displays and tabulations on a line-printer or
a computer terminal. In these displays, each MSS pixel is
represented by one character position on the output device.
The symbol displayed in that character position represents the
radiance value recorded for that pixel in a given channel.
Scan line numbers are shown along the left edge of each display
and sample numbers at the top edge (also at the bottom edge for
large displays).

Any number of displays, in any order, may be generated from
one tape within a single program execution. However, in order
to improve response time and minimize tape wear, displays
should be generated in the same order that the data is stored
on tape -- in order of increasing line numbers.

6.1 PREREQUISITES

PICTAB must be executed within a computer run, either batch or
demand (see 1.6). Approximate scanner coordinates for dis-
playing features of interest may be estimated by using a set
of ERTS-1 MSS Scales (see volume 3). These scales may be used
for both Landsat-1 and Landsat-2. For information on tape
staging and management, consult local installation standards.

6.2 EXEC COMMANDS

The following exec commands are normally used in executing
PICTAB (lowercase letters indicate user-supplied information):

@ASG,BOTH 3.,U9,reel-number

This exec command reserves an available 9 track tape
drive (800 BPI) and requests that the specified reel
containing Landsat data be mounted. Reel numbers are
limited to 6 characters chosen from the letters A-Z
and the numbers 0-9.

@REWIND 3.

This exec command insures that the tape is positioned
at the load point.

@XQT PICTAB

This exec command initiates execution of the PICTAB
program.

@FREE 3.

This exec command is the opposite of the @ASG exec
command. This command requests that the Landsat tape
be dismounted and the tape drive released for use by
other computer runs.

6.3 COMMANDS

The following commands are normally used to provide specifica-
tions for the PICTAB program and direct its operations (lower-
case letters indicate user-supplied information)·

ORIGIN,SCAN,line,sample

This command specifies the origin (typically center) scan
line and sample of the area to be processed by PICTAB.

WINDOW,PRINT,line,column,line,column

This command defines the boundary, relative to the origin, of a rectangular area to be processed. The first coordinate pair specifies the minimum print line and column relative to the origin, and the second coordinate pair specifies the maximum print line and column relative to the origin.

SPACING,line-increment,sample-increment

This command specifies the MSS scan line and sample increments to be used for processing the subsequent window.

DISPLAY

This command specifies that data for the current window be displayed by PICTAB. In the event a window does not exist for the DISPLAY command, the program will proceed without error to the next command.

EXIT

This command terminates the PICTAB program.

6.4 RUNSTREAM

PICTAB normally occurs in a separate batch computer run from other programs. In this run, PICTAB is usually executed once for each strip to be processed. The partial runstream required for PICTAB is.

. . .

```
@ASG,BOTH 3.,U9,reel-number
@REWIND 3.
@XQT PICTAB
ORIGIN,SCAN,line,sample          ⎫
WINDOW,PRINT,line,column,line,column  ⎬ repeat for
SPACING,line-increment,sample-increment ⎪ each display
DISPLAY                          ⎭
EXIT
@FREE 3.
```

. . .

6.5   SAMPLE RUN

The following portions of a demand terminal run illustrate typical use of the PICTAB program to produce displays from raw Landsat MSS data on tape. The computer provides a prompt character (>) before each statement keyed in by the user.


```
>@ASG,BOTH 3 ,U9,X06616
READY
>@REWIND 3
FURPUR 0026-06/11-10.09
```


The above exec commands assign the Landsat tape and position it at the load point. Once this is complete, initiate execution of the PICTAB program.


```
>@XQT PICTAB

MBL8A /MBL8A      DAM PICTAB(7605)        06/11/76   10 15
```

```
++++WARNING    NOMINAL REGISTRATION BASED ON ESTIMATED SCENE CENTER
   ERTS-1      MSS
 SCENE     1092-16305
 CCT          3 OF 4
 LINES        1 TO 2340 OF 2340
 SAMPLES   1621 TO 2430 OF 3240
 DATE        23 OCT 72
 CENTER      30 2167     96 7500
 NADIR       30 2000     96 6667
 SUN EL      41
 SUN AZ     146
 HDG-YAW    189
 ALT        912
 PITCH      +0 04
 ROLL       -0 52
 MODE/COR   047 (OCTAL)
```

PICTAB identifies the Landsat MSS scene and strip, and then
supplies default specifications for several commands. The
default commands for batch runs are different from those for
demand terminal runs, and are installation-dependent.

```
   ++CURRENT DEFAULT COMMANDS


 ON, CONFIRM
 SYMBOLS,     0,000,    9,009
 SYMBOLS,     A,010,    J,019
 SYMBOLS,     K,020,    T,039
 SYMBOLS,     U,040,    Z,127
 WINDOW, PRINT,
      -9 LINE,  -25 COLUMN,
       9 LINE,   25 COLUMN
```

The default WINDOW in this demand terminal run specifies a
rectangular area centered on the ORIGIN, and 18 print lines by
50 print columns in size. (The default WINDOW in a batch run
is much larger at most computer installations.)

'SPACING, 3 LINES, 2 SAMPLES

The default SPACING in this demand run specifies every third
scan line and every second sample. This allows the small print
WINDOW at a terminal to cover a larger area of MSS data, but
at a reduced resolution. (The default SPACING in a batch run
normally specifies every line and every sample.)

```
 CHANNEL, 4 (BAND 7)

 TICK,   SCAN, 2400 LINES, 3300 SAMPLES PRIMARY,
         SCAN,   10 LINES,   10 SAMPLES SECONDARY

 RADIANCE,   0 MINIMUM,  14 MAXIMUM

, ZONE, ** (UTM CENTRAL MERIDIAN ***** DEG)



 MBL8A /MBL8A      DAM PICTRE(7605)         06/11/76   10 15

     **USER COMMANDS
```

To specify the location of the window, use the ORIGIN command.

```
>ORIGIN, 865, 1870
   ****WARNING   BAD COORDINATE SYSTEM --
       865
```

PICTAB has detected a problem with the user input -- the key
word SCAN, specifying the coordinate system, was omitted. The
user then re-enters the ORIGIN command with the correct specifi-
cations.

```
>ORIGIN,SCAN,865,1870
  ORIGIN, SCAN,   865 LINE, 1370 SAMPLE
  ORIGIN, DEGREES,  30 45489 LATITUDE,   95 09579 LONGITUDE
```

PICTAB confirms the user input and estimates the geographic
coordinates of the origin. This estimate is based on the
approximate scene center recorded on the Landsat tape (unless
CONTROL was executed before PICTAB). The user now requests a
DISPLAY of the current WINDOW.

```
>DISPLAY
   *+*NOTE   PREVIOUS WARNINGS -- NO WINDOW GENERATED
   *+TRY AGAIN'
```

PICTAB notes that warnings have occurred. If all problems
have been corrected, enter DISPLAY again.

```
>DISPLAY
  'WINDOW NUMBER 001
```

```
 E-1092-16305-3 230CT72 3240SAMPLES SUNEL+41 PITCH+0 04 ROLL-0 52
 · CHAN= 4  RAD 000-014='0'-'E'  SPA=3X2  ORIGIN= 865,1870
        1111111111111111111111111111111111111111111111111111
        88888888888888888888888358892988888888889999999999
        22222333334444455555666677778888899999900000011111
        02468024680246802468024680246802468024680246802468
0837      D                                 E   E   E
0840                                           BE D
0843                                          DC E
0846                                 .           D E     D
0849                              7              E   E      D
0852      E   E')               EC7588C                 D      .
0855          .                   A31114      E        E
0858                              601119     EE  E           E
0861    7D         95             2100129
0864  433221111112CE   4 2012111112 D5
0867  8122111111101110111101121111E 102
0870     6    83021111111111110111    111C
0873  D           65B9111111100012129211112224411247
0876              11111121110112131111111111112
0879             01001010111111110011110111101
0882.            80001111111101111011011101111012.
0885            100010111111111011100011101111111·
0888  C         110111111011011111111111110111
0891    D250108B   8 70000101111111010110110001110010
                                              . ·
```

At the top of this display are listed the channel, the range
of radiance values displayed (000 - 014), and the range of
symbols used to display them ('0' - 'E'). This means that a
radiance of 000 is displayed by the symbol '0', 001 by '1', . . .
009 by '9', 010 by 'A', 011 by B, etc.

Note that one in every three lines is displayed and one in every
two samples. This SPACING is useful to locate a feature when
its coordinates are known only approximately. Once a feature
has been located in this manner, the ORIGIN can be refined and
a new display generated with line and sample SPACING of 1.

```
,>ORIGIN,SCAN,865,1860
 ORIGIN, SCAN,  865 LINE, 1860 SAMPLE
 ORIGIN, DEGREES,  30 45584 LATITUDE,   95 10174 LONGITUDE

,>SPACING,1,1
 SPACING, 1 LINES, 1 SAMPLES



,>DISPLAY
  WINDOW NUMBER 002
  E-1092-16305-3 230CT72 3240SAMPLES SUNEL+41 PITCH+0 04 ROLL-0 52
   CHAN= 4  PAD 000-014='0'-'E'  SPA=1X1  ORIGIN= 865,1860
        1111111111111111111111111111111111111111111111111111
        8888888888888888888888888888888888888888888888888888
        3312344444444455555555556666666667777777777889888
        56789012345678901234567890123456789012345678901234555
 0856 E                                      91101111129
 0857                                         C3111121115
 0858                                         E61011111129
 0859            E                            DA21111212224
 0860·       +     758   +        EE +        C93121121122229A
 0861 E           9559                 D       821100100011229
 0862 D  BACE   A36D              B6B          6111100121015E
 0863 32222237C75E            B31598ED6321121111112136  EE
 0864 11011111223C E      A4A A2101122111111111112B    D25    ·
 0865·2111221122222222222129  7112212112222122330   C113C
 0866 222211222211222122215AD70221352212122122129    21223
 0867 0111111001101001111111111001210211011136   511012C
 0868 1111110110110110110110110110101111111112A   9101107
 0869 211231221111111121110111111111111121130   E212123
 0870 438DB2011111111111111101111111101111115    E101112
 0871      E6212122221112212211211111222112212126    712111
 0872      D81222352221121122121212221121121137    8112111
 0873      D6458BC9211111011111111010101112111259921111011
 0874      EE       B655321110001111011110111110129 70111010
```

If a larger display is required, the WINDOW may be enlarged.

```
,>WINDOW,PRINT,-120,-60,+120,+60
  WINDOW, PRINT,
      -120 LINE,   -60 COLUMN,
       120 LINE,    60 COLUMN
```

This example specifies a WINDOW centered at the current ORIGIN,
and 240 print lines by 120 print columns in size.

```
>DISPLAY
  WINDOW NUMBER 003
  E-1092-16305-3 23OCT72 3240SAMPLES SUNEL+41 PITCH+0 04 ROLL-0 52
   CHAN= 4   PAD 000-014='0'-'E'   SPA=1X1   ORIGIN= 865,1860
```

This time PICTAB does not generate a display at the terminal
because the window is too large. Instead, the display is auto-
matically stored internally for subsequent printing at an onsite
line printer. Once all desired displays have been generated, we
EXIT.

```
>EXIT
```

PICTAB verifies the integrity of the Landsat tape and then
allows the user to request hard copies of all displays generated
(the user response is YES or NO).

```
    **PROGRAM TERMINATION
    VERIFYING EOF ON ERTS TAPE

    **PLEASE @FREE OP @REWIND ERTS TAPE
             )
 DO YOU WANT DISPLAYS FROM THIS SESSION PRINTED ONSITE?
 >YES
    3 DISPLAYS PRINTED


  NORMAL TERMINATION       06/11/76   10 27      0 FATAL ERRORS
```

A YES response results in all 3 of the displays being printed
onsite. The user now releases the Landsat tape and tape drive.

```
>@FREE 3
READY
```

7. CONTROL PROGRAM

CONTROL adjusts a scene-wide network of 6 or more points, for which both scanner coordinates and earth coordinates are known, to determine the exact relationship between these two coordinate systems. This program also estimates errors in individual control points and produces diagrams of the control network. Registration parameters generated by CONTROL are automatically stored on disk for use by subsequent programs in the same computer run.

7.1 PREREQUISITES

CONTROL must be executed within a computer run, either demand or batch (see 1.6). For information on selection and measurement of control points see volume 3. A control network consists of.

- scene identification information
- attitude information
- control point coordinates
- check point coordinates (not included in adjustment but errors are estimated)

The control network may be input to CONTROL from one or more of the following sources:

- punch cards (batch run only)
- terminal keyboard (demand run only)
- disk file (either batch or demand)

Network validation normally is an iterative process between human and computer in which the computer program locates errors and the human operator progressively corrects them until a satisfactory adjustment is achieved.

If a terminal is available, this process should preferably be carried out from the terminal in demand mode. In this case it is convenient to store and update the network as a symbolic element within a disk file, rather than keying it in repeatedly for each execution of CONTROL. Use of the @ED exec command to store and update a control network on disk is illustrated in 7.5.

7.2   EXEC COMMANDS

The following exec commands are normally used in executing CONTROL (lowercase letters indicate user-supplied information):

    @ASG,A   disk-file-name.

    This exec command assigns an existing disk file to this
    run. This is only required if the control network is
    already stored (or is to be stored) in a symbolic element
    within this file. The file remains assigned until freed.

    @ED,CPU disk-file-name.scene-number

    This exec command calls the text editor, (a system
    processor) to either store a new network or update and
    old network in the disk file. This is required only if
    input to CONTROL will be from disk.

    @XQT   CONTROL

    This exec command initiates execution of the CONTROL
    program.

@ADD   disk-file-name.scene-number
This exec command causes input to be taken from the control
network stored on disk, instead of from the terminal or
card reader. At the end of the network, input is again
taken from the terminal or card-reader.

@FREE   disk-file-name.
This exec command is the opposite of the @ASG exec command.
It releases a previously assigned disk file so that it may
be used by other computer runs.

7.3 COMMANDS

The following commands are normally used to provide specifica-
tions for the CONTROL program and direct its operations (lower-
case letters indicate user-supplied information):

SCENE,scene-number,samples-per-scene
This command specifies the scene number and the number
of MSS samples per scene. Both of these must agree with
the corresponding items as displayed for this scene by
the PICTAB program.

ATTITUDE,pitch,roll
Pitch and roll must agree in value with the corresponding
items as displayed by PICTAB. Both must be signed (even
if positive).

POINT,point-number,
     SCAN,line,sample,
          DEGREES,latitude,longitude,description

The POINT command specifies the coordinates of a control or
check point according to the following rules:

- the entire command must be on one card

- "POINT," may be omitted

- control point numbers are positive

- check point numbers are negative

- point numbers are limited to 3 digits

- line and sample must be integers

- "DEGREES" may be shortened to "DEG"

- description may be omitted

ADJUST
This command directs CONTROL to adjust the network.

DIAGRAM
This command directs CONTROL to produce a diagram of the network.

EXIT
This command terminates the CONTROL program.

7.4 RUNSTREAM

The partial runstream required for CONTROL is:

   . . .

   @XQT CONTROL

   SCENE,scene-number,sample-per-scene

   ATTITUDE,pitch,roll

   POINT,point-number,SCAN,line,sample,DEGREES,
       latitude,longitude

   . . .

   ADJUST

   DIAGRAM

   EXIT

   . . .

7.5 SAMPLE RUN

The following portions of a demand terminal run illustrate
typical use of the CONTROL program to adjust and diagram a
network. Note that the @ED processor is used to store the
network on disk and to update it. The computer displays a
prompt character (>) before each statement keyed in by the
user.

```
>@ASG,A SCHLOSSER
READY
```

The above exec command assigns an existing disk file to this
run. To enter the control network into a symbolic element
within this disk file, key in the @ED exec command, followed
by the file name and scene number.

```
>@ED,CPU SCHLOSSER 1092-16305
CASE UPPER ASSUMED
ELEMENT 1092-16305 NOT IN SPECIFIED FILE
INPUT MODE ASSUMED
ED 14 01-04/23-12 20-(,0)
INPUT
```

The computer responds that a symbolic element with this name
does not exist in the file. It then sets up a new element
with this name. Each time the computer requests input, key in
one more statement of the control network.

```
1I >*CONTROL NET FOR ERTS SCENE 1092-16305 (23 OCT 72)
2I >SCENE,1092-16305,3240
3I >ATTITUDE,+0 04,-0 52
4I >1, SCAN,2243,516, DEG,29 4956,97 624,   COST SPILLWAY
5I >5, SCAN,1315,502, DEG,30 1506,97 4534,   BASTROP RIVER BEND
6I >6, SCAN,646,947, DEG,32 5819,97 059,   ALCOA LAKE LARGE LAKE
7I >7, SCAN,1441,896, DEG,30 0263,97 2457,   SMITHVILLE RIVER BEND
8I >8, SCAN,480,1345, DEG,30 6625,96 7892,   MILANO SMALL LAKE
9I >9, SCAN,1163,1509, DEG,37 1644,96 8276,   LEDBETTER SMALL POND
```

```
10I >10,  SCAN,1447,1464,  DEG,29 9684,96 9102,   LA GRANGE W RIVER
11I >11,  SCAN,1603,1710,  DEG,29 8355,96 7956,   AMMANSVILLE RIVER
12I >14,  SCAN,1094,2052,  DEG,30 1617,96 4921,   BRENHAM SMALL LAKE
13I >16,  SCAN,44,2724,    DEG,30 8374,95 8827,   BEDIAS-LAKE DONNA V
14I >19,  SCAN,1851,2567,  DEG,29 5795,96 342,    EAGLE LAKE EAGLE LA
```

Once the last line of the network has been keyed in, respond
to the next computer request for input with a carriage return.

```
15I >
EDIT
```

This causes a mode change, from input to edit. After any errors
have been corrected, enter EXIT.

```
14 >EXIT
LINES 14 FIELDATA
```

The control network is now stored on disk and we are ready to
execute CONTROL.

```
>@XQT CONTROL
```

```
ESL8X /ESL8X     DAM CONTROL(7602)          04/23/76   12 22

   **CURRENT DEFAULT COMMANDS.

ON,CONFIRM


ESL8X /ESL8X     DAM CONTROL(7602)          04/23/76   12 22

   **USER COMMANDS
```

At this point CONTROL requests user input. Employ the @ADD
exec command to specify that input be taken from the symbolic
element just created.

```
>@ADD SCHLOSSER 1092-16305
   (001)    +CONTROL NET FOR ERTS SCENE 1092-16305 (23 OCT 72)
SCENE, 1092-16305, 3240 SAMPLES/SCENE
ATTITUDE, +0 04 PITCH, -0 52 ROLL
  POINT,   1,  SCAN, 2243 00,   516 00,   DEG,  29 49560,  97 62400
  POINT,   5,  SCAN, 1315 00,   502 00,   DEG,  30 15060,  97 45340
  POINT,   6,  SCAN,  646 00,   947 00,   DEG,  32 58190,  97 05900
  POINT,   7,  SCAN, 1441 00,   896 00,   DEG,  30 02630,  97 24570
  POINT,   8,  SCAN,  480 00,  1345 00,   DEG,  30 66250,  96 78920
  POINT,   9,  SCAN, 1163 00,  1509 00,   DEG,  37 16440,  96 82760
  POINT,  10,  SCAN, 1447 00,  1464 00,   DEG,  29 96840,  96 91020
  POINT,  11,  SCAN, 1603 00,  1710 00,   DEG,  29 83550,  96 79560
  POINT,  14,  SCAN, 1094 00,  2052 00,   DEG,  30 16170,  96 49210
  POINT,  16,  SCAN,   44 00,  2724 00,   DEG,  30 83740,  95 88270
  POINT,  19,  SCAN, 1851 00,  2567 00,   DEG,  29 57950,  96 34200
```

CONTROL checks all input and formats it for easy reference.
When the program requests additional input, enter ADJUST.

```
>ADJUST
```

```
ESL8X /ESL8X      DAM CONTROL(7602)        04/23/76    12 22

SCENE 1092-16305
                    LINE     SAMPLE    LATITUDE   LONGITUDE
SCENE CENTER       1170 50   1620 50   30 94671   96 76198
CONTROL CENTROID   1211 55   1475 64   30 95228   96 85673
CENTER-CENTROID     -41 05    144 86   -  00557   -  09475   (   9 1 KM
PROJECTION CENTRAL MERIDIAN                        96 76000

CONTROL COVERAGE      55 5 PERCENT

NOMINAL ALTITUDE      912 0 KM
COMPUTED ALTITUDE    1119 4 KM
```

```
RESIDUAL ERRORS IN CONTROL POINT ADJUSTMENT·
POINT      LINE    SAMPLE      LATITUDE  LONGITUDE   METERS      POINT
    1    -450 64  -152 46      - 59038    - 00442   65422          1
    5    -794 82  -267 77     -1 04076    - 00561  115340          5
    6     583 71   191 84        76240    - 00176   84508          6
    7    -664 46  -223 80     -  87010    - 00275   96421          7
    8    -920 35  -310 09     -1 20511      00178  133558          8
    9    4708 79  1597 86     6. 16710      00055  683787          9
   10    -541 28  -183 57     -  70929    - 00054   78597         10
   11    -431 35  -146 70     -  56542    - 00002   62652         11
   14    -544 94  -184 83     -  71407      00250   79130         14
   16    -786 52  -265 30     -1 02983      01127  114149         16
   19    -158 13   -55 19     -. 20782      00010   23026         19

RMS CTL1539 08   521 71      2 01566      00425  223474      11 CTL PTS

*****+FATAL ERROR    RMS ERROR TOO LARGE
```

Note the results of this adjustment. Both the individual
errors for each point and the Root-Mean-Square (RMS) error for
the total network are unacceptable. This is typical of an
initial adjustment. Point number 9 has the largest error, and
should be changed from a control point to a check point. To
do this, first EXIT from CONTROL, then call the @ED processor
to update the symbolic element containing the network.

>EXIT

```
 ABORT TERMINATION        04/23/76    12 25       1 FATAL ERRORS
```

```
>@ED,CPU SCHLOSSER 1092-16305
CASE UPPER ASSUMED
ED 14 01-04/23-12 26-(0,1)
EDIT
```

Assuming that the character string "9," occurs in the network
only once (as a control point number) then the following input
will LOCATE the information on point 9.

```
0 >LOCATE 9,
6, SCAN,646,947, DEG,32 5819,97 059,   ALCOA LAKE LARGE LAKE
```

Apparently, the first occurrence of "9," is in the latitude
for point number 6. To insure finding point 9, we LOCATE the
first occurrence of "9, SCAN".

```
6 >LOCATE 9, SCAN
9, SCAN,1163,1509, DEG,37 1644,96 8276,   LEDBETTER SMALL POND
```

Change the point number from "9" to "-9" (a negative point
number indicates a check point), and EXIT.

```
.9 >CHANGE /9/-9/
-9, SCAN,1163,1509, DEG,37 1644,96 8276,   LEDBETTER SMALL POND
9 >EXIT
LINES.14 FIELDATA
```

Now execute CONTROL again.

```
>@XQT CONTROL
```

```
ESL8X /ESL8X     DAM CONTROL(7602)          04/23/76   12 27

    **CURRENT DEFAULT COMMANDS

ON, CONFIRM
```

```
ESL8X /ESL8X     DAM CONTROL(7602)          04/23/76   12 27

    **USER COMMANDS
```

Then, @ADD the revised network.

```
>@ADD SCHLOSSER 1092-16305
   (001)    *CONTROL NET FOR ERTS SCENE 1092-16305 (23 OCT 72)
SCENE, 1092-16305, 3240 SAMPLES/SCENE
ATTITUDE, +0 04 PITCH, -0 52 ROLL
POINT,    1,    SCAN,  2243 00,    516 00,    DEG,  29 49560,  97 62400
POINT,    5,    SCAN,  1315 00,    502 00,    DEG,  30 15060,  97 45340
POINT,    6,    SCAN,   646 00,    947 00,    DEG,  32 58190,  97 05900
POINT,    7,    SCAN,  1441 00,    896 00,    DEG,  30 02630,  97 24570
POINT,    8,    SCAN,   480 00,   1345 00,    DEG,  30 66250,  96 78920
POINT,   -9,    SCAN,  1163 00,   1509 00,    DEG,  37 16440,  96 82760
POINT,   10,    SCAN,  1447 00,   1464 00,    DEG,  29 96840,  96 91020
POINT,   11,    SCAN,  1603 00,   1710 00,    DEG,  29 83550,  96 79560
POINT,   14,    SCAN,  1094 00,   2052 00,    DEG,  30 16170,  96 49210
POINT,   16,    SCAN,    44 00,   2724 00,    DEG,  30 83740,  95 88270
POINT,   19,    SCAN,  1851 00,   2567 00,    DEG,  29 57950,  96 34200
```

And once more enter ADJUST.

```
>ADJUST
```

```
ESL8X /ESL8X       DAM CONTROL(7602)            04/23/76    12 27

SCENE 1092-16305

                         LINE     SAMPLE    LATITUDE  LONGITUDE
SCENE CENTER       1170 50   1620 50   30 32320  96 76239
CONTROL CENTROID   1216 40   1472 30   30 33071  96 85948
CENTER-CENTROID     -45 90    148 20    - 00750   - 09709   ( 9 4 KM)
PROJECTION CENTRAL MERIDIAN                      96 76000

CONTROL COVERAGE       55 5 PERCENT

NOMINAL ALTITUDE       912 0 KM
COMPUTED ALTITUDE     1140 7 KM
```

```
RESIDUAL ERRORS IN CONTROL POINT ADJUSTMENT
POINT      LINE     SAMPLE     LATITUDE  LONGITUDE   METERS      POINT
    1   -56 11   -18 58    -  06953   -  00028    7704           1
    5  -363 44  -121 39    -  45073   -  00174   49949           5
    6  1138 37   380 06    1 41149   -  00013  156446           6
    7  -227 14   -75 40    -  28154   -  00021   31197           7
    8  -431 81  -144 31    -  53554      00152   59349           8
   -9  5467 50  1855 32    6 78890      00056  752693   CHK     -9
   10   -88 29   -29 85    -  10965   -  00003   12150          10
   11    22 27     7 22       02753   -  00020    3051          11
   14   -61 30   -20 71    -  07612      00031    8435.         14
   16  -241 97   -80 51    -  29992      00390   33242          16
   19   309 42   103 47    .  38385   -  00271   42530          19

RMS CTL 428 43   143 04       53125      00168   58879       10 CTL PTS

RMS CHK 5467 50  1855 32    6 78890      00056  752693        1 CHK PTS

*****FATAL ERROR    RMS ERROR TOO LARGE
```

The results of this adjustment are somewhat better, but still
far from acceptable. Point number 6 has the largest error of
the remaining control points. Again EXIT, update the network,
and re-execute CONTROL. The results of this adjustment are as
follows:

```
ESL8X /ESL8X      DAM CONTROL(7602)        04/23/76   12 31

SCENE 1092-16305

                     LINE    SAMPLE    LATITUDE   LONGITUDE
SCENE CENTER        1170 50  1620 50   30 14928    96 76295
CONTROL CENTROID    1279 78  1530 67   30 08070    96 83788
CENTER-CENTROID     -109 28    89 83      06858   -  07492   ( 10 5 KM
PROJECTION CENTRAL MERIDIAN                         96 76000

CONTROL COVERAGE       55 5 PERCENT

NOMINAL ALTITUDE      912 0 KM
COMPUTED ALTITUDE     921 9 KM
```

```
RESIDUAL ERRORS IN CONTROL POINT ADJUSTMENT
POINT        LINE     SAMPLE      LATITUDE   LONGITUDE   METERS      POINT
    1       1 46        64         00109       00010       121           1
    5       - 89       - 34      - 00066     - 00003        73           5
   -6    2715 08    906 46      1 99934     - 00024    221592  CHK    -6
    7         06        46         00009       00026        26           7
    8         30       - 05        00021     - 00009        24           8
   -9    9504 33   3203 06      6 99929       00001    776006  CHK    -9
   10       - 81       - 64      - 00063     - 00022        73          10
   11       - 38       - 34      - 00030     - 00012        35          11
   14       - 57       - 44      - 00045     - 00014        51          14
   16         81        54         00062       00015        71          16
   19         01        17         00002       00009        10          19

RMS CTL     .73        44         00055       00015        63       9 CTL PTS

RMS CHK 6989 42   2353 85      5 14720       00017    570652       2 CHK PTS
```

The RMS error for the 9 control points in this network is only 63 meters. Further inspection of the residual errors for check points 6 and 9 suggests that blunders of exactly 2 degrees and 7 degrees, respectively, have been made in recording their latitudes. If a check of the coordinate measurements confirms this, these points should be corrected, changed back to control points, and the network adjusted again. Once a satisfactory adjustment is obtained, enter DIAGRAM.

>DIAGRAM

ESL8X /ESL8X   DAM CONTROL(7602)   04/23/76   12 31

SCENE 1092-16305 --   ALL POINTS


```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+              +              +              +    16       +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +        8     +              +            +
+              +              +              +            +
+              +     6        +              +            +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +            9+       14      +            +
+              +              +              +            +
+       5      +              +              +            +
+              +              +              +            +
+              +  7     10    +              +            +
+              +              +              +            +
+              +              +11            +            +
+              +              +              +            +
+              +              +              +  19        +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+              +              +              +            +
+       1      +              +              +            +
+              +              +              +            +
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```


                    (HUNDREDS DIGIT OMITTED)

This diagram shows the location of all control and check points
within the Landsat scene. It should be evaluated visually to
determine if the control points are well-distributed throughout
the scene.

To terminate the program, enter EXIT.

>EXIT

 NORMAL TERMINATION   04/23/76   12 35   0 FATAL ERRORS

The disk file containing this network should be freed, unless
it will be used again within this run. The final network is
now available for use to control map generation in subsequent
computer runs.

>@FREE SCHLOSSER
READY

8. CLASSIFY PROGRAM

This program uses a spectral filter to transform raw Landsat MSS data into orthogonal form. The results of this transformation are stored in a density file on disk for use, in the same run, by PRTDENS, PRTCLASS, or PLTCLASS. All or part of a Landsat scene may be processed. If the area specified lies in more than one strip, then CLASSIFY must be executed once for each of the strips.

8.1 PREREQUISITIES

CLASSIFY must be executed within a computer run (normally batch -- see 1.6). Prior to executing CLASSIFY, there are several tasks that must first be accomplished:

● CONTROL must be executed in order to adjust a network of control points for the Landsat MSS scene to be processed (see volume 3 of this series for a comprehensive discussion of control network establishment. The parameters from this adjustment are required by CLASSIFY in order to process the raw data.

● Tapes covering the area to be processed must be provided. The tape(s) must be for the same scene as the control network. For information on tape staging and management, consult local installation standards.

8.2 EXEC COMMANDS

The following exec commands are normally used in executing CLASSIFY (lowercase letters indicate user-supplied information)·

@ASG,BOTH 3.,U9,reel-number

This exec commands reserves an available 9 track tape drive (800 BPI) and requests that the specified reel containing Landsat data be mounted. Reel numbers are limited to 6 characters chosen from the letters A-Z and the numbers 0-9.

@REWIND

This exec commands insures that the tape reel containing Landsat data is positioned at the load point.

@XQT CLASSIFY

This exec command initiates execution of the CLASSIFY program.

@ADD name-of-symbolic-element

This exec command causes input to be taken from a symbolic element in a disk file, instead of from the terminal or card reader. At the end of the element, input is again taken from the terminal or card reader. This exec command is normally used to input spectral limits to CLASSIFY.

@FREE 3.

This exec command is the opposite of the @ASG exec command. This command requests that the Landsat tape be dismounted and the tape drive released for use by other runs.

8.3 COMMANDS

The following commands are normally used to provide specifica-
tions for the CLASSIFY program and direct its operations (lower-
case letters indicate user-supplied information):

ORIGIN,SCAN,line,sample
This command specifies the origin (typically minimum
sample) of the area to be processed by CLASSIFY.

WINDOW,SCAN,line,sample
This command specifies the size (in lines and samples)
of a rectangular area to be processed by CLASSIFY.

DETECT
This command initiates the processing of data for the
previously specified window. CLASSIFY reads the Landsat
tape, detects all pixels which match the spectral limits,
and stores the results on disk.

EXIT
This command terminates the CLASSIFY program.

8.4 RUNSTREAM

CLASSIFY is executed in the same computer run (normally batch)
with several other programs. The partial runstream required
for CLASSIFY is:

```
•  •  •
(runstream for CONTROL)
@ASG,BOTH 3.,U9,reel-number
@REWIND 3.
@XQT CLASSIFY
@ADD element-containing-spectral-limits
ORIGIN,SCAN,line,sample
WINDOW,SCAN,line,sample
DETECT
EXIT
@FREE
(runstream for PRTDENS, PRTCLASS or PLTCLASS)
•  •  •
```

8.5 SAMPLE RUN

CLASSIFY always appears in a run with several other programs.
See 10.5 for a sample run illustrating its use with PRTCLASS.

9. PRTDENS PROGRAM

PRTDENS produces line-printer displays from density file(s) created by the CLASSIFY program. PRTDENS is normally used only for debugging and instructional purposes.

9.1 PREREQUISITES

PRTDENS must be executed within a computer run, either batch or demand (See 1.6). CLASSIFY must be executed in the same run, prior to PRTDENS, in order to generate the density file(s). Tape input is required for CLASSIFY, but not for PRTDENS.

9.2 EXEC COMMANDS

The following exec command is normally used to execute PRTDENS:

    @XQT   PRTDENS
    This exec command initiates execution of the PRTDENS
    PROGRAM.

9.3 COMMANDS

The following commands are normally used to provide specifications for the PRTDENS program and direct its operations (lowercase letters indicate user-supplied information)·

    ORIGIN,SCAN,line,sample
    This command specifies the origin (typically center)
    scan line and sample of the area to be displayed.

WINDOW,PRINT,line,column,line,column

This command defines the boundary, relative to the origin, of the rectangular area to be displayed. The first co-ordinate pair specifies the minimum print line and column relative to the origin, and the second coordinate pair specifies the maximum print line and column relative to the origin.

DISPLAY

This command specifies that data from the density file for the current window is to be displayed.

EXIT

This command terminates the PRTDENS program.

9.4 RUNSTREAM

PRTDENS is executed in the same computer run with several other programs. The partial runstream required for PRTDENS is:

```
  . . .
(runstream for CONTROL)
(runstream for CLASSIFY -- repeat once for each strip)
@XQT PRTDENS
ORIGIN,SCAN,line,sample
WINDOW,PRINT,line,column,line, column  ⎫  repeat for each
DISPLAY                                ⎬      display
EXIT                                   ⎭
  . . .
```

10. PRTCLASS PROGRAM

PRTCLASS generates any number of custom formatted and scaled maps on a line printer. The maps for a Landsat MSS scene are printed using data from the density file(s) produced by the CLASSIFY program. PRTCLASS assigns each pixel to a print position on the classification map. The number of Landsat pixels assigned to each print position will vary with the scale of the map. At 1.24,000, each character position on the map represents approximately one Landsat pixel.

10.1 PREREQUISITES

PRTCLASS must be executed in a computer run (normally batch -- see 1.6). CLASSIFY must be executed in the same run, prior to PRTCLASS, in order to generate the density file(s). Tape input is required for CLASSIFY, but not for PRTCLASS.

10.2 EXEC COMMANDS

@XQT PRTCLASS
This exec command initiates execution of the PRTCLASS program.

10.3 COMMANDS

ORIGIN,DEGREES,latitude,longitude
This command specifies the origin in degrees (typically minimum latitude and minimum longitude) of the area PRTCLASS is to map.

WINDOW,MINUTES,latitude,longitude
This command specifies the size (in minutes of latitude
and longitude) of a rectangular area to be mapped by
PRTCLASS.

HEADING,1,heading-text
This command specifies the text to be printed on line 1
of the map heading. The text is limited to 72 characters
and may not contain commas.

SCALE,1/denominator-of-representative-fraction
This command specifies the scale at which subsequent
windows are to be mapped. The minimum denominator is
20000 and the maximum is 260000 (commas may not be
embedded in the denominator).

TICK,MINUTES,latitude,longitude,MINUTES,latitude,longitude
This command specifies the intervals for printing the
primary ticks (*) and the secondary ticks (+) within
subsequent windows. The primary intervals in minutes are
given first, followed by the secondary intervals in
minutes.

MAP
This command generates a single map covering the current
window.

MAP,maximum-number-of-sub-windows
This variation of the MAP command divides the current
window into the specified number of sub-windows (based on
the current primary tick interval) and generates a separate
map for each sub-window.

EXIT

This command terminates the PRTCLASS program.

10.4 RUNSTREAM

PRTCLASS is executed in the same computer run with several
other programs. The partial runstream required for PRTCLASS
is·

        • • •

        (runstream for CONTROL)
        (runstream for CLASSIFY) -- repeat once for each strip
        @XQT PRTCLASS
        SCALE,1/denominator-of-representative-fraction
        TICK,MINUTES,latitude,longitude,MINUTES,latitude,
            longitude
        ORIGIN,DEGREES,latitude,longitude
        WINDOW,MINUTES,latitude,longitude
        HEADING,1,heading-text
        MAP
        EXIT

        • • •

(Right brace annotation: repeat for each area to be mapped)

10.5 SAMPLE RUN

PRTCLASS always appears in a computer run (normally batch) with
several other programs. The following portions of a demand
terminal run illustrate combined use of the CONTROL, CLASSIFY,
and PRTCLASS programs to produce registered maps from Landsat
MSS data. The computer displays a prompt character (>) before
each statement keyed in by the user.

First, assign the disk file containing the validated control
network for the scene to be processed.

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

.ˑ@ASG,A BROWN
READY

Now, execute the CONTROL program.
ˑ@XQT CONTROL

      MBL8X̃ /MBL8X   DAM CONTROL(7602)   05/05/76   09 39
        **CURRENT DEFAULT COMMANDS·

    ON,CONFIRM

      MBL8X /MBL8X   DAM CONTROL(7602)   05/05/76   09 39

        **USER COMMANDS

Here, CONTROL requests user input. Use the ˊ@ADD exec command
to specify that input be taken from the symbolic element con-
taining the previously validated control network.

>@ADD BROWN 1092-16305
    (001)·   *CONTROL NET FOR ERTS SCENE 1092-16305 (23 OCT 72)
  SCENE, 1092-16305, 3240 SAMPLES/SCENE
  ATTITUDE, +0 04 PITCH, -0 52 ROLL
    (004)   *LATITUDE SHOULD BE 30 5819 FOR PT -6 AND 30 1644 FOR PT
  POINT,   1,   SCAN, 2243 00,   516 00,   DEG,   29 49560,   97 62400
  POINT,   5,   SCAN, 1315 00,   502 00,,   DEG,   30 15060,   97 45340
  POINT,   -6,   SCAN, 646 00,   947 00,   DEG,   32 58190,   97 05900
  POINT,   7,   SCAN, 1441 00,   896 00,   DEG,   30 02630,   97 24570
  POINT,   8,   SCAN, 480 00,   1345 00,   DEG,   30 66250,   96 78920
  POINT,   -9,   SCAN, 1163 00,   1509 00,   DEG,   37 16440,   96 82760
  POINT,   10,   SCAN, 1447 00,   1464 00,   DEG,   29 96840,   96 91020
  POINT,   11,   SCAN, 1603 00,   1710 00,   DEG,   29 83550,   96 79560
  POINT,   14,   SCAN, 1094 00,   2052 00,   DEG,   30 16170,   96 49210
  POINT,   16,   SCAN, 44 00,   2724 00,   DEG, ˊ30 8374,   95 88270
  POINT,   19,   SCAN, 1851 00,   2567 00,   DEG,   29 5795,   96 3420
  ˑADJUST

When the program requests additional input, enter ADJUST.

```
MBL8X /MBL8X       DAM CONTROL(7602)          05/05/76   09 39

SCENE 1092-16305
                        LINE      SAMPLE    LATITUDE   LONGITUDE
SCENE CENTER        1170 50    1620 50    30 14928    96 76295
CONTROL CENTROID    1279 78    1530 67    30 08070    96 83788
CENTER-CENTROID     -109 28       89 83      06858     - 07492    ( 10 5 KM)
PROJECTION CENTRAL MERIDIAN                            96 76000
CONTROL COVERAGE        55 5 PERCENT
NOMINAL ALTITUDE       912 0 KM
COMPUTED ALTITUDE      921 9 KM


RESIDUAL ERRORS IN CONTROL POINT ADJUSTMENT
POINT       LINE    SAMPLE     LATITUDE   LONGITUDE   METERS     POINT
    1       1 46        64       00109       00010       121          1
    5        - 89      - 34     - 00066     - 00003        73          5
   -6    2715 08    906 46     1 99934     - 00024    221592   CHK   -6
    7         06        46     . 00009       00026        26          7
    8         30      - 05       00021     - 00009        24          8
   -9    9504 33   3203 06     6 99929       00001    776006   CHK   -9
   10        - 81      - 64     - 00063     - 00022        73         10
   11        - 38      - 34     - 00030     - 00012        35         11
   14        - 57      - 44     - 00045     - 00014        51         14
   16         81        54       00062       00015        71         16
   19         01        17       00002       00009        10         19
RMS CTL       73        44       00055       00015        63      9 CTL PTS
RMS CHK6989 42   2353 85       5 14720       00017    570652      2 CHK PTS
```

CONTROL also stores the registration parameters from this adjustment on disk for use by subsequent programs in the same run. To terminate the program, enter EXIT.


```
>EXIT

NORMAL TERMINATION      05/05/76    09.42      0 FATAL ERRORS
```

The control network is no longer needed by this computer run.
To avoid conflicts with other runs, free the file containing
this network.

```
>@FREE BROWN
READY
```

Now assign the reel of tape containing Landsat MSS data to be
processed.

```
>@ASG,BOTH 3 ,U9,X04745
READY
>@REWIND 3
FURPUR 0026-05/05-09 43
```

Once this tape is positioned at the load point, execute CLASSIFY.
```
>@XQT CLASSIFY
```

```
MBL8X /MBL8X       DAM CLASSIFY(7602)        05/05/76    09 55
E-1092-16305 2/4
    ***NOTE    EXACT REGISTRATION BASED ON CONTROL NETWORK
ERTS-1      MSS
SCENE     1092-16305
CCT         2 OF 4
LINES       1 TO 2340 OF 2340
SAMPLES   811 TO 1620 OF 3240
DATE       23 OCT 72
CENTER     30 1493      96 7630
NADIR        0000         0000
SUN EL      41
SUN AZ     146
HDG-YAW    189
ALT        922
PITCH      +0 04
ROLL       -0 52
MODE/COR   047 (OCTAL)
```

CLASSIFY identifies the Landsat MSS scene and strip and verifies
that the registration parameters from CONTROL match this scene.
The program then supplies default specifications for several
commands. ' (The user may override any that he wishes.)

```
    **CURRENT DEFAULT COMMANDS·


  ON, CONFIRM

  COPIES,  1

  WINDOW,  SCAN,
       -80 LINE,   -400 SAMPLE,
        80 LINE,    400 SAMPLE



   MBL8X /MBL8X      DAM CLASSIFY(7602)        05/05/76    09 55
       **USER COMMANDS
```

At this point, @ADD the symbolic element containing spectral
limits to be used in classification.

```
>@ADD DAM WATER-LIM
 NAME, WATER (CH4/CH1)
   (002) ·  *ORIGINAL 2-CHANNEL SPECTRAL LIMITS MODIFIED
```

The following ORIGIN and WINDOW commands specify that the area
to be processed is 1200 lines by 1000 samples, beginning at
line 700, and sample 1500. (Part of the data for this area are
recorded on the currently assigned tape, and part on the tape
to be assigned next.)

```
>ORIGIN,SCAN,700,1500
   ORIGIN, SCAN,  700 LINE, 1500 SAMPLE
   ORIGIN, DEGREES,  30 49248 LATITUDE,  96 74086 LONGITUDE

>WINDOW,SCAN,1200,1000
   WINDOW, SCAN,
      1200 LINE,  1000 SAMPLE
```

Enter the DETECT command. CLASSIFY now reads Landsat data for
the specified area from tape, detects all pixels which match
the spectral limits, and stores the results in a density file.
(This file is dynamically assigned by the program.)

```
>DETECT
 (@ASG,CP *DAMDEN-2 ,F/1/POS/4    CLS DENSITY)
    LINE 0700
    LINE 0750
    LINE 0800
    LINE 0850
    LINE 0900
    LINE 0950
    LINE 1000
    LINE 1050
    LINE 1100
    LINE 1150
    LINE 1200
    LINE 1250
    LINE 1300
    LINE 1350
    LINE 1400
    LINE 1450
    LINE 1500
    LINE 1550
    LINE 1600
    LINE 1650
    LINE 1700
    LINE 1750
    LINE 1800
    LINE 1850
    LINE 1900
```

Every 50 lines CLASSIFY prints out the scan line number. Once
detection is completed, enter EXIT. Before terminating, the
program verifies the integrity of the Landsat tape and then
catalogs the density file.

```
>EXIT
    **PROGRAM TERMINATION
    VERIFYING EOF ON ERTS TAPE


    **PLEASE @FREE OR @REWIND ERTS TAPE

-(@FREE          22         )

 (@ASG,AX *DAMDEN-2         )



, NORMAL TERMINATION        05/05/76   10 06      0 FATAL ERRORS
```

MSS data for the remainder of the area to be processed are on
another tape. First, @FREE,S the current tape (the S option
retains the tape drive). Then assign the next tape.

```
>@FREE,S 3
READY
>@ASG.BOTH 3 ,U9,X06616
READY
>@REWIND 3
FURPUR 0026-05/05-11 25
```

Now execute CLASSIFY again with the new tape.

```
>@XQT CLASSIFY
```

```
|MBL8X /MBL8X      DAM CLASSIFY(7602)         05/05/76    11·31
'E-1092-16305 3/4            ·                 ·
    ✦✦NOTE   EXACT REGISTRATION BASED ON CONTROL NETWORK

ERTS-1      MSS

SCENE.    1092-16305
CCT         3 OF 4
LINES       1 TO 2340 OF 2340
SAMPLES  1621 TO 2430 OF 3240
DATE·       23 OCT 72
CENTER      30 1493    96 7630
NADIR          0000       0000
SUN EL·     41
SUN AZ·    146
HDG-YAW    189
ALT·       922
MODE/COR   047 (OCTAL)



    ✦✦CURRENT DEFAULT COMMANDS


ON, CONFIRM

COPIES,  1

WINDOW, SCAN,
      -80 LINE,   -400 SAMPLE,
       80 LINE,    400 SAMPLE
```

At this point, do not enter any user commands. Instead enter
the @EOF exec command. CLASSIFY will then recall the user
commands from the last execution.

```
MBL8X /MBL8X      DAM CLASSIFY(7602)         05/05/76    11 31

    ✦✦USER COMMANDS


>@EOF
    ✦✦✦NOTE   NO PARAMETER INPUT -- PREVIOUS PARAMETERS RECALLED
    (✦✦✦)   ✦PARAMETERS FROM DAM CLASSIFY(7602)   05/05/76    09·5
```

NAME, WATER (CH4/CH1)

   (002)   *ORIGINAL 2-CHANNEL SPECTRAL LIMITS MODIFIED FOR

ORIGIN, SCAN,   700 LINE, 1500 SAMPLE
 ORIGIN, DEGREES,   30 49248 LATITUDE,   96 74086 LONGITUDE

 WINDOW, SCAN,
    1200 LINE,   1000 SAMPLE

 (@ASG,CP *DAMDEN-3 ,F/1/POS/4   CLS DENSITY)

    LINE 0700
    LINE 0750
    LINE 0800

    LINE 0850
    LINE 0900
    LINE 0950

    LINE 1000
    LINE 1050
    LINE 1100
    LINE 1150
    LINE 1200
    LINE 1250
    LINE 1300
    LINE 1350
    LINE 1400
    LINE 1450
    LINE 1500
    LINE 1550
    LINE 1600
    LINE 1650
    LINE 1700
    LINE 1750
    LINE 1800
    LINE 1850
    LINE 1900

     **PROGRAM TERMINATION
     VERIFYING EOF ON ERTS TAPE

     **PLEASE @FREE OR @REWIND ERTS TAPE

   (@FREE   23   )

   (@ASG,AX *DAMDEN-3   )

 NORMAL TERMINATION   05/05/76   11 46   0 FATAL ERRORS

CLASSIFY has used data from the second tape to generate another
density file for the remainder of the area, verified the tape,
cataloged the density file, and terminated. Since no more
tapes are to be processed (in this example), the user must free
the tape and release the tape drive.

```
>@FREE 3
READY
```

Next execute PRTCLASS (or PLTCLASS) to generate a series of
maps, using data in the density files produced by CLASSIFY.

```
>@XQT PRTCLASS



   MBL8X /MBL8X       DAM PRTCLASS(7602)        05/05/76    11 48

   (@ASG,AX *DAMDEN-1.         )
      ***NOTE    DENSITY FILE NOT CATALOGED

   (@ASG,AX +DAMDEN-2          )
   (@ASG,AX +DAMDEN-3          )
   (@ASG,AX +DAMDEN-4          )
      ***NOTE    DENSITY FILE NOT CATALOGED
```

PRTCLASS verifies that all density files assigned to this run
are for the same scene, have the same registration parameters,
and have the same spectral limits. It then prints the following
summary:

```
   ERTS SCENE    1092-16305
   DATE    23 OCT 72
   SUN ELEV    41 DEGREES
   SUN AZIMUTH    146 DEGREES
```

CCT STRIPS	1	2	3	4
DATE CLASSIFIED·		050576	050576	
MINIMUM LINE	0	698	698	0
MAXIMUM LINE·	0	1902	1902	0
MINIMUM SAMPLE	0	1498	1621	0
MAXIMUM SAMPLE·	0	1620	2430	0
MATERIAL CLASSIFIED	WATER (CH4/CH1)			

The program now supplies default specifications for several
commands. The default commands for batch runs are different
from those for demand terminal runs, and are installation
dependent.

    ✦✦CURRENT DEFAULT COMMANDS

ON, CONFIRM
COPIES,   1

SYMBOLS,   , 000,   , 000
SYMBOLS,   1, 001,   9, 009
SYMBOLS,   A, 010,   R, 099
SYMBOLS,   S, 100,   Y, 169
SYMBOLS,   Z, 170,   Z, 255

DENSITY, 10 MINIMUM, 19 MAXIMUM,·

SCALE, 1/24000

WINDOW, DEGREES,
        1250 LAT,   .1250 LON

TICK,   MINUTES,   7 500 LAT,   7 500 LON PRIMARY,
        MINUTES,   2 500 LAT,   2 500 LON SECONDARY

ZONE, ✦✦ (UTM CENTRAL MERIDIAN ✦✦✦✦✦✦ DEG)

The default SCALE, WINDOW, and TICK intervals shown above are
suitable for generating a standard USGS 7.5 minute quadrangle
map, and need not be changed. To specify the quadrangle loca-
tion, enter its ORIGIN (in North America, its southeast corner).

```
MBLSX /MBLSX      DAM PRTCLASS(7602)          05/05/76    11 48

    **USER COMMANDS


>ORIGIN,DEG,30 15,96 30
  ORIGIN, DEGREES,   30 25000 LATITUDE,   96 50000 LONGITUDE
  ORIGIN, DEGREES,   30 15 00 LATITUDE,   96 30 00 LONGITUDE
| ORIGIN, SCAN,   977 LINE, 1999 SAMPLE
```

Next specify the map HEADING and enter the MAP command.

```
>HEADING,1,SOMERVILLE--7 5' QUAD
  HEADING, 1. SOMERVILLE--7 5' QUAD

>MAP
```

Since the number of sub-windows was not given on the map com-
mand, PRTCLASS generates a single map covering the entire
window, and confirms this at the terminal. (The map will be
printed at an onsite line printer after program termination.)

```
MAP,    0 SUB-WINDOWS
      WINDOW #  1 (ORIGIN   30 2500 LAT,   '96 5000 LON)
```

The following example illustrates how to generate several
sub-window maps covering different parts of a window.


```
>WINDOW,MINUTES,15,15
 WINDOW, DEGREES,
        .2500 LAT,       .2500 LON

>HEADING,1,7 5' QUADS--SOMERVILLE VICINITY
 HEADING, 1, 7 5' QUADS--SOMERVILLE VICINITY

>MAP,4
```


PRTCLASS breaks the new 15 minute window into four 7.5 minute
sub-windows (based on the 7.5 minute primary tick interval),
and generates a separate map for each sub-window.


```
 MAP,     4 SUB-WINDOWS
        WINDOW #  2 (ORIGIN    30 2500 LAT,    96 5000 LON)
        WINDOW #  3 (ORIGIN    30 2500 LAT,    96 6250 LON)
        WINDOW #  4 (ORIGIN    30 3750 LAT,    96 5000 LON)
        WINDOW #  5 (ORIGIN    30 3750 LAT,    96 6250 LON)
```


To generate a single small-scale map covering the area of these
four quadrangles, change the SCALE and HEADING.


```
>SCALE,1/100000
 SCALE, 1/100000

>HEADING,1,SOMERVILLE VICINITY
 HEADING, 1, SOMERVILLE VICINITY

>MAP
 MAP,     0 SUB-WINDOWS
        WINDOW #  6 (ORIGIN    30 2500 LAT,    96 5000 LON)
```

To terminate the program, enter EXIT.

>EXIT
    **PROGRAM TERMINATION

 DO YOU WANT DENSITY FILES SAVED?

Unless YES is entered, PRTCLASS destroys the density files on
termination to conserve mass storage and prevent conflicts with
future runs. The density files should not be saved unless
needed by a subsequent program in this run.

>NO

 NORMAL TERMINATION   05/05/76   11·59   0 FATAL ERRORS

11. PLTCLASS PROGRAM

PLTCLASS generates any number of custom formatted and scaled
maps on a pen plotter. The maps for a Landsat MSS scene are
plotted using data from the density file(s) produced by program
CLASSIFY. PLTCLASS assigns each pixel to a plot position on
the classification map.

11.1 PREREQUISITES

PLTCLASS must be executed in a computer run (normally batch --
see 1.6). CLASSIFY must be executed in the same run prior to
PLTCLASS, in order to generate the density file(s). Tape input
is required for CLASSIFY, but not for PLTCLASS.

11.2 EXEC COMMANDS

@XQT PLTCLASS

This exec command initiates execution of the PLTCLASS
program.

11.3 COMMANDS

ORIGIN,DEGREES,latitude,longitude

This command specifies the origin in degrees (typically
minimum latitude and minimum longitude) of the area
PLTCLASS is to map.

WINDOW,MINUTES,latitude,longitude

This command specifies the size (in minutes of latitude
and longitude) of a rectangular area to be mapped by
PLTCLASS.

HEADING,1,heading-text
This command specifies the text to be printed on line 1 of
the map heading. The text is limited to 72 characters and
may not contain commas.

SCALE,1/denominator-of-representative-fraction
This command specifies the scale at which subsequent
windows are to be mapped. The minimum denominator is
20000 and the maximum is 260000 (commas may not be embedded in the denominator).

TICK,MINUTES,latitude,longitude,MINUTES,latitude,longitude
This command specifies the intervals for plotting the
primary ticks and the secondary ticks within subsequent
windows. The primary intervals in minutes are given
first, followed by the secondary intervals in minutes.

MAP
This command generates a single map covering the current
window.

MAP,maximum-number-of-sub-windows
This variation of the MAP command divides the current
window into the specified number of sub-windows (based
on the current primary tick interval) and generates a
separate map for each sub-window.

EXIT
This command terminates the PLTCLASS program.

11.4 RUNSTREAM

PLTCLASS is executed in the same computer run with several other programs. The partial runstream required for PLTCLASS is·

```
. . .
(runstream for CONTROL)
(runstream for CLASSIFY -- repeat once for each strip)
@XQT PLTCLASS
SCALE,1/denominator-of-representative-fraction
TICK,MINUTES,latitude,longitude,MINUTES,latitude,
    longitude
ORIGIN,DEGREES,latitude,longitude
WINDOW,MINUTES,latitude,longitude
HEADING,1,heading-text
MAP
EXIT
. . .
```

} repeat for each area to be mapped

12.   (RESERVED FOR FUTURE USE)

13. STATUS PROGRAM

The STATUS program allows a user to monitor the execution of programs in other demand or batch runs. This program is particularly useful for a demand user to inquire about the status of previously submitted batch runs.

13.1 PREREQUISITES

STATUS must be executed in a computer run (normally demand -- see 1.6).

13.2 EXEC COMMANDS

The following exec commands are the only ones required for the STATUS program.

    @XQT STATUS
    This exec command initiates execution of the STATUS'
    program.

    @EOF
    This exec command terminates the STATUS program. At
    least one runid (see below) must be entered before
    terminating the program.

13.3 COMMANDS

Command input to the STATUS program is normally either a runid or an index:

runid

A runid begins with a letter and may contain no more than
6 characters. STATUS responds to this command by printing
a short summary (including index number) for all recent
runs with the specified runid.

index

An index is composed entirely of numeric characters.
STATUS responds to this command by printing summary infor-
mation on every program execution within the indexed run.

13.4   RUNSTREAM

The partial runstream required for STATUS is:

```
•  •  •

@XQT STATUS
runid
          repeat as desired
index

•  •  •

@EOF

•  •  •
```

13.5   SAMPLE RUN

The following portion of a demand terminal run illustrates use
of the STATUS program. The computer displays a prompt char-
acter (>) before each statement keyed in by the user.

>@XQT STATUS

Once the @XQT STATUS exec command is entered, a list of current
default commands is printed, followed by a request for user
input.

```
MBL8A /MBL8A        DAM STATUS(7605)              06/11/76   10 06

    **CURRENT DEFAULT COMMANDS

ON, CONFIRM
MBL8A /MBL8A        DAM STATUS(7605) '            06/11/76   10 06

    **USER COMMANDS


ENTER RUNID
```

Now enter a string of characters corresponding to the runid of
a computer run for which summary status information is desired.
In this example, information is requested for all runs having
SRT17 in the first five characters of the runid, regardless of
the sixth character (slash matches with any character).

```
>SRT17/
```

The program responds by printing a status summary for the most
recent runs with runid matching that specified above.

```
INDEX   RUNID    MODE     DATE       TIME    QUALIFIER      ACCOUNT

  548   SRT17    DEMAND   06/08/76   08 02   TF5-N86750
  512   SRT17A   BATCH    06/05/76   02 08   TF5-L71312
  496   SRT17    DEMAND   06/03/76   08 06   TF5-N86750
```

The STATUS program now requests either another runid or an index.
In this example, the index 512 (for batch run SRT17A, dated
06/05/76) is entered.

```
ENTER RUNID OR INDEX
>512

 (00512)  SRT17A/SRT17A  +TF5-L71312
 ------------------------------------
DAM CONTROL(7605)         06/05/76    02 09
 NORMAL TERMINATION       06/05/76    02 09    0 FATAL ERRORS
 ------------------------------------

QUALIFIER CHANGED TO TF5-L713127A
 ------------------------------------
DAM CLASSIFY(7605)        06/05/76    02 11
 **NOTE    EXACT REGISTRATION BASED ON CONTROL NETWORK
 NORMAL TERMINATION       06/05/76    02 21
 ------------------------------------
DAM CLASSIFY(7605)        06/05/76    02 21
 ++NOTE    NO PARAMETER INPUT -- PREVIOUS PARAMETERS RECALLED
 NORMAL TERMINATION       06/05/76    02 33    0 FATAL ERRORS
 ------------------------------------
DAM CLASSIFY(7605)        06/05/76    02 36
 ++NOTE    NO PARAMETER INPUT -- PREVIOUS PARAMETERS RECALLED
 NORMAL TERMINATION       06/05/76    02 42    0 FATAL ERRORS
 ------------------------------------
DAM CLASSIFY(7605)        06/05/76    02 46
 ++NOTE    NO PARAMETER INPUT -- PREVIOUS PARAMETERS RECALLED
 NORMAL TERMINATION       06/05/76    02 52    0 FATAL ERRORS
 ------------------------------------
DAM PRTCLASS(7605)        06/05/76    02 52
 NORMAL TERMINATION       06/05/76    03 23    0 FATAL ERRORS
 ------------------------------------
```

The STATUS program has printed out a more detailed summary of
the run identified by index 512. This summary gives, for each
program executed in the run, the starting time and termination
time and whether or not the program terminated normally or in
error. Once the summary is completed, STATUS will once again
request a runid or index.

In this example, no additional information is desired and
execution of STATUS is terminated by entering the exec command
@EOF.

```
(ENTER RUNID OR INDEX
>@EOF
```

```
| NORMAL TERMINATION          06/11/76    10 09      0 FATAL ERRORS
```

14. (RESERVED FOR FUTURE USE)

15. ADDITIONAL CAPABILITIES

Preceding sections have summarized the basic procedures for
executing programs within the DAM package This section
explains several additional capabilities. For complete soft-
ware user specifications, see Appendices A through G.

15.1 EXEC COMMANDS

The following optional exec commands may be used with programs
in the DAM package (lowercase letters indicate user-supplied
information):

@EOF

If this exec command immediately follows the @XQT exec
command, then all commands from the previous program
execution are recalled and used by the currently
executing program. This is useful if the same proces-
sing is to be repeated with several different Landsat
data tapes.

@XQT,E program-name

This variation of the @XQT exec command initiates execu-
tion of the named program if and only if the previous
program execution terminated in error, otherwise the
program is not executed. This is useful in a batch run
when processing a Landsat tape which may have parity
errors. The following portion of a runstream illustrates
the use of this capability:

```
@XQT PICTAB
commands
EXIT
@REWIND 3.        ⎫
@XQT,E PICTAB     ⎬   repeat as desired
@EOF              ⎭
```

@LOCATE 3.,strip-number

This exec command searches a Landsat multi-file data tape
and locates that file containing data for the specified
strip. This exec command is used instead of @REWIND,
when processing a Landsat multi-file tape.

15.2 COMMANDS

All commands may be abbreviated to no fewer than the first
three characters.

Normally each card contains a single command. However, several
related commands may appear on the same card, provided they
are always separated by a triple comma (,,,).