(NASA-TM-82486) PHASE LINEAR INTERFEROMETER EXPERIMENT MAINTENANCE AND CALIBRATION MANUAL (NASA) 14 p HC A02/MF A01 CSCL 14B

N82-29581

Unclas

G3/35 28549

NASA TECHNICAL MEMORANDUM

NASA TM-82486

PHASE LINEAR INTERFEROMETER EXPERIMENT MAINTENANCE AND CALIBRATION MANUAL

By Steven J. Goodman
Space Sciences Laboratory

June 1982

NASA

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO.	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.
NASA TM-82486		

4. TITLE AND SUBTITLE	5. REPORT DATE
Phase Linear Interferometer Experiment Maintenance and Calibration Manual	June 1982
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT #
Steven J. Goodman	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. WORK UNIT NO.
George C. Marshall Space Flight Center Marshall Space Flight Center, Alabama 35812	11. CONTRACT OR GRANT NO.
	13. TYPE OF REPORT & PERIOD COVERED
12. SPONSORING AGENCY NAME AND ADDRESS	Technical Memorandum
National Aeronautics and Space Administration Washington, D.C. 20546	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

Prepared by Space Sciences Laboratory, Science and Engineering

16. ABSTRACT

The Phase Linear-Interferometer Experiment (PLIE) Maintenance and Calibration Manual describes the necessary procedures for assuring continuous lightning sferics data collection at Marshall Space Flight Center. A sister station is operating continuously at Southwest Research Institute. The PLIE is being evaluated as a candidate RF sensor to support the space-based optical lightning mapper system.

17 KEY WORDS	18. DISTRIBUTION STATEMENT
Lightning Sferics	Unclassified – Unlimited

19 SECURITY CLASSIF. (of this report)	20. SECURITY CLASSIF. (of this page)	21 NO. OF PAGES	22 PRICE
Unclassified	Unclassified	12	NTIS

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

TECHNICAL MEMORANDUM

PHASE LINEAR INTERFEROMETER EXPERIMENT MAINTENANCE AND CALIBRATION MANUAL

1.0 INTRODUCTION

The phase linear interferometer experiment (PLIE) began April 3, 1982, when Dick Johnson (Principal Investigator) of Southwest Research Institute (SWRI) and Gerry Smith (SWRI) completed the installation and checkout of the PLIE located at Anderson Road on Redstone Arsenal.

2.0 DOCUMENTATION

The following documentation was provided to Marshall Space Flight Center at that time:

Quantity	Description
1 ea.	Schematics for Phase Linear DF
1 ea.	Computer Printout of Applications Software in Fortran IV and Assembly Languages
1 ea.	Data General RDOS/DOS User's Handbook
1 ea.	Data General Learning to Use Your RDOS/DOS System
1 ea.	Data General Specifications of the Cabinet Mounted Components
1 ea.	Data General Specifications of Free-Standing Components
1 ea.	Data General Technical Manual 6052 6053 Display Terminal (Preliminary)
1 ea.	Data General Technical Manual NOVA 3
1 ea.	B&K-Precision Instruction Manual for Model 1477 15 MHz, Triggered Sweep Dual-Trace Oscilloscope
1 ea.	Newport 400 AS Digital Panel Meter wner's Manual
1 ea.	Dranetz Engineering Labs Instruction Manual for Phasemeter
1 ea.	Kinemetrics Operating and Service Manual Model 468-DC Satellite Synchronized Clock
1 ea.	RACAL Technical Manual for RA6790/GM HF Receiver RC1 84249

3.0 OPERATING PROCEDURES FOR PLIE

3.1 Introduction

Normal operating mode is 24-hr data collection. The only applications program running on the PLIE NOVA 3 computer is called "MSFC." There are a number of useful Real-time Disk Operating System (RDOS) commands that are used with data acquisition, disk initialization, and system bootstrapping which will be discussed in paragraph 3.3. The PLIE hardware is shown in Figure 1.

3.2 MSFC

The software program entitled MSFC has the following legal command codes which are entered by typing three numeric characters, followed by a carriage return. The commands are:

101	Start up with new data disk
102	Resume logging from shutdown
103	Stop collecting data
104	Display all data histogram
105	Display phase linear histogram
106	Do not display histogram.

Command 101 should only be used to initialize a new disk when swapping in a full data disk for a new one. Under no other circumstances should this command be used. The 101 command fills the 9600 disk blocks on a given disk with the value "-1" and therefore this command will destroy any and all data files. It takes about 3 min to complete this operation.

Command 102 is required to activate data collection and should be used after a system shutdown (no disk swapping), after aborting the MSFC program, and after a cessation of data collection (Command 103). The PLIE should always have Command 102 running before the operating or maintenance personnel leave the DASHER console or the RF Trailer (Trailer No. 79046). Command 102 searches the disk for the next "-1" value and begins writing data into this disk block. This process can take up to 3.5 min.

Command 103 halts data collection (log-off). This command should be used prior to all system shutdowns and prior to command line interpreter (CLI) commands (i.e., GTOD, DEBUG, RELEASE, FPRINT, etc.).

Command 104 will display a histogram of all data (phase linear and non-phase linear) on the CRT. For close-in storms the ratio of non-phase linear to phase linear events is at least 20 to 1. The display format is frequency versus azimuth (in 6 degree increments).

Command 105 will display a histogram of the phase linear data only (in the frequency versus azimuth format). During high flash rate situations, the 105 command should not be invoked because some data will be lost (i.e., not written to the disk data file).

Lastly, Command 106 will erase the histogram display and clear the CRT except for the flashing cursor. This command should follow the 104 or 105 command during any session at the terminal and the intensity knob on the front of the terminal should be turned off before leaving the trailer.

3.3 Special Procedures

A) Remove A Filled Disk, Insert a New Disk, and Initialize

Step	Key-In (with Carriage Return)	Comments
1	103	Halts data collection
2	RELEASE DP0	Logically removes a disk directory (DP0) from the system
3	CLEAR/A/D/V	Clears file use count/sets device use counts to zero/verifies files cleared on the console
4	RELEASE DP0F	Logically removes (the master) disk directory DP0F from the system

(After steps 1 through 4 a R prompt will be returned and after Step 4 is completed the system responds with MASTER DEVICE RELEASED).

Now switch the disk drive status switch from READY to LOAD. Wait for click (about 10 sec). The platter has been disengaged and the unit can be pulled out away from the rack (the tabs on either side of the disk pack need to be pulled down to release the disk). Remove the disk by pulling up the handle and moving the lock on top of the disk to the left. Pull out the disk and ship to SWRI. Install a new disk (found on the rack behind the CRT). Do not use the blue disk. Install the new data disk, close the disk pack drawer, lock the tabs, and switch the status switch from LOAD to READY. When the READY light comes on, turn the key on the NOVA computer panel from the LOCK to ON position. Make sure the data toggle switches 0, 11, 12, 14, and 15 are set. Next hit the STOP/RESET switch (do a STOP followed by a RESET). Hit the PRELOAD PROGRAM switch and turn the key from the ON to the LOCK position. The computer should have a FILENAME? prompt on the CRT. The new disk has been successfully booted.

Step	Key-In	Comments
5	DP0F:	You respond to boot query with name of executable system program

The computer next asks for date and day. The proper response is

Step	Key-In	Comments
6	MM DD YY	Input date (GMT month, day, year)
7	HH MM SS	Input time (hour, minute, second in GMT)

(NOTE: If the computer responds with PARTITION IN USE prompt, key in CLEAR/A/D/V and continue.)

Step	Key-In	Comments
8	INIT DP0	Initializes a directory called DP0 for I/O access
9	MSFC	Gives menu for mode selection
10	101	Choose command 101 to initialize disk with values of -1 (this takes about 3 min. The computer will respond with DISK INITIALIZATION COMPLETE).

B) Alphanumeric Display of Data in Octal Format

Key-In (with CR)	Comments
FPRINT/Z FRAMES.DA	Scrolls output data in octal format Col. 1 - word # Col. 2 - azimuth Col. 3 - elevation Col. 4 - day Col. 5 - time
CNTRL-S	halts scrolling
CNTRL-Q	continues scrolling
CNTRL-A	aborts program

C) Determine Remaining Disk Blocks for a Given Disk

Step	Key-In (with CR)	Comments
1	DEB MSFC	debugs program MSFC
2	.MAIN-2+1161	"002401" returned - contents of register
3	"ESCAPE" B (no CR) (hit the escape key and type B)	types in "$" inserts a breakpoint at " 1" on disk
4	"ESCAPE" R (no CR) (hit the escape key and type R)	runs the program from the beginning to the breakpoint. MSFC options returned
5	102	resumes logging. After a while the value "7B RE. SC+215" is returned
6	1267+7/	"021544" value returned for example; this is the octal value of the next available disk block. This says 9060 of 9600 disk blocks have been used.

Step	Key-In (W/CR)	Comments
7	ESC,D	type in ESC,D. This removes the breakpoint.
8	ESC,P	type in ESC,P - resumes normal operation. Computer responds with "DISK INITIALIZATION COMPLETE"

D) Restoration of System

Follow front panel switch, STOP/RESET and PROGRAM LOAD procedures after Step 4 in Section A.

Step	Key-In (with CR)	Comments
1	"FILENAME:" FBOOTSYS	Install blue disk as you would a data disk and respond to "FILENAME:" command with FBOOTSYS instead of with "DP0F:"
2	MM DD YY	input month, day, and year (GMT)
3	HH MM SS	input hours, minutes, and seconds (GMT)
4	BOOT BOOT	installs bootstrap
5	DP0F	type in boostrap device specifier
6	Y	clear buffer; read a page from input file. Turn lock key to "ON". Hit STOP/RESET switch on computer console; hit PROGRAM LOAD switch; turn key to "OFF". System should respond with "FILENAME:?"
7	FBOOTSYS	boot command
8	INIT/F DP0F	Creates System Directory
9	MOVE/A/V DP0F	copy all files from the current directory to DP0F and verify (copies programs on blue platter to fixed platter). "R" prompt says MOVE completed
10	RELEASE DP0F	master device released
11	CLEAR A/D	clears all files and sets device counts (RDOS) to zero
12	Release DP0	remove blue disk and now install a data disk

E) Calibration of Receivers

(Requires HP 8640B or equivalent 2.001 MHz signal generator.)

Remove cable W201 P2 from connector J1 on back of equipment rack (see arrow in Fig. 2). Apply the 2.001 MHz signal to connector J1. Set output level of signal generator to -70 dB and the variable level to 0 dB.

Set the scope on the equipment rack to 2 ms/cm horizontal sweep. There should be two traces on the scope. Adjust the IF level on each RACAL HF receiver (see arrow in Fig. 3) for a 2-cm scope deflection. Set the scope for 2 V/cm fullscale deflection and route the cable on the scope panel from the slave to the threshold jack (see Fig. 4). Check the reference level.

Adjust the signal generator to -80 dB. The threshold level should drop to the reference level. If pulses are less than 2-cm wide, while connected to threshold jack, there is no problem.

The purpose of the threshold check is to assure that data are received at -70 dB, but not at -80 dB. (The threshold at SWRI will be the same as the threshold setting at MSFC.)

Return the cable to the slave receiver at the scope panel, set the signal to DC, 0.2 V/cm, Ch B. Reconnect cable W201 P2 to connector J1. The calibration procedure is completed. Refer to the Technical Manual for RA6790/GM HF Receiver RC1 84249 for more details.

Figure 1. PLIE installation.

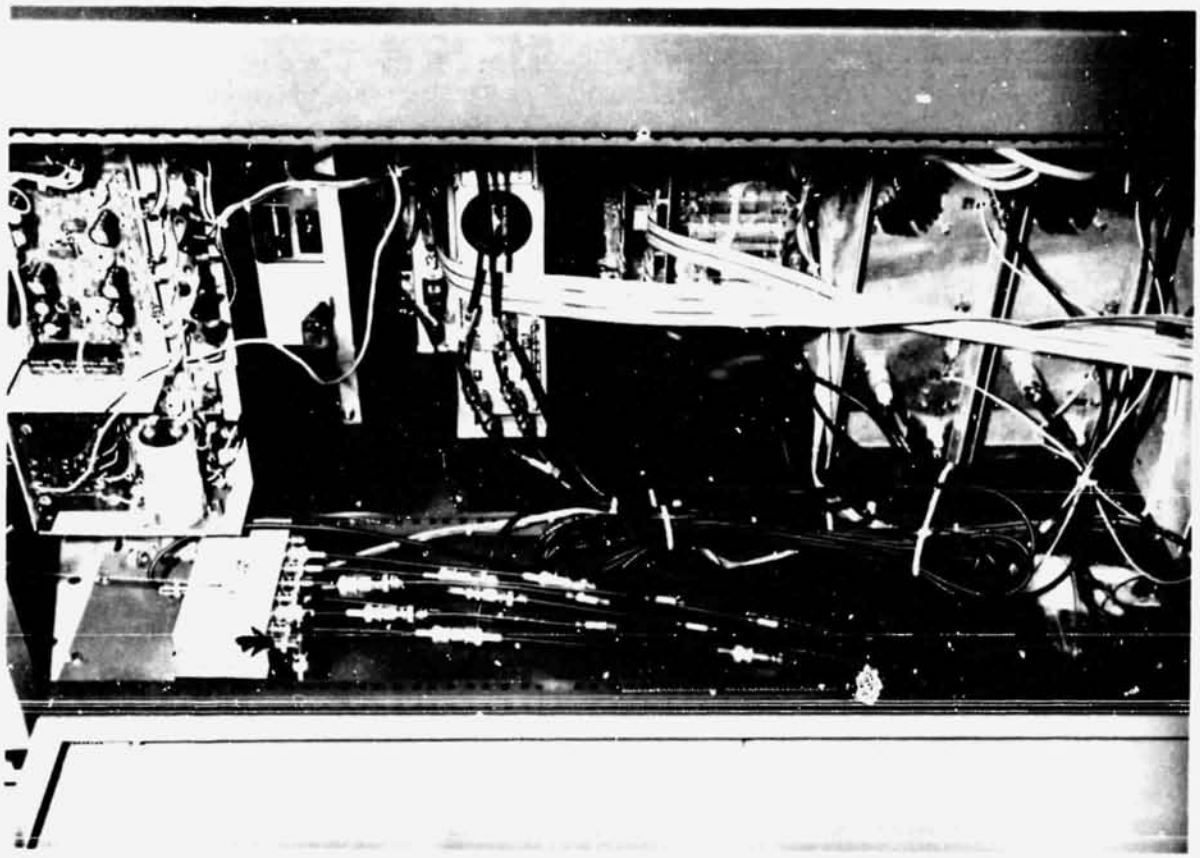

Figure 2. Rear view of equipment rack. Arrow points to connector J1.

Figure 3. View of RA 6790/GM HF receiver. Arrow points to IF gain potentiometer.

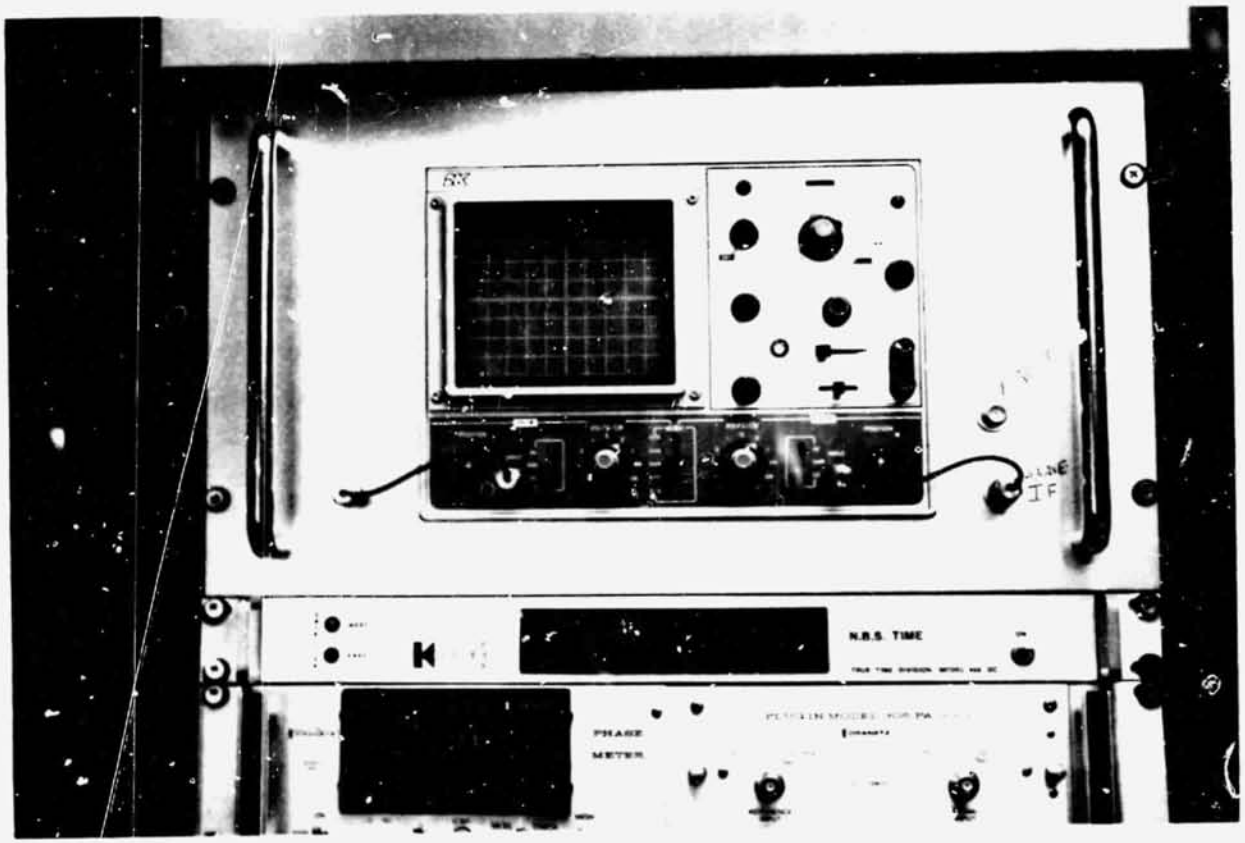

Figure 4. View of scope. Thresh and slave IF connectors are marked.

APPROVAL

PHASE LINEAR INTERFEROMETER EXPERIMENT MAINTENANCE AND CALIBRATION MANUAL

By Steven J. Goodman

The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or nuclear energy activities or programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

A. J. Dessler
Director, Space Sciences Laboratory

☆U.S. GOVERNMENT PRINTING OFFICE 1982-546-071/7 REGION NO. 4