80-10090

NASA CR-160475

National Aeronautics and
Space Administration

JSC-14633

Lyndon B. Johnson Space Center
Houston, Texas 77058

EARTH OBSERVATIONS DIVISION

SPACE AND LIFE SCIENCES DIRECTORATE

OPERATIONS MANUAL FOR THE LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM (LIVES)

Job Order 71-485

(E80-10090) OPERATIONS MANUAL FOR THE LANDSAT IMAGERY, VERIFICATION AND EXTRACTION SYSTEM (LIVES) (Lockheed Electronics Co.) 83 p HC A05/MF A01 CSCL 05B

N80-23717

Unclas
G3/43 00090

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Contract NAS 9-15800

August 1979

LEC-12903

JSC-14633

OPERATIONS MANUAL
FOR THE
LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM
(LIVES)

Job Order 71-485

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QUICK CONTENTS

OPERATIONS MANUAL

FOR THE

LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM

(LIVES)

FIGURES

1 SCOPE

The Landsat Imagery Verification and Extraction System (LIVES) extracts areas of interest for users from full Landsat scenes, which are taken from NASA High Density Tapes. It is a comprehensive system for obtaining portions of Landsat scenes (or complete scenes) that are useful for projects of the Earth Observations Division of NASA's Johnson Space Center.

This document describes functions of LIVES for computer operations personnel, including those who operate the system as well as those who direct its operation. For those who need only brief instructions, the last section of this document presents a complete set of abbreviated instructions.

Operations manuals are allowed by references 2.1-1 and 2.1-2 to take any convenient form which competently serves the uses for which they were intended. As such, this manual is modeled after guidelines in FIPS-38 (ref. 2.1-3), the current basic government reference on documentation. It is a stand-alone document for operations personnel. To avoid the inclusion of unnecessary data, and in the interest of completeness, it makes reference to other documents used in the development of LIVES (see section 2 of this document) following the practice recommended in FIPS-38.

1.1 BACKGROUND OF LIVES

Throughout the Large Area Crop Inventory Experiment (LACIE), the NASA facilities at Goddard Space Flight Center (GSFC) preprocessed all Landsat scenes containing areas of interest to that program. GSFC extracted segments of interest, registered the segments to reference images, and forwarded the final segment data to LACIE on tape in standard (universal) image format.

GSFC will change their method of operation in late 1979. Landsat images will be preprocessed and registered as full scenes. Imagery data will be forwarded to users as full scenes on high density tapes (HDT's). User agencies will be expected to extract the data as needed; the Goddard facilities will no longer extract subsets of the full-scene imagery. LIVES provides the capability of extracting areas of interest from these high density tapes.

1.2 ENVIRONMENT AND USE OF LIVES

In general terms, persons who need images will furnish information on Landsat scenes needed by the Earth Observations Division at NASA's Johnson Space Center. This information will be used to order scenes from the Image Processing Facility of Goddard Space Flight Center. That facility will furnish the needed scenes, and perhaps others, on high density tapes. At the same time it will furnish an inventory tape (the Goddard High Density Tape Inventory Tape, GHIT) with information on all scenes furnished on these tapes.

The high density tapes will be processed by the High Density Tape Reformatting System (HDTRS) currently being developed by the Ford Aerospace and Communications Corporation. The HDTRS will transfer full Landsat scenes to 300 megabyte disks. LIVES then extracts areas of interest from them. Ultimately, LIVES produces Computer Compatible Tapes (CCT's) containing areas of interest for specific users.

2. APPLICABLE DOCUMENTS

The information in this document will generally be sufficient for a user. In this sense it is designed to be a stand-alone document.

However, considerable information is available to a user who wishes to probe into the history and the internal detail of LIVES. All major LIVES documents are included in the list below, which is divided into the following sections.

2.1 SPECIFICATIONS FOR DOCUMENTS

2.2 PROGRAMMED DOCUMENTATION OF LIVES

2.3 DOCUMENTATION OF THE HIGH DENSITY TAPE REFORMATTING SYSTEM (HDTRS)

2.4 DOCUMENTATION OF EXTERNAL SYSTEMS

2.5 INFORMATION ON MAJOR SOFTWARE COMPONENTS

2.6 INFORMATION ON MAJOR HARDWARE ITEMS

All documents with JSC identification numbers are available through the NASA JSC Technical Library (code JM6, Building 45). All documents with LEC numbers are available through the Lockheed Library (code B09, Building Lockheed-10 in Nassau Bay, Texas). Most of the same documents are immediately available from the Data Techniques Library of the Earth Observations Division (Building 17, room 2062, JSC).

From the point of view of a user, reference 2.2-3 presents requirements specifications; reference 2.2-9 presents the design to which the system was actually built; and 2.2-14 will give definitive details on the complete system, including program listings.

2.1 SPECIFICATIONS FOR DOCUMENTS

2.1-1 Building 17 Facilities Configuration Management Plan A, JSC-10105 (September 1977); with change 2 (August 1978).

2.1-2 INTEGRATED STANDARDIZATION, OPERATION, AND QUALITY ASSURANCE PLAN FOR SOFTWARE DEVELOPMENT SECTION 626-45, LEC-9972 (January 1977).

2.1-3 GUIDELINES FOR DOCUMENTATION OF COMPUTER PROGRAM, Guidelines for Documentation of Computer Programs and Automated Data Systems, Federal Information Processing Standards FIPS PUB 38, U. S. Department of Commerce, National Bureau of Standards (February 1976).

2.2 PROGRAMMED DOCUMENTATION OF LIVES

The following documents are specified in reference 2.1-1 (above) and, in some cases, clarified in reference 2.2-2. At this date all of these references have been published except for 2.2-11 and 2.2-14 which are currently undergoing final revision.

2.2-1 Job Orders 71-485 and 71-523, High Density Tape Implementation.

2.2-2 Functional Requirements Document (FR) (informal document only), August 1978.

2.2-3 Implementation Requirements Specification (IRS), JSC-14647, LEC-12862, November 1978.

2.2-4 Preliminary Functional Design Document (FD) (informal document only), August 1978.

2.2-5 Project Development Plan (PDP), JSC-14579, LEC-12856, October 1978.

2.2-6 Preliminary Design Specification (FS: Functional Specifications), JSC-14577, LEC-12838, November 1978.

2.2-7 Test Specification (DTS), JSC-14635, LEC-12900, February 1979.

2.2-8 Test Plan (TP), JSC-14578, LEC-12857, October 1978.

2.2-9 Detailed Design Specification (DDS), JSC-14611, LEC-12901, January 1979.

2.2-10 Facility Preparation Plan, LEC-13069, January 1979.

2.2-11 Test Preparation Sheet, to be prepared.

2.2-12 Users Manual, JSC-14632, LEC-12902, March 1979.

2.2-13 Operations Manual, JSC-14633, LEC-12903, this document.

2.2-14 "As Built" Design Specification, JSC-14634, LEC-12904, to be prepared.

2.3 DOCUMENTATION OF THE HIGH DENSITY TAPE REFORMATTING SYSTEM HDTRS

2.3-1 Landsat HDT Reformatting System (HDTRS), Ford Aerospace and Communications Corporation, July 1978.

2.3-2 Landsat HDT Reformatting System, Interface Control Document, Ford Aerospace and Communications Corporation, August 1978.

2.3-3 HDTRS Users Manual (may not be exact title) (to be prepared by Ford Aerospace and Communications).

2.3-4 HDTRS Operations Manual (may not be exact title) (to be prepared by Ford Aerospace and Communications).

2.4 DOCUMENTATION OF EXTERNAL SYSTEMS

2.4-1 Goddard HDT Inventory Tape (GHIT) Operations Research Inc., NAS 5-23762, February 1978.

2.5 INFORMATION ON MAJOR SOFTWARE COMPONENTS

2.5-1 RIMS Design Specification, LEC-9564, February 1976.

2.5-2 Detail Design Specification for Enhancement of the Automatic Status and Tracking System Software, JSC-13789, LEC-11512, November 1977.

2.5-3 RIMS Users Guide, LEC-9301, Revision A, April 1977.

2.5-4 Addendum to RIMS Users Guide, LEC-11756, January 1978.

2.5-5 IBM User's Guide, LACIE, section 10.4.1.1 through 10.4.1.6, April 1975 (variously revised).

2.5-6 Software Description Volume of the IMAGE 100 User Manual, G. E. Space Division (Daytona Beach, Florida), June 1975.

2.5-7 LIVES Information Management System (IMS) Users Guide (to be prepared)

2.5-8 JSC Image-100 Users Guide, JSC-12585, LEC-10262, June 1977.

2.6 INFORMATION ON MAJOR EQUIPMENT

2.6-1 High-Density Digital Tape Recorder, Martin-Marietta Corporation, P75-18236-2, June 1975.

2.6-2 Serial Controller Interface - Input (SCII), Interface Control Document and Test Software Requirements, General Electric Company, February 1978.

2.6-3 Serial Controller Interface - Input (SCII), Product Specification, General Electric Company, February 1978.

3. DESCRIPTION OF HARDWARE

3.1 OVERVIEW

LIVES was built on the physical facilities of the Data Techniques Laboratory, room 2062 of Building 17, at NASA's Johnson Space Center (JSC). It uses only equipment in that laboratory, and makes use of image display facilities of its Image-100 system. The HDTRS, developed by the Ford Aerospace and Communications Corporation and physically located in the same area, is used concurrently with LIVES.

3.2 COMPUTERS

Figure 3.2-1 shows the computers, disks and terminals of the HDTRS and of LIVES. There are three general purpose computers: a PDP 11/20 for the HDTRS, the Support Processor (PDP 11/45), and the Image Processor (PDP 11/45) for LIVES. HDTRS operates in the PDP 11/20, placing full scene data on disk accessible to the Support Processor.

LIVES resides on the Support Processor and the Image Processor. The Extract Processor is implemented only on the Support Processor in order to access HDT data placed on disk by the High Density Tape Reformatting System. The display and translation functions are on the Image Processor because they both require the Image-100 terminal. All other functions are normally performed on the Support Processor but could be performed on the Image Processor equally as well.

3.3 DISKS

Figure 3.2-1 also presents the configuration of disks in the system. The two 300 MB disks are dual-ported, controlled by software, so that one is used by the HDTRS while the other is in use by LIVES; the two are not used by both systems at the same time.

The other disks in the system are all 88 MB. In theory, all are portable; but, in practice, the one marked "switchable" will not have a portable function.

3.4 HIGH DENSITY TAPES

"Fully processed" high density tapes will have been preprocessed and registered. This version of LIVES is designed to use "fully processed" tapes since it does not incorporate a registration capability other than line-by-line and pixel-by-pixel translation.

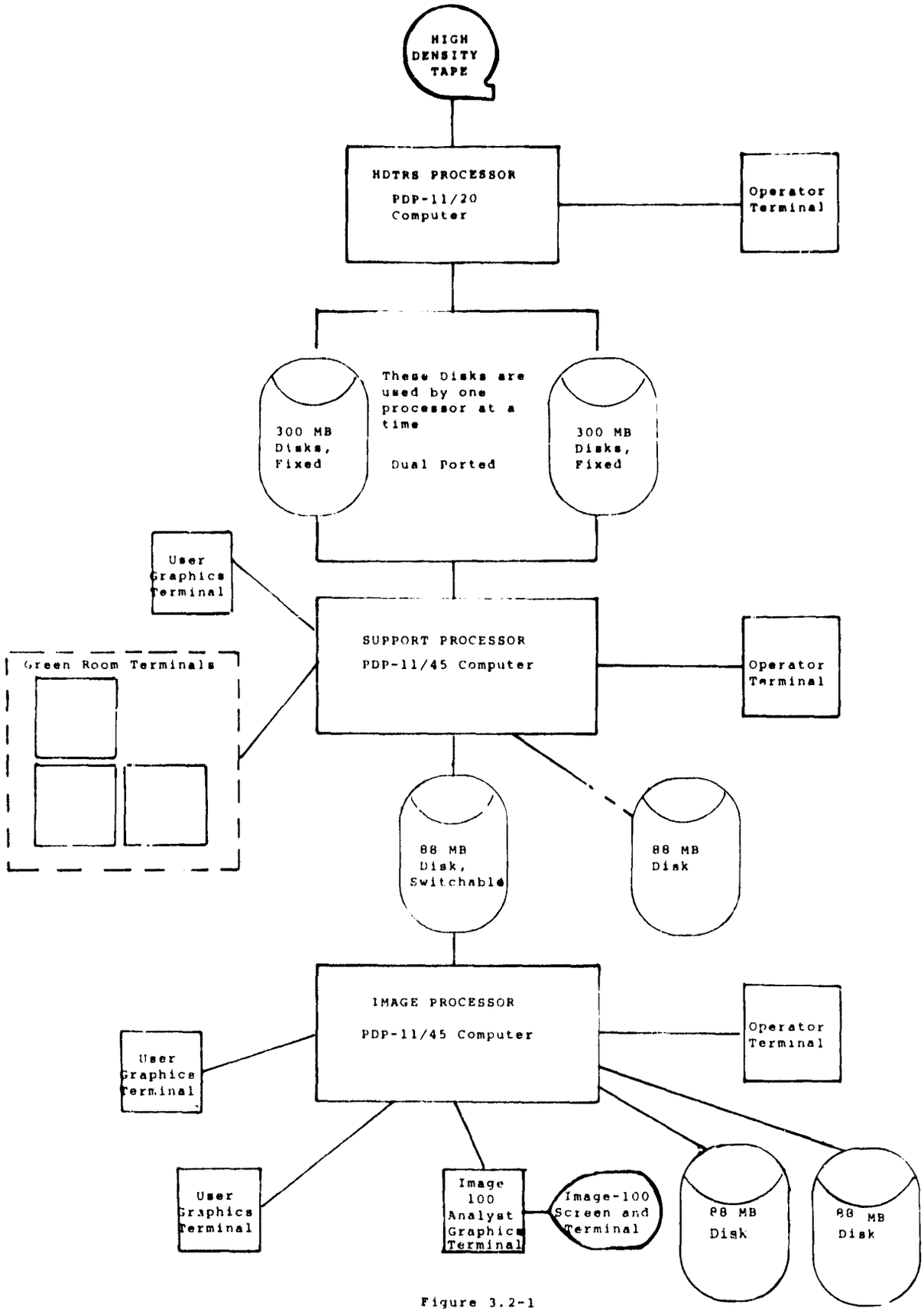

Figure 3.2-1

Computers, Disks, and Terminals

4. OVERVIEW OF SOFTWARE

4.1 SYSTEM OVERVIEW

LIVES and the HDT Reformatting System (HDTRS) comprise the HDT processing system which has been implemented in the Data Techniques Laboratory (DTL) in Building 17 of NASA's Johnson Space Center. This system reads high density Landsat tapes and produces computer compatible tapes (CCT's).

Figure 4.1-1 illustrates organization of LIVES software. This diagram shows the total flow of data within LIVES and between LIVES and some other systems. Initially, users identify areas of interest. On the basis of this information, notice will probable be sent to Goddard of the Landsat scenes that would be of interest. Goddard prepares high density tapes (HDT's) and inventory tapes (GHIT's) on a daily basis and sends them to the Earth Observations Division of NASA's Johnson Space Center. The HDTRS is used to reformat the data from the high density tapes and place them on the Full Scene Data Base. From these full scenes, LIVES extracts areas of interest; computes cloud cover, and gains and biases; optionally provides the capability to screen and translate; and, ultimately, writes the imagery data (areas of interest) to CCT's.

The major input to LIVES is imagery data which have been placed on disk by the HDTRS. Other input includes areas of interest descriptions and the Goddard HDT Inventory Tape (GHIT); the latter defines the information on a set of high density tapes.

The principal output is computer compatible tapes which contain imagery for areas of interest. Other output includes operations and management reports concerning system utilization and processing.

The status of LIVES is maintained in the Process Control and Status (PC&S) Data Base. This data base defines the various areas of interest for which Landsat data is needed by the users. It also contains information required for computations in the various system

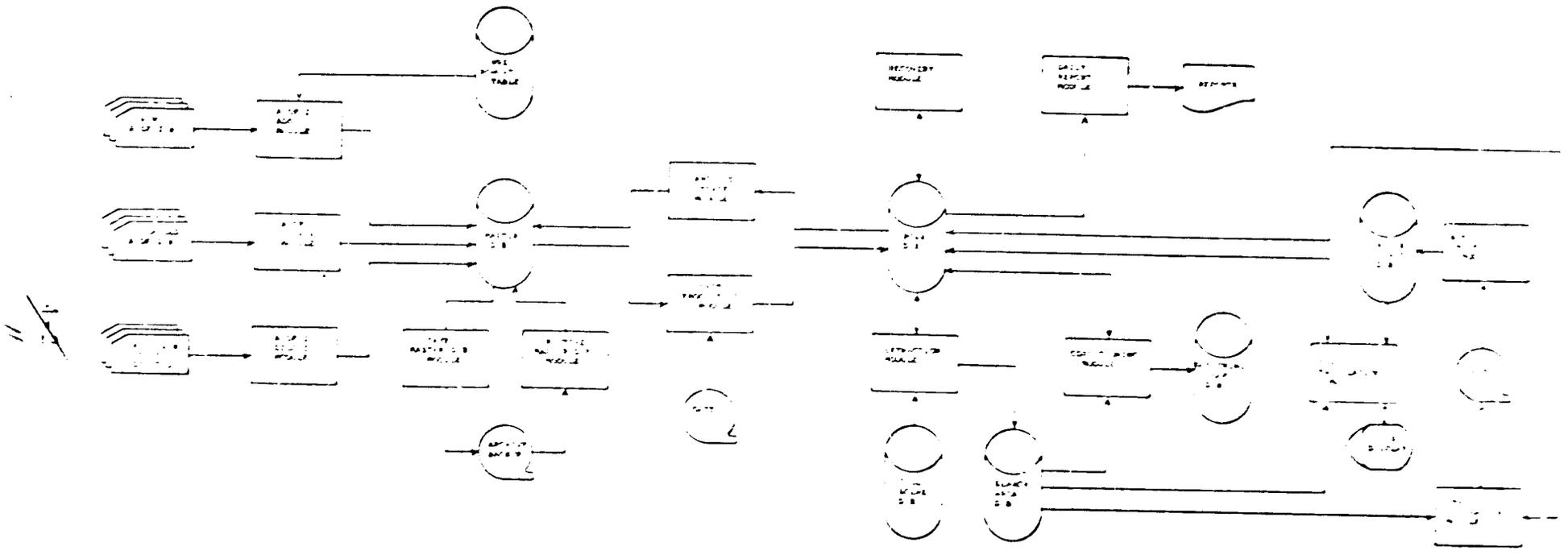

FIGURE 4.1.1
ORGANIZATION OF LIVES SOFTWARE

processes, other control information, and status information. Area of interest descriptions must be defined and constructed before an area of interest can be extracted. The generalized data management system, LIVES Information Management System LIMS, is used for generating and updating area of interest descriptions in the PC&S Data Base. (LIMS is nearly identical to RIMS, and contains only minor enhancements to that previously existing system (ref. 2.5 1 through 2.5 4).)

A processing cycle starts with execution of the GHIT processor, which compares the GHIT with the data base to determine which high density tapes require processing. The GHIT processor also updates the PC&S data base with information to be used in other system processes.

Then, the Extraction Processor is executed on the PDP 11/45. Concurrent with the execution of the extract program, the HDTRS is put into operation. It performs its primary task by reading full scene data from the HDT's to disk. By extracting pertinent data from the full scenes, the Extraction Processor builds the Search Area Data Base, which includes all data for areas of interest. A search area includes all data within the area of interest plus additional data to allow for translation, which is a form of registration. This search area is then moved to another disk, freeing the full scene disk so that the reformatting system may continue to read additional full-scene data from the high density tapes.

After extraction, the conditioning processor is initiated. This function analyzes the amount of cloud cover, and calculates bias and gains.

After conditioning, the screening and translation function may be performed on the Image-100 terminal. Screening is required for images that fail a user-supplied registration threshold quality. Screening options include the ability to reject the data from further processing, accept the data for CCT as is, and perform translation in a plane. Translation is accomplished by a user who can see both the image and a control image on a screen. Points

which correspond on each image are identified by positioning a cursor. The image is then translated to the control image based on the difference in the marked positions. After screening and translation, the Conditioning Processor is again initiated to calculate bias and gains for any images which have been translated.

Upon completion of the Conditioning Processor, the CCT Generate Processor is activated to write area-of-interest data to tape. The program provides the capability to produce tapes according to the needs of a given user.

All reports in the system are made with LIMS. Some are pre-programmed and formatted; other report information can be obtained via the "ad hoc" capability of LIMS. The LIMS system allows rapid response in meeting new or changing report requirements.

4.2 PROGRAMS IN LIVES

LIVES consists of a series of independent programs with the functions shown in the top portion of Figure 4.2-1. Programs called by the independent programs are listed at the bottom of the same figure for general information of the operator. Most of these are transparent to the operator; since he does not operate them or furnish data to them, they are not discussed further in this document. Details are available in the detailed design document (ref. 2.2-9).

An operator may use the Reference Image Load Processor (section 6.1 of this document) from any terminal with access to the Reference Image Data Base. He will normally use the GHIT Processor (6.2) from the Support Processor. The Extract Processor (6.3) must be run from the Support Processor. The Conditioning Processor (6.4) will be used on either processor, as most convenient. He will use the Screening and Translation Processor from the Image-100 console (6.5). He can generate CCT's with the CCT Processor (6.6) from either processor. In the initial release of LIVES, only the Reference Image Load Processor and the Screening and Translation Processor will exist on the Image Processor.

The operator may use the data base management system, LIMS, (7.) from any terminal with access to the Daily Data Base or the Master (Archive) Data Base. He can generate reports from a terminal connected to the appropriate data base (section 6.3.3). Possible operations include adding, modifying (updating), and deleting area-of-interest definitions (7.1-13); preparing reports (7.4); saving and restoring the Master (Archive) Data Base (7.5); and others (7.6).

INDEPENDENT MODULES

Program	Purpose	Normally Operated By	Frequency of Use *
Reference Image Load Processor	Load reference image	Computer Operator	Frequentiv at first, then infrequentlv
GHIT Processor	Interpret GHIT	Computer Operator	Dailv
Extraction Processor	Extract image from full scene data base	Computer Operator	Dailv
Conditioning Processor	Calculate gains and biases, and analyze for cloud cover	Computer Operator	Dailv
Screen and Translate Processor	Screen & Translate	User	Frequent
CCT Generate Processor	Write CCT	Computer Operator	Dailv
LIMS	Data Base Management	User	Dailv

DEPENDENT FUNCTIONS

Function	Dependent On
Create data bases	LIMS
Update data bases	LIMS
Delete data bases	LIMS
Find row and path in World Reference System	LIMS
Generate Reports	LIMS
Archive the data from a day's activity	LIMS
Recover from computer failure	LIMS
LIMS interface	LIMS

* In this context, "dailv" denotes use in every cycle of operation.

Figure 4.2 1
Modules/Functions of LIVES

5. DATA BASES AND SPECIAL FILES

In general, LIVES consists of separate programs which communicate only by reading and writing mutual files and data bases.

The function and content of the data bases and the major files are presented below in the following order:

5.1 FULL SCENE DATA BASE

Full scenes are the original Landsat images on the high density tapes from the Goddard facility; in content, these are complete Landsat scenes such as might be ordered from the EROS Data Center in Sioux Falls, South Dakota. However, their format is quite different from scenes furnished by EROS.

The High Density Tape Reformatting System (HDTRS) extracts images from high density tapes and loads them into this data base. The Extraction Processor of LIVES removes portions of certain images and places them on the Search Area Data Base. The HDTRS and the Extraction Processor work simultaneously but on separate disks (they use the 300 megabyte fixed disks in LIVES).

An operator should not need to examine the contents of this data base in any direct way, especially since it is highly dynamic.

5.2 SEARCH AREA DATA BASE

Imagery data extracted from the Full Scene Data Base are placed here. They consist of multichannel areas of interest or corresponding search areas, the former for high-quality images that do not need to be screened, and the latter for images that will need to be processed with the Screening and Translation Processor.

These images are maintained in two types of files, imagery files and non-image files; the latter contain header and annotation data.

5.3 REFERENCE IMAGE DATA BASE

This data base includes single channel images to which search areas can be registered. Images are loaded with the Reference Image Load Processor; they can be deleted using standard PDP commands.

5.4 SCREENING MAP DATA BASE

The conditioning processor produces class maps with the following classes: agricultural land, clouds, cloud shadow, snow, filled, water, and garbled. Maps are produced for the entire area of interest.

5.5 PROCESS CONTROL AND STATUS (PC&S) DATA BASE

All transactions in LIVES are recorded in transactions files, which are used to update a Daily PC&S Data Base, which is incorporated daily into the Master Data Base. The daily data base has the following functions: (1) defines today's areas of interest, (2) supports system computations, (3) supports system control, and (4) provides system statusing information. The contents of the PC&S data base is derived from area of interest definitions in the Master Data Base and the GHIT tape, as well as the various processors.

There are three types of records in the PC&S data base:

- o Area of Interest Descriptions - Define those items of an area of interest common to all image acquisitions (see figure 5.5-1).
- o Scene Descriptions - Describe scenes from the HDT (see figure 5.5-2).
- o Acquisition Descriptions - Contain data describing area-of-interest acquisitions and the processing of these acquisitions (see figure 5.5-3).

The Daily PC&S Data Base contains only those acquisition descriptions and their associated area of interest descriptions and scene descriptions from a given day. It is used to report on the status of a given day's activity. The use of this small data base for daily processing minimizes the system overhead for data management activities.

5.6 MASTER DATA BASE

The Master Data Base, also called the Archive Data Base, contains area-of-interest descriptions, scene descriptions, and acquisition descriptions from all days of processing with LIVES. This data base is used for weekly, monthly, and other periodic and aperiodic reporting, as well as for maintaining area-of-interest descriptions. It contains the same three record types as the Daily PC&S Data Base.

FIELD NO.	FIELD NAME	FIELD DESCRIPTION
1	RCTYPE	RECORD TYPE - ALWAYS A 1
2	USERID	USER ID - RANGE 1-20
3	AOIID	AREA OF INTEREST ID - RANGE 1-9999
4	AILNES	NUMBER OF LINES
5	AIPXLS	NUMBER OF PIXELS
6	REGQTS	REGISTRATION QUALITY THRESHOLD - SCREEN
7	REGQTR	REGISTRATION QUALITY THRESHOLD - REJECT
8	CLDPTH	CLOUD PERCENT THRESHOLD
9	COUNTR	COUNTRY
10	REG	REGION
11	ZONE	ZONE
12	STR	STRATA
13	PC	PRIORITY CODE
14	TY	AREA OF INTEREST TYPE
15	CRPCOD	CROP CODE
16	AILAT	LATITUDE/DIRECTION - FORMAT NDDD/MM
17	AILONC	LONGITUDE/DIRECTION - FORMAT EDDD/MM
18	ACQSRT	ACQUISITION START DATE - FORMAT YDDD
19	ACQSTP	ACQUISITION STOP DATE - FORMAT YDDD
20	PWRSRP	PRIMARY WRS ROW & PATH
21	SWRSRP	SECONDARY WRS ROW & PATH
22	FLMFLG	FILM FLAG
23	BNREQE	BAND NUMBERS REQUIRED FOR EXTRACTION
24	CLRCDS	COLOR CODES
25	LSTUPD	LAST UPDATE DATE & TIME - FORMAT YDDDHHMM

RECORD ID = USERID @ AOIID @ 0

FIGURE 5.5-1

AREA-OF-INTEREST DESCRIPTION RECORD

FIELD NO.	FIELD NAME	FIELD DESCRIPTION
1	RCTYPE	RECORD TYPE - ALWAYS A 2
2	SCENNO	SCENE NUMBER - RANGE 1-9999
3	ACQDAT	ACQUISITION DATE - FORMAT YDDD
4	HDTID	HDT TAPE ID
5	IMGID	IMAGE ID
6	NOBNDS	NUMBER OF BANDS ON TAPE
7	SCNCLA	SCENE CLOUD ASSESSMENT
8	REGPFL	REGENERATED PRODUCT FLAG
9	WRSDES	WRS DESIGNATOR
10	WRSOFF	WRS OFFSET
11	MISSNO	MISSION NUMBER
12	RESTYP	RESAMPLING TYPE
13	QAGEOM	QUALITY ASSESSMENT OF GEOGRAPHICAL MODEL
14	FMTLAT	FORMAT CENTER LATITUDE/DIRECTION
15	FMTLON	FORMAT CENTER LONGITUDE/DIRECTION
16	PLYBDR	PLAYBACK/DIRECT FLAG
17	ASCDES	ASCENDING/DESCENDING FLAG
18	SUNELA	SUN ELEVATION ANGLE
19	SUNAZA	SUN AZIMUTH ANGLE
20	DATGHT	DATE GHIT RUN
21	HDTPDT	HDT PROCESSED DATE
22	IRIGB	IRIG BEGIN TIME
23	IRIGE	IRIG END TIME

RECORD ID = 0 + SCENNO + ACQDAT

FIGURE 5.5-2

SCENE DESCRIPTION RECORD

FIELD NO.	FIELD NAME	FIELD DESCRIPTION
1	RCTYPI	RECORD TYPE - ALWAYS A 3
2	USERID	USER ID - RANGE 1-20
3	AOIID	AREA OF INTEREST ID - RANGE 1-9999
4	ACQDAT	ACQUISITION DATE - FORMAT YDDD
5	HDTID	HDT TAPE ID
6	IMGID	IMAGE ID
7	NOBNDS	NUMBER OF BANDS ON TAPE
8	DATGHT	DATE GHT RUN - FORMAT YDDD
9	PREJRS	PREPROCESSING REJECT REASON
10	SCRREG	SCREENING AND REGISTRATION
11	SACLDA	SEARCH AREA CLOUD ASSESSMENT
12	EXTRRC	EXTRACTION REJECT REASON CODE
13	SRGDAT	SCREEN AND REGISTER DATE
14	SRJCOD	SCREEN REJECT CODE
15	CCTDAT	CCT DATE - FORMAT YDDD
16	CCTNO	CCT NUMBER
17	SCENNO	SCENE NUMBER - RANGE 1-9999
18	BNDSEX	BAND NUMBERS EXTRACTED
19	NPT	NUMBER OF PIXELS TRANSLATED
20	NLT	NUMBER OF LINES TRANSLATED
21	BIASFC	BIAS FACTORS
22	GAINFC	GAIN FACTORS
23	PCNTCC	PERCENT CLOUD COVER
24	PRMSCN	PRIMARY/SECONDARY FLAG
25	FLLNES	NUMBER OF FILL LINES
26	FLPXLS	NUMBER OF FILL PIXELS

RECORD ID = USERID @ AOIID @ ACQDAT

FIGURE 5.5-3
ACQUISITION DESCRIPTION RECORD

6. OPERATOR PROCEDURES

This section includes specific instructions for the operation of individual processors in LIVES. It is intended to furnish information that is sufficiently detailed for understanding and recovery of abnormal situations; hence it includes details of various kinds of errors and diagnostics.

Processes are treated individually in the following order, which is a normal sequence of use.

Reference Image Loader	(6.1)
GHIT Processor	(6.2)
Extract Processor	(6.3)
Conditioning Processor	(6.4)
Screening and Translation	(6.5)
CCT Processor	(6.6)

Data base operations, generation of reports, etc., is presented in section 7. A brief description of operations procedures for daily use of operators is presented in section 8.

6.1 REFERENCE IMAGE LOADER

6.1.1 DESCRIPTION

The simplified registration procedure in LIVES requires that reference images be available in the Reference Image Data Base. This is the processor that places images in that data base, in proper form.

6.1.2 OPERATIC

This processor is activated on the Image Processor of the DTL. It is operated from any terminal of the processor. It may be run at any time previous to a cycle of operation which the reference images to be used.

6.1.3 INPJT

The reference image must be furnished on a CCT in JSC Universal Image Format. The Reference Image Data Base must also be furnished. Also a list of details about the desired reference images must be furnished.

6.1.4 OUTPUT

The only output is internal to the Reference Image Data Base. No other output is given, other than messages to the operator on the terminal.

6.1.5 OPTION

The operator will be called upon to choose specific images and channels of the images. This is done by direct interaction at the terminal.

6.1.6 PROCEDURES

A sample procedure is presented in figure 6.1.1. In general, the following are the steps to be used.

1. Log on to the terminal to LIVES UIC ([333,33]) and mount the input tape as foreign and "LIVES2" disk on DB2 as FILES11.
2. Call processor by typing RUN REFLOD($)

3. Furnish tape drive and tape unit number to system inter actively. The following steps show how this is done. (Assume input tape is mounted on MT1.)

   system: WHICH TAPE DRIVE? (0=MT, 1=XT)>

   operator types: 0

   system: WHICH TAPE UNIT? (0,1)>

   operator: 1

   system: MOUNT TAPE AND ENTER USER ID (01 19) TO CONTINUE>

   after tape is mounted operator types the User ID, for example example: 05

4. Furnish reference image numbers identifying each by segment number (SSSS), acquisition date (YYDDD), channel number (1, 2, 3, or 4) and whether primary or secondary (P or S). When finished, he types E instead of segment number. A sample case in which the operator requests only two images from a tape is shown below. Note that the system gives details of operator entries when asking for the first image, but only brief messages for the remaining entries.

   system: ENTER images to load from current tape as follows:
   SSSS(1-9999), YYDDD, CH(1-4), type (P or S)
   TO TERMINATE enter E for segment number
   INPUT REQUEST>

   operator: 4721, 78017, 2, P

   system: INPUT REQUEST>

   operator: 123, 77223, 4, S

   system: INPUT REQUEST>

   operator: E

5. At this point the system starts processing the input tape. It furnishes periodic messages showing its processing steps.

The following is a sample set of messages:

system: SEARCHING TAPE

system: STARTED PROCESSING 4721-78017

system: STARTED PROCESSING 123-77223

system: FINISHED PROCESSING

6. If all references were located on the tape, the system will furnish the following message:

system: ALL ENTRIES PROCESSED

system: STOP

If some entries were not found on this tape, a message such as the following will appear.

system: THE FOLLOWING REQUESTED AREAS WERE NOT FOUND ON THIS TAPE:

system: 123-77223

system: STOP

6.1.7 ERRORS AND DIAGNOSTICS

The following messages require obvious corrective action (i.e., in the first case, furnish the correct tape number).

INCORRECT TAPE ENTRY
AN INCORRECT ENTRY

These messages are merely informative. Their contents should be reported to the LIVES user or supervisory personnel.

TOO MANY ENTRIES, FIRST 100 WILL BE PROCESSED
THE FOLLOWING REQUESTED AREAS WERE NOT FOUND ON THIS TAPE

The following errors cannot, in general, be solved by an operator, if they cause operations to cease. In all cases, a supervisor or other responsible person should be notified.

ERROR FROM DISK WRITE
ERROR FROM FVOPEN
ERROR READING HEADER RECORD
ERROR READING LINE

6.2 GHIT PROCESSOR

6.2.1 DESCRIPTION

This processor performs a wide variety of functions for the LIVFS. All are performed automatically, without operator intervention The following are some of its principal functions; for more details consult ref. 2.2.14.

- o Reads the Goddard High Density Tape Inventory Tape (GHIT) and locates scenes that should be considered for extraction.
- o Extracts information from the Master Data Base and sets up a Daily Data Base for a "daily" cycle.
- o Sets up files needed for the cycle of operation.
- o Produces a report used by the operator to mount high density tapes in the proper order.

6.2.2 OPERATION

This processor must be used as the first operation in a "daily" cycle.

The operator mounts the GHIT and runs the processor. This is normally done on the Support Processor but could be done on the Image Processor.

6.2.3 INPUT

The inputs are the GHIT and the Master (Archive) Data Base.

6.2.4 OUTPUT

Three reports are produced by this processor. The first, the High Den sity Tape Processing Tape Order is designed for subsequent use of the Operator with the Extract Processor. The second, the High Density Tape Preprocessing Summary, summarizes the operation of the Processor, presenting such information as the scenes to be extracted, acquisition dates, geographical coordinates, etc. The third, the Expected Area of Interest Summary, reports basic data on areas of interest for which an acquisition occurs on one of that day's HDT's.

6.2.5 OPTIONS

There are no options.

6.2.6 PROCEDURES

- o Log on to the system in UIC [5,5].
- o Type BAT [333,333] GHIT($).
- o Respond to terminal instructions.
- o Recover the reports from the line printer.
- o Dismount the GHIT.

6.2.7 ERRORS AND DIAGNOSTICS

The mounting of an incorrect tape may cause one or more of the error messages listed below. If an error message occurs:

1. Verify that the proper tape was mounted.
2. If the proper tape was not mounted, mount the correct tape and restart the batch runstream.
3. If the proper tape was mounted, immediately notify the supervisor or other responsible person that an error has occurred.

Message	Program or Subroutine
FATAL ERROR CONDITION ENCOUNTERED IN GHIT PROCESSOR, PROCESSING DISCONTINUED	GHIT
ERROR IN READING SYSTEM PARAMETER FILE	GRDPRM
END OF FILE ON SYSTEM PARAMETER FILE	GRDPRM
FIRST GOOD RECORD SHOULD BE SYST, TYPE IS ---	GINIT
RECORD SHOULD BE TDWO, TYPE IS --- GHIT ID IS ---	GINIT
RECORD SHOULD BE HDRD, TYPE IS ---	GINIT
END OF FILE WHILE TRYING TO READ SYSTEM HEADER PARITY ERROR RECORDS =	GINIT
END OF FILE WHILE TRYING TO READ TAPE DIRECTORY, GHIT ID SET TO BLANKS, PARITY ERROR RECORDS =	GINIT
END OF FILE WHILE TRYING TO READ HDT DIRECTORY, PARITY ERROR RECORDS = END OF PROGRAM	GINIT
UNRECOVERABLE ERROR IN PROCESSING GHIT TAPE	GINIT
TYPE SHOULD BE HEDR, TYPE IS RECORD NUMBER IS ---	RDSCFN

Message	Program or Subroutine
TYPE SHOULD BE ANNO, TYPE ---, RECORD NUMBER IS ---	RDSCEN
TYPE SHOULD BE TRLR, TYPE IS ---, RECORD NUMBER IS ---	RDSCEN
END OF FILE - ANNOTATION RECORD 1	RDSCEN
END OF FILE - TRAILER RECORD	RDSCEN

If the following message appears, install FLIMS and LIMS and restart the GHIT batch runstream.

Message	Program or Subroutine
BAD INTERFACE WITH LIMS IN SELECTING AREA OF INTEREST IMAGE ID	SELAIS
BAD STATUS FROM LIMS, !STAT= -2	SELAIS

The following messages are only informative.

Message	Program or Subroutine
NO SCENES SELECTED FROM TAPE: NO FURTHER GHIT PROCESSING NECESSARY	GHIT
NUMBER OF HIGH DENSITY TAPES- ---	GHIT
NUMBER OF SCENES= ---	GHIT

If any other message occurs, the operator should enter ABO when given the opportunity by the batch run stream and inform the supervisor or other responsible person.

6.3 EXTRACT PROCESSOR

This processor removes images from the Full Scene Data Base (on the 300 megabyte disks) and places them on the Search Area Data Base. It operates concurrently with the High Density Tape Reformatting System (HDTRS) which loads images onto those disks.

The processor examines all Landsat full scenes on the Full Scene Data Base that contain areas of interest, as interpreted by the GHIT Processor.

Scenes are rejected if registration is below rejection standard. If the registration is marginal, it extracts search areas which are areas of interest with a surrounding fringe of pixels to allow translation (a crude form of registration). If registration is good, it extracts the areas of interest without fringes.

6.3.2 OPERATION

This processor must be run on the Support Processor since it runs concurrently with the HDTRS. It is called by the operator at a terminal.

It must be run after the GHIT processor, and it must run alone in the system with no communication with the computer while it is running.

6.3.3 INPUT

The Full Scene Data Base on the 300-megabyte disks is the only data input. However, the high density tapes must be loaded onto the HDTRS (in the order specified by the GHIT Report) before the scenes can be loaded onto that data base.

6.3.4 OUTPUT

Extracted search areas and areas of interest are written to the search area data base on the LIVES disk (an 88 megabyte disk). This is transparent to the operator.

6.3.5 OPTIONS

There are none.

6.3.6 PROCEDURES

1. Log on to the system in UIC [333,33]
2. Mount two scratch RP06 disks on the DA0 and DA1 disk drives as foreign with the disk drives switches set for: 11/20 ACCESS, 11/45 ACCESS, READ/WRITE.
3. Initiate the HDTRS on the PDP 11/20 computer, noting that the HDT should be positioned approximately 20 seconds before the reported start time and that the HDTRS program should be given a start time approximately 10 seconds before the reported start time. Note also that the reported stop time is in tenths of a second granularity and should be rounded up to the next whole second for input to HDTRS. Make both drives initially available to HDTRS in the dual mode at 7.5 inches per second for MSS data.
4. Type RUN EXTRCT(\$) after the HDT has passed the reported start time.
5. The operator will, if necessary, keep HDTRS and EXTRCT working on different disks by manual input to HDTRS to keep a disk busy if EXTRCT has not completed extraction (indicated by flashing light characteristics of the 11/45 and the DA disk drive - static 11/45 lights and no DA lights indicate completion).

6.3.7 ERRORS AND DIAGNOSTICS

If one of the following messages occurs, the operator should inform his supervisor or other responsible person.

Message	Program or Subroutine
ERROR IN EXTRACTING SCENE RECORDS, STATUS:	PINIT
ERROR IN READING SYSTEM PARAMETER FILE	RDPARM

END OF FILE ON SYSTEM PARAMETER FILE	RDPARM
ERROR IN READING ACQ. DESC-A OF 1 RECORD, SCENE NO. =	RDACQD
RESULTS INCORRECT DUE TO CHANGE IN LATITUDE DIRECTION, SCENE LATITUDE, AREA OF INTEREST LATITUDE	CCPIXL
BAD INTERFACE WITH LIMS IN SUBROUTINE UPDPCS	UPDPCS
PARITY ERROR IN READING AREA OF INTEREST DATA FROM REPORT FILE 2	RDAOI
END OF FILE WHILE READING AREA OF INTEREST DATA ON REPORT FILE 2	RDAOI
READ SCENE, AI RECORD SCENE NUMBER = SCENE RECORD NUMBER =	RDSCEN
AI SCENE NOT FOUND, AI SCENE = SCENE =	RDSCEN
END OF FILE, NO SCENE RECORD FOR SCENE	RDSCEN

Message	Program or Subroutine
BAD INTERFACE WITH LIMS IN SELECTING AREA OF INTEREST IMAGE ID	SELAIS
BAD STATUS FROM LIMS, ISTAT =	SELAIS

If the following message appears, install FLIMS AND LIMS:

Message	Program or Subroutine
FLIMS AND LIMS NOT INSTALLED	SELAIS

The following messages are only informative:

Message	Program or Subroutine
--- AREAS OF INTEREST PROCESSED. END OF EXTRACT PROCESSING	EXTRCT
SCENE ---, WRS INDICATES ---, NOT ON DISK	EXTRCT

6.4 CONDITIONING PROCESSOR

6.4.1 DESCRIPTION

This processor examines areas of interest and search areas for cloud cover. It also calculates biases and gains for adequate display of images on the Image-100 and other display systems.

6.4.2 OPERATION

This processor must be used after the Extract Processor is complete, and additionally after the Screening and Translation Processor is used for translations.

6.4.3 INPUT

Input consists of the Search Area Data Base, but is invisible to the operator.

6.4.4 OUTPUT

Output consists only of data in the Screening Map Data Base and PC&S Data Base, also invisible to the operator.

6.4.5 OPTIONS

There are no options.

6.4.6 PROCEDURES

1) Log on to the system in UIC [333,33].
2) Type RUN CONDTN(\$)
3) Operation is wholly automatic

6.4.7 ERRORS AND DIAGNOSTICS

The following message is only advisory. -

THERE ARE NO DATA TO PROCESS, NORMAL TERMINATION (CONDTN)

If any of the following messages appear, there may be no way to recover. They indicate errors in the data base.

DATA TO BE READ FROM THE PC&SDB WERE NOT WRITTEN TO THE CONDTN.RP1 FILE (STATUS =) (CONDTN)

DATA TO BE UPDATED IN THE PC&SDB WERE NOT UPDATED (STATUS =) (CONDTN)

CANNOT OPEN THE DATA FILE (STATUS =) (INTGP)

6.5 SCREENING AND TRANSLATION

6.5.1 Description

This processor allows a user or operator to screen and translate images extracted from the Search Area Data Base. In the sense used here, screening is the examination of an image on the television screen of the Image-100, and the acceptance or rejection of that scene. Screening and translation is the same, except that the user may also choose to register the image to a reference image by simple translation, and then accept or reject the translated image. These instructions assume that the operator is familiar with operation of the Image-100 system (ref. 2.5-8).

LIVES uses two thresholds in the Extract Processor for use with the registration quality threshold (QACEOM: quality assessment of geographical model) furnished in the header of the full Landsat scene. It uses a single threshold for cloud cover, as a measure of the number of pixels classified as non-agriculture by the Conditioning Processor. Their combined use results in the following four image categories:

Classification	Abstract Processor	Conditioning Processor
1) Automatically accepted areas of interest (not available for screening or translation)	Above Upper registration threshold in quality	Above cloud threshold
2) Areas of interest that need to be screened	Above Upper registration threshold	Below cloud threshold
3) Search areas to be screened and, at option of user, translated	Between upper and lower registration thresholds	Above or below cloud threshold
4) Rejected areas	Below lower registration thresholds	

With these categories as a guide, a person at the Image 100 terminal will be presented areas from the second class for screening, which implies only that he may look at them, and decide whether to preserve them or to reject them. He may not translate them.

He will also be presented search areas from the third class for screening and translation to a reference image. After translation, he may either accept or reject each one.

In routine use of this processor a person will neither see, nor be advised of the existence of, images of the first or fourth class. However, this information will be accessible in the Daily Data Base, and could be made the subject of reports.

6.5.2 OPERATION

In essence, the operator or user works with the image at the Image 100 terminal. He views the images on the television screen of that terminal, and makes decisions interactively leading to acceptance or rejection of areas of interest.

Because of the use of the Image 100 terminal, this processor can only be operated in the Image Processor.

6.5.3 INPUT

All input is transparent to the operator or user. Imagery data come from the Search Area Data Base. Reference images come from the reference image data base. Other data come from the Daily Data Base.

6.5.4 OUTPUT

Output is also transparent. Annotations are made to the Daily Data Base.

6.5.5 OPTIONS

These is very wide variety of options to the user or operator, available at every point in which he needs to respond. At almost any time, instead of furnishing the requested informaiton, the user may furnish any of the responses shown below. For the most part these responses have consequences that are easily understood. However, it should be noted that HELP causes that same list to be furnished, and -LONG or -SHORT causes the system to furnish full or abbreviated messages.

COMMAND ENTRIES:

-EXIT	CLOSE ALL FILES AND TERMINATE PROCESSING
-LONG	SET FLAG TO GIVE LONG FORM OF MESSAGE
-SHORT	GET FLAG FOR SHORT FORM OF MESSAGES
-HELP	GIVE THIS LIST OF COMMANDS
-RESTART	STOP CURRENT PROCESS AND ACCEPT NEW USER ID
-LIST	GIVE LIST OF AREAS AVAILABLE FOR PROCESSING
-ALTER	EXHIBIT DISPLAY WINDOW PARAMETERS AND ALLOW CHANGES
-DEFAULT	USE DEFAULT DISPLAY WINDOW PARAMETERS
-BACKUP	REPEAT THE IMMEDIATELY PREVIOUS OPERATION"
-SKIP	SKIP THE AREA NOW IN PROCESS
-SELECT	SELECT A PARTICULAR AREA FOR PROCESSING
-REJECT	MARK CURRENT AREA REJECTED
-ACCEPT	MARK CURRENT AREA ACCEPTED
-FORCE	ACCEPT SEARCH AREAS WITH THOSE VALUES

6.5.6 PROCEDURES

The fundamental procedures are the screening of areas of interest, described in 6.5.6.1 below, and the screening and translation of search areas, in 6.5.6.2. Other operations are discussed in 6.5.6.3 procedures. The person using this processor must have "LIVES" mounted on DB1, "LIVES2" mounted on DB2, log onto the Image Processor on TTI in UIC [333,33], and type RUN SCRNTR($).

6.5.6.1 Screening

If the system furnishes an image for screening, the message will be in the following form:

```
AREA ccnnnn FOR SCREENING
YOU CAN:  ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -SELECT YOUR OWN CHOICE FOR NEXT
AREA OR CHOOSE TO -ALTER OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT,
>
```

To cause the scene to be shown on the television screen with default values of display parameters the user merely depresses the carriage return key. If he wishes to change the display parameters, he types -ALTER, and display parameters appear in order to be altered. To stop inserting changes, the operator types END, and the image is displayed.

On display, the system presents the following message:

```
AREA ccnnnn FOR SCREENING.  AFTER
VIEWING DISPLAYED IMAGE, ENTER -A
TO ACCEPT OR -R TO REJECT IMAGE.
>
```

By typing -A, the operator accepts the scene. By typing -R, he rejects it. He may also deter decision by typing -SKIP. In all these cases, the system automatically proceeds to the next scene needing action by the operator.

If accepted, the scene will be preserved and may later be written to a CCT. If rejected, it will be so flagged in the PC&S data base and it will not be available to be written to a CCT. However, these actions do not occur until a user has logged off.

A sample procedure leading to the saving of a scene is shown in figure 6.5.1. The operator has specified the long form of messages by typing -LONG.

6.5.6.2 Screening and Translation

If an area may be registered by translation, a message will identify it as a search area in the following way:

```
SEARCH AREA XXXXXX FOR TRANSLATION
```

The following are the steps required to translate an image and accept or reject it.

1) Pick a control point by positioning the cursor, as requested by the system, and type a carriage return.

2) Accept the default parameters for display of control point neighborhood by typing a carriage return.

3) The neighborhood of the control point will appear on the screen to the right, (provided the correct color buttons are depressed, as specified by the message on the terminal screen).

```
MCR>HEL (333,33)
TASK NAME>LIVES
YOUR NAME>GOODE
MCR>RUN SCRNTR$
SCREENING AND TRANSLATION PROCESSOR 30-MAR-79 15'51'47
USER I.D.
>
11$
11
  AREA 111234 FOR SCREENING
>HELP$
HELP
COMMAND ENTRIES'
  -EXIT      CLOSE ALL FILES AND TERMINATE PROCESSING
  -LONG      SET FLAG TO GIVE LONG FORM OF MESSAGES
  -SHORT     SET FLAG FOR SHORT FORM OF MESSAGES
  -HELP      GIVE THIS LIST OF COMMANDS
  -RESTART   STOP CURRENT PROCESS AND ACCEPT NEW USER ID.
  -LIST      GIVE LIST OF AREAS AVAILABLE FOR PROCESSING
  -ALTER     EXHIBIT DISPLAY WINDOW AND ALLOW CHANGES
  -DEFAULT   USE DEFAULT DISPLAY WINDOW PARAMETERS
  -BACKUP    REPEAT THE IMMEDIATELY PREVIOUS OPERATION
  -SKIP      SKIP THE AREA NOW IN PROCESS
  -SELECT    SELECT A PARTICULAR AREA FOR PROCESSING
  -REJECT    MARK CURRENT AREA REJECTED
  -ACCEPT    MARK CURRENT AREA ACCEPTED
  -FORCE     READ TRANSLATION OFFSET DX, DY FROM KEYBOARD AND
             ACCEPT SEARCH AREAS WITH THOSE VALUES
>
LIST$
LIST
 ** LIST OF AREAS FOLLOWS.  PLEASE CLEAR SCOPE.
 ** ENTER CARRIAGE RETURN WHEN READY.
$
  AREA 111234 FOR SCREENING
  SEARCH AREA  112468 FOR TRANSLATION
  SEARCH AREA 115678 FOR TRANSLATION
 RESTARTING SEARCH AT BEGINNING OF LIST
  AREA 111234 FOR SCREENING
>
LONG$
LONG
YOU CAN: ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
```

FIGURE 6.5.1
SAMPLE PROCEDURE FOR SCREENING
(CONTINUED)

```
>
SELECT$
SELECT
SPECIFY AREA OF INTEREST BY FOUR-DIGIT NUMBER.
>
1234$
1234
  AREA 111234 FOR SCREENING
YOU CAN: ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
>
AFTER VIEWING DISPLAYED IMAGE ENTER
-A TO ACCEPT OR -R TO REJECT IMAGE.
>
ALTER$
ALTER
 ** PLEASE CLEAR YOUR SCREEN FOR LIST OF PARAMETERS.
 ** ENTER CARRIAGE RETURN WHEN READY.

$
 WINDOW 1          FULL AREA        Ø
 DISPLAY POSITION
    LINE                              16
    RASTER                             Ø
 SIZE-DISPLAY
    NUMBER OF LINES                  488
    NUMBER OF RASTERS                512
 SIZE-IN SOURCE FILES
    NUMBER OF LINES                  117
    NUMBER OF PIXELS                 197
 STATUS - DEFAULT

                                SEARCH AREA
 SOURCE
    START LINE                     Ø
    START PIXEL                    Ø
 BAND                              Ø
 REFRESH CHANNEL                   1

 BIAS
    BAND 4                                -5.1
    BAND 5                                -5.1
    BAND 6                                -5.1
    BAND 7                                -5.1
 GAIN
    BAND 4                                 3.1
    BAND 5                                 3.1
    BAND 6                                 3.1
    BAND 7                                 3.1
**KEY-IN VALUE TO CHANGE (PARM = VAL)**
****KEY-IN END WHEN FINISHED.****
```

FIGURE 6.5.1(CONTINUED)

```
LINE = 3Ø$
 **KEY-IN VALUE TO CHANGE (PARM = VAL)**
 ****KEY-IN END WHEN FINISHED ****
RASTER = 3Ø$
 **KEY-IN VALUE TO CHANGE (PARM = VAL)**
 ****KEY-IN END WHEN FINISHED ****
END$
 ** PLEASE CLEAR YOUR SCREEN FOR LIST OF PARAMETERS.
 ** ENTER CARRIAGE RETURN WHEN READY.

$
 WINDOW 1        FULL AREA          Ø
 DISPLAY POSITION
    LINE                              3Ø
    RASTER                            3Ø
 SIZE-DISPLAY
    NUMBER OF LINES                  488
    NUMBER OF RASTERS                512
 SIZE-IN SOURCE FILES
    NUMBER OF LINES                  117
    NUMBER OF PIXELS                 197
 STATUS - MODIFIED

                                SEARCH AREA
 SOURCE
    START LINE                     Ø
    START PIXEL                    Ø
 BAND                              Ø
 REFRESH  CHANNEL                  1

 BIAS
    BAND 4                           -5.1
    BAND 5                           -5.1
    BAND 6                           -5.1
    BAND 7                           -5.1
 GAIN
    BAND 4                            3.1
    BAND 5                            3.1
    BAND 6                            3.1
    BAND 7                            3.1

AFTER VIEWING DISPLAYED IMAGE ENTER
-A TO ACCEPT OR -R TO REJECT IMAGE.
>
A$
A
  SEARCH AREA 112468 FOR TRANSLATION
YOU CAN ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
```

FIGURE 6.5.1
(CONCLUDED)

4) The neighborhood of the control point on the reference image will appear on another channel specified by a message. Display that channel by depressing buttons on the Image-100 console.

5) In response to a message, display the reference image and position the cursor on the corresponding point on the reference image, and then depress the ESCAPE key.

6) In response to a message, display the original image, position the cursor on the original control point neighborhood, and depress the ESCAPE key.

7) Select another control point on the original image (not on the first control point neighborhood). Move the cursor to it and depress ESCAPE.

8) Repeat Steps 2) through 6) for this point. At this time, if the translation required of the first control point is within a single pixel of that for the second control point, the system advises acceptance.

   If the values are within a single pixel, the operator should probably choose to accept by typing -A.

   If he chooses to reject the entire image, he should type -R.

   If he chooses to postpone a decision, he may type -SKIP to go on to the next area.

   If the registration is <u>not</u> within one pixel, repeat steps 2) through 6).

   If any two of the three registrations are within a single pixel, the system advises acceptance. The operator may accept, reject, or postpone, as shown above.

   If none are within a pixel, the system advises rejection. Again, the operator may accept, reject, or postpone. He may also elect to force a translate by furnishing the two line and pixel translations by typing -FORCE and furnishing the translations.

Figure 6.5-2 presents a typical procedure for translating and accepting an image. The operator has specified the long form of messages.

```
>
SELECT$
SELECT
SPECIFY AREA OF INTEREST BY FOUR-DIGIT NUMBER.
>
2468$
2468
  SEARCH AREA 112468 FOR TRANSLATION
YOU CAN: ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
>
$
YOU CAN: ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
>
$
 SELECT SUB-AREA FOR CONTROL POINT1
POSITION CURSOR ON REFERENCE IMAGE AND
THEN ENTER KEYBOARD CARRIAGE RETURN. .
>
$
YOU CAN: ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
>
$
 IMAGE IS IN REFRESH CHANNEL 2
 IMAGE IS IN REFRESH CHANNEL 5
 GIVE REFERENCE IMAGE FOR CONTROL POINT 1
POSITION CURSOR ON REFERENCE IMAGE, THEN GIVE
CARRIAGE RETURN.
>
$
 **RETURN SUB-AREA IN REFRESH CHANNEL 2
 GIVE SEARCH AREA LOCATION OF CONTROL POINT 1
POSITION CURSOR ON SEARCH AREA SUB-IMAGE, THEN
GIVE CARRIAGE RETURN.
>
$
```

FIGURE 6.5.2
SAMPLE PROCEDURE FOR SCREENING AND TRANSLATION
(CONTINUED)

```
 CONTROL POINT 1 OFFSETS: DX =    4 DY =   Ø
 SELECT SUB-AREA FOR CONTROL POINT 2
POSITION CURSOR ON REFERENCE IMAGE AND
THEN ENTER KEYBOARD CARRIAGE RETURN.
>
$

YOU CAN: ENTER CARRIAGE RETURN TO BEGIN PROCESSING
THIS AREA, -SKIP TO NEXT AREA IN THE LIST, -LIST
ALL EXISTING AREAS, -NAME YOUR OWN CHOICE FOR NEXT
AREA, OR CHOOSE TO -MODIFY OR TAKE -DEFAULT DISPLAY
WINDOW PARAMETERS, OR -EXIT.
>

$

 IMAGE IS IN REFRESH CHANNEL 2
 IMAGE IS IN REFRESH CHANNEL 5
 GIVE REFERENCE IMAGE FOR CONTROL POINT 2
POSITION CURSOR ON REFERENCE IMAGE, THEN GIVE
CARRIAGE RETURN.
>
$

 **RETURN SUB-AREA IN REFRESH CHANNEL 2
 GIVE SEARCH AREA LOCATION OF CONTROL POINT 2
POSITION CURSOR ON SEARCH AREA SUB-IMAGE, THEN
GIVE CARRIAGE RETURN.
>

$

 CONTROL POINT 2 OFFSETS: DX =    4 DY =    Ø
 DIFFERENCE IN OFFSETS OF CONTROL POINTS
 POINT 1 TO POINT 2 DDX =     Ø DDY =     Ø
DIFFERENCES ARE WITHIN TOLERANCES.
ENTER CARRIAGE RETURN TO ACCEPT NEW IMAGE
AND CONTINUE.
>
A$
A

 AT THIS TIME FOR USER ID 11 THERE ARE NO IMAGES
 FILES IN THE QUEUE FOR SCREENING OR TRANSLATION
 AND NOT ALREADY PROCESSED.
YOU CAN: -EXIT AND RESTART WITH A DIFFERENT USE
I.D. -LIST EXISTING AREAS.
>
EXIT$
EXIT
STMMP NORMAL EXIT
SCRNTR -- STOP
```

FIGURE 6.5.2 (CONCLUDED)
SAMPLE PROCEDURE FOR SCREENING AND TRANSLATION

6.5.6.3 Other Operations

This processor was designed for the convenience of the person using it and incorporates a wide variety of options. An operator may return to the previous query at any time by typing -BACKUP. He may obtain a list of areas being processed by -LIST (he should note, however, that the list is not changed during a session; it is changed only after a person types -EXIT to leave the processor.) He can defer decision by typing -SKIP, or he can force a registration by typing -FORCE. He can also change display parameters by typing -ALTER, and refer to system display parameters by typing -DEFAULT.

6.5.7 ERRORS AND DIAGNOSTICS

If the following error message appears the operator should inform a responsible person in LIVES:

***** SCRNTR ABORT. STAT = mm **** (error condition detected during access to PC&S Data Base.)

6.6 CCT PROCESSOR

6.6.1 DESCRIPTION

This processor writes areas of interest to computer compatible tapes (CCT's).

6.6.2 OPERATION

The processor can be activated at any time, but will only write areas that have been accepted automatically or accepted in screening and translation operations.

6.6.3 INPUT

All data input is invisible to the operator. It consists of scenes on the Search Area Data Base.

6.6.4 OUTPUT

Output consists of CCT's on which areas of interest are written.

6.6.5 OPTIONS

An operator may specify that all areas of interest be written, in which CCT's are produced which contain all areas of interest for all users, segregated by user (only one user on any given tape). He may specify all areas for a given User ID, or he can specify one or more areas of the same user ID. The choice is given in the following words:

1. Output all areas of interest for all user ID's.
2. Output all areas of interest for current user ID.
3. Output only areas of interest requested.
4. Exit.

6.6.6 PROCEDURE

1. Log on to the system in UIC [333,33].
2. Mount output tape as foreign.
3. Type RUN CCTGEN($).
4. Upon request, enter User ID.
5. Upon request, enter tape drive and unit.
6. Note data for tape label as displayed.
7. Upon request, enter Option No.
8. Respond to subsequent instructions regarding mounting of tapes, tape labels, and options.

6.6.7 ERRORS AND DIAGNOSTICS

For the following error cases, there is no remedial action to be taken by the operator, other than doing a LIVES Recovery Procedure. If the error persists, the operator should inform his supervisor.

XXX CCTGEN ABORT. STAT = XX STOP BAD STAT

OPEN FAILURE ON IMDB, ISTA = XX PROGRAM CCTGEN TERMINATED

READ ERROR FROM FVREAD, IOST = XX STOP

WRITE ERROR FROM WRTLIN IERR = XX STOP

7. DATA BASE OPERATIONS AND LIMS

An operator will be called upon to perform several operations which involve the Master (Archive) Data Base and the Daily Data Base. These operations are described under the following headings.

All of these operations but the last can be run with instructions included here. The last requires specialized knowledge of LIMS. References in section 7.8 will guide the operator to source documents rather than furnish instructions.

7.1 ADD AREA-OF-INTEREST DEFINITIONS

7.1.1 DESCRIPTION

This batch program writes new area-of-interest definitions onto the Master (Archive) Data Base.

7.1.2 OPERATION

This program can be used at any time except during GHIT or EXTRCT runs. It must be used before a cycle is initiated if the definition is to be used in that cycle.

7.1.3 INPUT

Area of Interest input data are on cards. The user furnishes data cards, and the operator loads them into the card reader when requested by the batch runstream.

The user-furnished cards must have a certain form, which is described next.

In a given deck, for each area of interest to be added there must be one "Add Area of Interest Transaction Card" followed by a pair of "Area of Interest (Site)" cards. For example, a sample deck might be as follows:

Add Area of Interest Transaction card (for first area of interest)
First Area of Interest (Site) card (for first area of interest)
Continuation Area of Interest (Site) card (for first area of interest)

Add Area of Interest Transaction card (for second area of interest)
First area of Interest (Site) card (for second area of interest)
Continuation Area of Interest (Site) card (for second area of interest)

The exact format is given in figure 7.1-1.

An additional input is the World Reference System Row-Path Table, which is a file that is resident on the system disk in UFD [333,33].

7.1.4 OUTPUT

Output consists of changes in the Master (Archive) Data Base and the printer output from the batch run, which should be given to the user with his input cards.

7.1.5 OPTIONS

There are none.

ADD AREA OF INTEREST TRANSACTION CARD

Column	Format	Contents
2	'A'	Card Identifier Field - Must be an 'A'.
4-19	AA...AA	Country name. Only leftmost six characters will be carried by LIVES.
21-24	DDDD	Region. Only rightmost two digits will be carried by LIVES.
26-29	DDDD	Zone.
31-34	DDDD	Strata.
51-52	DD	User ID. An identification number associated with a particular user project. The number can range from 1 through 19 and must be right-justified and blank-filled.
54-61	DD...DD	Reserved for use by LIVES. The current date and time will be placed here in the input card images on disk in a YDDDHHMM format.

First Area of Interest (Site) Card

2	'2'	Card Identifier Field - Must be a '2'.
4-7	DDDD	Site on Area of Interest ID. Number may range from 0001 through 9999.
9	D	Segment Type.
11	A	Crop Type.
13-19	AAAAAAA	Area of Interest Center Point Latitude. Format is XDDD/MM where S is an 'N' for North or an 'S' for South, DDD must be degrees from 000 through 090, and MM must be minutes from 00 through 59.
21-27	AAAAAAA	Area of Interest Center Point Longitude. Format is XDDD/MM where X is an 'E' for East or a 'N' for West, DDD must be degrees from 000 through 180, and MM must be minutes from 00 through 59.
29	D	Film Processing Flag.
31-34	DDDD	Color Codes Field.

Second Area of Interest (Site) Card

2	'3'	Card Identifier Field - Must be a '3'.
4-7	DDDD	Site or Area of Interest ID - same number as on the '2' card.
10-13	DDDD	Acquisition Start Date in YDDD format, where Y is the last digit of the year, and DDD is the Julian day of the year.
52-55	DDDD	Acquisition Stop Date in YDDD format.

Figure 7.1-1
Cards for Addition of Area of Interest Description

7.1.6 PROCEDURE

1. Log on to the system in UIC [5,5].
2. Start the batch via BAT [333,33]AOIADD $.
3. Load the data cards into the reader when requested by the batch run.
4. At run completion return the data cards and printer output to the user.

7.1.7 ERRORS AND DIAGNOSTICS

The following messages point out problems with input cards. If it is feasible to correct the problem, the cards may be resubmitted. If not, the card deck should be returned to the user with a copy of the message.

THE INPUT CARD CONTAINS DATA WHICH ARE INCOMPATIBLE WITH THE FORMAT TYPE

THE INPUT CARD CONTAINS AN INVLAID AREA OF INTEREST ID

THE INPUT CARD SEQUENCE IS INCORRECT OR THE CARD IDENTIFIER MISSING OR INCORRECT

THE INPUT CARD HAS AN INVALID USER ID

The following message will normally occur in connection with one of the above. If it occurs alone there is no way for the operator to recover directly, and he should inform his supervisor.

DATA FROM INPUT RECORD WERE NOT ADDED

7.2 MODIFY (UPDATE) AREA-OF-INTEREST DEFINITIONS

7.2.1 DESCRIPTION

This batch program makes changes in the area-of-interest descriptions resident in the Master (Archive) Data Base.

7.2.2 OPERATION

The program can be used any time (except during GHIT or EXTRCT runs) previous to the cycle in which the area-of-interest definition is to be used.

7.2.3 INPUT

Input is also by cards. Again, the user furnishes data cards, and the operator loads them when requested by the batch run.

A user may change any field in an Area-of-Interest definition (except User ID, Area-of-Interest ID and location) by submitting cards in the format shown in figure 7.2-1. Only the fields which contain data will be changed in the data base; i.e., a blank field will cause the existing value in that field to be retained. Each change transaction must consist of all three cards of the set (same layout as for additions) even though no field may be changing on a particular card

7.2.4 OUTPUT

The output consists of changes in the Master (Archive) Data Base and the printer report. Requested changes are not made to the Master Data Base if the area of interest records are not found in the data base. For these area of interest records a listing will be produced on the line printer in addition to the changes or deletions made.

7.2.5 OPTIONS

None.

CHANGE AREA OF INTEREST TRANSACTION CARD

Column	Format	Contents
2	'C'	Card Identifier Field - Must be a 'C'
4-19	AA...AA	Country name. Only leftmost six characters will be carried by LIVES.
21-24	DDDD	Region. Only rightmost two digits will be carried by LIVES.
26-29	DDDD	Zone.
31-34	DDDD	Strata.
51-52	DD	User ID. An identification number associated with a particular user project. The number can range from 1 through 19 and must be right-justified and blank-filled.
54-61	DD...DD	Reserved for use by LIVES. The current date and time will be placed here in the input card images on disk in a YDDDHHMM format.

First Area of Interest (Site) Card

2	'2'	Card Identifier Field - Must be a '2'.
4-7	DDDD	Site or Area of Interest ID. Number may range from 0001 through 9999.
9	D	Segment Type.
11	A	Crop Type.
29	D	Film Processing Field.
31-34	DDDD	Color Codes Field.

Second Area of Interest (Site) Card

2	'3'	Card Identifier Field - Must be a '3'.
4-7	DDDD	Site or Area of Interest ID - same number as on the '2' card.
10-13	DDDD	Acquisition Start Date in YDDD format, where Y is the last digit of the year, and DDD is the Julian day of the year.
52-55	DDDD	Acquisition Stop Date in YDDD format.

Figure 7.2-1
Cards for Change of Area of Interest Description

7.2.6 PROCEDURE

1. Log on to the system in UIC [5,5].
2. Start the batch run via BAT [333,33]AO1UPD($)
3. Load the data cards into the reader when requested by the batch run.
4. At run completion, return the data cards and printer output to the user.

7.2.7 ERRORS AND DIAGNOSTICS

The following messages point out problems with input cards. If it is feasible to correct the problem, the cards may be resubmitted. If not, the card deck should be returned to the user with a copy of the message.

THE INPUT CARD CONTAINS DATA WHICH ARE INCOMPATIBLE WITH THE FORMAT TYPE

THE INPUT CARD CONTAINS AN INVALID AREA OF INTEREST ID

THE INPUT CARD SEQUENCE IS INCORRECT OR THE CARD IDENTIFIER IS MISSING OR INCORRECT

THE INPUT CARD HAS AN INVALID USER ID

The following message will normally occur in connection with one of the above. If it occurs alone there is no way for the operator to recover directly, and he should inform his supervisor.

DATA TO BE UPDATED FROM THE DATA BASE WERE NOT PRINTED (STATUS = ---)

7.3 DELETE AREA-OF-INTEREST DEFINITIONS

This batch program removes definitions from the Master (Archive) Data Base. To be reinstated, the procedure in 7.1 must be executed.

7.3.2 OPERATION

The program can be executed at any time except during GHIT or EXTRCT runs. The area-of-interest definition will not be available in the succeeding cycle of operation.

7.3.3 INPUT

The user furnishes data cards, and the operator loads them into the reader when requested by the batch run.

The user-furnished cards are described in figure 7.3-1. There is only one input card per area of interest to be deleted.

7.3.4 OUTPUT

Changes in the Master Data Base and the printer report are the only output. Requested deletions are not made to the Master Data Base if the area of interest records are not found in the data base. For these areas of interest records a listing will be produced on the line printer in addition to the changes or deletions made.

7.3.5 OPTIONS

There are none.

7.3.6 PROCEDURE

1. Log on to the system in UIC [5,5].
2. Start the batch run via BAT [333,33]AOIDEL($).
3. Load the data cards into the reader when requested by the batch run.
4. At run completion, return the data cards and the printer report to the user.

7.3.7 ERRORS AND DIAGNOSTICS

The following messages point out problems with input cards. If it is feasible to correct the problem, the cards may be resubmitted. If not, the card deck should be returned to the user with a copy of the message.

THE INPUT CARD CONTAINS DATA WHICH ARE INCOMPATIBLE WITH THE FORMAT TYPE

AREA-OF-INTEREST ID NOT FOUND IN THE DATA BASE -- SIDE ID -- USER ID --

THE INPUT CARD CONTAINS AN INVALID AREA-OF-INTEREST ID

THE INPUT CARD IDENTIFIER IS INCORRECT OR MISSING

THE INPUT CARD HAS AN INVALID USER ID

The following messages will normally occur in connection with one of the above. If one of these occur alone there is no way for the operator to recover directly, and he should inform his supervisor.

DATA TO BE DELETED FROM THE DATA BASE WERE NOT DELETED (STATUS = ---)

DATA TO BE DELETED FROM THE DATA BASE WERE NOT PRINTED (STATUS = ---)

DELETE AREA OF INTEREST TRANSACTION CARD

Column	Format	Contents
2	'D'	Card Identifier Field - Must be a 'D'.
4-7	DDDD	Site or Area of Interest ID. Number may range from 0001 through 9999.
51-52	DD	User ID. Number may range from 1 through 19 and must be right-justified and blank-filled.

Figure 7.3-1
Card for Deleting of Area of Interest Description

7.4 PREPARING PROGRAMMED REPORTS

7.4.1 DESCRIPTION

Two reports have been preprogrammed:

Extraction Processing Summary

Screening and Registration Processing Summary

Both are available on submission of a batch program. In addition, other reports can be prepared at will by an operator with sufficient working knowledge of LIMS (see section 7.7).

7.4.2 OPERATION

These programs, which consist of command files, can be run at any time except during the GHIT or EXTRCT runs.

7.4.3 INPUT

The operator obtains these reports from operations at the operator terminal. See section 7.4.6 below.

7.4.4 OUTPUT

The output consists of the requested reports on the line printer. Sample reports are shown in figure 7.4-1 and 7.4-2.

7.4.5 OPTIONS

There are no options. Reports are only generated as they have been preprogrammed.

HIGH DENSITY TAPE
EXTRACTION PROCESSING SUMMARY
(29-JUN-79)

LANDSAT 3 SENSOR MSS

USER	AOFT	ACQ. DATE	WRS	REG	ZONE	STRATA	SRQ	AC %	SA	CCT NUMBER	REG CODE
5	50	9063	120A3	A1	0001	0001	7	30	0	91801	
5	100	9063	140A3	A1	0001	0001	7	99	0		
5	246	9063	210A3	A1	0001	0001	7	52	1	91801	1

FIGURE 7.4-1
SAMPLE REPORT

HIGH DENSITY TAP
SCREENING AND REGISTRATION PROCESSING SUMMARY
(29-JUN-79)

LANDSAT 3 SENSOR MSS

USER	AOFI	ACQ. DATE	WRS	REG	ZONE	STRATA	SRQ	AC	%	SA	CCT NUMBER	REG CODE
5	246	9063	21083	01	0001	0001	7	52		1	91601	1

FIGURE 7.4-2
SAMPLE REPORT

7.4.6 PROCEDURES

1. Log on to UIC [5,5].
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES.
3. Type BAT [333,33]DLYRPT($).
4. Operation is fully automatic. Recover reports from line printer.

7.4.7 ERRORS AND DIAGNOSTICS

None

7.5 ARCHIVE UPDATE PROCESS

7.5.1 DESCRIPTION

This process transfers all scene and acquisition description records from the Daily PC&S Data Base to the Master Data Base for archiving.

7.5.2 OPERATION

This batch job is executed toward the end of a LIVES daily processing cycle, after all desired CCT's have been created and before the Master Data Base save.

7.5.3 INPUT

This job reads its input data directly from the PC&S Data Base.

7.5.4 OUTPUT

This job writes its output data directly into the Master Data Base. As a batch job, it creates a printer listing labeled "ARCUPD".

7.5.5 OPTIONS

There are no options.

7.5.6 PROCEDURES

1. Log on to [5,5].
2. Mount the LIVES disk on DB1 if necessary by entering MOU DB1:LIVES.
3. Enter BAT [333,33]ARCUPD($).

7.5.7 ERRORS AND DIAGNOSTICS

None

7.6 SAVE AND RESTORE MASTER (ARCHIVE) DATA BASE

After all operations of a daily cycle of LIVES have been completed, the operator will save the Master Data Base to a tape. This tape will be kept one week as a backup to the disk files. The following steps will be executed:

1. Log on to [5,5].
2. Ready a scratch tape with a write ring on drive MTx, where x is 0 or 1.
3. Enter INI MTx:mmddhh/UIC=[333,33] where

01	mm	12 is the current month number,
01	dd	31 is the current day number, and
00	hh	23 is the current hour number.

4. Enter MOU MTx:/OVR.
5. Enter PIP MTx:[333,33]=DBØ:[333,33]LMDB.*/FO
6. Enter PIP MTx:[333,33]/LI and verify that the following files are shown to be on the tape:

   LMDB.R1
   LMDB.R2
   LMDB.R3
   LMDB.R4
   LMDB.LCK

7. Enter DMO MTx: and attach a physical label to the tape identifying it as a LIVES Archive Backup, with the date and time of creation and the drive on which it was mounted ('H' or 'I').

Whereas the save operation will be done at the end of every cycle, the restore operation will only be done when the current system disk copy of the Master Data Base is determined to be unusable. At this point, the save tape from the previous cycle will be readied without a write ring on MTx and the operator will execute the following steps:

1. Log on to [5,5].
2. Enter MOU MTx:/OVR
3. Check that the label printed at the console is the desired date and hour.
4. Enter PIP [333,33]LMDB.*;*/DE.
5. Enter PIP DBØ:[333,33]=MTx:[333,33]/BO
6. Enter PIP [333,33]LMDB.*/LI and verify that the following files are shown to be on DBØ:

LMDB.R1
LMDB.R2
LMDB.R3
LMDB.R4
LMDB.LCK

7. Enter DMO MTx: and return tape to its storage location.

7.7 RECOVERY PROCESS

7.7.1 DESCRIPTION

The LIVES Recovery Process provides a means of re-establishing a working environment for LIVES after loss of that environment due to some event such as a computer crash. Using the recovery process allows LIVES to continue its normal processing without having to repeat all of the day's previous processing. LIVES will resume at the beginning of the transaction (handling of one area-of-interest) on which it was working at the time of the trouble.

7.7.2 OPERATION

LIVES Recovery is a batch run which needs to be run only if one of the EXTRCT, CONDTN, SCRNTR, or CCTGEN processors was active at the time of the trouble. If no LIVES processors were active, nothing needs to be done to recover LIVES. If one of the REFLOD, GHIT, AOIADD, AOIUPD, AOIDEL, DLYRPT, or ARCUPD processors was active at the time of the trouble, that processor is to just be restarted from its beginning point.

7.7.3 INPUT

There is no data input from the operator when the LIVES recovery batch run is executed.

7.7.4 OUTPUT

As a batch run, LIVES Recovery produces a printer output labeled "LIVESR". Contained within this listing is a report which tells which areas-of-interest had been processed by which LIVES processors at the time of the trouble. Also, at the operator's console, advisory messages are printed as the Peripheral Interface Processor (PIP) attempts to unlock files which are not locked. One other message is printed at the operator's console, taking one of the two following forms:

CURRENT COPY OF LIVES DATA BASE IS VALID.

meaning that the PC&S Data Base had not been interrupted during an update and consequently its structure is still valid, or

LIVES DATA BASE UNDERGOING RESTORATION.
ANY USER ONLINE DIRECT UPDATES ARE LOST.

meaning that the PC&S Data Base was interrupted during an update session and consequently its structure might be invalid. So the LIVES Recovery batch job is reinitializing the PC&S Data Base to its creation status (just after GHIT run) and is re-applying all updates that had occurred today from the EXTRCT, CONDTN, SCRNTR, and CCTGEN processors. The fact is noted that if anyone updated the PC&S Data Base directly from a terminal, that update is lost.

7.7.5 OPTIONS

There are no options available to the operator when running the LIVES recovery batch job.

7.7.6 PROCEDURES

1. Log on to [5,5].
2. Enter BAT [333,33]LIVESRCVY($).

3. At the completion of the batch restart, via the normal procedure, the LIVES processor that was active at the time of the trouble.

7.7.7 ERRORS AND DIAGNOSTICS

None

7.8 OTHER DATA BASE OPERATIONS

An operator may query either data base at any time, with a single exception: he may not query the Daily Data Base while the GHIT Processor is running. He may also modify information in either data base, with the same restriction.

For this function it must be assumed that the operator has background knowledge of use of LIMS, or of RIMS, its predecessor. This manual cannot furnish sufficient information for a user to perform these functions without such a background. It should be noted that most users of RIMS and LIMS are programmers, or have a depth of knowledge of the art of programming.

The basic reference on RIMS is ref. 2.5-3, the RIMS Users Guide. That document, and its addendum, ref. 2.5-4, furnish instructions for all fundamental uses of RIMS. All modifications to these instructions are included in reference 2.5-7.

8. ABBREVIATED INSTRUCTIONS FOR OPERATIONS

8.1 REFERENCE IMAGE LOADER (section 6.1 of Operations Manual)

1. Log on to [333,33] on the Image Processor
2. Ready "LIVES2" on DB2 and enter MOU DB2:LIVES2
3. Ready the supplied tape on MTx and enter MOU MTx:/CHA=[FOR]
4. Enter RUN REFLOD($) and answer interactive questions
5. Note for the requester any unfound reference images

8.2 GHIT PROCESSOR (section 6.2 of Operations Manual)

1. Log on to [5,5] on the Support Processor
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
3. Ready the supplied GHIT tape on MTx and enter MOU MTx:/CHA=[FOR]
4. Enter BAT [333,33]GHIT($) and respond to terminal instructions
5. Return printer output to requestor, retaining the Processing Tape Order report for use with the HDTRS and EXTRCT processors

8.3 EXTRACT PROCESSOR (section 6.3 of Operations Manual)

1. Log on to [333,33] on the Support Processor
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
3. Set switches on DAØ and DA1 for 11/20 ACCESS, 11/45 ACCESS, and READ/WRITE, ready two scratch disks and enter MOU DAØ:/CHA=[FOR] and MOU DA1:/CHA=[FOR]
4. Ready the first HDT on the drive (using GHIT's Processing Tape Order Report for tape number and time span) and initiate the HDTRS on the 11/20 per Ford Aerospace instructions in the dual mode at 7.5 inches per second for MSS data, making both DA drives initially available.
5. After the HDT has passed the reported start time, enter RUN EXTRCT($)

6. Use 11/20 console input if necessary to keep HDTRS and EXTRCT working on different disks

7. Do not communicate with the 11/45 while extraction is taking place

8.4 CONDITIONING PROCESSOR (section 6.4 of Operations Manual)

1. Log on to [333,33] on the Support Processor
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
3. Enger RUN CONDTN($)

8.5 SCREENING AND TRANSLATION (section 6.5 of Operations Manual)

1. Log on to [5,5] on the Image Processor
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
3. Ready "LIVES2" on DB2 and enter MOU DB2;LIVES2
4. Allow the user to log on to [333,33[on TTI and enter RUN SCRNTR($)

8.6 CCT PROCESSOR (section 6.6 of Operations Manual)

1. Log on to [333,33] on the Support Processor
2. Ready a tape with a write ring on MTx and enter MOU MTx:/CHA=[FOR]
3. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
4. Enter RUN CCTGEN($)
5. Respond to directions and questions at the console, preparing tape labels as instructed.

8.7 ADD AREA-OF-INTEREST DEFINITIONS (section 7.1 of Operations Manual)

1. Receive and check user cards for general format and order and end-of-file card.
2. Logon to [5,5] on the Support Processor.
3. Start the batch job by entering BAT [333,33]AOIADD($)
4. Load the data cards into the reader when requested by the batch run.

5. At run completion, return the data cards and printer output to the user.

8.8 MODIFY AREA-OF-INTEREST DEFINITIONS (section 7.2 of Operations Manual)

1. Receive and check user cards for general format and order and end-of-file card.
2. Log on to [5,5] on the Support Processor
3. Start the batch job by entering BAT [333,33]AOIUPD($)
4. Load the data cards into the reader when requested by the batch run.
5. At run completion, return the data cards and printer output to the user.

8.9 DELETE AREA-OF-INTEREST DEFINITIONS (section 7.3 of Operations Manual)

1. Receive and check user cards for general format and end-of-file card.
2. Log on to [5,5] on the Support Processor
3. Start the batch job by entering BAT [333,33]AOIDEL($)
4. Load the data cards into the reader when requested by the batch run.
5. At run completion, return the data cards and printer output to the user

8.10 PREPARE PROGRAMMED REPORTS (section 7.4 of Operations Manual)

1. Log on to [5,5] on the Support Processor
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
3. Enter BAT [333,33]DLYRPT($)
4. At run completion, return printer output to user.

8.11 ARCHIVE UPDATE (section 7.5 of Operations Manual)

1. Log on to [5,5] on the Support Processor
2. Ready "LIVES" on DB1 and enter MOU DB1:LIVES
3. Enter BAT [333,33]ARCUPD($)
4. At run completion, return printer output to user.

8.12 SAVE AND RESTORE MASTER (ARCHIVE) DATA BASE (section 7.6 of Operations Manual)

Save Operation:

1. Log on to [5,5] on the Support Processor
2. Ready a scratch tape with write ring on MTx and enter INI MTx:mmddhh/UIC=[333,33]
3. Enter MOU MTx:/OVR
4. EnterPIP MTx:[333,33]=DBØ:[333,33]LMDB.*/FO
5. Enter PIP MTx:[333,33]/LI and verify that the tape contains LMDB.R1, LMDB.R2, LMDB.R3, LMDB.R4 and LMDB.LCK
6. Enter DMO MTx: and attach a physical label to the tape identifying it as a LIVES Archive Backup, with the date and time of creation and the drive on which it was mounted ('H' or 'I')
7. Retain the tape for one week.

Restore Operation:

1. Log on to [5,5] on the Support Processor
2. Ready the tape (without write ring) which contains the data base to be restored and enter MOU MTx:/OVR
3. Check that the label printed at the console is the desired date and hour.
4. Enter PIP [333,33]LMDB.*;*/DE
5. Enter PIP DBØ:[333,33]=MTx:[333,33]/FO
6. Enter PIP [333,33]LMDB.*/LI and verify that DBØ contains LMDB.R1, LMDB.R2, LMDB.R3, LMDB.R4, and LMDB.LCK
7. Enter DMO MTx: and return tape to its storage location

8.13 RECOVERY PROCESS (section 7.7 of Operations Manual)

1. Log on to [5,5] on the Processor where the trouble occurred
2. Enter BAT [333,33]LIVESRCVY $

3. At run completion, return the printer output to the user and restart (or inform the user that he can restart) the LIVES processor that was active at the time of the trouble (EXTRCT, CONDTN, SCRNTR, or CCTGEN).

8.14 OTHER DATA BASE OPERATIONS (section 7.8 of Operations Manual)

These operations depend upon a knowledge of LIMS and are variable depending on the situation and current needs.

APPENDIX A

ABBREVIATIONS, ACRONYMNS, AND DEFINITIONS

A of I Area of Interest (q.v.)

Acquisition - a given scene, consisting of imagery data for an area of interest taken on a given date. There are normally several acquisitions for each area of interest.

Archive PC&S Data Base - see Master (Archive) PC&S Data Base.

Area of Interest - a portion of a scene which has been specified by the data user. The area of interest size is a variable specified by a user. It can vary from a single pixel to any portion of a Landsat scene, or it may consist of the full scene. In LACIE this was called a sample segment and the size was restricted to 196 pixels by 117 lines. The acronym AI should not be used since it is preempted for Analyst-Interpreter; A of I may be used, but is not recommended. Area-of-Interest descriptions are maintained in the Master (Archive) Data Base.

ASATS Automatic Status and Tracking System.

bpi Bits per inch.

C&I Cataloging and Indexing.

CCT Computer-compatible tape.

CCT Generator Module - The LIVES computer program unit which actually produces the output tapes.

CDR Critical Design Review (also called Detailed Design Review.)

client a person that requests or obtains images from LIVES.

CPC Control Point Center.

Conditioning Processor - the LIVES computer program which distinguishes clouds, water, and other special pixels by use of the external SCREEN subroutine, and calculate biases and gains for non-cloud pixels.

Control points - a geographical point used in registration; its position must be precisely identifiable on an image to be registered and on the reference image to which it is to be registered.

CPU Central processing unit.

CRT Cathode ray tube.

cycle of operation - all operations connected with a given GHIT. A cycle starts with operation of the GHIT Processor and normally ends with the final use of the CCT Processor, writing areas of interest to tape. The cycle is often conceived as daily since the GHIT is expected to reflect one day's production of high density tapes at Goddard; however, a cycle may be run in any period of time and in any relation to other cycles. Special precautions may be necessary if two cycles are interspersed.

daily This word normally refers to a cycle of operation (above). However, there are no time limitations on cycles of operation.

Daily PC&S Data Base - the ephemeral data base which is created at the beginning of a cycle of operation. It reflects all major operations performed in a cycle of operation. At the end of a cycle of operation it is used to update the Master (Archive) PC&S Data Base, and then it is discarded. In nomenclature, the "PC&S" portion of its name is normally omitted.

DAPTS Data Acquisition Preprocessing Transmission System.

DEC Digital Equipment Company of Maynard, Massachusetts, maker of the PDP-11 computers.

DMS Data Management System.

DRB Discipline Registration Band.

DRR Detailed Requirements Review.

DTL Data Techniques Laboratory, the EOD computer center in JSC Building 17, Room 2062.

EOD/JSC Earth Observations Division of NASA/JSC

EOD/LEC Earth Observations Department of LEC

ERIM Environmental Research Institute of Michigan at Ann Arbor.

ERIPS Earth Resources Interactive Processing System, the primary interactive system used for image analysis in the LACIE system.

Extraction Module - the LIVES computer program unit which extracts the areas of interest and search areas.

FDR Functional Design Review.

FRD Functional Requirements Document.

full scene - in LIVES, this term refers to a set of Landsat data which normally covers 185 km (cross-track) by 170 km (in-track); a full scene's radiation is spectrally separated into one, four or five bands depending on Landsat sensor and configuration at the time of data acquisition.

Full Scene data base - the archive of Landsat scenes extracted from the high density tapes by the High Density Tape Reformatting System; resident on a non-portable 300 Mb disk.

GCP Ground control points; see control points.

GHIT Goddard High Density Tape (HDT) Inventory Tape.

GHIT Processor Module - the LIVES computer program unit which extracts information from the Goddard High Density Tape (HDT) Inventory Tape (GHIT).

GSFC The Goddard Space Flight Center of NASA, located at Greenbelt, Maryland in the Washington, D. C. area.

HDT High density tape.

HDTRS High Density Tape Reformatting System; the front end subsystem consisting of software and hardware to be delivered by the Ford Aerospace Corporation.

I-100 See Image-100.

ICD Interface Control Document.

ID Identification

Image-100 - Interactive imagery data analysis system manufactured by the General Electric Corporation; in LIVES, this term refers to the system in the DTL, consisting of an interactive terminal with CRT, color television monitor for display of images, and associated firmware and software, used in association with the Image Processor.

Image Processor - The PDP-11/45 computer and peripherals to which the Image-100 is connected. The DTL has both an Image and a Support Processor (q.v.).

IRS Implementation Requirements Specification.

JSC NASA's Lyndon B. Johnson Space Center in Houston, Texas.

LACIE Large Area Crop Inventory Experiment, the first large experiment on world-wide inventory of a crop from satellite data. LACIE was limited to the inventory of wheat.

LACIE segment - a segment (area of interest) of exactly 117 lines of 196 pixels each, used in the LACIE.

LEC Lockheed Electronics Company.

LIMS LIVES Information Management System, an elaboration of the RIMS.

LIMS Interface Module - a LIVES computer program unit that allows the LIMS data management system to be called as a normal FORTRAN subroutine.

LIVES Landsat Imagery Verification and Extraction System.

Master (Archive) PC&S Data Base - the data base, maintained in disk, which maintains the long-term archive of LIVES. It is updated regularly from the Daily PC&S Data Base, and it can be modified by users (q.v.)of LIVES at will. Its primary contents are records of areas of interest. In nomenclature, often the "PC&S" portion of the name is omitted.

mB Megabyte.

MSS Multispectral Scanner, a Landsat sensor.

NASA National Aeronautics and Space Administration.

Operator - a person who operates the LIVES. Operators must have detailed expertise in computer science.

PC&S Process Control and Status.

PC&S Data Base - the information on areas of interest, etc., maintained on disk in two different forms; the Master (Archive) PC&S Data Base and the Daily PC&S Data Base (q.v.).

PC&S Update Generator - the LIVES computer program unit which updates the PC&S Data Base.

PDP Project Development Plan.

PDR Preliminary Design Review

RBV Return Beam Vidicon, a Landsat sensor.

RCP Registration Control Point - see Control Point.

reference images - standard images to which search images are to be registered.

Reference Image Data Base - the collection of reference images to be used in LIVES, maintained on disk.

Reference Image Load Processor - the LIVES computer program unit which loads reference images into the Reference Image Data Base.

Registration - remapping of an image so that it corresponds, pixel by pixel, with a reference image.

Report Generator Module - the LIVES computer program unit which provides the capability of generating a variety of reports.

RIMS Regional Information Management System, a data base management system developed for the Regional Applications Project and subsequently modified for generality. A version of RIMS, renamed LIMS, was enhanced for use in LIVES.

RMS Root Mean Square.

RSX-11 The operating system of the PDP-11/45 computer.

scene a set of imagery data of the earth. In LIVES, this term refers to Landsat imagery data, normally from the MSS, but conceivably from the RBV. The term sometimes refers to a full scene (q.v.).

SCREEN An external subroutine that was incorporated into the Conditioning Processor of LIVES. SCREEN, developed at ERIM, is described in Appendix A of ref. 2.2-9.

Screening and Translation Processor - the LIVES computer program unit which provides the user with the capability to examine search areas and areas of interest; the unit also provides the user with the capability to translate some areas, line by line and pixel by pixel, for rough registration with reference images.

Search Area - a portion of a scene which contains an area of interest plus a border large enough to assure the capability to search for and find the area of interest when registration confidence is low.

SCI-Serial Controller Interface - General Electric device to be used in the transfer of data from high density tapes to 300 MB disks; it is semiprogrammable and will allow images or portions of images to be extracted.

Support Processor - the PDP-11/45 computer and periphals in the DTL that are not directly used with the Image-100. The DTL has both a Support and an Image Processor (q.v.).

System Parameter File - a file containing parameters required to adapt LIVES to a given problem; for example, the sizes of areas of interest (segments) would be stored here for reference by all programs in LIVES.

TBD To be determined.

TBS To be supplied.

TP Test Plan.

Translation - the adjustment of an image in x and y directions only; a one-point registration; does not compensate for rotation or variation of scale in any direction.

UIC User identification code for the PDP-11/45 computer. An example would be [333,33].

UIF Universal Image Format.

user one of a very small number of persons, perhaps as few as three or four, that actually directs the operations of LIVES. A user will normally have an administrative function within LIVES, but will not need to have special expertise in computer science.

WRS World Reference System - a geographical parameter system in which Landsat scenes are described in terms of rows (roughly analogous to latitude) and paths (roughly analogous to longitude). Row numbers vary from 1, at 80^{0} N. Lat., to 251 at the south pole. Path numbers vary from 1 at Greenwich through 250.

WRS Row Path Generator Processor - the LIVES computer program unit which computes the row and path of the Landsat scene corresponding to a geographical area described in longitude and latitude.