

## N O T I C E

THIS DOCUMENT HAS BEEN REPRODUCED FROM  
MICROFICHE. ALTHOUGH IT IS RECOGNIZED THAT  
CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED  
IN THE INTEREST OF MAKING AVAILABLE AS MUCH  
INFORMATION AS POSSIBLE

JSC-16437

8.0 - 100.94

NASA CR-

160532

# TEXAS NATURAL RESOURCES

## INVENTORY AND MONITORING SYSTEM

"Made available under NASA sponsorship  
in the interest of early and wide dis-  
semination of Earth Resources Survey  
Program information and without liability  
for any use made thereof."

### (TNRIMS)

### APPLICATIONS SYSTEM

### VERIFICATION AND TRANSFER (ASVT)

REMOTE SENSING INFORMATION SUBSYSTEM (RSIS)

UNIVAC SOFTWARE USER'S GUIDE



(E80-10096) TEXAS MONITORING SYSTEM  
(TNRIMS), APPLICATIONS SYSTEM VERIFICATION  
AND TRANSFER (ASVT), REMOTE SENSING  
INFORMATION SUBSYSTEM (RSIS): UNIVAC  
SOFTWARE USER'S GUIDE (Lockheed Electronics G3/43

N80-23723

Unclass  
00096

TNRIS Task Force  
Austin, Texas

A. S. STORY  
M. V. MARTIN  
LOCKHEED ELECTRONICS  
COMPANY, INC.  
SYSTEM & SERVICES DIV.  
1830 NASA ROAD 1  
HOUSTON, TEXAS 77058



National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas

NAS 9-15800  
LEC-14287  
DECEMBER 1979

TEXAS NATURAL RESOURCES INVENTORY AND MONITORING SYSTEM (TNRIMS)  
APPLICATIONS SYSTEM VERIFICATION AND TRANSFER (ASVT)

REMOTE SENSING INFORMATION SUBSYSTEM (RSIS)  
UNIVAC SOFTWARE USER'S GUIDE

Job Order 75-562

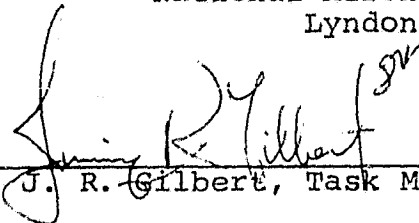
PREPARED BY

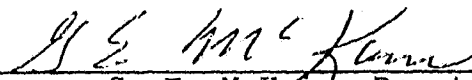
A. S. Story and M. V. Martin

Lockheed Electronics Company, Inc.  
Systems and Services Division  
Houston, Texas

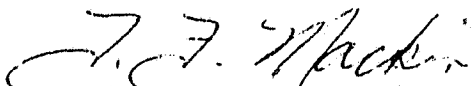
APPROVED BY

National Aeronautics and Space Administration  
Lyndon B. Johnson Space Center

  
\_\_\_\_\_  
J. R. Gilbert, Task Monitor

  
\_\_\_\_\_  
G. E. McKain, Deputy  
Project Manager, Texas ASVT

Lockheed Electronics Company, Inc.  
Systems and Services Division

  
\_\_\_\_\_  
T. F. Mackin, Supervisor  
Exploratory Investigations Section

Version 7911

CONTENTS

VOLUME 1

<u>Section</u>	<u>Page</u>
1. INTRODUCTION . . . . .	1-1
1.1 <u>BACKGROUND</u> . . . . .	1-1
1.2 <u>LANDSAT MSS DIGITAL DATA</u> . . . . .	1-1
1.3 <u>COMPUTER SYSTEM REQUIREMENTS</u> . . . . .	1-2
1.4 <u>COMPUTER PROGRAMS</u> . . . . .	1-2
1.5 <u>PROGRAMMING LANGUAGE</u> . . . . .	1-3
1.6 <u>USER LANGUAGE</u> . . . . .	1-3
1.7 <u>COMPUTER RUN PROCEDURES</u> . . . . .	1-9
1.7.1 BATCH PROCEDURE . . . . .	1-9
1.7.2 DEMAND PROCEDURE. . . . .	1-10
2. CLRTAB PROGRAM . . . . .	2-1
2.1 <u>PREREQUISITES</u> . . . . .	2-1
2.2 <u>EXEC COMMANDS</u> . . . . .	2-1
2.3 <u>COMMANDS</u> . . . . .	2-3
2.4 <u>CURRENT VALID COLOR NAMES</u> . . . . .	2-5
2.5 <u>RUNSTREAM</u> . . . . .	2-5
2.6 <u>SAMPLE RUN</u> . . . . .	2-6
3. CRTCLASS PROGRAM . . . . .	3-1
3.1 <u>PREREQUISITES</u> . . . . .	3-1
3.2 <u>EXEC COMMANDS</u> . . . . .	3-1

Table of Contents (Continued)

<u>Section</u>	<u>Page</u>
3.3 <u>COMMANDS</u> . . . . .	3-2
3.4 <u>RUNSTREAM</u> . . . . .	3-4
3.5 <u>SAMPLE RUN</u> . . . . .	3-4
4. CRLCLASS PROGRAM . . . . .	4-1
4.1 <u>PREREQUISITES</u> . . . . .	4-1
4.2 <u>EXEC COMMANDS</u> . . . . .	4-1
4.3 <u>COMMANDS</u> . . . . .	4-3
4.4 <u>RUNSTREAM</u> . . . . .	4-5
4.5 <u>SAMPLE RUN</u> . . . . .	4-5

Version 7911

ACRONYMS

CCT	computer-compatible tape
DAM	Detection And Mapping Package
JSC	Lyndon B. Johnson Space Center
MSS	Multispectral scanner
Pixel	picture element
RSIS	Remote Sensing Information Subsystem

Version 7911

## 1. INTRODUCTION

The Remote Sensing Information Subsystem is an integrated set of computer programs and graphic devices designed for production of color graphics maps and displays from digital Landsat MSS data. This volume describes the computer programs and how to operate them. See RSIS functional design Document (LEC-13258) for the function of each module in the overall system.

### 1.1 BACKGROUND

The RSIS was developed from the 7903 version of the the Detection And Mapping package (DAM) which produces black and white maps and displays on a line printer. All currently running DAM package programs may be used in the RSIS system, such as ERTS-DUP, ERTSIDC, PICTAB, CONTROL, CLASSIFY, PRTDENS, PRTCLASS, and STATUS.

### 1.2 LANDSAT MSS DIGITAL DATA

A Landsat scene covers an area of the Earth's surface 100x100 nautical miles. Each scene is composed of approximately 7,500,000 digital picture elements (pixels). The scanner coordinates 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 (numbered 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.

Version 7911

The RSIS accepts the original Landsat tape format. Users, therefore, are not required to reformat the data prior to processing.

### 1.3 COMPUTER SYSTEM REQUIREMENTS

The computer programs in the RSIS Univac software 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)

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

The computer programs in the RSIS Interactive Graphics subsystem are described in RSIS Interactive Graphics Subsystem User's Guide.

### 1.4 COMPUTER PROGRAMS

The RSIS Univac software is currently organized in 3 main programs. Program names and functions are as follows:



Version 7911

<u>PROGRAM</u>	<u>FUNCTION</u>
CLRTAB	Display and tabulate raw Landsat data
CRTCLASS	Produce color graphics maps from detection file data
CRLCLASS	Produce color graphics maps from class data

### 1.5 PROGRAMMING LANGUAGE

The RSIS contains approximately 300 subroutines. Over 90 percent of the subroutines are written in Univac FORTRAN V, and the remainder in assembler and EXEC-8 control language.

### 1.6 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 program are explained below.

### COMMANDS

THE GENERAL FORMS FOR ALL COMMANDS ARE LISTED BELOW. MOST PROGRAMS HAVE DEFAULT VALUES FOR MANY OF THESE COMMANDS. THESE DEFAULT VALUES DEPEND ON THE COMPUTER INSTALLATION, THE PROGRAM, AND WHETHER THE RUN IS BATCH OR DEMAND. MOST COMMANDS WILL OUTPUT A TABULATION OF THE CONTENTS OF VARIABLES PREVIOUSLY DEFINED BY THE COMMAND IF THE USER TYPES IN THE COMMAND NAME WITH NO SPECIFICATIONS.

Version 7911

ADJUSTJC, <TYPE OF POINTS>]

ALIGNJC, SCANNJC, <LINE>, <SAMPLE>, <EARTH COORDINATE SYSTEM>,  
<COORDINATE PAIR>

ATTITUDEJC, <DEGREES PITCH>, <DEGREES ROLL>]

CHANNELJC, <RAW OR LINEAR> OR POLARJC, <CHANNEL NUMBER>C, ... ]]

CLEARJC, <DIAGNOSTIC TYPE>]

COLORJC, <COLOR 1>, <VALUE 1>, <COLOR 2>, <VALUE 2>]

COPIESJC, <NUMBER OF OUTPUT COPIES>]

COUNTJC, <MAXIMUM COUNT PER PIXEL>]

CROSSSTAB]

CRTC, <FUNCTION>C, <SPECIFICATIONS>]]

DENSITYJC, <MINIMUM>, <MAXIMUM>]

DETECTJC, <DETECTION TYPE>]

DIALGRAMJC, <TYPE OF POINTS>]

DISPLAYJC, <DATA TYPE>]

EXIT)]

EXPLAINJC, <PROGRAM OR COMMAND NAME>C, ... ]]

FACTOR]

GRAPHICSJC, <COLOR FILE NAME>C, <IMAGE FILE NAME>]]

HEADINGJC, <LINE NUMBER>, <HEADING TEXT>]

INTENSITYJC, <FIRST SCALING FACTOR>, <LOW VALUE>,  
<SECOND SCALING FACTOR>, <HIGH VALUE>]

LINEARJC, <LINEAR CHANNEL NUMBER>C, <COEFFICIENT TYPE>C, <COEFF(S)>]]]

MAPC, <MAXIMUM NUMBER OF SUB-WINDOWS>]

NAMCEJC, <NAME OF TRANSFORM OR SPECTRAL LIMITS>]

Version 7911

NEWS)C, (PROGRAM NAME)C, ... JJ  
NEXT (F), (OFF OR ON), (MODE OPTION)  
OFF)C, (MODE OPTION)C, ... JJ  
ON)C, (MODE OPTION)C, ... JJ  
ORIGIN)C, (COORDINATE SYSTEM), (COORDINATE PAIR)  
PAGE)C, (MESSAGE)  
PLOT)ER)  
CPOINT, J (POINT NUMBER), (SCAN, J (LINE), (SAMPLE),  
    (EARTH COORDINATE SYSTEM), (COORDINATE PAIR)C, (DESCRIPTION)  
POLAR)C, (POLAR CHANNEL NUMBER)C, (COEFFICIENT TYPE)C, (COEFF)JJJ  
PRI)NTER)C, (METRIC)C, (SPECIFICATIONS)JJ  
P)ROFILE)  
RADIANCE)C, (MINIMUM), (MAXIMUM)C, ... JJ  
REN)UMBER), (NEW WINDOW NUMBER)  
ROT)ATE)C, (CRITERIA)C, (MATRIX)C, (NORMALIZATION)JJJ  
SAT)URATION)C, (COLOR CHANNEL VALUE), (INTENSITY CHANNEL VALUE)  
SCAL)E)C, 1/(DENOMINATOR OF REPRESENTATIVE FRACTION)  
SCEN)E)C, (LANDSAT SCENE NUMBER), (SAMPLES/SCENE)  
SHAR)PENING)C, (CHANNEL NUMBER)C, SAMPLE)C, (COEFF), (COEFF)JJJ  
SPAC)CING)C, (LINE INCREMENT), (SAMPLE INCREMENT)  
TAB)ULATE)C, (DATA TYPE)  
TICK) INTERVAL)C, (PRIMARY COORDINATE SYSTEM), (COORDINATE PAIR),  
    (SECONDARY COORDINATE SYSTEM), (COORDINATE PAIR)  
TIM)E)  
TOL)ERANCE)C, (VALUE)  
TOT)AL)  
WIN)DOW)C, (COORDINATE SYSTEM)C, (COORDINATE PAIR)C, ... JJJ  
ZON)E)C, (UTM ZONE NUMBER)

Version 7911

## COLOR COMMAND

\*\*\*\*\*

COLOR], (DELETED)  
COLOR], (COLOR 1), (VALUE 1), (COLOR 2), (VALUE 2)]  
COLOR], (COLOR 1), (VALUE 1), (=), (COLOR 2), (VALUE 2)]

### EXPLANATION

-----  
THIS COMMAND SPECIFIES COLOR AND VALUES FOR DISPLAY.

### RESTRICTIONS

- 
1. USE COLOR, DELETE COMMAND BEFORE COLORS ARE INPUT.
  2. THE COLORS MUST BE INPUT IN PAIRS.
  3. COLOR NAMES CAN BE DUPLICATED.
  4. COLOR VALUES MUST BE IN ASCENDING ORDER AND IN RANGE 0 TO 63 INCLUSIVE.
  5. THERE IS A LIMIT ON NUMBER OF COLORS, NOW 10.
  6. COLORS MAY BE REPLACED BY USING THE THIRD FORM OF COLOR COMMAND, COLOR TO BE REPLACED IS LEFT OF = SIGN, AND REPLACEMENT COLOR AND VALUE IS RIGHT OF = SIGN.

### PROGRAMS

-----  
CLRTAB  
CRTCLASS  
CRLCLASS

CRT COMMAND  
\*\*\*\*\*

CRT[, DEVICE], (DEVICE TYPE MNEMONIC)  
RESOLUTION], (NUMBER OF CRT LINES), (NUMBER OF CRT COLUMNS)  
SCREEN SIZE], (INCHES DIAGONAL) ]

EXPLANATION  
-----

THIS COMMAND SPECIFIES CRT FUNCTIONS.

RESTRICTIONS  
-----

1. THIS COMMAND SHOULD BE USED RARELY, AND THEN ONLY BY PERSONNEL FAMILIAR WITH THE LOCAL SYSTEMS GRAPHICS.
2. THIS COMMAND MAY BE USED ONLY BEFORE THE FIRST WINDOW IN THE CURRENT PROGRAM HAS BEEN PROCESSED.

PROGRAMS  
-----

CRTCLASS  
CRLCLASS

GRAPHICS COMMAND  
\*\*\*\*\*

GRAPHICS]], (COLOR FILE NAME)], (IMAGE FILE NAME)]]

EXPLANATION  
-----

THIS COMMAND SPECIFIES FILE NAMES.

RESTRICTIONS  
-----

1. THE FIRST 5 CHARACTERS OF COLOR FILE NAME MUST BE VOL2: OR OS32:  
THE FIRST 5 CHARACTERS OF IMAGE FILE NAME MUST BE VOL2: OR OS32:
2. FILE NAMES HAVE A MAXIMUM LENGTH OF 18 CHARACTERS.

PROGRAMS  
-----

CLRTAB  
CRTCLASS  
CRLCLASS

ORIGINAL PAGE IS  
OF POOR QUALITY

1-7  
7

INTENSITY COMMAND  
\*\*\*\*\*

INTENSITY] [, (FIRST SCALING FACTOR), (LOW VALUE),  
(SECOND SCALING FACTOR), (HIGH VALUE)]

EXPLANATION  
-----

THIS COMMAND SETS SCALING FACTORS AND ASSOCIATED VALUES FOR COLORS.

RESTRICTIONS  
-----

- 1. SCALING FACTORS MUST BE IN RANGE 0 100 INCLUSIVE, WITH FIRST FACTOR LESS THAN SECOND.
- 2. VALUES ARE USUALLY IN RANGE 0.31 INCLUSIVE.
- 3. MAXIMUM VALUE IS DETERMINED BY SATURATION COMMAND

PROGRAMS  
-----

CLRTAB

SATURATION COMMAND  
\*\*\*\*\*

SATURATION] [, (FIRST CHANNEL SATURATION LIMIT),  
(SECOND CHANNEL SATURATION LIMIT)]

EXPLANATION  
-----

THIS COMMAND SETS LIMITS ON SATURATION VALUES.

RESTRICTIONS  
-----

- 1. THE FIRST CHANNEL SATURATION LIMIT AND SECOND CHANNEL SATURATION LIMIT MUST TOTAL LESS THAN 2<sup>11</sup>.

PROGRAMS  
-----

CLRTAB  
CRTCLASS  
CRLCLASS

## 1.7 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 following four cards are always required to initiate an RSIS 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 RSIS 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.

### 1.7.1 BATCH PROCEDURE

The procedure for using the RSIS in batch mode is listed below.

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

Version 7911

```
@RUN,priority/NR runid,acct,project,minutes,pages
@ASG,A name-of-program-file
@USE DAM.,name-of-program-file
@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
```

### 1.7.2 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 procedure below, always remembering to end each line with a carriage 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
```



Version 7911

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.

Version 7911

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.

~~1-11~~

~~12~~

Version 7911

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. CLRTAB PROGRAM

CLRTAB reads raw Landsat MSS data from a computer compatible tape, and produces a magnetic display tape used for generating color CRT displays on the INTERDATA/RAMTEK. In these displays, each MSS pixel is represented by one display position on the RAMTEK output device. The pixel displayed in that character position represents: (1) the radiance, gradient, or Laplacian value recorded for that pixel in a given channel; (2) two channel values per pixel, with the first channel for that pixel being the color and the second channel being the intensity, or (3) the class value of the pixel assigned by an ISOCLS/ELLTAB classification run.

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 the order of increasing line numbers.

### 2.1 PREREQUISITES

CLRTAB must be executed within a computer run, either batch or demand. Approximate scanner coordinates for displaying features of interest may be estimated by using a set of ERTS-1 MSS scales. These scales may be used for both Landsat-1 and Landsat-2. For information on tape staging and management, consult local installation standards.

### 2.2 EXEC COMMANDS

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

@ASG,T 3.,tape-unit-type, reel-number

This exec command reserves an available 800 BPI tape drive unit and requests that the specified reel containing Landsat data be mounted. For 1600 BPI tapes, tape-unit-type will be 16N.

Reel numbers are limited to 6 characters chosen from the letters A-Z and the numbers 0-9.

@ASG,T 2., 16N, reel number

This exec command reserves an available 1600 BPI tape drive unit and requests that a display data tape that will be sent to the INTERDATA/RAMTEX be mounted. See preceding paragraph for unit and reel definitions.

@USE 25., Qualifier\*filename1.

This exec command assigns an ELLTAB class file for the first strip. If this file does not exist, this command may be omitted.

@ASG,A 25.

This exec command assigns the first ELLTAB class file to the run. If this file does not exist, this command may be omitted. At least one ELLTAB class file must be assigned to the run.

@USE 26., Qualifier\*filename2.

This exec command assigns an ELLTAB class file for the second strip. If this file does not exist, this command may be omitted.

@ASG,A 26.

This exec command assigns the second ELLTAB class file to the run. If this file does not exist, this command may be omitted.

@USE 27., Qualifier\*filename3.

This exec command assigns an ELLTAB class file for the third strip. If this file does not exist, this command may be omitted.

@ASG,A 27.

This exec command assigns the third ELLTAB class file to the run. If this file does not exist, this command may be omitted.

@USE 28., Qualifier\*filename4.

This exec command assigns an ELLTAB class file for the fourth strip. If this file does not exist, this command may be omitted.

@ASG,A 28.

This exec command assigns the fourth ELLTAB class file to the run. If this file does not exist, this command may be omitted.

@REWIND 3.

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

@REWIND 2.

This exec command insures that the display data tape for the INTERDATA/RAMTEK is positioned at the load point.

@XQT CLRTAB

This exec command initiates execution.

@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 transformations to CLRTAB.

@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.

## @FREE 2.

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

### 2.3 COMMANDS

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

ORIGIN,SCAN,line,sample

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

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 graphics line and column relative to the origin, and the second coordinate pair specifies the maximum graphics 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.

RADIANCE,low-radiance-or-class value,high-radiance-or-class value

This command specifies the range of radiance values or class values used in creating the display. Any radiance or class values in the window which are outside of this range are ignored.

HEADING,1,heading-text

This command specifies the text heading to be displayed on the color CRT with the map. The text is limited to 36 characters and may not contain commas.

TICK,SCAN,lines,samples,SCAN,lines,samples

This command specifies the intervals for output of primary and secondary ticks within subsequent windows. The primary intervals are given first, followed by the secondary intervals.

SATURATION,color-saturation-limit,intensity-saturation  
limit

This command specifies the maximum allowable value (radiance, function of radiance, or class) for the color channel and/or intensity channel. If two channels are being processed, the combined values of the two may not exceed  $2^{11} - 1$ . Any values in the window larger than the saturation limit are set to the limit.

INTENSITY,first-scaling-factor,low-value,second-scaling-  
factor,high-value

This command specifies the scaling factors associated with low and high values of radiance or function of radiance. This command is used when generating radiance, gradient, or Laplacian displays. It is not used with class displays. The scaling factors must be in the range of 0 to 100, inclusive, with the first factor less than the second. The normal range for the low and high values are 0 to 31.

COLOR,color-name1,associated starting value,color-name2,  
associated starting value

This command is analogous to the SYMBOLS command in PICTAB. It specifies the color to display for a specified class or for a range of radiance values or function of radiance values. The colors must be specified in pairs and more than one color command is normally used. The range for a color goes from its associated starting value through one minus the associated starting value of the following color for radiance or function of radiance values; valid colors are listed in section 2.4.

GRAPHICS, color-file-name, image-file-name

~~25~~  
18



This command specifies the name of a standard color file or image file in RAMTEK compatible format that has previously been saved on the INTERDATA/RAMTEK, used for the current display. If no file names are specified, the INTERDATA/RAMTEK processor uses the color video lookup table and image data records present on the output tape from CLRTAB.

DISPLAY,type or DIS1, type

Either command requests that data for the current window be displayed by CLRTAB. In the event the area specified by the current window and origin does not fall within the coverage of the Landsat tape currently mounted, the program will proceed without error to the next command. The DIS1 macro command requests the display using default commands for the particular type of display specified. Display type may be RADIANCE, GRADIENT, LAPLACIAN or CLASS for DISPLAY command. The display type for DIS1 must be RAD, GRA, LAP, or CLA.

EXIT

This command terminates the CLRTAB program.

TABULATE,type

This command tabulates the number of pixels per color that were displayed on the preceding display. When a display of radiance or function of radiance (gradient or Laplacian) has been done, a range of radiance values is associated with each color. Thus, the tabulation would output the total of all pixels within the range as the total for each color. When a display of class has been done, one class is associated with each color.

## 2.4 CURRENT VALID COLOR NAMES

The current valid color names used in the COLOR command are as follows:

<u>COLOR NAMES</u>	<u>COLOR GUN SETTINGS</u>			<u>PRIMARY OR SECONDARY COLOR</u>
	<u>Red</u>	<u>Green</u>	<u>Blue</u>	
C01	15	0	0	Red
C02	0	15	0	Green
C03	0	0	15	Blue
C04	15	15	0	Yellow
C05	15	0	15	Magenta
C06	0	15	15	Cyan
C07	15	7	0	Yellow-Red
C08	7	15	0	Green-Yellow
C09	15	0	7	Red-Purple
C10	7	0	15	Purple-Blue

## 2.4 RUNSTREAM

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

```
. . .
@ASG,T 3.,tape-unit-type,reel
@REWIND 3.
@ASG,T 2.,tape-unit-type,reel-number
@REWIND 2.
@USE 25.,class-file-name } this is needed
@ASG,A 25. } for CLASS dis-
@XQT CLRTAB plays only
@ADD element-defining-spectral-transformation (optional)
ORIGIN,SCAN,line,sample
WINDOW,PRINT,line,column,line,column } repeat for
SPACING,line-increment,sample-increment } each display
DISPLAY,type
```

```
EXIT
@FREE 3.
@FREE 2.
. . .
```

## 2.6 SAMPLE RUN

The following portions of a demand terminal run illustrate typical use of the CLRTAB 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.

See Detection and Mapping Package Volume 2a: Software User's Manual (part 1) document (JSC-11377)

The above exec commands assign the Landsat tape and position it at the load point and assign the output tape for the display data for the INTERDATA/RAMTEK.

```
>@XQT CLRTAB
```

Then initiate execution of the CLRTAB program.

170AS /170AS DAM CLRTAB(7911) 12/07/79 16:35

\*\*\*\*WARNING: JUL 77 GODDARD FORMAT -- NO NADIR

\*\*\*\*WARNING: ATTITUDE MISSING -- SEE END OF CCT4

\*\*\*\*WARNING: NOMINAL REGISTRATION BASED ON ESTIMATED SCENE CENTER

9TRK 16N 1600 FPI W0820

LANDSAT-2 MSS

SCENE: 20899-16033  
ACT: 1 OF 4  
LINES: 1 TO 2340 OF 2340  
SAMPLES: 1 TO 816 OF 3264  
DATE: 9 JUL 77  
CENTER: 28.8000 98.6167  
NADIR: \*\*\*\*\*  
SUN EL: 54  
SUN AZ: 91  
HDG-YAW: \*\*\*\*  
ALT: 912.  
PITCH: -\*\*\*\*  
ROLL: -\*\*\*\*  
MODE/COR: 047 (OCTAL)

CLRTAB identifies the Landsat MSS scene and strip, and then supplies default specifications for several commands.

\*\*\*CURRENT DEFAULT COMMANDS:

ON, CONFIRM, LEGEND, PROMPT  
CRT, RES, 511, 511  
CRT, SCREEN, 19  
SATURATION, 62 COLOR CHANNEL, 31 INTENSITY CHANNEL  
INTENSITY, 0 1ST FACTR, 0 LOW VALUE, 100 2ND FACTR, 31 HIGH VALUE  
GRAPHICS, DELETE  
\*\*\*NOTE: DELETED COLOR FILE AND IMAGE FILE NAMES  
WINDOW, PRINT,  
-255 LINE, 255 COLUMN,  
255 LINE, 255 COLUMN  
SPACING, 1 LINES, 1 SAMPLES  
CHANNEL, RAW, 4  
RADIANCE, 0, 35  
TICK, SCAN, 2400 LINES, 3300 SAMPLES PRIMARY,  
SCAN, 100 LINES, 100 SAMPLES SECONDARY  
ZONE, \*\* (UTM CENTRAL MERIDIAN \*\*\*\*\* DEG)

The default WINDOW in this demand terminal run specifies a rectangular area centered on the ORIGIN, and 510 print lines by 510 print columns in size.

```
SPACING, 1, 1
SPACING, 1 LINES, 1 SAMPLES
```

The default spacing in this demand run specifies every scan line and every sample.

```
SPACING, 1 LINES, 1 SAMPLES
CHANNEL, RAW, 4
RADIANCE, 0, 35
TICK, SCAN, 2400 LINES, 3300 SAMPLES PRIMARY,
SCAN, 100 LINES, 100 SAMPLES SECONDARY
ZONE, ** (UTM CENTRAL MERIDIAN ***** DEG)
```

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

```
ORIGIN, 1100, 561
```

```
****WARNING: BAD COORDINATE SYSTEM --
1100
```

CLRTAB 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 specifications.

```
ORIGIN,SCAN,1100,561
ORIGIN, SCAN, 1100 LINE, 561 SAMPLE
ORIGIN, DEGREES, 28.93341 LATITUDE, 99.22617 LONGITUDE
```

CLRTAB 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 CLRTAB). The user now requests a DISPLAY of the current WINDOW.

DISPLAY,RADIANCE

```
***NOTE: PREVIOUS WARNINGS -- BAD OR NO DISPLAY GENERATED!
**TRY AGAIN!
```

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

DISPLAY,RADIANCE

```
WINDOW NUMBER 004      DISPLAY
9TRK  16N  1600 FPI  W4820
E-20079-16033-1  9JUL77 3264SAMPLES SUNEL+54 PITCH-**** ROLL-****
(CHAN,RAW,1,,,RAD,0 @,35 @,,,SPA,1,1,,,ORIG,SCAN,1100,561)
***NOTE: DEFAULT IMAGE FILE SPECIFIED
```

```
>SPACING,3,2,  
  SPACING, 3 LINES, 2 SAMPLES
```

This spacing command requests that one in every three lines and one in every two samples be displayed. 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 as follows:

```
>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 23OCT72 3240SAMPLES SUNEL+41 PITCH+0.04 ROLL-0.52
```

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.

Once all desired displays have been generated the user enters:

```
>EXIT
```

CLRTAB verifies the integrity of the Landsat tape.

```
>EXIT
```

```
**PROGRAM TERMINATION
```

```
.. VERIFYING EOF ON ERTS TAPE
```

```
..
```

```
NORMAL TERMINATION      12/07/79   17:08      0 FATAL ERRORS
```

```
**PLEASE @FREE 3. OR @REWIND 3. OR @LOCATE 3.
```

```
>@FREE 3
READY
```



1 7911

CLRTAB SAMPLE RUN

=====

```
@RUN,U/NR RJT17A,9/99-DAM-P,TF5-N12345,8,80 JONES,RJ
@USE DAM,,TF5-L76758*DAM.
@ASC,A DAM.
@ADD DAM.SETUP
@ASC,T 3,,16N,RJT17A . SCENE 1092-16305, STRIP 2
@REWIND 3.
@ASC,T 2,,16N,DISPLAY
@REWIND 2.
@XQT CLRTAB
SPACING,1,1
WINDOW,PRINT,-255,-255,+255,+255 ,, 510 LINES X 510 COLUMNS,
,, CENTERED ON ORIGIN
*ALL OTHER DEFAULT COMMANDS ARE ACCEPTABLE
ORIGIN,SCAN,480,1345 ,,, DISPLAY,RAD
ORIGIN,SCAN,646,947 ,,, DISPLAY,RAD
ORIGIN,SCAN,1094,2052 ,,, DISPLAY,GRA
ORIGIN,SCAN,1163,1309 ,,, DISPLAY,LAP
ORIGIN,SCAN,1441,896 ,,, DISPLAY,LAP
ORIGIN,SCAN,1447,1464 ,,, DISPLAY,CLA
ORIGIN,SCAN,1603,1710 ,,, DISPLAY,CLA
EXIT
@REWIND 3.
@XQT,E CLRTAB . REPEAT IF PREVIOUS EXECUTION ERROR TERMINATED
@EOF
@FREE 3.
@FREE 2.
@ASC,T 3,,16N,RJT17B . SCENE 1092-16305, STRIP 3
@REWIND 3.
@XQT CLRTAB
@EOF
@FREE 3.
@FREE 2.
@FIN
```

### 3. CRTCLASS PROGRAM

CRTCLASS generates any number of custom formatted and scaled maps on a color graphics CRT. The maps for a Landsat MSS scene are displayed using data from detection file(s) produced by the CLASSIFY program. CRTCLASS assigns each pixel to a display position on the classification map. The number of Landsat pixels assigned to each display position will vary with the scale of the map.

#### 3.1 PREREQUISITES

CRTCLASS must be executed in a computer run (normally batch). CLASSIFY must be executed in the same run, prior to CRTCLASS, in order to generate the detection file(s). Tape input is required for CLASSIFY, but not for CRTCLASS. However, an output tape is required for CRTCLASS. After CRTCLASS has run, this tape will contain all the necessary information used by the INTERDATA computer to generate the requested color maps on a color graphics CRT.

#### 3.2 EXEC COMMANDS

@ASG,T 2., tape-unit-type, reel-number

This exec command reserves an available 1600 BPI tape drive unit and requests that a scratch tape be mounted. Tape-unit-type for 9-track tapes is 16N. Reel numbers are limited to 6 characters chosen from the letters A-Z and the numbers 0-9.

@REWIND 2.

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

@XQT CRTCLASS

This exec command initiates execution of the CRTCLASS program.

@FREE 2.

This exec command is the opposite of the @ASG exec command. This command requests that the scratch tape be dismounted and the tape

drive released for use by other runs.

### 3.3 COMMANDS

ORIGIN, DEGREES, latitude, longitude

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

WINDOW, PRINT, line, column

This command specifies the size (in graphics display coordinates) of the rectangular area to be mapped by CRTCLASS. Latitude and longitude may be used with the WINDOW, MINUTES command, but the PRINT specification ensures that the map will fill the portion of screen desired.

HEADING, l, heading-text

This command specifies the text to be displayed on the color CRT, along with the map. The text is limited to 36 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 secondary ticks within subsequent windows. The primary intervals in minutes are given first, followed by the secondary intervals in minutes.

COUNT, count-per-pixel

This command specifies the resampling algorithm used in generating the map. When the count-per-pixel is zero, last-in resampling is used. When the count-per-pixel is greater than zero, a count is added to a CRT display position each time a pixel registers there. The count added for each qualifying pixel will be either the (radiance/density) value or the count, whichever is less.

SATURATION, saturation-limit

This command specifies the largest allowable (radiance/density) value. Any values in the window larger than the saturation limit are set to the limit. This protects the CRTCLASS program from detection file values outside the allowable range (0-61). The usual saturation limit is 61 for radiance and class detection files and 18 for density files.

COLOR, color-name, first (radiance/density) value,  
color-name, second (radiance/density) value

This command is analagous to the SYMBOLS command in PRTCLASS. It is used to specify the color to be displayed for a range of (radiance/density) values. More than one color command is usually specified. See section 2.4 for valid color names.

RADIANCE, low-radiance-value, high-radiance-value

This command specifies the range of radiance values used in creating the map. Any radiance values in the window which are outside of this range are ignored.

DENSITY, low-density-value, high-density-value

This command specifies the range of density values used in creating the map. Any density values in the window which are outside of this range are ignored.

TABULATE,

This command tabulates the number of pixels with each color or (radiance/density) value that was displayed by the previous MAP command. Pixels not displayed (outside of the current radiance/density range) are not included in the tabulation.

MAP

This command generates a single map covering the current window. The map is stored on an output tape for later display on the color graphics CRT.

EXIT

This command terminates the CRTCLASS Program.

### 3.4 RUNSTREAM

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

```
. . .
(runstream for CONTROL)
(runstream for CLASSIFY) -- repeat once for each strip
@ASG,T 2., 16N, X09052
@REWIND 2.
@XQT CRTCLASS
ORIGIN,DEGREES,latitude,longitude } repeat for
HEADING,1,heading-test           } each area to
MAP                               } be mapped
EXIT
. . .
```

### 3.5 SAMPLE RUN

CRTCLASS 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 CRTCLASS programs to produce registered color CRT maps from Landsat MSS data. The computer displays a prompt character (>) before each statement keyed in by the user.

See Detection and Mapping Package Volume 2a: Software User's Manual (part 1) document (JSC-11377) page 10-4 through 10-12 for instructions on using CONTROL and CLASSIFY.

. . .

Next assign an output tape that will be used by CRTCLASS to store the maps for later display on the color graphics device.

```
>@ASG,T 2., 16N, X09052
READY
>@REWIND 2.,
FURPUR 0026-05/05 -1:47
```

Next execute CRTCLASS to generate a series of color CRT maps, using data in the detection files produced by CLASSIFY.

>@XUT CRTCLASS

CRTCLASS verifies that all detection 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:

170MVM/170MVM      DAM CRTCLASS(7911)      12/07/79      14:54  
\*\*\*NOTE: NO FILE \*DAMDET-3.  
\*\*\*NOTE: NO FILE \*DAMDET-4.

ERTS SCENE: 20899-16033  
DATE: 9 JUL 77  
SUN ELEV: 54 DEGREES  
SUN AZIMUTH: 91 DEGREES

CCT STRIPS:	1	2	3	4
DATE CLASSIFIED:	053179	053179		
MINIMUM LINE:	800	800	0	0
MAXIMUM LINE:	1800	1800	0	0
MINIMUM SAMPLE:	400	817	0	0
MAXIMUM SAMPLE:	816	1632	0	0
MATERIAL(S) DETECTED:	WATER-LIM/2B-412F-PUR4			(DEN)
TOLERANCE:	0			

The program 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, LEGEND, PROMPT  
COPIES, 1  
DEF-DET, DEN  
DEF-DEN  
DENSITY, 10 MINIMUM, 18 MAXIMUM  
COUNT, 1 PER PIXEL  
SATURATION, 18 COLOR CHANNEL, 0 INTENSITY CHANNEL  
COLOR,C01 COLOR1, 10 VALUE1,C02 COLOR2, 12 VALUE2  
COLOR,C03 COLOR1, 14 VALUE1,C04 COLOR2, 16 VALUE2  
COLOR,C05 COLOR1, 17 VALUE1,C06 COLOR2, 18 VALUE2  
SCALE, 1/24000  
WINDOW, PRINT ,  
500 LINE, 500 COLUMN  
TICK, MINUTES, 2.500 LAT, 2.500 LON PRIMARY,  
MINUTES, 2.500 LAT, 2.500 LON SECONDARY  
ZONE, 14 (UTM CENTRAL MERIDIAN 99.0 DEG)  
CRT, RES, 511, 511  
CRT, SCREEN, 19  
GRAPHICS , DELETE  
\*\*\*NOTE: DELETED COLOR FILE AND IMAGE FILE NAMES

The default WINDOW and SCALE commands will allow a 1:24000 scale map to fill the entire color graphics screen. Next, specify the location of the map, enter its ORIGIN.

170MVM/170MVM DAM CRTCLASS(7911) 12/07/79 12:19

**\*\*USER COMMANDS:**

>ORIGIN, SCAN, 1000, 600  
ORIGIN, SCAN, 1000 LINE, 600 SAMPLE  
ORIGIN, DEGREES, 29.00973 LATITUDE, 99.19476 LONGITUDE  
ORIGIN, KM, 481.032 EAST, 8208.903 NORTH

Next specify the map HEADING and enter the MAP command.

>HEADING, 1, RSIS CRTCLASS TEST  
HEADING, 1, RSIS CRTCLASS TEST

>MAP  
MAP

\*\*\*NOTE: DEFAULT IMAGE FILE SPECIFIED



CRTCLASS will then generate a single map covering the entire window. The map will be generated and sent to the output tape assigned to the run. After program termination, this tape is used by the INTERDATA/RAMTEK to show the display on the color graphics CRT.

Next, a tabulation of the number of (radiance/density) pixels in each color range may be generated by the TABULATE command.

```

)TAB
KBTYP = COL
WINDOW NUMBER 001      TABULATE      WATER-LIM/2B-412F-PUR4
E-20899-16033-1  9JUL77 3264SAMPLES SUNEL+54 PITCH+0.05 ROLL-0.11
(CHAN,,0,0,0,,,RAD,10 @,18 @,8,63,0,80,,,SPA,0,0,,,ORIG,SCAN,1000,600)

```

COL CH 0	DEN VALUE	FREQUENCY CH 0 CH
000	010	0
000	011	0
000	010 - 011	0
C02	012	0
C02	013	0
C02	012 - 013	0
C03	014	0
C03	015	0
C03	014 - 015	0
C04	016	0
C04	016 - 016	0
C05	017	0
C05	017 - 017	0
C06	018	0
C06	018 - 018	0
TOTAL		0

To terminate the program, enter EXIT.

```
)EXIT
```

```

**PROGRAM TERMINATION
DO YOU WANT DETECTION FILES SAVED?

```

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

>NO

DETECTION FILES DELETED

NORMAL TERMINATION

12/07/79

12:23

0 FATAL ERRORS

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

>NO

DETECTION FILES DELETED

NORMAL TERMINATION

12/07/79

12:23

0 FATAL ERRORS

1 7911

CRTCLASS SAMPLE RUN

=====

```
@RUN, U/NR RJT17M, 9999-DAM-P, TF5-N12345, 20, 300 JONES, RJ
@USE DAM., TF5-L76758*DAM.
@ASC, A DAM.
@ADD DAM.SETUP
@ASC, T 2., 16N, SCRATCH
@REWIND 2.
@USE 25., ELLTABCLASSFILE.
@ASC, A ELLTABCLASSFILE.
@XQT CRTCLASS
COPIES, 1
HEADING, 1, SAMPLE MAPS FROM THE DAM PACKAGE
SCALE, 1/24000
TICK, MINUTES, 7.5, 7.5, MINUTES, 2.5, 2.5 , , PRIMARY 7.5 X 7.5 MINUTES &
, , SECONDARY 2.5 X 2.5 MINUTES
WINDOW, PRINT, 509, 509 , , FILLS ENTIRE CRT SCREEN
ORIGIN, DEG, 30:15, 97:37.5 , , , HEADING, 2, AUSTIN E , , , MAP
ORIGIN, DEG, 30:15, 97:45 , , , HEADING, 2, AUSTIN W , , , MAP
EXIT
@FREE 2.
@FIN
```

## 4. CRLCLASS PROGRAM

CRLCLASS generates any number of custom formatted and scaled maps on a color graphics CRT. The maps for a Landsat MSS scene are displayed using data from ELLTAB class file(s) produced by the ELLTAB classification program, and from detection file(s) generated by the CLASSIFY program. CRLCLASS assigns each pixel to a display position on the classification map. The number of Landsat pixels assigned to each display position will vary with the scale of the map.

### 4.1 PREREQUISITES

CRLCLASS must be executed in a computer run (normally batch). CLASSIFY must be executed in the same run prior to CRLCLASS, in order to generate the detection file(s). The ELLTAB classification program must also be run prior to CRLCLASS in order to generate the ELLTAB class file(s). ELLTAB will normally be executed in a separate computer run, and the class file(s) assigned to the CRLCLASS run. An output tape is required for CRLCLASS. After CRLCLASS has run, this tape will contain all of the necessary information used by the INTERDATA computer to generate the requested color maps on a color graphics CRT.

### 4.2 EXEC COMMANDS

@ASG,T 2., tape-unit-type, reel-number

This exec command reserves an available 1600 BPI tape drive unit and requests that a scratch tape be mounted. Tape-unit-type for 9-track tapes in 16N. Reel numbers are limited to 6 characters chosen from the letters A-Z and the number 0-9.

@REWIND 2.

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

@USE 25., Qualifier\*filename1.

This exec command assigns an ELLTAB class file for the first strip. If this file does not exist, this command may be omitted.

@ASG,A 25.

This exec command assigns the first ELLTAB class file to the run. If this file does not exist, this command may be omitted. At least one ELLTAB class file must be assigned to the run.

@USE 26., Qualifier\*filename2.

This exec command assigns an ELLTAB class file for the second strip. If this file does not exist, this command may be omitted.

@ASG,A 26.

This exec command assigns the second ELLTAB class file to the run. If this file does not exist, this command may be omitted.

@USE 27., Qualifier\*filename3.

This exec command assigns an ELLTAB class file for the third strip. If this file does not exist, this command may be omitted.

@ASG,A 27.

This exec command assigns the third ELLTAB class file to the run. If this file does not exist, this command may be omitted.

@USE 28., Qualifier\*filename4.

This exec command assigns an ELLTAB class file for the fourth strip. If this file does not exist, this command may be omitted.

@ASG,A 28.

This exec command assigns the fourth ELLTAB class file to the run. If this file does not exist, this command may be omitted.

@XQT CRLCLASS

This exec command initiates execution of the CRLCLASS program.

@FREE 2.

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

#### 4.3 COMMANDS

ORIGIN, DEGREES, latitude, longitude

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

WINDOW, PRINT, line, column

This command specifies the size (in graphics display coordinates) of the rectangular area to be mapped by CRLCLASS. Latitude and longitude may be used with the WINDOW, MINUTES command, but the PRINT specification ensures that the map will fill the portion of screen desired.

HEADING, l, heading-text

This command specifies the text to be displayed on the color CRT, along with the map. The text is limited to 36 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 secondary ticks within subsequent windows. The primary intervals in minutes are given first, followed by the secondary intervals in minutes.

COUNT, count-per-pixel

This command specifies the resampling algorithm used in generating the map. When the count-per-pixel is zero, last-in resampling is used. When the count-per-pixel is greater than zero, a count is added to a CRT display position each time a pixel registers there. The count added for each qualifying pixel will be either the class value or the count, whichever is less.

SATURATION, saturation-limit

This command specifies the largest allowable class value. Any values in the window larger than the saturation limit are set to the limit. This protects the CRTCLASS Program from class values outside the allowable range (0-61). The usual saturation limit is 61.

COLOR, color-name, first class value,  
color-name, second class value,

This command is analagous to the SYMBOLS command in PRTCLASS. It is used to specify the color to be displayed for a range of class values. More than one color command is usually specified.



RADIANCE, low-class-value, high-class-value

This command specifies the range of class values used in creating the map. Any class values in the window which are outside of this range are ignored.

TABULATE

This command tabulates the number of pixels with each color or class value that was displayed by the previous MAP command. Pixels not displayed (outside of the current class range) are not included in the tabulation.

MAP

This command generates a single map covering the current window. The map is stored on an output tape for later display on the color graphics CRT.

EXIT

This command terminates the CRLCLASS program.

~~45~~  
43

#### 4.4 RUNSTREAM

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

```
. . . .
(runstream for CONTROL)
(runstream for CLASSIFY) -- repeat once for each strip
@ASG,T 2., 16N, X09052
@REWIND 2.
@ASG,A 25.
@XQT CRLCLASS
ORIGIN,DEGREES,latitude,longitude } repeat for
HEADING,1,heading-text           } each area to
MAP                               } be mapped
EXIT
. . . .
```

#### 4.5 SAMPLE RUN

CRLCLASS 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 CRLCLASS programs to produce registered color CRT maps from Landsat MSS data. The computer displays a prompt character (>) before each statement keyed in by the user.

See Detection and Mapping Package Volume 2a: Software User's Manual (part 1) document (JSC-11377) page 10-4 through 10-12 for instructions on using CONTROL and CLASSIFY.

. . . .

Next assign an output tape that will be used by CRLCLASS to store the maps for later display on the color graphics device.

```
>@ASG,T 2., 16N, X09052
READY
>@REWIND 2.
FURPUR 0026-05/05 -1:47
```

Assign at least one ELLTAB class file to the run, which contains the class data for the map.

Next execute CRLCLASS to generate a series of color CRT maps, using data in the class files produced by ISOCCLASS/ELLTAB. The detection files provide registration and scene information only

>@XBT CRLCLASS

CRLCLASS verifies that all detection 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:

170MVM/170MVM DAM CRLCLASS(7911) 12/07/79 12:24  
\*\*\*NOTE: NO FILE \*DAMDET-3.  
\*\*\*NOTE: NO FILE \*DAMDET-4.

ERTS SCENE: 20899-16033  
DATE: 9 JUL 77  
SUN ELEV: 54 DEGREES  
SUN AZIMUTH: 91 DEGREES

CCT STRIPS:	1	2	3	4
DATE CLASSIFIED:	053179	053179		
MINIMUM LINE:	800	800	0	0
MAXIMUM LINE:	1800	1800	0	0
MINIMUM SAMPLE:	400	817	0	0
MAXIMUM SAMPLE:	816	1632	0	0
MATERIAL(S) DETECTED:	WATER-LIM/2B-412F-PUR4			(DEN)
TOLERANCE:	0			

The program 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, LEGEND, PROMPT  
COPIFS, 1  
DEF-DET, CLA  
DEF-CLA  
RADIANCE, 0, 61  
COUNT, 0 PER PIXEL  
SATURATION, 61 COLOR CHANNEL, 0 INTENSITY CHANNEL  
COLOR, C01 COLOR1, 0 VALUE1, C02 COLOR2, 10 VALUE2  
COLOR, C03 COLOR1, 20 VALUE1, C04 COLOR2, 30 VALUE2  
COLOR, C05 COLOR1, 40 VALUE1, C06 COLOR2, 50 VALUE2  
COLOR, C07 COLOR1, 55 VALUE1, C08 COLOR2, 61 VALUE2  
SCALE, 1/24000  
WINDOW, PRINT ,  
500 LINE, 500 COLUMN  
TICK, MINUTES, 2.500 LAT, 2.500 LON PRIMARY,  
MINUTES, 2.500 LAT, 2.500 LON SECONDARY  
ZONE, 14 (UTM CENTRAL MERIDIAN 99.0 DEG)  
CRT, RES, 511, 511  
CRT, SCREEN, 19  
GRAPHICS , DELETE  
\*\*\*NOTE: DELETED COLOR FILE AND IMAGE FILE NAMES

The default WINDOW and SCALE commands will allow a 1:24000 scale map to fill the entire color graphics screen. Next specify the location of the map, enter its ORIGIN.

170MVM/170MVM DIAM CRLCLASS(7911) 12/07/79 12:26

**\*\*USER COMMANDS:**

>ORIGIN, SCAN, 1000, 600  
ORIGIN, SCAN, 1000 LINE, 600 SAMPLE  
ORIGIN, DEGREES, 29.00973 LATITUDE, 99.19476 LONGITUDE  
ORIGIN, KM, 481.032 EAST, 3208.903 NORTH

Next specify the map HEADING and enter the MAP command.

>HEADING, 1, RSIS TEST OF CRLCLASS  
HEADING, 1, RSIS TEST OF CRLCLASS  
>MAP  
MAP  
\*\*\*NOTE: DEFAULT IMAGE FILE SPECIFIED

CRLCLASS will then generate a single map covering the entire window. The map will be generated and sent to the output tape assigned to the run. After program termination, this tape is used by the INTER-DATA/RAMTEK to show the display on the color graphics CRT.

Next, a tabulation of the number of class pixels in each color range may be generated by the TABULATE command.

```

)TAB
KBTYP = COL
WINDOW NUMBER 001          TABULATE          WATER-LIM/2B-412F-PUR4
E-20899-16033-4  9JUL77 3264SAMPLES SUNEL+54 PITCH+0.05 ROLL-0.11
(CHAN,,0,0,0,, ,RAD,0 @,61 @,8,63,0,80,, ,SPA,0,0,, ,ORIG,SCAN,1000,600)

```

COL CH 0	CLA VALUE	FREQUENCY CH 0 CH
C01	000	0
C02	010	14
C03	020	0
C04	030	0
C05	040	0
C06	050	0
C07	055	0
C08	061	0

TOTAL 14

To terminate the program, enter EXIT.

```

)EXIT
**PROGRAM TERMINATION
DO YOU WANT DETECTION FILES SAVED?

```

~~49~~  
47

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

>NO

DETECTION FILES DELETED

NORMAL TERMINATION

12/07/79

12:27

0 FATAL ERRORS

1 7911

CRLCLASS SAMPLE RUN

\*\*\*\*\*

@RUN,U/NR R) (17M,9999-DAM-P,TF5-N12345,20,300 JONES,RJ  
@USE DAM.,TF5-L76758\*DAM.  
@ASC,A DAM.  
@ADD DAM.SETUP  
@ASC,T 2.,16N,SCRATCH  
@REWIND 2.  
@USE 25.,ELLTABCLASSFILE.  
@ASC,A ELLTABCLASSFILE.  
@XQT CRLCLASS  
COPIES,1  
HEADING,1,SAMPLE MAPS FROM THE DAM PACKAGE  
SCALE,1/24000  
TICK,MINUTES,7.5,7.5,MINUTES,2.5,2.5 , , PRIMARY 7.5 X 7.5 MINUTES &  
 , , SECONDARY 2.5 X 2.5 MINUTES  
WINDOW,PRINT,509,509 , , FILLS ENTIRE CRT SCREEN  
ORIGIN,DEG,30:15,97:37.5 , , ,HEADING,2,AUSTIN E , , ,MAP  
ORIGIN,DEG,30:15,97:45 , , ,HEADING,2,AUSTIN W , , ,MAP  
EXIT  
@FREE 2.  
@FIN