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

NASA

National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
Houston. Texas 77058

EARTH OBSERVATIONS DIVISION

SPACE AND LIFE SCIENCES DIRECTORATE

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

Job Order 71-485

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

Contract NAS 9-15800

August 1979   LEC-12902

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

Job Order 71-485

Prepared By

L. E. Giddings
Data Systems Department

Approved By
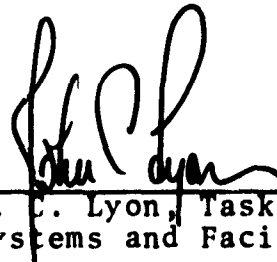
LEC

G. W. Buchman, Project Manager
HDT Implementation

NASA

J. C. Lyon, Task Monitor
Systems and Facilities

Prepared By

Lockheed Electronics Company, Inc.

For

Earth Observations Division

Space and Life Sciences Directorate

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS

August 1979   LEC-12902

CHANGE SHEET
FOR THE
USERS MANUAL
FOR
LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM
(LIVES)

CHANGE 1

Job Order 76-662

Prepared by
D. K. McCarley

LEMSCO   NASA

J. I. Morrow, Supervisor
Software Section

J. M. Sulester, Technical Monitor
Systems and Facilities Branch

Prepared by
Lockheed Engineering and Management Services Company, Inc.
For
Earth Observations Division
Space and Life Sciences Directorate

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS

April 1980   LEC-12902
                                              CHANGE 1

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

CONTENTS

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 sys-
tem 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 in a non-specialized
language so that a user can determine its applicability, and when
and how to use it. It should serve as a reference document for the
preparation of input data and interpretation of results. As such,
it contains detailed procedures for its use.

A user is conceived to be one of a very small number of persons,
perhaps as few as three or four, who actually directs the operations
of LIVES. In general, a user will normally have an administrative
function within LIVES. Persons external to LIVES who submit requests
for images are not considered to be users; they will not have
responsibilities for operation of LIVES, but will function as the
system's clients. A user is not expected to have specialized
knowledge of computers.

A separate document, ref. 2.2-13, has been prepared for
operations personnel. They will be expected to have specialized
knowledge of computers and their operation.

Users 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 users. However,
to avoid the inclusion of unnecessary data, and in the interest of
completeness, it makes full 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, local users 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 details 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 BO9, 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 Auto-
         mated 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 2.1-2. 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, this document.

2.2-13 Operations Manual, JSC-14633, LEC-12903, March 1979.

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 19781

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 (LIMS) Users Guide.

2.5-8. JSC Image-100 User's Manual, JSC-12586, LEC-10262, June 1977.

2.6   INFORMATION ON MAJOR EQUIPMENT

2.6-1   High-Density Digital Tape Recorder, Martin-Marietta
        Corporation, P75-48236-2, 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.

HIGH
DENSITY
TAPE

HDTRS PROCESSOR

PDP-11/20
Computer

Operator
Terminal

These Disks are
used by one
processor at a
time.

Dual Ported

300 MB
Disks,
Fixed

300 MB
Disks,
Fixed

User
Graphics
Terminal

SUPPORT PROCESSOR

PDP-11/45 Computer

Operator
Terminal

Green Room Terminals

88 MB
Disk,
Switchable

88 MB
Disk

IMAGE PROCESSOR

PDP-11/45 Computer

Operator
Terminal

User
Graphics
Terminal

User
Graphics
Terminal

Image
100
Analyst
Graphics
Terminal

Image-100
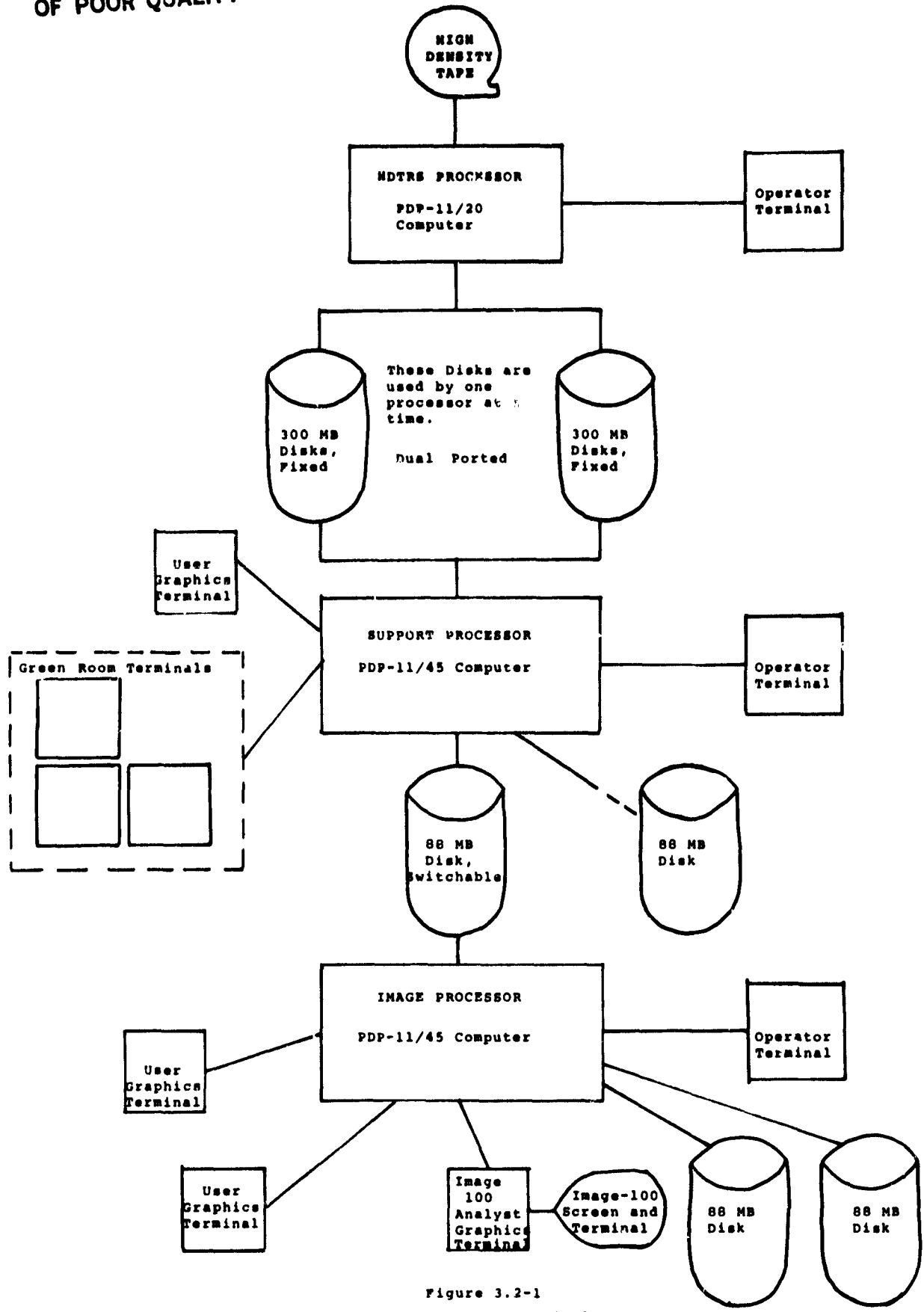Screen and
Terminal

88 MB
Disk

88 MB
Disk

Figure 3.2-1

Computers, Disks, and Terminals

3-5

9

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 probably be
sent to Goddard of the Landsat scenes that would be of interest. Goddard
prepares high density tapes (HDT's) and inve ry 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 define 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 upda ing 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 HDTRS is put into operation. It performs its primary task of reading full scene data from the HDT's to disk. Concurrent with the execution of this program on the PDP 11/20, the Extraction Processor is executed on the PDP 11/45. 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 user. Most of these are
transparent to the user; 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).
Only the Reference Image Load Processor, the Screening and Transla-
tion Processor, and certain data base operations require user
interaction or input.

A user 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 use the Screening and Translation Processor
from the Image-100 console (section 6.2). He may use the data
base management system, LIMS, from any terminal with access to the
Daily Data Base or the Master (Archive) Data Base (section 6.3). He
can generate reports from a terminal connected to the appropriate data
base (section 6.4). He may also perform certain other data base operations

(section 6.5). In the initial release of LIVES, only the Reference
Image Load Processor and the Screening and Translation Processor
will exist on the Image Processor.

A user may call on the LIVES computer operator to run these or
other LIVES processors. Details on operator functions are pre-
sented in the LIVES Operations Manual (ref. 2.2.-13).

INDEPENDENT MODULES

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

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	FLIMS

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

Figure 4.2-1. Modules/Functions of LIVES

5. DATA BASES AND SPECIAL FILES

In general, a user needs to have an idea of the internal workings of LIVES. 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:

Full Scene Data Base	(5.1)
Search Area Data Base	(5.2)
Reference Image Data Base	(5.3)
Process Control and Status Data Base	(5.4)
Master Data Base	(5.5)

5.1 FULL SCENE DATA BASE

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

Neither user nor operator should 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 neeed 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 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. These transactions have the following functions: (1) they define today's areas of interest, (2) they support system computations, (3) they support system control, and (4) they provide 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 tapes, as well as the various processors.

There are three types of records in the data base:

o Area of Interest Descriptions - Define those items of an area of interest common to all image acquisitions (see figure 5.4-1).

o Scene Description - Describe scenes from the HDT (see figure 5.4-2

o Acquisition Descriptions - Contain data describing an area of interest acquisition and the processing of this acquisition. (see figure 5.4-3).

LEC-12902
CHANGE 1

The Daily PC&S Data Base contains only those acquisition descriptions and their associated area of interest descriptions and all 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.

5.5 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 types of records 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 1-19
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	PSSSEL	PRIM./SEC. SCENE SELECTION FLAG
15	CRPCOD	CROP CODE
16	AILAT	LATITUDE/DIRECTION - FORMAT NDDD-MM-SS
17	AILONG	LONGITUDE/DIRECTION - FORMAT EDDD-MM-SS
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	SATSEL	SATELLITE SELECTION FLAG
24	CLRCDS	COLOR CODES
25	LSTUPD	LAST UPDATE DATE & TIME - FORMAT YDDDHHMM

RECORD ID = USERID @ AOIID @ 0

FIGURE 5.4-1

AREA-OF-INTEREST DESCRIPTION RECORD

LEC-12902
CHANGE 1

FIELD NO.	FIELD NAME	FIELD DESCRIPTION
1	RCTYPE	RECORD TYPE - ALWAYS A 2
2	SCENNO	SCENE NUMBER - RANGE 1-9999
3	DATGHI	DATE GHIT RUN - FORMAT YDDD
4	HDTID	HDT TAPE ID
5	GHITID	GHIT 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	ACQDAT	ACQUISITION DATE - FORMAT YDDD
21	HDTPDT	HDT PROCESSED DATE - FORMAT YDDD
22	IRIGB	IRIG BEGIN TIME
23	IRIGE	IRIG END TIME

RECORD ID = 0 @ SCENNO @ DATGHI

Figure 5.4-2
SCENE DESCRIPTION RECORD

FIELD NO.	FIELD NAME	FIELD DESCRIPTION
1	RCTYPE	RECORD TYPE - ALWAYS A 3
2	USERID	USER ID - RANGE 1-19
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	DATGHI	DATE GHIT 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 5.4-3

ACQUISITION DESCRIPTION RECORD

LEC-12902
CHANGE 1

6. USER PROCEDURES

This section furnishes some detail on each of the following functions, all of which are of importance to the user.

Loading Reference Images (6.1)
Screening and Translating Images (6.2)
Defining Areas of Interest (6.3)
Preparing Programmed Reports (6.4)
Other Data Base Operations (6.5)

Where feasible, actual instructions for the function are furnished. Where appropriate, instructions are furnished for requesting action by the operator. In the general case of data base operations, reference is made to the fundamental documents. These instructions concern user interaction with the LIVES system and assume that the user is completely familiar with standard I-100 system operation and with LIMS DBMS query procedures.

6.1 REFERENCE IMAGE LOADER

This module is used to load reference images from a tape to disk where they are accessible to other processors of LIVES.

In addition to brief instructions, the user will furnish a tape containing images in JSC Universal Image Format to an operator. The reference image will be a single channel image. The furnished images may have several channels of which only one is to be selected. There may be images on the tape which are not destined for loading into the Reference Image Data Base.

The operator is responsible for operation of this program. It will normally be initiated from the operator's terminal on the Image Processor. The user must supply the operator with the User ID (01-19) and, for each reference image to be loaded, the segment (area-of-interest) number (1-9999), the acquisition date, the channel number (1-4), and whether the reference image is to be loaded as a primary or secondary.

6.2 SCREENING AND TRANSLATION

6.2.1 INTRODUCTION

The principal function of a user, if he decides to exercise it, is
the screening of certain areas of interest, and the screening and,
perhaps, translation of search areas. 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. Screen-
ing 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
procedures assume that the user is trained and familiar with
general Image-100 operating procedures (ref. 2.5-6). Those instructions
have not been repeated in this manual.

The system uses two thresholds in the Extract Processor for use with
the registration quality threshold (QAGEOM: 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 categories of images:

Classification	Extract 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 translated	Between upper and lower registration thresholds	Above or below cloud threshold
4) Rejected areas	Below lower registration thresholds	Not Applicable

23

With these categories as a guide, a user 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 user will neither see nor be advised of the existence of images of, the first or fourth class. However this information will be accessible to him in the Daily Data Base, and could be made the subject of reports.

6.2.2 ACCESS TO THE PROCESSOR

A user will need to have "LIVES" mounted on DB1, have "LIVES2" mounted on DB2, log on the Image-100 terminal to UIC [333,33], and then type: RUN SCRNTR($). The system will then ask for his user identification, which consists of a two digit positive number.

At this point the system searches all files for images identified with the furnished user identification. It presents the images one by one for action by the user, as specified in section 6.2.3 and 6.2.4 below.

During the course of processing these images, the user may interject various commands. For the most part these commands have consequences that are easily understood. However, it should be noted that -HELP causes that command list to be furnished, and -LONG or -SHORT causes type system to furnish full or abbreviated messages.

COMMAND ENTRIES:

```
    -EXIT          CLOSE ALL FILES AND TERMINATE PR CESSING
    -LONG          SET FLAG TO GIVE LONG FORM OF MESSAGES
    -SHORT         GET FLAG FOR SHORT FORM OF MESSAGES
    -HELP          GIVE THIS LIST OF COMMANDS
    -RESTART       STOP CURRENT PROCESS AND ACCEPT       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
```

6.2.3 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 user 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 user accepts the scene. By typing -R, he rejects it.
He may also defer decision by typing -SKIP. In all of these cases, the
system automatically proceeds to the next scene which needs action by
the user.

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
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 one scene is shown
in figure 6-1. Note that the user specifies the long form of
messages by typing LONG. With familiarity the user will probably
prefer the -SHORT form of messages.

6.2.4   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 depress the ESCAPE key.

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).

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 the first
    control point neighborhood). Move the cursor to it and depress
    the ESCAPE key.

8) Repeat steps 2) through 6) for an additional 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 user should probably choose to accept by typing -A.

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

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

If the registration is not 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 user may accept, reject, or postpone, as shown above.

If none are within a pixel, the system advises rejection. Again, the user may accept, reject, or postpone. He may also elect to force a translation by typing -FORCE and furnishing the trans- lation values.

Figure 6-2 presents a typical procedure for translating and accepting an image.

6.2.5   OTHER OPERATIONS

This processor was designed for the convenience of the user, and in- corporates a wide variety of command options. A user may return to the previous query at almost 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 translation by typing -FORCE. He can also change display parameters by typing -ALTER, and refer to system display parameters by typing -DEFAULT.

```
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 6-1
SAMPLE PROCEDURE FOR SCREENING

```
>
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 6-1 (CONTINUED)

```
LINE = 30$
 **KEY-IN VALUE TO CHANGE (PARM = VAL)**
 ****KEY-IN END WHEN FINISHED ****
RASTER = 30$
 **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          0
 DISPLAY POSITION
     LINE                              30
     RASTER                            30
 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            0
     START PIXEL           0
 BAND                      0
 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 6-1 (CONTINUED)

```
>
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 6-2
SAMPLE PROCEDURE FOR SCREENING AND TRANSLATION

6-10

```
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 6-2 (CONTINUED)

6.3 AREA-OF-INTEREST DEFINITIONS

Area-of-interest definitions are maintained in the Master (Archive) Data
Base. Creation, changes, and deletions of area-of-interest definitions are
made via batch programs by the LIVES operator, using special transaction
cards, normally furnished for this purpose by a user. An actual deck of
cards may be furnished, or the user may just build a card image file on
disk which will be used by the add, update, or delete processors.

6.3.1 ADDITION OF AREA-OF-INTEREST DEFINITION

A user may add definitions of areas of interest by submitting cards (or a
file) in the format shown in figure 6.3.1-1. If a file is to be used, it
must be file SY:[333,33]AOIADD.DT1 and must be present when the AOIADD
batch run is started. There must be one or two cards for each new area-of-
interest to be added. The "A" card (column 1) is required. The "2" card
is optional and if omitted, values for all of its fields will be read from
the system parameter file, LIVESP.DAT.

6.3.2 CHANGE (UPDATE) OF AREA-OF-INTEREST DEFINITIONS

A user may change any field in an area-of-interest definition (except User
ID or Area of Interest ID) by submitting cards (or a file) in the format
shown in figure 6.3.2-1. If a file is to be used, it must be file
SY:[333,33]AOIUPD.DT1 and must be present when the AOIUPD batch run is
started. There must be one or two cards for each area-of-interest to be
changed. The "C" card (column 1) is required and the "2" card is optional.
Only the input fields which contain data will be changed in the data base,
i.e., a blank field means to retain the existing value in that field. The
user is responsible for keeping the location, size, and row-path fields in
agreement with each other for any particular area-of-interest.

6.3.3 DELETE AREA-OF-INTEREST DEFINITIONS

A user may delete area-of-interest definitions by submitting cards (or a file)
in the format shown in figure 6.3.3-1. If a file is to be used, it must be

file SY:[333,33]AOIDEL.DT1 and must be present when the AOIDEL batch run is started. There must be exactly one "3" card (column 1) for each area-of-interest definition to be deleted. It is to be noted that only area-of-interest description records (type 1) are deleted from the data base, and that all acquisition description records (type 3) which relate to that area-of-interest remain.

6.4 PREPARING REPORTS

A variety of reports may be preprogrammed, available semi-automatically to the user. In addition, a user with sufficient knowledge can generate reports using the LIVES information management system LIMS (see section 6.5 below). A predefined set of reports will be produced automatically toward the end of each daily cycle of processing.

A user is expected to request that an operator generate the preprogrammed reports. He merely requests this of the operator. The operator will generate them on request.

ADD Transaction "A" Card

Column	Contents
1	Card identifier - must be an "A".
2-3	User ID - right-justified, blank-filled integer, 1-19.
4-7	Area-of-interest ID - right-justified integer, 1-9999.
8-13	Country name.
14-15	Region Number.
16-19	Zone Number.
20-23	Strata Number.
24-33	Center Point Latitude - format XDDD-MM-SS where X is "N" or "S".
34-43	Center Point Longitude - format XDDD-MM-SS where X is "E" or "W".
44-47	Acquisition Start Date - format YDDD.
48-51	Acquisition Stop Date - format YDDD.
52-53	Crop Code.
54-55	Priority Code.
56	Primary/Secondary Scene Selection Flag - integer "1" means only use primary scene, "2" means only use secondary, any other number means to use both types of scenes.
57-59	Satellite Selection Flag - a three-digit number. A non-zero in column 57 means use Landsat 2, a non-zero in column 58 means use Landsat 3, a non-zero in column 59 means use Landsat 4. Coverage by multiple satellites may be coded.
60	Film Flag.
61-64	Color Codes Field.

Figure 6.3.1-1

Cards for Addition of Area of Interest Description

LEC-12902
CHANGE 1

ADD Transaction "2" Card

Column	Contents
1	Card identifier - must be a "2".
2-3	User ID - must match "A" card exactly.
4-7	Area-of-Interest ID - must match "A" card exactly.
8	Registration Quality Threshold for Screening - integer.
9	Registration Quality Threshold for Rejection - integer.
10-11	Cloud Percent Threshold for Screening - integer, 0-99.
12-17	Primary WRS Row-Path - three digit row followed by three digit path number, all zero-filled.
18-23	Secondary WRS Row-Path - three digit row followed by three digit path number, all zero-filled.
24-28	Size of Area-of-Interest in lines - right-justified integer, 1 - scene size.
29-33	Size of Area-of-Interest in pixels - right-justified integer, 1 - scene size.
72-80	Reserved for use by LIVES.

Figure 6.3.1-1 Continue

Cards for Addition of Area of Interest Description

CHANGE Transaction "C" Card

Column	Contents
1	Card identifier - must be a "C".
2-3	User ID - right-justified, blank-filled integer, 1-19.
4-7	Area-of-Interest ID - right-justified integer, 1-9999.
8-13	Country Name.
14-15	Region Number.
16-19	Zone Number.
20-23	Strata Number.
24-33	Center Point Latitude - format XDDD-MM-SS where X is "N" or "S".
34-43	Center Point Longitude - format XDDD-MM-SS where X is "E" or "W".
44-47	Acquisition Start Date - format YDDD.
48-51	Acquisition Stop Date - format YDDD.
52-53	Crop Code.
54-55	Priority Code.
56	Primary/Secondary Scene Selection Flag - integer, "1" means use primary scene, "2" means only use secondary, any other number means to use both types of scenes.
57-59	Satellite Selection Flag - a three-digit number. A non-zero in column 37 means use Landsat 2, a non-zero in column 58 means use Landsat 3, a non-zero in column 59 means use Landsat 4. Coverage by multiple satellites may be coded.
60	Film Flag.
61-64	Color Codes Field.

Figure 6.3.2-1

Cards for Change of Area of Interest Description

CHANGE Transaction "2" Card

Column	Contents
1	Card identifier - must be a "2".
2-3	User ID - must match "C" card exactly.
4-7	Area-of-Interest ID - must match "C" card exactly.
8	Registration Quality Threshold for Screening - integer.
9	Registration Quality Threshold for Rejection - integer.
10-11	Cloud Percent Threshold for Screening - integer, 0-99.
12-17	Primary WRS Row-Path - three digit row followed by three digit path number, all zero-filled.
18-23	Secondary WRS Row-Path - three digit row followed by three digit path number, all zero-filled.
24-28	Size of Area-of-Interest in lines - right-justified integer, 1 - scene size.
29-33	Size of Area-of-Interest in pixels - right-justified integer, 1 - scene size.
72-80	Reserved for use by LIVES.

Figure 6.3.2-1 Continue

Cards for Change of Area of Interest Description

DELETE Transaction "D" Card

Column	Contents
1	Card identifier - must be a "D".
2-3	User ID - right-justified, blank-filled integer, 1-19.
4-7	Area-of-Interest ID - right-justified integer, 1-9999.

Figure 6.3.3-1

Card for Deleting of Area of Interest Description

LEC-12902
CHANGE 1

6.5 OTHER DATA BASE OPERATIONS

A User may make several uses of the two major data bases in LIVES, the Daily Data Base and the Master (Archive) Data Base. The pre-programmed uses are presented in sections 6.3 and 6.4 above (concerning area of interest definitions and the preparation of reports, respectively).

In addition, he may query either data base at any time, with a single exception: he may not query the Daily Data Base while the GHIT or EXTRCT Processors are running. He may also modify information in either data base, with the same restriction.

For this function it is assumed that the user has background knowledge of use of LIMS, or of RIMS, its predecessor. This manual does not furnish sufficient information for a user to perform these functions without such a background. It should be noted that in the past, most users of RIMS and LIMS have been programmers, or have had 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 those instructions are included in reference 2.5-7.

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.

A-1

43

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 c eated at the beginning of a cycle of operation. It ref.ects 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.

A-4
46

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   cne 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° 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.