

LARS Information Note 091273

The LARSYS
Educational Package:
Instructor's Notes

by
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The Laboratory for Applications of Remote Sensing

Purdue University, West Lafayette, Indiana

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LARSYS EDUCATIONAL PACKAGE

INSTRUCTOR'S NOTES

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PREFACE

The material included in this volume has been designed to help LARSYS "instructors" guide "students" through the LARSYS Educational Package. A Survey of the LARSYS Educational Package and Instructor's Notes for each of the six mini-courses are included here. Instructor's Notes are printed on buff paper.

For your convenience, we have also included Student Notes for two of the units: Unit III (Demonstration of LARSYS) and Unit IV (A Hands-On Experience). The Student Notes for Unit I (A Basic Preparation) and Unit VI (Guide to Data Analysis) are bound volumes and are available to you as part of the Site Library.

A Survey of the LARSYS Educational Package

John C. Lindenlaub

The LARSYS Educational Package is a set of instructional materials that was developed to train people to analyze remotely sensed multispectral data using LARSYS, a computer software system developed at LARS/Purdue. A high priority was placed on designing the materials for individual study as it was felt that this would be the most likely situation in practice. Organizations just getting started in the use of multispectral data would probably have only two or three people making initial use of LARSYS. As their experience and skills improve other workers would be expected to join the effort. Students would be starting at random times and, depending on their backgrounds and other duties, would progress at different rates.

To meet these educational challenges, a series of mini-courses has been prepared. A mini-course is a set of instructional materials designed to take a student from an initial point, defined by the mini-course prerequisites, to an end point, defined by its instructional objectives. Each mini-course provides informational materials, an opportunity for the student to practice or study the skills or ideas presented, and a problem or test situation to help him determine whether he has met the objectives of the mini-course.

A variety of media has been used in the educational package, the selection dependent on the nature of the material and the defined instructional objectives of each mini-course. Reinforcement of certain concepts is interwoven throughout the mini-courses: examples are the multispectral concept, the multidimensional statistical approach, and the reality that some ground cover types, while of economic interest, may not necessarily be spectrally distinct.

Essential to the effective use of the educational package is the concept of a "LARSYS expert" or "site expert." Each student should be assigned to one or two persons experienced with LARSYS who can serve as instructor-consultants. At LARS/Purdue the LARSYS expert would probably be a fellow researcher from within the same program area. At geographically remote sites, the "site expert" would be an individual who has spent anywhere from several days to several weeks at LARS learning about LARSYS. While at LARS he would have had

the opportunity to go through the training materials while working with a terminal identical to his remote site terminal and to observe operations in the computation center. As the number of experienced LARSYS users at a given remote site grows, it is expected that some of them will also assume instructional duties. Instructor notes, designed to assist those serving as instructors, demonstrators or consultants, accompany each mini-course.

The function of the instructor consultant is not to plan and preside over formal classroom sessions but rather to serve as a tutor helping clarify troublesome points for the student. It is intended that student/instructor sessions be brief with the instructor providing the necessary corrective feedback or encouragement to enable the student to continue on his own.

Description of the LARSYS Educational Package

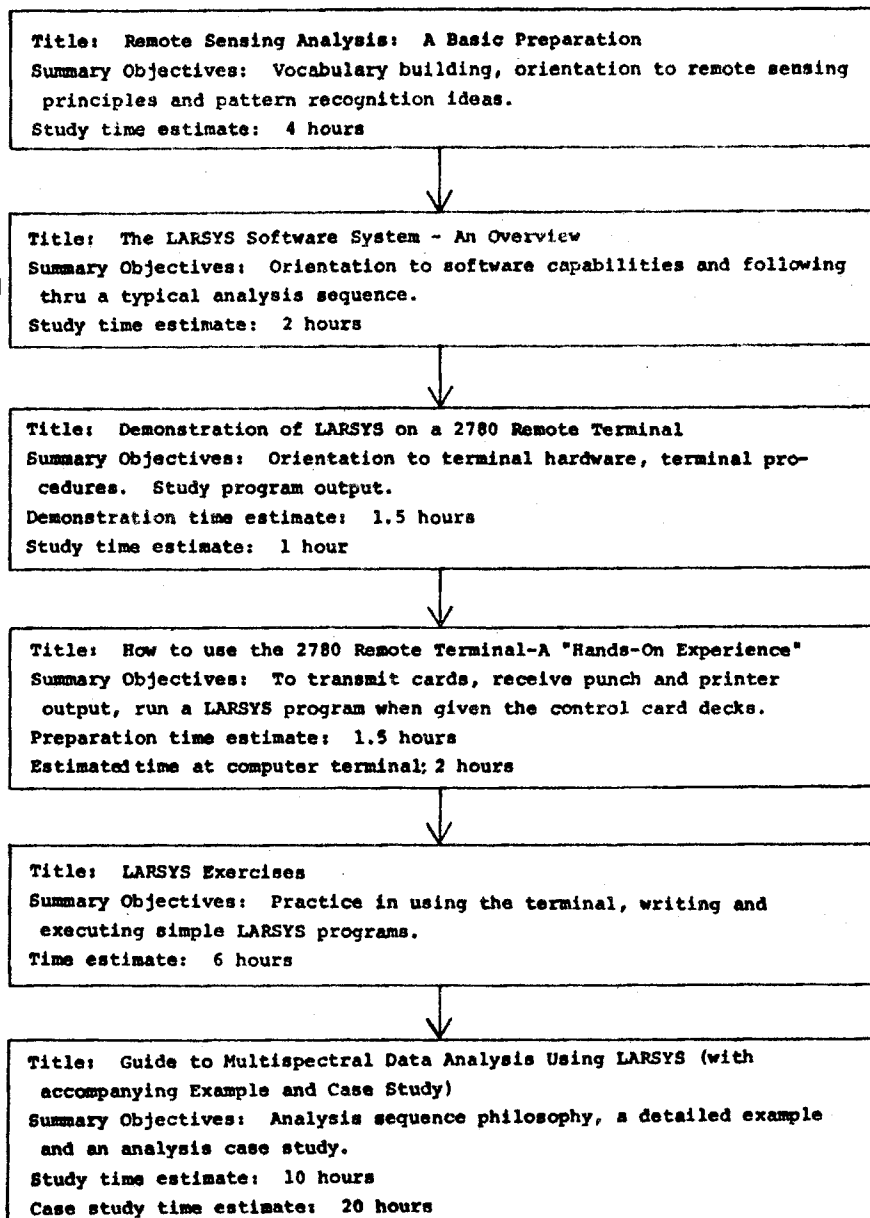
The LARSYS Educational Package consists of six mini-courses or modules. A flow chart of the materials is shown on the next page.

Students begin with a background manual entitled Remote Sensing Analysis: A Basic Preparation. This is an introduction to remote sensing stressing the role of pattern recognition in numerically-oriented remote sensing systems. Its specific purpose is to provide a common background and orientation for those who expect to make use of the LARSYS data analysis computer software system. For newcomers to remote sensing, this manual introduces concepts and terminology which are needed later on; remote sensing veterans will be introduced in this material to numerically-oriented remote sensing data analysis. The format of the Basic Preparation resembles that of a programmed text.

The second module entitled The LARSYS Software System - An Overview consists of a recorded tape which accompanies a set of slides or a notebook of illustrations. It takes the viewer through a typical remote sensing data analysis sequence and illustrates the commonly used features of the LARSYS set of processing functions.

An introduction to the computer terminal follows next. The unit Demonstration of LARSYS on a 2780 Remote Terminal provides the student with an introduction to the data processing hardware he will be working with and provides him an opportunity to be introduced to some aspects of the LARSYS software system. He will see several LARSYS jobs run at the 2780 remote terminal.

The LARSYS Educational Package



A flow chart of the LARSYS Educational Package giving the title, summary objectives and time requirement estimate for each unit.

The demonstration takes about an hour and requires a demonstrator to present the material and guide the student. Demonstrator's notes have been designed so that persons with only a modest amount of experience with the terminal can satisfactorily run the demonstration.

Students are instructed in the use of the terminal by means of an audio-tutorial lesson How to Use the 2780 Remote Terminal: A Hands-On Experience. The student is guided by an audio tape on how to use the terminal off-line as a card lister, login to the computer and initiate the LARSYS system, run sample LARSYS jobs and transmit data to and receive data from the main computer. The audio tape is supported by a set of written notes.

LARSYS Exercises are short problems which the student solves by using the computer terminal and LARSYS processing functions. The purpose of these problems is to increase the student's experience in the use of LARSYS processing functions for multispectral scanner data analysis and to help him develop an appreciation for the capabilities and limitations of the LARSYS software system package. The mini-course consists of a set of notes for the instructor and a set of problem statements for the student.

The Guide to Multispectral Data Analysis Using LARSYS gives a detailed breakdown of the philosophy of the analysis methods describing steps in the analysis, why they are necessary and how they are carried out. A detailed example parallels the description, and in addition students have an opportunity to carry out an analysis of their own by mean of a case study.

The flow chart summarizes the objectives of each mini-course and gives a time estimate for completing each unit.

Other Educational Resources

A Site Library containing LARSYS annual reports, selected LARS Information Notes, the LARSYS User's Manual, "One Man's Analysis of Run 71053900" (an analysis example), and copies of Focus is included in the support materials accompanying the LARSYS Educational Package. The Site Library also contains a listing of available LARS publications.

Two documents in particular are referenced frequently in the LARSYS Educational Package. They are the LARSYS User's Manual edited by T. L. Phillips, and Pattern Recognition: A Basis for Remote Sensing Data Analysis by P. H. Swain. The former document provides a detailed documentation of the LARSYS system from the user's viewpoint; the latter provides a theoretical framework for the algorithms used in the LARSYS processing functions.

Students are also encouraged to do some background reading. This material may vary according to the specific application of remote sensing of interest to the student. Selections from the LARS Annual Reports might include the following:

<u>Volume</u>	<u>Pages</u>	<u>Subject</u>
1*	all	Concepts
2*	33-43	Data Collection
	47-51	Data Handling
	57-63	DK-2 Data Analysis
	64-67	Future Experiment
	72-75	Satellite Test Site
3	6-58	Agricultural Remote Sensing
	148-160	The Potential for Remote Sensing
	165-171	Data Handling
4	11-41	Data Processing
	52-76	Applications Research
	76-86	Laboratories Studies

Information Notes and/or selections from the remote sensing literature may be selected to emphasize the discipline orientation of the student.

Special Note to Instructor-Consultants

Each terminal site has one or more Multispectral Image Storage Tapes assigned to it. The person charged with the responsibility of coordinating educational activities at the site should dedicate one of these tapes to educational purposes. In particular, students will need access to runs 66000600, 66005200 and 71053900 at one or more times as they go through the educational materials. Each site expert is responsible for generating a tape with these runs on it. This may be accomplished by means of the following LARSYS run:

```
*DUPLICATERUN
FROM RUN(66000600)
TO TAPE(TTT), FILE(1)
END
*DUPLICATERUN
FROM RUN(66005200)
TO TAPE(TTT), FILE(2)
END
*DUPLICATERUN
FROM RUN(71053900)
TO TAPE(TTT), FILE(3)
END
```

where TTT is the tape number used for educational purposes at your particular site.

*Volumes 1 and 2 are no longer available for distribution. Check your technical library for copies.

Acknowledgments

Many people have contributed to the development of the LARSYS Educational Package. Valuable suggestions have come from students working with an earlier version of the educational package. You, as a student, can aid in the further development of the materials by returning the evaluation questionnaires which will be made available to you.

Credit is given to S. M. Davis for her imaginative approach to the format, packaging and distribution of this multimedia set of materials, her technical editing skills and her close attention to the details of how the various mini-courses interrelate with one another.

Appreciation is extended to Dr. P. H. Swain, Program Leader for Data Processing and Analysis Research, for his help in defining the needs of the LARSYS Educational Package, his contributions to the planning of the mini-courses and his critical review of the materials.

REMOTE SENSING ANALYSIS:
A BASIC PREPARATION

Instructor's Notes

LARS Information Note 110471, Remote Sensing Analysis: A Basic Preparation, is written as a programmed test. Urge your student to read the Preface first. The material is self-contained and the reader should require no external assistance. Each student should be provided with a personal copy.

If your student is a newcomer to remote sensing, you should suggest additional readings from the Site Library. Select materials that emphasize the discipline orientation of the student. Selections from the LARS Annual Reports might include the following:

<u>Volume</u>	<u>Pages</u>	<u>Subject</u>
1*	all	Concepts
2*	33-43	Data Collection
	47-51	Data Handling
	57-63	DK-2 Data Analysis
	64-67	Future Experiments
	72-75	Satellite Test Site
3	6-58	Agricultural Remote Sensing
	148-160	The Potential for Remote Sensing
	165-171	Data Handling
4	11-41	Data Processing
	52-76	Applications Research
	76-86	Laboratory Studies

*Volumes 1 and 2 are no longer available for distribution.
Check your technical library for copies.

THE LARSYS SOFTWARE SYSTEM:
AN OVERVIEW

Instructor's Notes

This instructional module consists of a prerecorded audio tape and a set of slides or a notebook of illustrations. For group presentations the slide set is recommended. For individual instruction the notebook is recommended.

Students should be briefed on the operation of the tape player (and slide projector for group presentations).

You should emphasize this is an overview and that it is not intended that the students absorb all the details. Have them pay close attention to the set of instructional objectives stated near the beginning of the presentation.

Materials Required: Audio tape and tape player
Slide set and projector (for group presentations)
Notebook of Figures (for individual instruction)

Estimate of Instructor time required: Briefing time: 5 to 10 minutes.

DEMONSTRATION OF LARSYS
ON THE 2780 REMOTE TERMINAL

Instructor's Guide

Preface to the Instructor

This Instructor's Guide is intended to help you give a "first time" demonstration of the 2780 remote terminal.* It is assumed that you are already familiar with the terminal and use the terminal in your daily activities. If you are a knowledgeable but infrequent user of the terminal, you are urged to go thru a "dry run" of the demonstration before presenting it to your students.

Materials required: Student Notes (2 pages)
Control Card decks
Instructor's notes

Time Estimate: The demonstration can be completed in one hour if the demonstrator doesn't talk too much. One and a half hours is typical.

Terminal sign-up and tape drive requirements: To insure access to the terminal and the availability of a tape drive, reserve the terminal and tape drive ahead of time. One tape drive is required.

Steps in carrying out the demonstration

1. Read the Instructor's Guide and Student Notes; locate the required control card decks.
2. Check to see that one of the Multispectral Image Storage Tapes assigned to your terminal site has a copy of run 66000600 on it. If it does, enter the tape number and file number below for easy reference:

Tape TTT = ____; File F = ____.

If it does not, see page 5 of A Survey of the LARSYS Educational Package.

3. Check the control card decks used with this demonstration. Make sure the decks include a RUNTABLE initiation function to call into use the tape with run 66000600 on it. The deck set-up should be:

*With slight modification (deletion of showing how to list a deck), this same demonstration can be used to show how to use the terminals at the LARS computation center.

-RUNTABLE
DATA
RUN(66000600), TAPE(TTT), FILE(F)

where TTT and F are the tape and file number determined in step 2 above.

4. Talk to your student and determine where he is with respect to remote sensing, pattern recognition and LARSYS. See if he has any questions as a result of going thru the material included in the LARSYS Software System - An Overview.
5. Cover the points listed under Objective 1 in the Student Notes. Review these points occasionally throughout the demonstration. For your own reference fill in the blanks below:

Terminal coordinator at this site is _____.
Person to contact if the printer is out of paper or a malfunction occurs is _____.

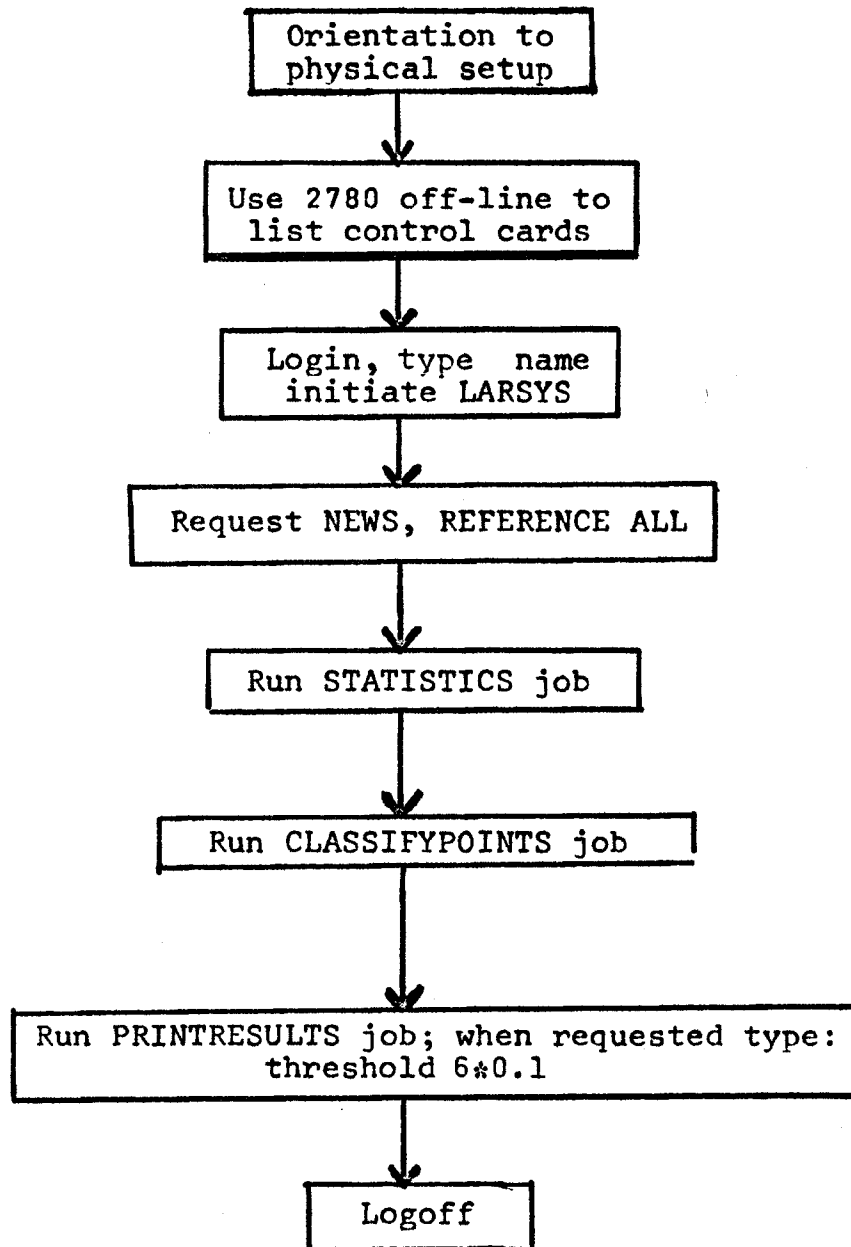
6. Use the terminal off-line to list the control card deck marked "for listing."
7. Login and begin the demonstration. A flow chart and outline of the demonstration appear on the following pages.

Points to emphasize:

LARSYS error messages and diagnostics
The system mode and program mode

8. At the end of the demonstration go over Objective 3 with the student. Make sure he has all the needed material and understands his assignments.

FLOW CHART FOR 2780 DEMONSTRATION



Demonstration Outline

1. Orient student to the physical setup.
 - a. point out terminal documentation, LARSYS User's Manual, bulletin board, etc.
 - b. mention sign-up procedures for terminal and tape drives
 - c. point out and show controls, on/off switches on:
 - card reader/punch
 - printer
 - typewriter
 - data modem
 - d. give student the name of the terminal coordinator and the person to see if a malfunction occurs.
2. Demonstrate use of the 2780 off-line as a card lister.
 - a. using the deck labeled "for listing" demonstrate:
 - card loading
 - mode switch (use off-line position)
 - printer operation
 - b. give listing to student
3. Demonstrate LARSYS Control Commands
 - a. login - (get "on the air") and enter name
 - b. i larsys - (initiate LARSYS)
 - c. news - (this is the system bulletin board)
 - d. reference all - (mention that system has numerous user aids such as NEWS, REFERENCE, and LIST control commands. Student will need the LARSYS control card listing to do his future assignments. Point out how easily control card listings are obtained.)
 - e. msg cp - I'm demonstrating system; if you get this message please respond.
4. Demonstrate how cards are read. Use deck labeled STATISTICS
 - a. point out need for ID card and what happens if you forget the ID card (cards won't read).
 - b. point out need to hit End-of-File before last card is read and how to recover if forgotten (load a blank card, hit EOF and read blank card).
 - c. point out computer response to a successful transfer of cards (typewriter message).

5. Run the STATISTICS job read in above (type 'run larsys')
 - a. As you proceed discuss need to and procedures for reserving tape drives.
 - b. While STATISTICS is running, read in all the remaining control cards (CLASSIFYPOINTS and PRINTRESULTS).
 - c. Demonstrate receiving printer output.
 - d. Demonstrate receiving punched output. Point out why you should use plenty of cards (if you run out of cards you can load more and START again but you may get some duplicate cards).

6. Run the CLASSIFYPOINTS and PRINTRESULTS jobs (type 'run larsys')
 - a. Point out progress messages; they let one know that the program is running.
 - b. Point out how you can receive output from one job while running a second job.

7. Correct (intentional) control card error in PRINTRESULTS deck
 - a. An error was deliberately made on a control card in the PRINTRESULTS program. When asked to type the correct card type:

 threshold 6*0.1

 - b. If you have not already done so, this is a good time to demonstrate how to recover from a typing error. (@ to delete a single character, & to delete a whole line).
 - c. You might also point out that by using the initialization card -TYPE in the card deck, one can then enter control cards from the typewriter.

8. Logoff. Type 'quit.' Obtain printer and punched output.

DEMONSTRATION OF LARSYS
ON A 2780 REMOTE TERMINAL

Student's Notes

Prerequisites:

- a) List the information (without regard to format) contained on a Multispectral Image Storage Tape.
- b) State at least three types of cards used in running LARSYS programs.
- c) List and briefly describe at least 40% of the LARSYS output features covered in the LARSYS Software System - An Overview.

General Description: This phase of the training program introduces you to the hardware you will actually be working with and provides an opportunity to increase your familiarity with the LARSYS system of programs. You will witness the running of several LARSYS jobs from a 2780 terminal. During the demonstration you will see:

the 2780 used off-line as a card lister
the login procedure
user information obtained from the LARSYS control command
card information transmitted from the 2780 to the computer
card punch output being received
the logout procedure

The demonstration takes about 1 hour. You will have ample opportunity to discuss the operations with the demonstrator during the demonstration. At the end of the demonstration you will be given a listing of the control cards used, the typewriter output and the printer output.

After the demonstration you should sit down with the demonstration output and your listing of the LARSYS control commands and cards and go through them step by step in order to gain an understanding of how each control card and each typewriter input is related to the printer output.

After you have completed examining the demonstration output in detail, arrange for a conference with one of the designated tutors.

Objective 1. Upon completion of the demonstration you should be able to:

- a) point to the physical location of the LARSYS User's Manual.
- b) explain the local sign-up procedures.
- c) name the person who acts as terminal coordinator.
- d) name the person to be contacted if the printer is out of paper or if another malfunction occurs.

- e) while standing in the remote terminal area, point to the printer, card reader/punch and typewriter terminal.
- f) point to the control panels of the printer and card reader/punch.

Objective 2. Upon completion of the demonstration you will have witnessed the running of several LARSYS functions from the 2780 terminal. In particular you will have seen:

- a) the 2780 used in the off-line mode as a card lister
- b) user assistance information requested by the LARSYS Control Commands
- c) STATISTICS job
- d) CLASSIFYPOINTS job
- e) PRINTRESULTS job

- f) control statements entered by the card reader
- g) control statement errors corrected by the typewriter
- h) data entered by the card reader
- i) punched output received
- j) printed output received
- k) logout procedure

Objective 3. After the demonstration, with the following items available to you:

- a) a listing of the control cards used in the demonstration
- b) the typewriter output
- c) the printer output,

you should be able to:

- a) relate each typewriter or card command (or set of commands) to the corresponding response of the computer
- b) correctly identify each control card (or typewriter command) as a Control Command, Function Selector Card or Function Control card.

HOW TO USE THE 2780 REMOTE TERMINAL
A "HANDS-ON" EXPERIENCE

Instructor's Notes

Materials required: Student's Notes
Instructor's Notes
Audio Tape
Punched Cards for Listing
LARSYS User's Manual (located in Site
Library)

Estimate of Instructor Time Required:

Briefing student on the preparation of his control cards:
5 minutes.

Checking control cards: 5 to 10 minutes

Getting the student set up, explaining the audio-tutorial
instruction method: 10 minutes.

You will need to be available for help during the time the
student is at the terminal.

Terminal Sign-up and Tape Drive Requirements

Sign up for two hours of terminal time and reserve one
tape drive.

Instructional Objectives

The student will obtain a copy of the instructional objectives
for this mini-course when he lists the punched cards provided.
For your information this listing is included as a part of these
Instructor's Notes.

Before going to the terminal:

1. Check to see that one of the Multispectral Image Storage
Tapes assigned to your terminal site has a copy of run 66000600
on it. If it does, enter the tape number and film number
below for easy reference:

Tape TTT = ____; FILE F = ____.

If it does not, see page 5 of A Survey of the LARSYS Educa-
tional Package.

2. See if your student has a user ID and password assigned to
him. If not, assist in this task.
3. Give student the notes which accompany the audio tape,
the computer tape number and file number used at your remote
site and have the student punch up the control card decks
described in the first part of the student's notes. (Show
student how to operate the key punch if necessary.)
4. Check over the control card decks for errors.

At the terminal:

1. Make sure the terminal is powered up.
2. Explain the general procedure to the student: use of audio tape and notes. Emphasize that you are available for consultation.
3. Demonstrate how to load cards into the hopper, 9-edge down, card weight, etc.
4. Help student conveniently place the tape recorder, notes, etc. at the terminal. Point out location of the LARSYS User's Manual.
5. Start student on his way - answer questions as they arise.

After the demonstration:

1. Show the student how to find the first and last card of his punched output decks. He will have both a binary and a character deck. Show him to distinguish between these.
2. Show the student how to reassemble his punched deck if it is dropped on the floor. (Use sequence numbers in columns 79 and 80.)

***** LISTING DECK FOR 2780 HANDS-ON EXPERIENCE *****

HOW TO USE THE 2780 REMOTE TERMINAL, A HANDS-ON EXPERIENCE 7-3-73

OBJECTIVES FOR 2780 HANDS-ON EXPERIENCE

BY THE TIME YOU FINISH WITH THE TERMINAL TODAY YOU SHOULD BE ABLE TO

USE THE 2780 OFFLINE AS A CARD LISTER

LOGIN

USE THE LARSYS CONTROL COMMANDS TO

A) OBTAIN THE LATEST NEWS FILES FOR ANY OF THE FOLLOWING

SYSTEM
LARSYS
SCHEDULE

B) OBTAIN THE LATEST CONTROL CARD LISTINGS FOR THE LARSYS FUNCTIONS

RECEIVE PRINTER OUTPUT

TRANSMIT A DECK OF CARDS

RECEIVE PUNCHED OUTPUT

*****END OF HANDS-ON LISTING DECK*****

HOW TO USE THE 2780 REMOTE TERMINAL:
A "HANDS-ON" EXPERIENCE

Student's Notes

Estimated time for this demonstration - 2 hours

Prerequisites

- a) Satisfactory completion of Remote Sensing Analysis - A Basic Preparation.
- b) An ability to state, without regard to format, the four types of information contained on a Multispectral Image Storage Tape.
- c) An ability to state the three types of control cards used in LARSYS functions.
- d) An ability to list at least 4 types of output available from the LARSYS functions.
- e) You must have been assigned a user ID and a password.
- f) You should have witnessed a demonstration of the 2780 terminal and studied the printer output and typewriter output resulting from the demonstration.
- g) You should be able to operate a keypunch machine.
- h) Your consultant should give you the tape and file numbers used in this demonstration.

Reference

Skim the material in Section 2 of the LARSYS User's Manual. Then continue with this demonstration. Prior to beginning the demonstration you should keypunch the control cards shown below. (The annotations on the right will help explain the purpose of the cards.)

Control cards for first LARSYS function

<u>Punched on Card</u>	<u>Comment</u>
① ⑩ ID your id	①, ⑩ indicate columns 1 and 10 on card, respectively.
-COMMENT DEMONSTRATION OF STATISTICS FUNCTION	
	This comment will appear at the top of your printer output.
-RUNTABLE	
DATA	
RUN(66000600), TAPE(TTT), FILE(F)	
END	These four cards create a special runtable which allows you to access the Multispectral Image Storage Tape assigned to your remote terminal site. See consultant for tape and file numbers.

*STATISTICS

Tells LARSYS monitor you want to run a job under the statistics processor.

PRINT HIST(C), CORR(C)

PRINT card indicates that histograms and correlation matrices are desired for each class.

PUNCH CHARACTERS

Requests punched output in character format.

CHANNELS 1,2,3,4,5,6,7,8,9,10,11,12

Channels card designates channels for which statistics are to be computed.

OPTIONS HIST(1,8,12)

Options card designates channels for which histograms are desired.

DATA

Signifies the start of data deck

CLASS SOYBEANS

Indicates cards to follow are soybean training fields

66000600	31-13	237	253	1	141	167	1	SOYBN
66000600	36-7	307	327	1	59	81	1	SOYBN

Field description cards for soybean training fields. See next page for format. Just type the cards for now, then ask your consultant to explain how these cards are used. The following are for corn.

CLASS CORN

66000600	36-9	267	283	1	45	61	1	CORN
66000600	36-8	319	341	1	21	31	1	CORN

END

Signifies end of function.

Put a rubber band around the above batch of cards. They will be used in your first LARSYS job.

Now type up the following cards:

①

⑩

ID your id

-COMM DEMONSTRATION OF IDPRINT AND PICTUREPRINT FUNCTIONS

-RUNTABLE

DATA

Hands-On
Student's Notes

-4-

RUN(66000600), TAPE(TTT), FILE(F) Use same tape and file
number you used before.

END

*IDPRINT Requests ID record of run
66000600.

PRINT RUN(66000600)

END

*PICTUREPRINT Requests gray scale map of
area.

DISPLAY RUN(66000600), LINE(1,199,2), COL(1,222,2)

HISTOGRAM COMPUTE Histograms computed.

PUNCH HIST Punch histogram file.

BLOCK RUN(66000600), LINE(1,999,2), COL(1,222,2)

 Gives area for histogram.

CHANNEL 6 Signifies channel desired.

END Signifies end of function.

Put a rubber band around this deck. This will be your second set
of LARSYS functions.

Materials required

- 2 decks of punched cards as specified above
- 1 audio tape entitled "How to use the 2780 Remote Terminal -
a 'Hands-On' Experience"
- 1 set of punched cards (for listing)
- 1 experienced consultant
- 1 copy of LARSYS User's Manual (there should be a copy near
the terminal)

<u>Outline and time estimates</u>	<u>Estimated elapsed time (min.)</u>
1.0 Introduction and Orientation to hardware layout	10
2.0 Using the 2780 offline as a card lister	25
3.0 "Login", enter name, and initiate the LARSYS system	55
4.0 Sample LARSYS jobs	90

Begin the demonstration by having your consultant explain the use of the tape recorder and general procedure to be followed during the demonstration. Your consultant should let you know where he can be reached and you should not hesitate to ask him for help.

After locating yourself physically in the remote terminal area, start the tape recorder.

1.0 Introduction and Orientation to hardware layout

Listen to tape - see Figure 1 on next page.
See outline above.

2.0 Using the 2780 offline as a card lister

Standing in front of the card reader/punch unit:

set mode switch to "off-line"

load "listing deck" cards as directed on tape-see Figure 2.

Heed the warning on tape - if you get a card reader malfunction, try the procedure given in Appendix A. If that doesn't work get your consultant to help.

Move over to the printer controls and press the start button.

Go back to card punch unit; press and hold the start button until the green light comes on.

After the cards have finished, remove the cards from the card reader and press the NPRO button to "clear" the card reader.

Then walk over to the printer and push CARRIAGE STOP button, press CARRIAGE RESTORE button on printer a few times, remove the printer output, and read over the Instructional Objectives for this demonstration, which have just been printed from the cards.

The above steps are summarized in Appendix B.

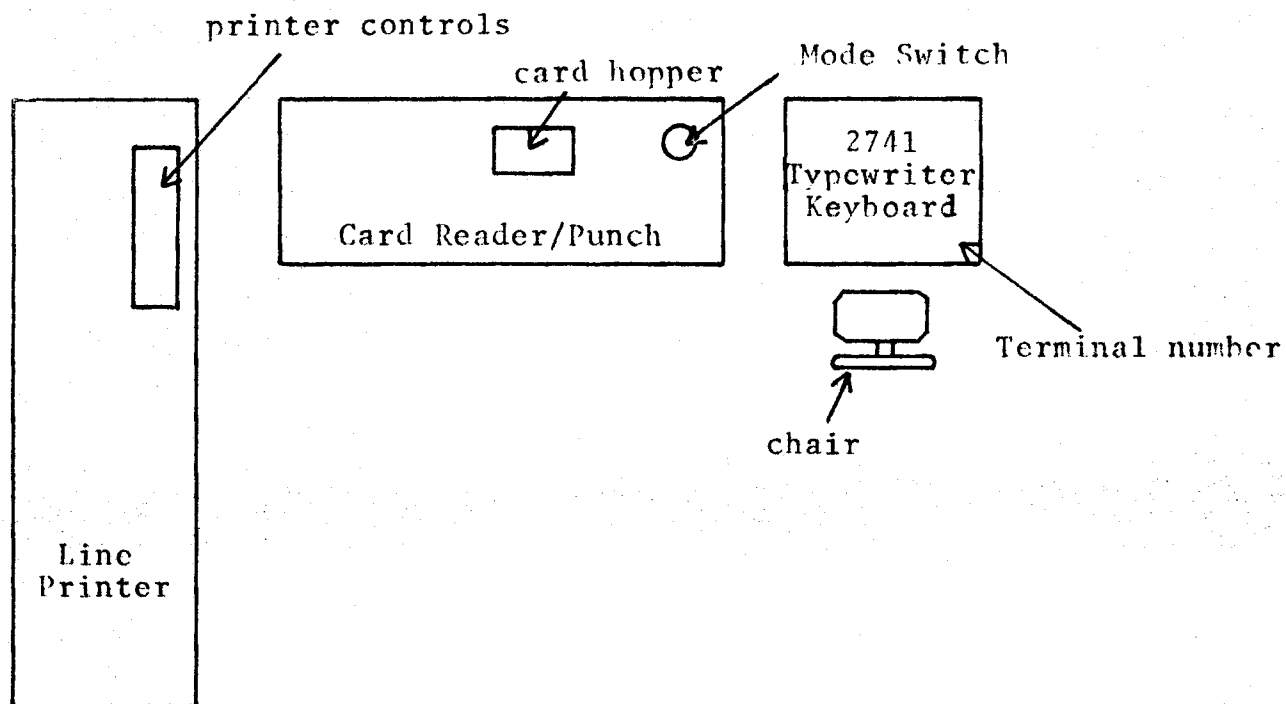


Figure 1

General Layout of the Terminal Area

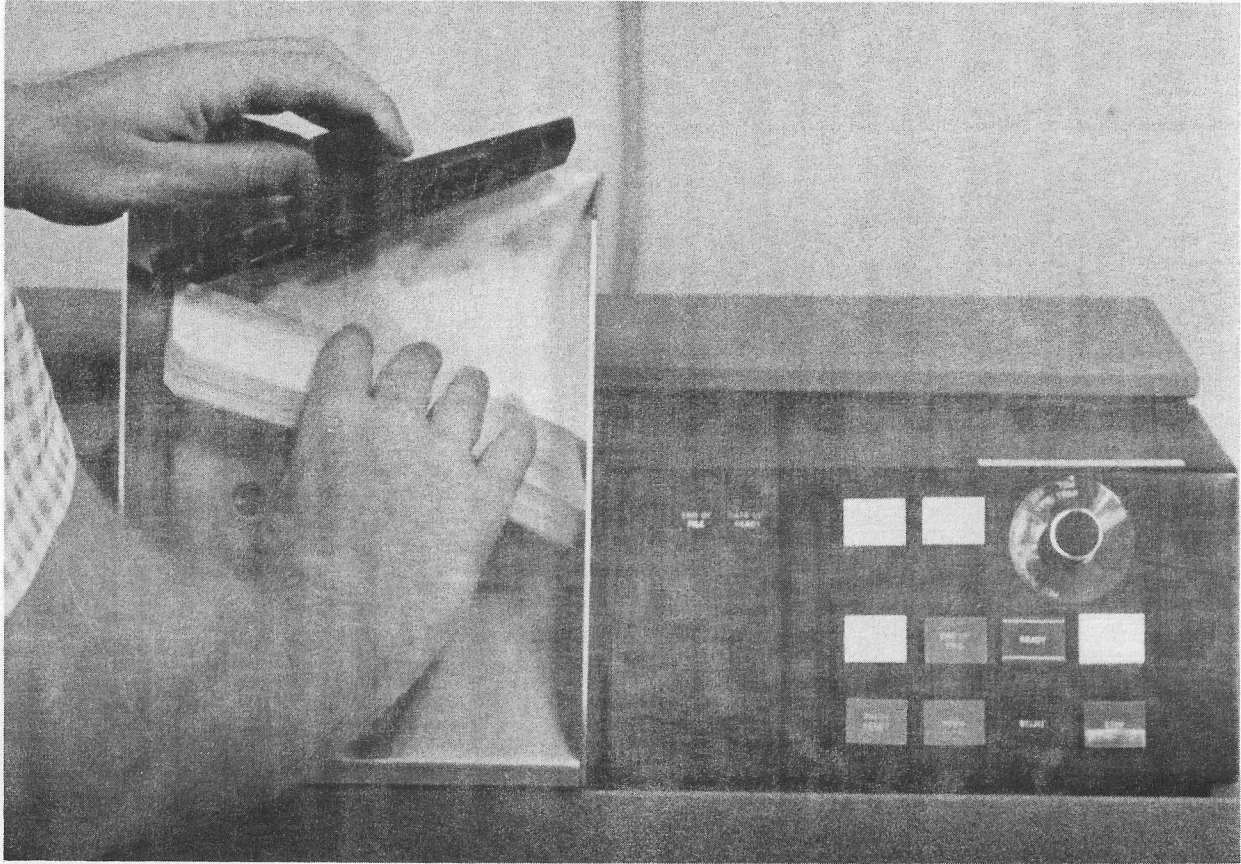


Figure 2
Loading Cards into the Card Hopper

login questl
ENTER PASSWORD:

ENTER NAME: lindenlaub
OPERATORS: ROBIN, ROGER & PERRY
NEXT SCHEDULED SHUTDOWN: 1700 EST SATURDAY
READY AT 08.51.15 ON 05.23/73
CP

you type (and press RETURN)
computer responds
type password (and press RETURN)
type your name (and press RETURN)

i larsys
LARSYS (Ver 3) READY:
T=1.20/1.89 08.51.47

type 'i larsys'

news
REVISED 3/29/72

type 'news' (and press RETURN)

LARSYS VER3 CAN NOW BE INVOKED BY USING EITHER OF THE COMMANDS
I LARSYS I LARSYS 3
YOU CAN OBTAIN MORE DETAILS BY USING THE COMMAND 'NEWS LARSYS'
t=0.87/1.17 08.52.36

Note: response to the NEWS command changes from time to time. You will probably get a different message.

news larsys
T=0.90/1.23 08.53.22

type 'news larsys' (RETURN)

Stand up and:
set mode switch to REC
press START button to printer.
When printer is finished:
move mode switch to OFF LINE
press CARRIAGE STOP on printer
press CARRIAGE RESTORE a few times.
Remove printer output.
Return to typewriter terminal.

reference statistics
T=0.98/1.44 09.02.14

type 'reference statistics'
(RETURN)

Stand up and repeat above procedure to obtain printer output.

Optional - If you want a complete listing of LARSYS commands type 'reference all.' Otherwise continue.

4.0 Sample LARSYS jobs

Review the objectives of this demonstration.
Locate your first LARSYS control deck (*STATISTICS) and move to the card reader.
Set mode switch to TSM/TRSP.
Load cards into hopper.
Press END OF FILE.
Press START, holding it until the READY light comes on, cards should read in.

After cards have been read:
set mode switch to OFF LINE
clear reader by pressing NPRO
remove cards from the reader.

type 'run larsys' (RETURN)

run larsys ←
CARDS XFERED BY FLEXLAB1
EXECUTION BEGINS...

I0198 STATISTICS FUNCTION REQUESTED (STASUP)
I0034 ALL CONTROL AND DATA CARDS HAVE BEEN READ (STAIN)
I0200 TRAINING FIELDS NOW BEING PROCESSED (STAIN)
I0201 STATISTICS BEING CALCULATED FOR CLASS SOYBEAN (LEARN)
I0002 TAPE 1000 HAS BEEN REQUESTED ON UNIT 0181 (MOUNT)

DEV 181 ATTACHED
I0003 TAPE READY...EXECUTION CONTINUING (MOUNT)
I0036 DESIRED RUN FOUND...66000600 (GADRUN)
I0201 STATISTICS BEING CALCULATED FOR CLASS CORN (LEARN)
I0209 COINCIDENT SPECTRAL PLOTS(S) PRINTED (MULSPC)
I0208 STATISTICS BEING PUNCHED (PCHSTA)
I0199 STATISTICS FUNCTION COMPLETED (STASUP)
I0004 END OF INPUT DECK - RUN COMPLETED (LARSMN)
DEV 181 DETACHED
T=13.11/16.43 09.09.48

Get your printer output by:
setting mode switch to REC
press START on line printer.

After output stops:
press CARRIAGE STOP
press CARRIAGE RESTORE several times
remove printer output from printer.

Get your punched output by:

loading blank cards into hopper
press and hold START until cards start through the punch
after punching stops, move mode switch to OFF LINE
remove and store excess blank cards
press and hold NPRO to clear readers.

There is one more program to be run.

run larsys ← *type 'run larsys' (RETURN)*

Notice appearance of "beep tone." Secure your printer output.
Discussion - why the error occurred.

E-messages and I-messages: reference Appendix III of
LARSYS User's Manual

To correct the error-

Locate your second deck (*IDPRINT and *PICTUREPRINT),
load into the card reader, and read in.

run larsys ← *type 'run larsys' (RETURN)*
CARDS XFERED BY FLEXLAB1
EXECUTION BEGINS...

I0065 IDPRINT FUNCTION HAS BEEN REQUESTED (RUNSUP)
I0114 IDPRINT FUNCTION COMPLETED (RUNSUP)

I0092 PICTUREPRINT FUNCTION REQUESTED (PICSUP)
I0237 ALL CONTROL CARDS FOR PICTUREPRINT HAVE BEEN READ (PICRDR)
I0002 TAPE 1000 HAS BEEN REQUESTED IN UNIT 0181 (MOUNT)

DEV 181 ATTACHED

I0003 TAPE READY...EXECUTION CONTINUING (MOUNT)
I0036 DESIRED RUN FOUND...66000600 (GADRUN)
I0082 100 LINES HISTOGRAMMED (HISTD)
I0084 HISTOGRAM(S) READY TO BE PUNCHED (HISTD)
I0098 100 LINES DISPLAYED FOR CHANNEL 6 (PIC1)
I0093 PICTUREPRINT FUNCTION COMPLETED (PICSUP)
I0004 END OF INPUT DECK - RUN COMPLETED (LARSMN)

DEV 181 DETACHED

T=6.12/9.30 09.17.54 8

type 'quit' (RETURN)

quit ←

CONNECT=00:27:14 VIRTCPU=000:25.20 TOTCPU=000:35.00
LOGOUT AT 09.18.20 ON 05/23/73

cp-67 online xd.65 qsyosu

Pause - turn the cassette over, rewind to the beginning of the tape, and begin side 2 of the audio tape.

Obtain your printer output. See Appendix C if you need more detailed instructions.

Obtain your punched output. See Appendix C if you need more detailed instructions. Save your cards and discuss them with your consultant after completing the demonstration.

Save these notes, your typewriter output and your printer output for future reference.

Let your consultant know how you did.

Appendix A: MALFUNCTION RECOVERY PROCEDURES

Cards won't read

Remove cards from hopper.
Press, and hold for a few seconds, the NPRO* button.
Pick up any cards that come out of the reader,
reassemble your deck, reload the cards and try again.

Typing Errors

One (or up to a few) letter(s) in error.
type an @ symbol for each letter in error,
then continue with your message.

Example:

RUN LARTY@@SYS would be interpreted as

RUN LARSYS

Deletion of a whole line.
type †, then the desired line.

Example:

NEWS LARYS† REFERENCE LARSYS would be interpreted as

REFERENCE LARSYS

System Error Messages

?CP-system is in the CP mode, you have just typed an invalid
CP command.
E116-'COMMAND' IS NOT A VALID CONTROL COMMAND (EXCOMD)
System is in the LARSYS mode, you have just typed an
invalid command.

*NPRO stands for non-process run out.

Appendix B: USING 2780 AS A CARD LISTER

mode - OFF LINE

Load Cards

Press START on printer

Press START on card reader and hold until READY light comes on.

.

.

cards will be listed

.

.

.

Press CARRIAGE STOP on printer

Clear card reader (NPRO)

Remove cards

Press CARRIAGE RESTORE on printer

Remove listing

Appendix C: TRANSMITTING DATA TO AND RECEIVING DATA FROM THE
MAIN COMPUTER

To transmit cards

load cards in hopper
mode switch to TSM/TRSP
press END OF FILE
press and hold START until READY light comes on
:
wait until all cards are read
:
move mode switch to OFF LINE
press NPRO
pickup your cards

To receive printer output

mode switch to REC
press START on printer
:
wait for output to finish
:
press CARRIAGE STOP
hit CARRIAGE RESTORE a few times
remove printer output from back of printer
put mode switch in OFF LINE position

To receive punched output

mode switch to REC
load blank cards in hopper
press START
:
wait for punching to stop, pick up your cards
:
mode switch to OFF LINE
store extra cards
clear punch by pressing NPRO

Materials Required

Problem statements for students
Instructor's Notes

Instructor Time Estimate

Interaction with students before and after each exercises:
10 to 15 minutes per exercise.

Sequence of problems

The problems are intended to be given in the following order:

Reference ALL
LARSYS Control Commands
Gray Scale Printouts
Graph Columns
Graph Lines
Color Panels

General instructional procedure

It is suggested that you assign these problems one at a time and interact with the student between problems.

For each problem the recommended approach is to:

- a) Go over the problem statement with the student.
Discuss which processing function he will be using.
- b) Have student type up the control cards.
- c) Check over the control cards, point out errors or alternate approaches if you wish.
- d) Have student run program.
- d) Discuss results.

Encourage your students to use the LARSYS User's Manual as a reference. Encourage your students to use the -CHECKOUT procedure to check for control card errors.

If appropriate at your location, have the student run some jobs using the BATCH mode.

In all exercises requiring access to a Multispectral Image Storage Tape the student should be encouraged to use a personal runtable using the card sequence

```
-RUNTABLE  
DATA  
RUN(xxxxxxxx), TAPE(TTT), FILE(F)  
END
```

See "Note to Instructor-Consultants" in A Survey of the LARSYS Educational Package at the beginning of this volume.

Reference ALL

This exercise is intended for all students who did not get a complete listing of all LARSYS Control Commands, Initiation Function Control Cards and Processing Function Selector and Control Cards.

Login to the computer, and, after taking care of your ID, password and name, type the command:

reference all

Keep the printer listing for future reference.

Instructor's Notes

1. *Check with your student to see that he has a 'Reference All' listing. If he already has one, skip this problem.*
2. *No control cards are required. Student merely has to review how to login, get his listing and quit.*

LARSYS EXERCISES
PROBLEM STATEMENT 2

Instructor's Notes

LARSYS Control Commands

The purpose of these exercises is to reinforce the login procedure and to illustrate use of some of the LARSYS Control Commands.

Login and:

- a) obtain the NEWS file pertaining to the system operation SCHEDULE
- b) obtain the latest LARSYS news file
- c) type the command LIST
- d) obtain the RUNTABLE entry for run 7205070

Instructor's Notes

1. *No control cards are required for this exercise. It is designed to give the student practice on the login procedure, issuing control commands and obtaining printer output.*

Gray Scale Printouts

Set up the control deck to obtain a single width gray scale printout of lines 560-949 of run 66000600. Show channels 1 through 12. Run the job.

Instructor's Notes

1. *Your student will probably need help in deciding which processing function to use. Try to get him to discover the answer himself by directing him to his REFERENCE ALL output and the LARSYS User's Manual.*
2. *Explain the set up for a user runtable so that your student will use the tape that has been reserved for instructional purposes at your remote terminal location.*
3. *You can use your student's output from this exercise to illustrate the value of multispectral data. Show how some field boundaries are more easily detected in certain channels.*
4. *You might want to encourage your student to use the -CHECKOUT procedure before running this job.*
5. *Point out how you might want to use the PUNCH control card if you expect to make additional gray scale printouts of the same area. (Saves computing the histograms again.)*

*For easy reference run 66000600 is stored on Tape TTT = _____;
File F = _____.*

Graph Columns

Graph columns 49, 59, 69 lines 408 to 503 of run 66000600.
Show data from the .44-.46, .62-.66 and .80-1.00 micrometer
channels.

Instructor's Notes

1. The problem statement emphasizes the wavelength bands of the channels. Student will have to refer to IDPRINT output to find the corresponding channel numbers.
2. Let the student set up the control card deck. As long as it will work, let it run. Afterwards you may want to point out various ways of setting up the control cards so as to get desired types of graphs (not too many plots on one set of axes, etc.).

For easy reference run 66000600 is stored on Tape TTT = _____;
File F = _____.

Graph Lines

Graph line 708 of run 66000600. In which channel, if any, is the road down the middle of the flightline more pronounced?

Instructor's Notes

1. Students will have to decide which channels they want.
2. A common blunder is to plot all 12 channels on the same graph. This results in a mass of symbols. Three or four channels per graph works out better.
3. If appropriate at your location, you may want your students to run this job in the batch mode.

For easy reference run 66000600 is stored on Tape TTT = _____;
File F = _____.

Color Panels

Run 66005200 is a low level flight over a set of color panels on the ground. These panels are used to obtain data which help in calibrating the aircraft scanner data.

The panels are located between line 400 and 1000 and columns 315 and 425. Obtain representative gray scale printouts of this area and determine the row and column boundaries of the color panels. Then select a particular panel and obtain lineprinter output of the data values for all points within the panel boundaries. Show the data for a representative set of channels.

Instructor's Notes

1. Before starting student on this problem be sure a copy of run 66005200 is on the tape dedicated to instructional use at your remote terminal location. If a copy is not available you can make one by running

```
*DUPLICATERUN
FROM RUN(66005200)
TO TAPE(TTT), FILE(F)
END
```

For your future reference:

TTT = _____, F = _____

at this location for run 66005200.

Student should be encouraged to use a personal runtable when running this exercise.

2. This run has only 6 channels. Suggest you let the student stumble into this himself. Then point out the value of the ID record (IDPRINT) when working with a new run.
3. Student must decide for himself what a representative set of channels is. Channel 5 shows the panels quite well.
4. The data for line 431 does not exist and a message to this effect will appear on the gray scale printout. Let the student discover this for himself and use the opportunity to point out the many diagnostic features built into LARSYS.

LARSYS Exercises
Instructor's Notes

-2-

5. Panels are in the vicinity of 687-712, columns 340-378. The degree to which the panels show up the gray scale depends on how large a percentage of the area the panels occupy compared to the area histogrammed to determine gray levels.
6. For more information on the color panels and this run see LARS Information Note 102171, Imagery Enhancement through Data Processing by T. Riemer.

For easy reference run 66005200 is stored on Tape TTT = _____; File F = _____.

GUIDE TO MULTISPECTRAL DATA
ANALYSIS USING LARSYS

Instructor's Notes

Materials Required

Student copy of Guide to Multispectral Data Analysis using LARSYS by J. C. Lindenlaub

Student copy of Pattern Recognition Notes by P. H. Swain

Reference copy of LARSYS User's Manual

Reference copies of LARS Information Notes:

120371 - The Importance of Ground Truth Data in Remote Sensing by R. M. Hoffer

102670 - Random Noise in Multispectral Classification by S. Whitsitt

062273 - Analysis Research for Earth Resource Information Systems: Where Do We Stand? by D. A. Landgrebe

020871 - Comparison of the Divergence and β -Distance in Feature Selection by P. H. Swain, T. B. Robertson and A. Wacker

"One Man's Analysis of Run 71053900"

Instructor's Notes

1. The philosophy taken in preparing this part of the LARSYS Education Package is described in the "Preface to the Student" section of the document. Please read over this section.

2. It is suggested that you monitor the progress of your student frequently - you should plan on talking to him at least once during each step of the analysis sequence. Experience indicates that frequent student/instructor conferences of short duration are more beneficial than longer duration lecture sessions.

3. Each remote terminal site has been provided with a copy of "One Man's Analysis of Run 71053900." The analysis of remotely sensed multispectral data is very much an art and you should not expect your student's analysis to match the results of the "school solution" we have provided. There is no single "correct" analysis. In particular, it is doubtful that a person analyzing a flightline for the first time would obtain as high a degree of correct classification as has been achieved on the analysis provided to you. Consider our solution a "crutch" but not an "authority."