28
2-2-81 25/6 NTS
SAND80-2143

UNLIMITED RELEASE

①
R1622

MASTER

STRATEGIC PETROLEUM RESERVE
DATA ACQUISITION SYSTEM

NOTICE

PORTIONS OF THIS REPORT ARE ILLEGIBLE.

It has been reproduced from the best available copy to permit the broadest possible availability.

P. D. MERILLAT
A. G. BAUER

Prepared by Sandia Laboratories, Albuquerque, New Mexico 87185
and Livermore, California 94550 for the United States Department of
Energy under Contract DE-AC04-76DP00789.

OCTOBER 1980

Sandia National Laboratories
energy report

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Issued by Sandia National Laboratories, operated for the United States Department of Energy by Sandia Corporation.

NOTICE: This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, any agency thereof or any of their contractors or subcontractors. The views and opinions expressed herein do not necessarily state or reflect those of the United States Government, any agency thereof or any of their contractors or subcontractors.

Printed in the United States of America

Available from

National Technical Information Service

U. S. Department of Commerce

5285 Port Royal Road

Springfield, VA 22161

NTIS price codes

Printed copy: \$9.00

Microfiche copy: A01

SAND--80-2143

DE81 011118

UC-92

SAND80-2143
Unlimited Release
October 1980

STRATEGIC PETROLEUM RESERVE DATA ACQUISITION SYSTEM

Paul D. Merillat
Project Engineering Division 1759

and

A. G. Bauer
SPR Geotechnical Division 4543

Sandia National Laboratories
Albuquerque, NM 87185

ABSTRACT

The Strategic Petroleum Reserve Data Acquisition System is a general purpose, digital data acquisition system designed for field use in the DOE's Strategic Petroleum Reserve testing and monitoring program. The system is computer driven, under the control of an operator. The system is designed to allow the operator to perform pre-test system configuration; test monitoring and control; and post test analysis.

This document is a system description and an operator users manual. Topics covered include: configuration and running on-line tests, software documentation, and maintenance programming information.

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

TABLE OF CONTENTS

	<u>Page</u>
CONFIGURATION AND RUNNING ON-LINE TESTS	5
Introduction	6
General Low Speed Description	7
General High Speed Description	11
SPR--Program Directory	16
M02AF--Create or Alter Low Speed Configuration Table. . .	18
CVTRW--Convert to Real World Units Function Subprogram. .	31
M08AF--Create or Alter High Speed Configuration Table . .	33
M01AN--Run On-Line Data Acquisition System	45
M17AN--Shutdown After On-Line Failure	63
 MONITOR AND ANALYSIS PROGRAMS--LOW SPEED	 65
B00AN--Display Low Speed Configuration and Status	66
M05AN--List Low Speed Sensor Readings	69
M07AN--Dynamic Display of Low Speed Sensor Readings . . .	72
J00AN--Plot Readings of Low Speed Sensors	75
M06RU--Load Low Speed Data From Tape to Disc	83
 MONITOR AND ANALYSIS PROGRAMS--HIGH SPEED	 85
M13AN--Display High Speed Configuration and Status	86
M19AN--Dynamic Display of Disc Event Space Status	89
B02AN--Lock or Release Disc Event Space	92
M20AN--Plot High Speed Channel	94
M12AN--Verify Level 1 Trigger	98
M22AN--Verify Preston Event Format on Disc	102
M21RU--Load High Speed Events From Tape to Disc	103
 MAINTENANCE PROGRAMMING INFORMATION	 109
Hardware Environment	110
Structure of Low Speed On-Line Programs	116
Structure of High Speed On-Line Programs	123
Structure of Programs in the HSDAS CPU	130

TABLE OF CONTENTS (CONT'D)

	<u>Page</u>
The SPR Utility Library	.134
Programming Standards	.137
The Program Production Library	.143
Data Structure Definitions	.154
File Definitions	.165
Program to Program Messages	.176
Program Naming Convention	.179

SECTION I
CONFIGURATION AND RUNNING OF ON-LINE TESTS

INTRODUCTION

The Strategic Petroleum Reserve (SPR) data acquisition system is capable of collecting and recording data from up to 120 low speed sensors and up to 12 high speed seismic channels.

The intended use of the system is to establish data collection and analysis techniques involving a wide array of sensors which can be used to monitor various aspects of the salt caverns being used in the Strategic Petroleum Reserve project. The design does not limit the use of this system to this specific goal.

Because of the experimental nature of this activity, one of the primary design goals was that of flexibility. The user has a great deal of freedom to determine what sensors he wishes to use and how to configure them in the system.

This manual details the steps which are required to be taken by the user in order to configure, run, and monitor the real time collection of data. This manual also includes a section directed to the person or group who will maintain and extend the software.

The first section describes how to set up and run an on-line data acquisition test. The second section explains how to monitor the low speed data collection and the third section

explains how to monitor the high speed data acquisition. The last section details the system design from a programming point of view and is not required reading for operations personnel.

LOW SPEED DATA ACQUISITION

The SPR data acquisition system provides the ability to read low speed data from a variety of sensors. These sensors may provide analog output in the form of voltage measurements or resistance measurements. The algorithm to convert from volts or ohms to real world units such as degrees is completely arbitrary and is supplied by the user.

There may be up to a total of 120 sensors connected to the system at one time. Their aggregate sample rate may be as high as 120 readings per minute. Data is stored on disc during the test. If the low speed system is run at its full capacity of 120 readings per minute, the disc will hold just over 13 hours of data.

The sensors may be located in three groups external to the trailer. There may be up to 60 sensors in any one group. Each group's sensors are supported by one DVM (HP3455A) and one scanner (HP3495A). The DVM takes the measurement and the scanner multiplexes the sensors. An HP-IB extender (HP37201A) at the group site transmits the readings from the DVM to another HP-IB extender in the trailer.

The DVM supports three types of readings: DC volts, 2-wire ohms and 4-wire ohms. The difference between 2-wire ohms and 4-wire ohms is that the 4-wire ohm measurement uses a known current supplied by the DVM for additional accuracy. This measurement requires the closure of two channels in the scanner. The other two measurements require the closure of only one.

The scanner is configured such that channels 0-59 are used for the measurement function of the DVM and channels 60-79 may be used for the current source. Hence up to 20 4-wire ohm measurement devices may exist in a single group (utilizing all 20 current channels and 20 measurement channels). This would leave 40 channels of the scanner free for 2-wire ohm or DC volt measurements. The specific mix of different types of measurements is left up to the user.

Once the user has determined what particular sensors he requires, he has three responsibilities. The first is to define the algorithms which convert the readings (in ohms or volts) to real world units. The function subprogram, CVTRW, is referenced by several of the on-line programs to accomplish this conversion. A current version of this program is supplied to the system by the user and is included in the necessary loader runs to configure the system for a particular acquisition run.

The second user's responsibility is to inform the system of the particular configuration of sensors he has defined. This is done by creating a low speed configuration table. The program M02AF interactively helps the user define this table.

The third user's responsibility is to configure and cable the sensors as he defined them and to run the acquisition system. The acquisition system is run via program M01AN.

Once the system is running the user may monitor the progress of the acquisition run by watching the scanners and DVMs and running several on-line monitoring programs.

The on-line monitoring programs supplied are B00AN, M05AN, J00AN, and M07AN.

B00AN lists the current details of a specific sensor or all sensors. Information displayed (on the CRT terminal or the line printer) includes current time, time since start of test, time of next reading of this sensor, last value read by this sensor (in real world units), the status of the sensor (busy, idle, hardware fault, etc.) the type, range and resolution of the reading by the DVM, the scanner channels being used, the reading rate, the scanner being used, the name of the sensor, the real world units of the sensor, and the high and low warning levels.

M05AN is used to list (on the CRT terminal or the line printer) all the readings taken so far or the readings taken within a specified time period. The list details the values in real world units and the time at which the readings were taken.

J00AN is used to plot the data taken by up to three sensors. The Plot may be displayed on the CRT (then copied to the 7310A printer) or it may be plotted on the line printer. Plots may be made over the entire test time so far or over a specified time interval. Plots may be of one or two sensors of different units or of up to three sensors of the same units (y axes must match). The plot may be a log/linear plot or a linear/linear plot. The user may supply the y axis upper and lower limits or he may let the program get them from the defined upper and lower limits for that sensor.

M07AN is used to display the current readings and status of all the sensors in the system up to a maximum of 80. Sensors which are not operating or have readings out of their defined range are highlighted. The display may be refreshed at a user-defined interval ranging from once a minute to once every two seconds.

Besides the above mentioned monitor routines, the on-line system itself, via M01AN, is constantly monitoring the acquisition run for sensors which have exceeded their defined limits and for hardware problems. The user may, if desired,

stop acquisition of data from any sensor in the system and may later start it up again. If a DVM or scanner goes down and is then fixed the user may inform the system and cause resumption of data collection.

The user may terminate the acquisition run at any time. He then has the option to record the low speed data on tape along with the configuration table used for this run.

Details of use of all the routines mentioned in this section are given later in the manual.

HIGH SPEED DATA ACQUISITION

The SPR data acquisition system provides the ability to read high speed data from up to twelve channels. The data, typically, is produced by seismic sensors in an environment where no external trigger exists to identify that an "event" has occurred. An aggregate sample rate for all sensors connected to the system is limited to 100,000 data points per second. The design limit for a single channel is 10,000 data points per second.

The input signals are connected to a Precision analog filter, the output of which provides the input to a sample and hold device which feeds a Preston analog to digital converter.

The Preston digital data is read by a dedicated HP-1000 Model E computer referred to as the high speed data acquisition system (HSDAS). Another HP-1000, a Model F referred to as the data acquisition controller (DAC), controls the activity of the HSDAS.

During the running of a data acquisition exercise, the HSDAS will continuously examine the incoming data based on a set of user-supplied parameters. The algorithms in the HSDAS are designed to establish whether or not the current incoming data may be of interest. It is performing a Level 1 trigger check which is discussed in detail later. If the incoming data passes the Level 1 trigger check, the HSDAS will log a burst of high speed data to the system disc. The burst consists of data which arrived before the trigger as well as data which arrived subsequent to it. The amount of data logged is defined by the user. Due to the speed at which the high speed data is arriving, the Level 1 trigger checking algorithm is relatively unsophisticated. When the data is logged to disc, the HSDAS informs the DAC that some data has arrived and what channel produced the Level 1 trigger.

The DAC, not being restricted to analyzing the data in real-time, will apply a more complex trigger check on the logged data. This is called a Level 2 trigger check. If the data passes the Level 2 trigger check, the data (now called an event) is written to magnetic tape.

The parameters defining the behavior of the two trigger checking algorithms are defined prior to an on-line run using program M08AF, create or modify high speed configuration table. The configuration of the high speed channels is defined here as well. A few of the trigger parameters may be changed during an on-line run, but the basic definitions will remain static throughout the test. (See M08AF and M01AN)

There are actually two Level 1 algorithms which can be selected by the user. The first algorithm (algorithm zero) looks at amplitudes of the incoming signal and the second (algorithm 1) looks at first differences; i.e., the differences between the current and most recent data points.

In either case the Level 1 algorithm will compare a ratio against a user-supplied threshold once every Q points, where Q is user defined. Q points are called a quantum. For algorithm 0, the ratio is the average absolute value of the signal over a short term interval versus the average absolute value of the signal over a long term interval. Algorithm 1 computes a ratio of absolute values of first differences. The long and short term intervals are defined by the user as specific numbers of quanta.

The user also supplies a Level 1 threshold and a list of channels which can cause triggers. There may be up to three such channels, the rest being strictly data channels.

The Level 2 trigger checking algorithm is similar to the Level 1 algorithm except that it compares variances of the signal instead of amplitudes or first differences. The variance is the squared sum of the data points minus the sum of the squared data points. The check of the ratio against another user-supplied threshold is made at the same quantum size and long and short term intervals as was the Level 1 trigger check.

Parameters which can be changed on-line are the list of channels which can cause triggers and the thresholds.

These algorithms are obtained from S. D. Stearns of Division 1111, and are based on his event detection memorandum of November 3, 1978.

It is also possible for the user to cause the logging of a high speed event without trigger analysis. This is a demand trigger. If desired, the user may put the system in the auto demand mode. This will cause the recording of high speed events on a demand basis at regular, user-specified intervals.

While the system is running the user has at his disposal several programs that allow him to monitor the activity of the high speed system. These are M13AN, M19AN, B02AN, M20AN, M12AN, and M22AN.

M13AN is used to display the current trigger parameters, high speed configuration, disc event space status, and statistical counters. A disc event space is an area on disc into which a Preston event is written by the HSDAS. It is a temporary area which holds the data until it can be written to tape or freed up for future events.

M19AN is used to display a dynamically-refreshed report of the disc event space statuses.

B02AN is used to put a lock on a disc event space so that it will not be freed up. This is generally run in preparation for running a monitor program which looks at the high speed data. It is also run after the user is finished looking at the data to release the space back to the system.

M20AN is used to plot a channel of high speed data from an event residing in a disc event space.

M12AN is used to verify the Level 1 trigger against a Preston event residing in a disc event space.

M22AN is used to verify the format of the Preston data residing in a disc event space.

After an on-line test has been run and all the high speed events are on tape the user may run M21RU to load specifically

selected high speed events back into the disc event spaces. Once this has been done, he may run the high speed event monitor programs as if the system were in the on-line mode.

SPR--DIRECTORY OF PROGRAMS IN THE DATA ACQUISITION SYSTEM

The programs in this manual are all described by their formal program names. The name indicates author, type and location of the programs, and has no functional meaning. For this reason the program names are difficult to remember. Any program in the on-line system to which the operator has access may be run via a directory.

Once logged on under session, the operator may input:

```
:SPR    (note that with the colon prompt the line  
         appears as ::SPR)
```

A directory of programs will be displayed to the operator. The right hand side contains the functional description of the programs, the middle column contains their formal names. The number at the left of the function the operator wishes to perform should be entered in response to the request for a program number. The selected program will be executed for the user.

Below is the standard SPR directory.

::SPR

B01GU: SPR Directory

B01GU: 1 X00AF--RECOVER LOW SPEED DATA

B01GU: 2 M02AF--CREATE OR ALTER LOW SPEED CONFIGURATION TABLE

B01GU: 3 M05AN--LIST OF SENSOR READINGS

B01GU: 4 M06RU--LOAD LOW SPEED DATA TAPE

B01GU: 5 M07AN--DYANAMIC SENSOR DISPLAY

B01GU: 6 B00AN--SENSOR(S) CONFIGURATION AND STATUS DISPLAY

B01GU: 7 J00AN--PLOT LOW SPEED SENSOR DATA

B01GU: 8 M08AF--CREATE OR ALTER HIGH SPEED CONFIGURATION

TABLE

B01GU: 9 M12AN--VERIFY LEVEL 1 TRIGGER

B01GU: 10 M13AN--DISPLAY HIGH SPEED CHANNEL AND DISC STATUS

B01GU: 11 M17AN--SHUTDOWN AFTER ON-LINE FAILURE

B01GU: 12 M19AN--DYNAMIC HIGH SPEED DISPLAY

B01GU: 13 M20AN--PLOT HIGH SPEED DATA

B01GU: 14 M21RU--LOAD HIGH SPEED DATA FROM TAPE

B01GU: 15 M22AN--CHECK FORMAT OF HIGH SPEED DATA FILE

B01GU: 16 B02AN--LOCK OR RELEASE DISC EVENT SPACE

B01GU: 17 M23AN--VERIFY LEVEL 2 TRIGGER

B01GU: PLEASE ENTER NUMBER OF DESIRED FUNCTION

B01GU: ENTER !! TO TERMINATE

B01GU? !!

M02AF--CREATE OR ALTER LOW SPEED CONFIGURATION TABLE

The program M02AF is used to create or alter a low speed configuration table file and a related label file. The low speed configuration table file (LSCT file) contains all the information about the configuration of the low speed sensors which is required to be available to the on-line system at run time. The associated label file (which is referenced by the LSCT file) contains alphanumeric information about each sensor. This information is used by such routines as the sensor plot generation routine and the sensor status display routine.

M02AF allows the user to interactively define the sensor configuration so that the on line system is aware of the physical configuration as well as aspects of the intended use of the sensor system.

The user may define up to 120 different sensor inputs. These sensors must present outputs which can be read by an HP3455 digital volt meter as a DC volts measurement, a 2-wire ohm measurement, or a 4-wire ohm measurement. The inputs to the volt meter are multiplexed via an HP3495 scanner. There are three DVMs and three scanners in the system, and this file will contain information specifying to which pair of scanner and DVM a particular sensor is physically connected.

Each scanner has 80 channels. The first 60 (0-59) have been reserved for multiplexing the signal component of the measurement. The last 20 (60-79) have been reserved for the current source from the DVM for the 4-wire ohm measurements. Hence, up to 60 sensors may be physically connected to one scanner, 20 of which may be 4-wire ohm type devices. The LSCT file contains information specifying these choices.

Each time a sensor is read by the on-line system, the DVM is programmed for reading. Besides the reading type, (DC volts, etc.) the resolution may be specified as high or low and the range is specified as 0.1 through 10,000 or auto range. Auto calibration is never used, nor is the math feature.

The reading which comes back from the DVM is in either volts or ohms. These values correspond to measurements in a real world units system (such as degrees). The user must supply an algorithm which converts from volts or ohms to real world units. This algorithm is implemented in the function subprogram, CVTRW, which will be included in the load of the on-line system. The CVTRW routine is passed an algorithm code and a reading. It returns the converted result. There typically are several algorithms in the system at one time. The algorithm code is used to select the algorithm. This code is an element of the LSCT file, one for each sensor.

During the actual running of the on-line test, the system will watch the magnitude of the readings (in real world units) for the operator. A warning will appear on the system console whenever a reading gets out of range. The LSCT file contains an upper and lower bound for the readings against which the comparison can be made. Each sensor has its own upper and lower bound. These bounds are also used by the monitor routines. The auto Y scale of the plot routine uses these values and the general sensor monitor routine will highlight readings exceeding these values.

The rate at which each sensor is to be read is specified in the LSCT table. The rate is specified as the number of half seconds between readings. The system is designed to read low speed sensors no faster than an aggregate reading rate of 120 readings per minute. This could be one sensor being read twice a second, or 120 sensors being read once per minute, or anything in between. Sensors may be read at different rates.

The user may also label each sensor with an alphanumeric label of up to 40 characters. This should be a descriptive note specifying what the sensor is as well as its location. The user is also given the ability to specify the real world units of the sensor. This is primarily used for labeling the Y axes of the plots.

M02AF enables the user to specify all the choices mentioned above. The first part of the discussion between the user and M02AF establishes the two files involved. The second part is used to prepare or make changes to the files. During the second phase the user may create hard copy or CRT listings of the configuration.

The program is activated by entering:

RU,M02AF

The program will identify itself and indicate that the user may terminate the program by entering !!. The name of the LSCT file is then requested. This file may be an old LSCT file created by this program, or it may be an entirely new file.

The program will inform the user whether the file already exists or if it is new. The user has the option to reenter the file name if things are not as he expected.

Once the user and the program have agreed on the LSCT file, the program will check to see if there is a label file associated with the LSCT file. If there is something wrong with the file (wrong size or type), the user is instructed to enter a name for the label file. If the user enters a name the file will be created if it does not exist and checked for size and type if it does.

After the files have been established, the user is prompted with:

PLEASE ENTER REQUEST

The user has several options at this point. He may enter

HELP

to get a list of the syntax of legal requests. He may enter instructions to add a new sensor to the table, to change an existing sensor in the table, to purge an existing sensor from the table, to list the details of a sensor, or to save the new or modified tables on disc.

NOTE: No changes will be made to the disc files until the user specifies the change via the SAVE command.

Listings of sensor configuration information may be displayed on the user's terminal or sent to the line printer. The user may display the details of a single sensor or get a list of the entire configuration. If the entire configuration is listed, the program will compute and display the aggregate reading rate of the sensors. The upper design limit is 120 readings per second.

The form of the list command is:

```
LIST,sn,lu
```

where sn is the sensor number or "ALL" and

lu is the logical unit of the list device

1 terminal

6 line printer

For example, to list all sensors on the line printer enter:

```
LIST,ALL,6
```

A sensor may be purged by entering:

```
PURGE,sn (where sn is the sensor number)
```

The entire table may be cleared by entering:

```
PURGE,ALL
```

A sensor may be added to the table by entering:

```
NEW,sn (where sn is the sensor number)
```

An existing sensor may be changed by entering:

ALTER,sn (where sn is the sensor number)

When the NEW or ALTER command is entered, the user will be asked for the details concerning this particular sensor. Note that entering !! at this point will not terminate the program but will instead terminate work on this particular sensor. If this is an ALTER command, entering // to requests for input will leave that particular detail as it was.

Details will be requested in the following order:

1. Resolution (high or low).
2. Type of reading (DC volts, 2-wire ohms or 4-wire ohms).
3. Scale (0.1 through 10,000 or auto range).
4. Real world unit conversion code (a positive integer).
5. High limit in real world units (a floating point number).
6. Low limit in real world units (a floating point number).
7. The scanner to which this sensor is connected (35, 45, or 55).
- 8a. The channel number for the DVM signal measurement (0-59).
- 8b. For 4-wire ohm measurements: the channel number for the current source (60-79).
9. The rate at which the sensor is to be read (1-32767 half seconds).
10. A 40-character identifying label.
11. A 24-character units label.

As much error checking is done as possible during this entry phase. Duplicate use of channels is checked, answer ranges are checked, the existence of conversion code algorithm is checked, etc. Any time the program detects an anomaly, the user is warned and given a chance to correct the entry.

Once the eleven specifications are made, the program again prompts:

PLEASE ENTER REQUEST

Note that entering !! will terminate the program with no changes to the disc file.

When the user is satisfied with the tables, he may enter:

SAVE

to cause them to be written to disc. This terminates the program.

It is a good idea to obtain a hard copy listing of the configuration specifications for later reference. An error in the configuration specifications may cause some particularly vague problems.

The following is an example run of M02AF. It creates a new table with 2 sensors in it and then changes some entries in the second one.

♦♦ EXAMPLE RUN OF M02AF

:RU,M02AF

M02AF: CREATE OR ALTER LOW SPEED CONFIGURATION TABLE

M02AF: TERMINATE AT ANY TIME BY REPLYING !!

M02AF: PLEASE ENTER FILE NAME FOR CONFIGURATION TABLE

M02AF? EXAM1

M02AF: EXAM1 DOES NOT EXIST

M02AF: DO YOU WANT TO CREATE A NEW FILE?

M02AF? YES

M02AF: NO LABEL FILE IS DEFINED

M02AF: PLEASE ENTER FILENAME OF LABEL FILE

M02AF? EXAM1L

M02AF: PLEASE ENTER REQUEST

M02AF? HELP

M02AF: -----FORM-----	-----MEANING-----
M02AF: LI(ST),SENSOR(G),LISTLU)	LIST INFO ON SPECIFIC SENSOR
M02AF: LI(ST),ALL(G),LISTLU)	LIST INFO ON ALL SENSORS
M02AF: HE(LP)	LIST LEGAL RESPONSES
M02AF: PU(RGE),SENSOR	REMOVE A SENSOR FROM TABLE
M02AF: PU(RGE),ALL	REMOVE ALL SENSORS FROM TABLE
M02AF: NE(W),SENSOR	ADD A SENSOR TO THE TABLE
M02AF: AL(TE),SENSOR	CHANGE DETAILS OF A SENSOR
M02AF: SA(VE)	WRITE NEW TABLES TO DISC
M02AF: !!	TERMINATE

M02AF: PLEASE ENTER REQUEST

M02AF? NEW,1

M02AF: NOTE - !! RESPONSE DOES NOT TERMINATE PROGRAM

M02AF: IT ONLY STOPS WORK ON THIS SENSOR DEFINITION

M02AF: ENTER H FOR HIGH RESOLUTION OR

M02AF: L FOR LOW RESOLUTION

M02AF? H

M02AF: ENTER V FOR DC VOLTS

M02AF: T FOR TWO WIRE OHMS OR

M02AF: F FOR FOUR WIRE OHMS

M02AF? V

M02AF: ENTER 1 FOR 0.1 RANGE,

M02AF: 2 FOR 1.0 RANGE,

M02AF: 3 FOR 10.0 RANGE,

M02AF: 4 FOR 100.0 RANGE.

M02AF: 5 FOR 1000.0 RANGE,

M02AF: 6 FOR 10000.0 RANGE OR

M02AF: 7 FOR AUTO RANGE

M02AF? 4

M02AF: ENTER REAL WORLD UNIT CONVERSION CODE

M02AF? 2

M02AF: ENTER HIGH LIMIT IN REAL WORLD UNITS

M02AF? 140

M02AF: ENTER LOW LIMIT IN REAL WORLD UNITS
 M02AF? 10.5

 M02AF: ENTER LU OF SCANNER (35, 45 OR 55)
 M02AF? 35

 M02AF: ENTER PRIMARY CHANNEL NUMBER (0-59)
 M02AF? 5

 M02AF: ENTER RATE AS NUMBER OF HALF SECONDS BETWEEN READINGS
 M02AF? 10

 M02AF: ENTER 40 CHARACTER IDENTIFYING LABEL
 M02AF: <----->
 M02AF? SOUTH CAVERN PRESURE

 M02AF: ENTER 24 CHARACTER UNITS LABEL
 M02AF: <----->
 M02AF? PSI

 M02AF: PLEASE ENTER REQUEST
 M02AF? NEW,20

 M02AF: NOTE - !! RESPONSE DOES NOT TERMINATE PROGRAM
 M02AF: IT ONLY STOPS WORK ON THIS SENSOR DEFINITION

 M02AF: ENTER H FOR HIGH RESOLUTION OR
 M02AF: L FOR LOW RESOLUTION
 M02AF? L

 M02AF: ENTER V FOR DC VOLTS
 M02AF: T FOR TWO WIRE OHMS OR
 M02AF: F FOR FOUR WIRE OHMS
 M02AF? F

 M02AF: ENTER 1 FOR 0.1 RANGE,
 M02AF: 2 FOR 1.0 RANGE,
 M02AF: 3 FOR 10.0 RANGE,
 M02AF: 4 FOR 100.0 RANGE,
 M02AF: 5 FOR 1000.0 RANGE,
 M02AF: 6 FOR 10000.0 RANGE OR
 M02AF: 7 FOR AUTO RANGE
 M02AF? 5

 M02AF: ENTER REAL WORLD UNIT CONVERSION CODE
 M02AF? 3

 M02AF: THIS CONVERSION CODE IS NOT DEFINED FOR
 M02AF: VERSION 6.0680 OF CVTRW
 M02AF: DO YOU STILL WISH TO USE IT?
 M02AF? YES

 M02AF: ENTER HIGH LIMIT IN REAL WORLD UNITS
 M02AF? 1000

 M02AF: ENTER LOW LIMIT IN REAL WORLD UNITS
 M02AF? 0

 M02AF: ENTER LU OF SCANNER (35, 45 OR 55)
 M02AF? 45

 M02AF: ENTER PRIMARY CHANNEL NUMBER (0-59)
 M02AF? 1

M02AF: ENTER SECONDARY CHANNEL (60-79)
 M02AF? 61

 M02AF: ENTER RATE AS NUMBER OF HALF SECONDS BETWEEN READINGS
 M02AF? 15

 M02AF: ENTER 40 CHARACTER IDENTIFYING LABEL
 M02AF: <----->
 M02AF? NORTH CAVERN TEMPERATURE

 M02AF: ENTER 24 CHARACTER UNITS LABEL
 M02AF: <----->
 M02AF? DEGREES CELCIUS

 M02AF: PLEASE ENTER REQUEST
 M02AF? ALTER,20

 M02AF: NOTE - !! RESPONSE DOES NOT TERMINATE PROGRAM
 M02AF: IT ONLY STOPS WORK ON THIS SENSOR DEFINITION

 M02AF: ON NEXT SERIES OF QUESTIONS, ENTER // FOR NO CHANGE

 M02AF: ENTER H FOR HIGH RESOLUTION OR
 M02AF: L FOR LOW RESOLUTION
 M02AF? //,

 M02AF: ENTER V FOR DC VOLTS
 M02AF: T FOR TWO WIRE OHMS OR
 M02AF: F FOR FOUR WIRE OHMS
 M02AF? //

 M02AF: ENTER 1 FOR 0.1 RANGE,
 M02AF: 2 FOR 1.0 RANGE,
 M02AF: 3 FOR 10.0 RANGE,
 M02AF: 4 FOR 100.0 RANGE,
 M02AF: 5 FOR 1000.0 RANGE,
 M02AF: 6 FOR 10000.0 RANGE OR
 M02AF: 7 FOR AUTO RANGE
 M02AF? 7

 M02AF: ENTER REAL WORLD UNIT CONVERSION CODE
 M02AF? //

 M02AF: ENTER HIGH LIMIT IN REAL WORLD UNITS
 M02AF? 10000

 M02AF: ENTER LOW LIMIT IN REAL WORLD UNITS
 M02AF? !!

M02AF: PLEASE ENTER REQUEST

M02AF? LIST,ALL,1

M02AF:	SENSOR	TYPE/RANGE	CODE	HIGH LIMIT	LOW LIMIT	CONFIG	RATE
--------	--------	------------	------	------------	-----------	--------	------

M02AF:	1	HIGH RESL.	2	140.00	10.50	SC =35	10
--------	---	------------	---	--------	-------	--------	----

M02AF:		DC VOLTS				CH1= 5	
--------	--	----------	--	--	--	--------	--

M02AF:		100.0					
--------	--	-------	--	--	--	--	--

M02AF: LABEL = SOUTH CAVERN PRESURE

M02AF: UNITS = PSI

M02AF:	SENSOR	TYPE/RANGE	CODE	HIGH LIMIT	LOW LIMIT	CONFIG	RATE
--------	--------	------------	------	------------	-----------	--------	------

M02AF:	20	LOW RESL.	3	10000.00	0.00	SC =45	15
--------	----	-----------	---	----------	------	--------	----

M02AF:		4 WIRE OHM				CH1= 1	
--------	--	------------	--	--	--	--------	--

M02AF:		AUTO				CH2=61	
--------	--	------	--	--	--	--------	--

M02AF: LABEL = NORTH CAVERN TEMPERATURE

M02AF: UNITS = DEGREES CELCIUS

M02AF: CUMMULATIVE READING RATE IS 20.00 READINGS PER MINUTE

M02AF: END OF LIST,ALL REPORT

M02AF: PLEASE ENTER REQUEST

M02AF? SAVE

M02AF: CONFIGURATION TABLE FILE WRITTEN

M02AF: LABEL FILE WRITTEN

M02AF: TERMINATED

CVTRW--CONVERT TO REAL WORLD UNITS FUNCTION SUBPROGRAM

CVTRW is the function subprogram which converts a low speed reading in ohms or volts and converts it to real world units (PSI, degrees C, etc.). This program is called by M02AF (create or alter low speed configuration table) and M03AN (on-line low speed data collector). Whenever this function subprogram is modified, M02AF and M03AN should be reloaded into the system.

When the user adds a new type of sensor to the system he will need to define a conversion algorithm for it. This algorithm is implemented in CVTRW. CVTRW takes as input ICODE and VALUE where ICODE is a positive integer defining which of several algorithms are to be used, and VALUE is the real number which has been returned from the digital volt meter.

ICODE = 0 is a request for the version date of CVTRW.
ICODE = 1 is reserved for no conversion (i.e., CVTRW = VALUE).
All other positive values of ICODE are available to the user.

When adding a new algorithm to CVTRW, the following steps should be taken:

1. Alter the comments in the functional description to include this new algorithm.

2. Update the "Record of Updates" section to show who added the algorithm and when.
3. Change the date in the loader information message to the date when the function subprogram was returned to the production program library.
4. Alter the computed GO TO branch at Statement 200 to include knowledge of the new algorithm number.
5. Insert the code to implement the new algorithm. This will often be one line of computation and a RETURN statement.
6. Ensure the new algorithm is commented.
7. Change the version ID in statement 100. The version ID is a real number in the form MM.DDYY, where MM is the month, DD is the day, and YY is the year.
8. Return the source and object code to the production program library. See the section describing the maintenance of the production program library.
9. Reload M02AF and M03AN.

M08AF--CREATE/ALTER HIGH SPEED CONFIGURATION TABLE

M08AF is an interactive program which is used to define the configuration of the high speed data collection system. Up to 12 channels of high speed data may be connected to the Preston analog to digital converter. The aggregate sample rate may be 100,000 samples per second. The sample rate per channel should not exceed 10,000 samples per second.

The high speed system will continuously read the data and search for the existence of a trigger on up to three of the input channels. The parameters which define the trigger levels are specified with this program. Some of these parameters may be changed on-line (via M01AN) as well. When the high speed system detects a trigger, it will write a specified amount of high speed data to the disc on cartridge HS. This data includes a specified amount of data collected before the trigger was detected followed by the data which followed the trigger.

Once data has reached the disc it is said to have passed the Level 1 trigger check. The Data Acquisition Controller (DAC) will apply a second trigger check to the data. This is the Level 2 check. The trigger threshold for Level 2 is supplied via this program and may be changed on-line. If the data passes the Level 2 check, the data is written to magnetic

tape. If the data did not pass Level 2, it is discarded. In either case, the space on the disc where the data resides will eventually be freed for further use by the high speed system.

There are some timing considerations to be taken into account when selecting number of channels, data rate, event length, and threshold parameters. The high speed system was designed under the following assumptions:

1. No more than ten percent of the data will pass Level 1 trigger checks.
2. No more than ten percent of the data passing Level 1 checks will pass Level 2. This means we expect to log no more than one percent of the data.
3. The most common requirement will be for 12 channel, 8.5 second events at an aggregate sample rate of 100,000 points per second.
4. We can write 16,000 points to tape per second.
5. During the Level 2 check, we can examine one second's worth of data in 2.5 seconds.

Assuming the above to be correct, in an 850 second period, 10 events will be logged. This takes 85 seconds. The Level 2 check will take about 20 seconds per event or 200 seconds. One event will pass Level 2 check and be written to tape in about 55 seconds. The total time used would be 340 seconds or 40 percent of the available time. This leaves some time for those periods where events are occurring more rapidly than normal.

The amount of space on cartridge HS is limited. There is room for only five events which are 8.5 seconds long taken at an aggregate sample rate of 100,000 points per second. The high speed acquisition system has absolute priority over the disc. This means that if a burst of events occurs only four events will be logged assuming that an old event is being written to tape at the time. Any other Level 1 events will be lost. Once the disc becomes full (one event being written to tape and four waiting for writes to tape) a disc event space will free up once every 64 seconds allowing one more Level 1 event to be logged to disc.

Tape writes cannot proceed while the high speed system is logging an event to disc. Level 2 processing is also excluded during this period. Level 2 checks can be progressing while a tape write is in progress.

The most important parameter in minimizing the lost data is to set the trigger threshold for Level 1 checks as high as possible. The next most critical consideration is the event length and sample rate product. Shortening the event length or lowering the sample rate will produce more disc event spaces on disc. This will allow more Level 1 events to be logged during a burst of activity. Note that unless the sample rate is lowered, the total disc storage space available represents the same amount of data with respect to time; i.e., one could store five 8.5 second events or eight 5.3 second events at a 100,000 points per second sample rate. Keeping the Level 2 threshold as high as possible will minimize the number of events requiring writes to tape.

It is expected that a fair amount of "tuning" will be required with these parameters. The thresholds may be changed on-line. The event length and sample rate must be specified via this program, and they remain constant during an acquisition run.

M08AF is used to specify the configuration and parameters for the high speed system. The result of this program is a pair of files which reside on disc LS. The name of the configuration file is given to M01AN when an on-line test is started.

M08AF will first establish the names of the two files to be created or altered. The first is the high speed configuration file. The user inputs the file name and is told if it exists or not. The user is asked to verify his choice. The second file is a high speed label file. If a label file is not yet associated with the configuration file, the user is asked to specify its name. When the user specifies new files, they are created for him.

Once the files have been agreed upon, M08AF will ask the user for a request. The user may respond with HELP to get a list of legal responses. These are:

1. LIST--List configuration table
2. HELP--List legal responses
3. NEW--Create a new configuration table
4. ALTER--Change an existing configuration table
5. SAVE--Write files to disc
6. !!--Terminate (Don't write files to disc)

The LIST command format is:

LI,lu where lu is the logical unit of the list device
 1--terminal
 6--line printer

This will list the current configuration and parameter details of the files being worked on. The first section of the list contains one line for each defined channel. The channel number (0-11) is given. The next column shows whether the channel is a data or a trigger channel. If it is a trigger channel, the next two columns will show the current Level 1 and Level 2 trigger thresholds. The last column is the alphanumeric label assigned to the channel.

Following the configuration report are listed the various operating parameters. The aggregate sample rate in thousands of samples per second is given followed by a computation of the sample rate per channel this implies. The actual event length is displayed. This is in general slightly larger than the event length specified. The excess is due to the fact that the system always writes data in 24576 word blocks. The pretrigger storage in 24576 word blocks is listed followed by the amount of time this represents in seconds. The next line details the trigger parameters and is followed by the number of the disc event spaces and their size in cylinders.

This report may be directed to the terminal or to the line printer, the default being the terminal.

The format of the NEW command is simply:

NEW

This function allows the user to create a new configuration table. The user will be asked to supply the configuration specification in the following order:

1. Number of channels to be used. The legal responses are 1,2,3,4,6,8, and 12. The restriction is due to the internal structure of the high speed Preston read routines. If the user has a different number of channels than this, he must specify the next highest number and treat the excess as dummy channels.
2. Up to 3 channels which can cause triggers.
3. The Level 1 and Level 2 thresholds for the channels which can cause triggers. These values are times 1000, hence a threshold of 1.35 is input as 1350.
4. The aggregate sample rate in 1000's of samples per second.
5. The minimum acceptable event length is seconds. The actual event length is usually slightly longer.

6. The pretrigger storage requirements in number of 24576 point blocks.
7. The trigger parameters. A is the algorithm number (0 or 1). 0 causes amplitude comparison for Level 1, 1 causes first difference comparison for Level 1. Q is number of points per quantum. This defines how often a trigger check is made. S is the number of quanta in a short term interval and L is the number of quanta in a long term interval
8. The skip parameter which specifies how many points to skip while performing the trigger checks.
9. A series of up to 40 character labels to identify each channel.

The form of the ALTER command is simply:

ALTER

This function allows the user to alter an existing configuration. Here, responding // will leave the value as it was. The questions appear in the same order as in the NEW function.

The format of the SAVE command is simply:

SAVE

This function causes the created or altered tables to be written to disc. The program then terminates. Note that no change will be made to tables on the disc if this command is not used.

Below is an example conversation between a user and M08AF.

•RU,MOBAF

MOBAF: CREATE OR ALTER HIGH SPEED CONFIGURATION TABLE
MOBAF: TERMINATE AT ANY TIME BY REPLYING !!

MOBAF: PLEASE ENTER FILE NAME FOR CONFIGURATION TABLE
MOBAF? BRMH3

MOBAF: BRMH3 DOES NOT EXIST
MOBAF: DO YOU WANT TO CREATE A NEW FILE?
MOBAF? YES

MOBAF: NO LABEL FILE IS DEFINED
MOBAF: PLEASE ENTER FILENAME OF LABEL FILE
MOBAF? BRMH3L

MOBAF: PLEASE ENTER REQUEST
MOBAF? HELP

MOBAF: -----FORM-----	-----MEANING-----
MOBAF: LI(CT) (GLU)	LIST INFO ON ALL CHANNELS
MOBAF: HE(LP)	LIST LEGAL RESPONSES
MOBAF: NE(W)	SPECIFY CHANNEL CONFIGURATION
MOBAF: AL(CTER)	CHANGE CONFIGURATION DETAILS
MOBAF: SA(VE)	WRITE NEW TABLES TO DISC
MOBAF: !!	TERMINATE

MOBAF: PLEASE ENTER REQUEST
MOBAF? NEW

MOBAF: NOTE - !! RESPONSE DOES NOT TERMINATE PROGRAM
MOBAF: IT ONLY STOPS WORK ON THIS CONFIGURATION

MOBAF: ENTER NUMBER OF CHANNELS TO BE USED (1,2,3,4,6,8,12)
MOBAF? 6

MOBAF: ENTER UP TO 3 CHANNEL NUMBERS WHICH CAN CAUSE TRIGGERS
MOBAF? 0,3

MOBAF: ENTER L1,L2 FOR CHANNEL 0 WHERE
MOBAF: L1 IS LEVEL 1 THRESHOLD * 1000 (1000-20000)
MOBAF: L2 IS LEVEL 2 THRESHOLD * 1000 (1000-20000)
MOBAF? 1350,1400

MOBAF: ENTER L1,L2 FOR CHANNEL 3 WHERE
MOBAF: L1 IS LEVEL 1 THRESHOLD * 1000 (1000-20000)
MOBAF: L2 IS LEVEL 2 THRESHOLD * 1000 (1000-20000)
MOBAF? 1375,1450

MOBAF: ENTER SAMPLE RATE * 1000 (1-100)
MOBAF? 100

MOBAF: ENTER MINIMUM EVENT LENGTH IN SECONDS (5.0-20.0)
MOBAF? 8.3

MOBAN: ENTER PRE-TRIGGER STORAGE REQUIREMENTS IN # OF 24576 PT. BLOCKS(0-8)
MOBAF? 4

MO3AF: ENTER LEVEL 1 ALGORITHM PARAMETERS AS A,Q,S,L

MO3AF: A - ALGORITHM NUMBER (0 OR 1)

MO3AF: Q - QUANTUM SIZE (2-512, POWER OF 2)

MO3AF: S - SHORT TERM INTERVAL (1-10)

MO3AF: L - LONG TERM INTERVAL (2-100)

MO3AF? 0,8,3,10

MO3AF: ENTER 1 TO CHECK TRIGGER BASED ON EVERY POINT

MO3AF: 2 TO CHECK BASED ON EVERY OTHER POINT

MO3AF: ETC. UP TO 256

MO3AF? 1

MO3AF: ENTER 40 CHARACTER IDENTIFYING LABEL FOR CHANNEL 0

MO3AF: <----->

MO3AF? X - SOUTH CAVERN

MO3AF: ENTER 40 CHARACTER IDENTIFYING LABEL FOR CHANNEL 1

MO3AF: <----->

MO3AF? Y - SOUTH CAVERN

MO3AF: ENTER 40 CHARACTER IDENTIFYING LABEL FOR CHANNEL 2

MO3AF: <----->

MO3AF? Z - SOUTH CAVERN

MO3AF: ENTER 40 CHARACTER IDENTIFYING LABEL FOR CHANNEL 3

MO3AF: <----->

MO3AF? X - NORTH CAVERN

MO3AF: ENTER 40 CHARACTER IDENTIFYING LABEL FOR CHANNEL 4

MO3AF: <----->

MO3AF? Y - NORTH CAVERN

MO3AF: ENTER 40 CHARACTER IDENTIFYING LABEL FOR CHANNEL 5

MO3AF: <----->

MO3AF? Z - NORTH CAVERN

MO3AF: PLEASE ENTER REQUEST

MO3AF? LIST

MO3AF: HIGH SPEED DATA CONFIGURATION

MO3AF: CH# TYPE LEVEL 1 LEVEL 2 LABEL

MO3AF: -----

MO3AF: 0 TRIG 1.350 1.400 X - SOUTH CAVERN

MO3AF: 1 DATA 0.000 0.000 Y - SOUTH CAVERN

MO3AF: 2 DATA 0.000 0.000 Z - SOUTH CAVERN

MO3AF: 3 TRIG 1.375 1.450 X - NORTH CAVERN

MO3AF: 4 DATA 0.000 0.000 Y - NORTH CAVERN

MO3AF: 5 DATA 0.000 0.000 Z - NORTH CAVERN

MO3AF: SAMPLE RATE TOTAL: 100K SAMPLE RATE/CHANNEL: 16667. EVENT LENGTH: 8.356

MO3AF: PRE-TRIGGER STORAGE: 4 24.5K BLOCKS (.98 SECONDS)

MO3AF: ALGORITHM NUMBER: 0 Q: 8 S: 3 L: 10 SKIP: 1

MO3AF: NUMBER OF DISC EVENT SPACES: 5 CYLINDERS/EVENT: 68

MO3AF: PLEASE ENTER REQUEST
MO3AF? ALTER

MO3AF: NOTE - !! RESPONSE DOES NOT TERMINATE PROGRAM
MO3AF: IT ONLY STOPS WORK ON THIS CONFIGURATION

MO3AF: ON NEXT SERIES OF QUESTIONS, ENTER // FOR NO CHANGE

MO3AF: ENTER NUMBER OF CHANNELS TO BE USED (1,2,3,4,6,8,12)
MO3AF? //

MO3AF: ENTER UP TO 3 CHANNEL NUMBERS WHICH CAN CAUSE TRIGGERS
MO3AF? //

MO3AF: ENTER L1,L2 FOR CHANNEL 0 WHERE
MO3AF: L1 IS LEVEL 1 THRESHOLD * 1000 (1000-20000)
MO3AF: L2 IS LEVEL 2 THRESHOLD * 1000 (1000-20000)
MO3AF? //

MO3AF: ENTER SAMPLE RATE * 1000 (1-100)
MO3AF? //

MO3AF: ENTER MINIMUM EVENT LENGTH IN SECONDS (5.0-20.0)
MO3AF? 8.4

MO3AM: ENTER PRE-TRIGGER STORAGE REQUIREMENTS IN # OF 24576 PT. BLOCKS (0-8)
MO3AF? !!

MO3AF: PLEASE ENTER REQUEST
MO3AF? LIST

MO3AF: HIGH SPEED DATA CONFIGURATION

MO3AF: CH# TYPE LEVEL 1 LEVEL 2 LABEL

MO3AF:	CH#	TYPE	LEVEL 1	LEVEL 2	LABEL
MO3AF:	0	TRIG	1.350	1.400	X - SOUTH CAVERN
MO3AF:	1	DATA	0.000	0.000	Y - SOUTH CAVERN
MO3AF:	2	DATA	0.000	0.000	Z - SOUTH CAVERN
MO3AF:	3	TRIG	1.375	1.450	X - NORTH CAVERN
MO3AF:	4	DATA	0.000	0.000	Y - NORTH CAVERN
MO3AF:	5	DATA	0.000	0.000	Z - NORTH CAVERN

MO3AF: SAMPLE RATE TOTAL: 100K SAMPLE RATE/CHANNEL: 16667. EVENT LENGTH: 8.602

MO3AF: PRE-TRIGGER STORAGE: 4 24.5K BLOCKS (.98 SECONDS)

MO3AF: ALGORITHM NUMBER: 0 Q: 8 S: 3 L: 10 SKIP: 1

MO3AF: NUMBER OF DISC EVENT SPACES: 5 CYLINDERS/EVENT: 70

MO3AF: PLEASE ENTER REQUEST
MO3AF? SAVE

MO3AF: CONFIGURATION TABLE FILE WRITTEN
MO3AF: LABEL FILE WRITTEN
MO3AF: TERMINATED

M01AN--CONTROL SPR ON-LINE DATA ACQUISITION RUN

M01AN is used to start and control an SPR on-line data acquisition run. It should be run from the system console (silent 700) so that a record of the run is maintained. The hard copy record should be filed for future reference. Should any problems occur in the running of an on-line test, this document will be required by the maintenance programmer.

Before running M01AN, several steps must be taken.

Ensure that a valid low speed configuration file exists and that the low speed system is physically configured in the manner specified by the low speed configuration table. The configuration table is created by program M02AF.

If the high speed system is to be used, ensure that a valid high speed configuration table exists, and that the high speed system is physically configured in the manner specified by the high speed configuration table. The configuration table is created by program M08AF.

If you are going to log high speed Preston events to tape, clean the tape heads on both drives and mount 2400 foot tapes on them. Ensure that you have an adequate supply of 2400 foot tapes. It is also a good practice to see that the tapes are prelabeled by volume number. Volume 1 is mounted on LU 8 and volume 2 is mounted on LU 9.

Boot up both systems. Note if the high speed system is not going to be used, it does not require booting up.

Be sure to set the correct date and time and to run LSTEN on both systems.

To run M01AN, strike the break key on the Data Acquisition Controller system console. You will obtain an asterisk prompt. Type:

RU,M01AN

M01AN will identify itself and warn the user that running an on-line test will destroy any data on the high speed cartridge and will wipe out the data in the low speed data file. It will then ask the user for the name of the low speed configuration table. When the user supplies the file name, M01AN will configure real time common for an on-line test and create and initialize the low speed data file LSDATA.

M01AN will then ask the user for the name of the high speed configuration table. The user may respond:

NONE

if he does not wish to collect Preston data. If the user supplies a valid high speed configuration file name, M01AN will set up the high speed data cartridge for Preston data files.

M01AN will next ask the user to mount 2400 foot tapes on both drives. If the user is not recording high speed data on tape, he may answer:

NO

If the user wishes high speed tapes produced he should answer:

GO

when both tapes are ready.

M01AN will continue its initialization of the system and then inform the user how long the low speed system can run before it exceeds its available low speed data space. The user is asked if that length of time is long enough. If it is not, the user will respond NO and M01AN will terminate. The user will have to alter his low speed configuration table or create some more space on cartridge LS.

If the low speed time is long enough, the user responds YES and M01AN will complete the initialization process. When the system is initialized, M01AN will report the test start time and begin scheduling all the required on-line programs. All the scheduled on-line programs will output a message to the

system console when they are scheduled. If the high speed system is being used, M01AN will write:

M01AN: DS LOOP WORKING

The user should verify that this message has appeared.

From this point on, the on-line system is running. The system console is used by all programs in the on-line system to report critical changes in status or to request service. The RTE-IVB operating system also uses the system console to report certain problems and changes in status.

The SPR on-line system will report only critical events on the system console. General status information is to be obtained by running the various monitor programs from the CRT terminals under session. It is important that only operators log on while an on-line test is in progress. Operator account names are in the form:

opname.OPER where opname is the operator's last name.

The OPER account has a restricted set of available logical units so as to minimize the possibility of inadvertent conflicts with the on-line system.

Messages which are sent to the system console by the on-line system are accompanied by the bell to alert the operator. It should be noted that the operating system does not ring the bell, and that its messages may be of critical importance. For this reason, the operator should routinely check the system console for messages.

Messages from the on-line system include:

1. Low speed DVM failures.
2. Low speed system out of data space on disc.
3. Low speed sensor out of range (will be reported no more often than once every five minutes per out of range sensor).
4. High speed tape logging system requires new tape mounted,
5. High speed disc, track or Preston failures.
6. Loss of high speed system.

Messages from the operating system include:

1. Logon and logoff reports.
2. Abnormal program terminations (very serious).
3. Device failure (usually serious).

Due to the complexity of providing recovery support for the high speed system and the lack of time available, if the high speed system fails, it cannot be recovered on-line. The logging of high speed data to tape occurs as events are received and verified so typically very little high speed data is lost in such a failure.

If components of the low speed system are lost, they can be fixed and recovered on-line. A power failure will result in the loss of all low speed data, however.

Once the on-line system is running, the user may interact with the system to restore failed low speed devices, change certain high speed trigger parameters, start and stop the high speed system, place the high speed system in auto demand mode, cause a demand high speed trigger, selectively halt or restore data collection by a low speed sensor, or terminate the on-line data acquisition run. The user acquires the attention of the

system by striking the break key. He will receive an asterisk prompt at which point he types:

BR,MOLAN

MOLAN will respond with a prompt for a request and give the time of day. The user has 20 seconds in which to respond. He may respond:

HELP

to get a list of legal responses.

A description of the other legal responses follows:

DVM:

If a DVM, scanner, or HP-IB extender failed, the user will be informed by MOLAN:

MOLAN: DVM nn FAILED where nn is the DVM LU.

When the problem has been rectified, the user may enter:

DVM,lu where lu is the failed DVM lu.

The system will then try to recover the DVM and report to the user as to its success.

SENSOR:

The user may wish to inhibit the reading of a low speed sensor, and perhaps later restart it. This is done with the SENSOR command:

SENSOR,nn,DN where nn is the sensor number
obtained from the low speed
configuration table.

Use of this command will inhibit further readings from this sensor.

Use of the following command will restart a sensor:

SENSOR,nn,UP

PAUSE:

If the user wishes to temporarily halt the collection of high speed data, he may respond with:

PAUSE

CONT:

If the user wishes to restart the collection of high speed data, he may respond:

CONT

DEMAND:

If the user wishes to force the logging of a high speed Preston event (independent of the normal trigger analysis) he responds with:

DEMAND or

DEMAND,CONT

In the first case, the high speed system will pause after the logging of an event. In the second case it will resume normal operations using the trigger checking to determine further requirements for logging. If the demand implied PAUSE, the high speed system may be restarted with the CONT command.

CHAN:

The user may temporarily prevent a specified high speed Preston channel from producing triggers by turning it into a data only channel. This is done by responding:

CHAN,n,OFF where n is a Preston channel
 number.

The user may turn this channel back into a trigger producing channel by responding:

CHAN,n,ON

If additionally, the user wants to change the trigger thresholds when turning a channel on he responds:

CHAN,n,ON,lev1,lev2 where n is the Preston
 channel number, lev1 is the
 Level 1 threshold*1000, and
 lev2 is the Level 2
 threshold*1000.

Hence, to make channel 7 produce a trigger based on a Level 1 threshold of 1.25 and a Level 2 threshold of 1.565 he would respond:

CHAN,7,ON,1250,1565

Note that the CHAN command can be used to add a new trigger channel providing that the total number of trigger channels will not exceed three.

TRIG:

The user may modify the trigger threshold levels associated with a Preston channel by responding:

TRIG,n,lev1,lev2 where n is the Preston
channel number, lev1 is the
Level 1 threshold*1000 and
lev2 is the Level 2
threshold*1000.

AUTO:

The user may place the high speed system in the auto demand mode. The auto demand mode will cause the high speed system to log Preston events at a specified regular interval by automatically sending DEMAND requests to the high speed system. In this mode, all channels have been set to data channels only (hence, no logging will occur based on the standard trigger analysis). The user initiates this mode by responding:

AUTO,n where n is the number of seconds
between demand requests.

M01AN will compute the smallest delay which can be used and not cause a backlog of high speed events. If the user attempts to enter a delay shorter than this time, M01AN will inform the user what the low limit is, and the user may reenter the command. The upper limit is one hour (3600 seconds).

The user may halt the auto demand mode by entering:

AUTO,OFF

Note that at this point, there will be no channels capable of producing triggers. If the user wants trigger producing channels, he will have to use the CHAN command to get them.

!!:

When the user has taken all the data he requires, he may terminate the on-line data acquisition run by responding:

!!

The programs in the system will now proceed to shut down in an orderly fashion. Each program will print a message on the system console as it shuts down. Some

programs may not shut down right away because they are still busy. The most obvious case is M16AN, the high speed tape handler. It will not shut down until all of the high speed Preston events which currently reside on disc have been written to tape.

If any high speed events have been written to tape, M16AN will produce a high speed event report on the line printer. This report details by event number the time of day the event occurred, the amount of time since the start of test this represents, the volume number on which it was written, the position (in number of data points) at which the Level 2 trigger occurred, and the channel number which produced the trigger. Channel number 99 indicates a demand trigger.

Once all the programs have shut down, M01AN will ask the user for a tape on which to write the low speed data. The user may respond 0 (zero) to inhibit the recording of the low speed data, or he may answer 8 or 9 specifying the LU of the desired tape drive.

When M01AN writes out its termination message, the on-line test has ended. The collected data is now safely stored on magnetic tape, and the user is free to use the system in the off-line mode. Accounts other than the OPER accounts may log on.

The following is an example run of M01AN. Following that is a typical display of the WHZAT program taken while the on-line system was running.

◆RU,M01AN
 M01AN: STRATEGIC PETROLEUM RESERVE ON-LINE TEST
 M01AN: TERMINATE AT ANY TIME BY RESPONDING !!

 M01AN: WARNING - THIS ON-LINE TEST WILL OVERWRITE ANY
 M01AN: DATA ON FILE LSDATA (TOP PLATTER)
 M01AN: AND THE ENTIRE HIGH SPEED CARTIRIDGE

 M01AN: PLEASE ENTER FILE NAME OF LOW SPEED CONFIGURATION TABLE
 M01AN? LSTST1

 M01AN: PLEASE ENTER FILE NAME OF HIGH SPEED CONFIGURATION TABLE OR NONE
 M01AN? NEWS

 M01AN: MOUNT 2400 FOOT TAPES ON BOTH DRIVES
 M01AN: ENTER GO WHEN THEY ARE BOTH READY OR
 M01AN: NO IF YOU ARE NOT RECORDING HIGH SPEED DATA
 M01AN? GO

 M01AN: CUMMULATIVE LOW SPEED RATE IS 117.00 READINGS/SEC
 M01AN: MAXIMUM TIME FOR LOW SPEED TEST IS 13 HOURS 54 MINUTES
 M01AN: IS THIS LONG ENOUGH?
 M01AN? YES

 M01AN: TEST START TIME
 M01AN: YEAR DAY HOUR MIN SEC
 M01AN: 1980 253 12 16 18

 M00AN: ON-LINE TIMER RUNNING

 M03AN: LOW SPEED DATA COLLECTOR RUNNING

 M09AN: DS MASTER PROGRAM RUNNING

 M04AN: LOW SPEED DISC HANDLER RUNNING

 M14AN: HIGH SPEED DISC MANAGER RUNNING

 M16AN: HIGH SPEED EVENT TAPE WRITER RUNNING

 M10AN: DS HSDAS SLAVE RUNNING

 M15AN: LEVEL 2 TRIGGER CHECKER RUNNING

 M01AN: DS LOOP WORKING

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:16:42
M01AN? HELP

M01AN: -----FORM-----	-----MEANING-----
M01AN: HE(LP)	LIST LEGAL RESPONSES
M01AN: DV(M),DVM LU	PUT A DVM UP
M01AN: SE(NSOR),SENSOR#,UP	PUT A SENSOR UP
M01AN: SE(NSOR),SENSOR#,DN	PUT A SENSOR DOWN
M01AN: DE(MAND)	HS DEMAND TRIGGER THEN PAUSE
M01AN: DE(MAND),CD(NT)	HS DEMAND TRIGGER THEN CONT.
M01AN: PA(USE)	HALT HIGH SPEED SYSTEM
M01AN: CD(NT)	RESTART HIGH SPEED SYSTEM
M01AN: CH(AN),N,OFF	INHIBIT TRIGGER FROM CHAN. N
M01AN: CH(AN),N,ON(TL1,TL2)	ALLOW TRIGGER FROM CHAN. N
M01AN:	TL1 IS TRIG LEVEL 1 ♦ 1000
M01AN:	TL2 IS TRIG LEVEL 2 ♦ 1000
M01AN: TR(IG),N,TL1,TL2	CHANGE TRIGGER LEVEL CHAN. N
M01AN: AU(TO),N	AUTO DEMAND EVERY N SECONDS
M01AN: AU(TO),OFF	TURN OFF AUTO DEMAND MODE
M01AN: ::	TERMINATE

M03AN: TIME - 12:17:44
M03AN: WARNING SENSOR 42 OUT OF RANGE READING = 32.48

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:17:58
M01AN? SENSOR,42,DN

M03AN: SENSOR 42 DOWNED BY OPERATOR

IDNR L 34 E 3 S 4 1
M03AN: TIME - 12:18:48
M03AN: DVM 34 FAILED

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:19:02
M01AN? DVM,34

M03AN: DVM 34 HAS BEEN RECOVERED

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:20:12
M01AN? AUTO,65

M01AN: AUTO DEMAND MODE IN EFFECT

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:21:50
M01AN? AUTO,OFF

M01AN: AUTO DEMAND MODE OFF

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:22:50
M01AN? TRIG,0,1150,1200

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:25:56
M01AN? CONT

◆BR,M01AN

M01AN: PLEASE ENTER REQUEST (HELP FOR LEGAL RESPONSES)
M01AN: TIME - 12:26:09
M01AN? !!

M00AN: TIMER SHUT DOWN

M03AN: LOW SPEED DATA COLLECTOR SHUT DOWN

M04AN: LOW SPEED DISC HANDLER SHUT DOWN

M14AN: HIGH SPEED DISC MANAGER SHUT DOWN

M16AN: HIGH SPEED EVENT TAPE WRITER SHUT DOWN

M09AN: DS MASTER PROGRAM SHUT DOWN

M10AN: DS HSDAS SLAVE SHUT DOWN

M15AN: LEVEL 2 TRIGGER CHECKER SHUT DOWN

M01AN: ENTER LU OF TAPE FOR LOW SPEED DATA (0 FOR NO TAPE WRITE)
M01AN? 8

M01AN: CONFIGURATION TABLE WRITTEN TO TAPE

M01AN: LS DATA FILE WRITTEN TO TAPE

M01AN: LABEL FILE WRITTEN TO TAPE

M01AN: ON-LINE SCHEDULER SHUT DOWN

:WH,,AL

14:31:47:110

PRGRM	T	PRIOR	PT	SZ	DO	SC	IO	WT	ME	DS	OP	PRG CNTR	NEXT TIME				
**FMG26	3	00099	19	10	*	*	*	*	3	WHZAT	*	*	*	*	*	P:36367	
WHZAT	1	00001	0	.	.	.	.	1	.	.	.	.	.	.	.	P:66232	
**FMG22	3	00099	22	10	*	*	*	*	3	MO722	*	*	*	*	*	P:36367	
MO722	3	00099	23	5	.	.	.	2	EQ: 11	RV:2	ST:002					P:30662	
UPLIN	1	00003	0	.	0	.	.	.	.	.	.	.	.	.	.	P:00000	14:31:49:830
RTRY	1	00020	0	.	.	.	.	.	3	CL	035	.	.	.	.	P:35573	
GRPM	1	00004	0	.	.	.	.	.	3	CL	036	.	.	.	.	P:36032	
EXECM	1	00030	0	.	.	.	.	.	3	CL	030	.	.	.	.	P:36642	
PTOPM	1	00030	0	.	.	.	.	.	3	CL	031	.	.	.	.	P:40751	
R\$PNE	1	00005	0	.	.	.	.	.	3	CL	037	.	.	.	.	P:63276	
R\$AM	3	00030	13	9	.	.	.	.	3	CL	029	.	.	.	.	P:33564	
EXECW	3	00030	5	2	.	.	.	.	3	CL	032	.	.	.	.	P:31460	
OPERM	3	00030	6	2	.	.	.	.	3	CL	028	.	.	.	.	P:30207	
QCLM	3	00028	7	2	.	.	.	.	3	CL	034	.	.	.	.	P:30045	
DLIST	3	00030	8	3	.	.	.	.	3	CL	033	.	.	.	.	P:32004	
PROGL	3	00030	10	5	.	.	.	.	3	CL	027	.	.	.	.	P:30065	
LOGON	3	00050	12	11	.	.	.	.	3	CL	038	.	.	.	.	P:32137	
LGOFF	3	00099	15	9	.	.	.	.	3	CL	039	.	.	.	.	P:31133	
MOORAN	3	00001	4A	2	0	.	.	.	.	.	.	.	.	.	.	P:30107	14:31:47:470
MO4AN	3	00020	18	7	0	.	.	.	.	.	.	.	.	.	.	P:30617	14:31:47:310
MO9AN	3	00065	25	6	.	.	.	.	3	CL	018	.	.	.	.	P:30630	
M10AN	3	00066	21	6	.	.	.	.	3	CL	015	.	.	.	.	P:22976	
M14AN	3	00031	11	5	0	.	.	.	.	.	.	.	.	.	.	P:30446	14:31:47:280
M15AN	4	00077	2	9	0	.	.	.	.	.	.	.	.	.	.	P:21773	14:31:47:530
M16AN	4	00045	26	23	.	.	.	1	.	.	.	.	.	.	.	P:60642	
M01AN	4	00070	20	19	0	.	.	.	.	.	.	.	.	.	.	P:37106	14:31:47:280
M03AN	4	00010	17	9	.	.	.	1	.	.	.	.	.	.	.	P:22305	

ALL LU'S OK

ALL EQT'S OK

MAX CONT. FREE TRKS : 14, LU 2

14:31:47:250

:

M17AN--SHUTDOWN AFTER ON-LINE FAILURE

M17AN is used to effect a shutdown of M01AN if an on-line program has been aborted or if an on-line program is hung up, perhaps waiting on a failed device. This is primarily used to allow M01AN to write the low speed data to tape.

M01AN should have been requested to shut down in the normal fashion; i.e., by responding !! to a request for a command. If M01AN does not ask the user for a low speed tape then M01AN has not detected the successful shut down of all the on-line programs. Be very certain that M16AN, the high speed tape handler, is not busy completing its writes to tape as a delay here is quite normal.

When M17AN is run, it will identify itself and display the current contents of the shutdown list. Copy this number down for the maintenance programmer. Answer YES to the request to continue, and M17AN will make it appear to M01AN that all of its on-line programs have shut down.

M01AN should now proceed with its low speed tape write.

SECTION II

MONITOR AND ANALYSIS PROGRAMS--LOW SPEED

B00AN--LOW SPEED SENSOR STATUS

The program B00AN is used to list the configuration and status details of a low speed sensor. This program may be run during an on-line test or after one is finished providing that the files and common area are intact, or if M06RU has been run to set up the files and common area from the low speed tape generated at the end of the desired test.

On activation of the program, the user is asked to supply a sensor number and the LU of the list device. Omitting the list device will produce a display at the user's terminal. Specifying 6 as the list device will produce a listing at the line printer. The user may also specify ALL in place of sensor number and obtain a display of all low speed sensors in the system. The aggregate reading rate is displayed when ALL is specified.

The list is begun with the current time and the elapsed time into the test. From this point on, each sensor's details are listed. The sensor number is listed under the heading SENSOR. The DVM programming information is listed under the heading TYPE/RANGE. The conversion code to convert volts or ohms to real world units (see CVTRW documentation) is listed under the heading CODE. The high and low limits for the sensor are listed under the next two headings. The scanner LU and the associated channel numbers appear under CONFIG. The reading

rate for this sensor is the number of half seconds between readings and is given under the heading RATE. The sensor's current status is listed under STATUS.

Below the above-described table appears the last value read in real world units, the number of hours, minutes, and seconds until the next reading is due, and the label information for this sensor as found in the low speed configuration table.

Note that if the time until the next reading figure is negative, the reading is overdue. If it is more than a few seconds, a problem exists.

When ALL was specified, the aggregate reading rate will be given at the end of the report.

Below is an example conversation with the program and the resulting displays.

RU, BOOAN

BOOAN: LOW SPEED SENSOR STATUS

BOOAN: PLEASE ENTER SN,LU (SN=SENSOR # OR ALL)

BOOAN: (ENTER !! TO HALT)

BOOAN? 2

BOOAN: CURRENT TIME = 12:39:38

BOOAN: TIME SINCE TEST START = 0:06:17

BOOAN: SENSOR TYPE/RANGE CODE HIGH LIMIT LOW LIMIT CONFIG RATE STATUS

BOOAN: -----

BOOAN:	2	LOW RESL.	1	1400.00	100.00	SC =35	12	HARDWARE FAULT
BOOAN:		2 WIRE OHM				CH1=21		
BOOAN:		1.0						

BOOAN: LAST VALUE READ = - 504.65

BOOAN: NEXT READING IN - 0:01:33

BOOAN: LABEL = LOW RES. 2-WIRE OHM TEST POT - SOUTH

BOOAN: UNITS = OHMS

BOOAN: PLEASE ENTER SN,LU (SN=SENSOR # OR ALL)

BOOAN: (ENTER !! TO HALT)

BOOAN? 44

BOOAN: CURRENT TIME = 12:39:38

BOOAN: TIME SINCE TEST START = 0:06:17

BOOAN: SENSOR TYPE/RANGE CODE HIGH LIMIT LOW LIMIT CONFIG RATE STATUS

BOOAN: -----

BOOAN:	44	LOW RESL.	1	25.00	1.00	SC =45	12	IDLE
BOOAN:		DC VOLTS				CH1=12		
BOOAN:		100.0						

BOOAN: LAST VALUE READ = -1.96

BOOAN: NEXT READING IN 0:00:03

BOOAN: LABEL = VARIABLE VOLTAGE SOURCE - MIDDLE

BOOAN: UNITS = VOLTS

BOOAN: PLEASE ENTER SN,LU (SN=SENSOR # OR ALL)

BOOAN: (ENTER !! TO HALT)

BOOAN? !!

BOOAN: TERMINATED

M05AN--LIST OF SENSOR READINGS AND TIMES OF READINGS

M05AN will display the readings taken by a specified sensor and the times at which the readings were taken. The user may request the list to appear at his terminal or on the line printer. If the user requests the list at his terminal he should be using an HP2647 terminal. The user may get a listing of all readings taken so far or he may specify a time window.

This program may be run while an on-line test is in progress, after it has been shut down or after running M06RU (load low speed data into system routine).

The program is activated by entering:

RU,M05AN

The program will identify itself and inform the user he may terminate by entering !!. It then asks for the specification of the listing.

The user responds in the form:

sn,lu,T1,T2

where: sn is the sensor number,
lu is the logical unit of the list device
1 terminal
6 line printer,
T1 is the beginning time in the form HHMM and
T2 is the end time in the form HHMM.

For example, to list on the line printer all readings of sensor 2 taken between 11:00 PM and 3:15 AM, enter:

2,6,2300,0315

If T1 and T2 are omitted, the listing will be for the entire test so far. If lu is omitted, the list will appear at the terminal.

If the list is output to a 2647A terminal (and the total amount of information does not overflow the alphanumeric memory of the terminal) then the user may use the top of page, next page, and prev page keys to control the resulting display.

The following is an example output from M05AN.

♦♦ EXAMPLE RUN OF MOSAN

:RU,MOSAN

MOSAN: LIST OF READINGS FROM A SENSOR

MOSAN: TERMINATE AT ANY TIME BY RESPONDING !!

MOSAN: PLEASE ENTER SN(,LU(,LOWTIME,HIGHTIME))

MOSAN: SN = SENSOR NUMBER, LU=1 OR 6, TIMES IN FORM HHMM

MOSAN? 2,1,1350,1400

HJ

MOSAN:	READINGS OF SENSOR	2	READING TIME	READING TIME	READING TIME	PAGE 1	READING TIME
MOSAN:	448.63	13:50	488.03	13:50	488.03	13:50	488.03
MOSAN:	532.17	13:50	532.16	13:50	532.16	13:50	489.37
MOSAN:	489.36	13:50	489.36	13:50	489.35	13:51	489.35
MOSAN:	489.35	13:51	489.35	13:51	489.35	13:51	489.35
MOSAN:	489.35	13:51	489.35	13:51	489.36	13:51	489.35
MOSAN:	489.35	13:52	489.35	13:52	489.35	13:52	489.35
MOSAN:	489.35	13:52	489.35	13:52	489.34	13:52	489.35
MOSAN:	525.58	13:52	525.57	13:52	525.58	13:52	485.62
MOSAN:	485.62	13:53	485.62	13:53	485.62	13:53	485.62
MOSAN:	485.61	13:53	485.63	13:53	485.62	13:53	485.61
MOSAN:	485.61	13:53	485.62	13:54	485.63	13:54	485.63
MOSAN:	485.62	13:54	485.62	13:54	485.62	13:54	485.62
MOSAN:	522.00	13:54	522.01	13:54	479.04	13:54	479.06
MOSAN:	479.05	13:55	479.05	13:55	479.04	13:55	434.91
MOSAN:	434.91	13:55	434.91	13:55	434.91	13:55	434.91
MOSAN:	434.91	13:55	406.26	13:56	406.27	13:56	435.52
MOSAN:	435.52	13:56	435.52	13:56	391.34	13:56	391.34
MOSAN:	391.34	13:56	391.34	13:56	337.66	13:57	337.66

MOSAN:	READINGS OF SENSOR	2	READING TIME	READING TIME	READING TIME	PAGE 2	READING TIME
MOSAN:	337.66	13:57	337.67	13:57	337.66	13:57	412.24
MOSAN:	412.24	13:57	412.24	13:57	458.78	13:57	458.79
MOSAN:	458.78	13:58	458.78	13:58	458.78	13:58	507.73
MOSAN:	507.72	13:58	507.72	13:58	507.72	13:58	476.06
MOSAN:	476.06	13:58	476.06	13:58	476.06	13:59	519.62
MOSAN:	519.62	13:59	561.39	13:59	561.40	13:59	561.39
MOSAN:	561.39	13:59	561.39	13:59	594.15	13:59	594.15
MOSAN:	594.15	14:00	594.15	14:00	594.15	14:00	594.16
MOSAN:	559.59	14:00	559.60	14:00	559.60	14:00	586.41
MOSAN:	586.41	14:00	586.41	14:00			

MOSAN: PLEASE ENTER SN(,LU(,LOWTIME,HIGHTIME))

MOSAN: SN = SENSOR NUMBER, LU=1 OR 6, TIMES IN FORM HHMM

MOSAN? !!

MOSAN: TERMINATED

M07AN--DYNAMIC LOW SPEED SENSOR DISPLAY

The program, M07AN, is used to obtain a dynamically refreshed display of each low speed sensor's last reading and status. This is run only on the HP2647A terminal and is meaningful only when run during an on-line test.

The user may select the refresh rate from once every 2 seconds to once every minute. Once selected, the display will start and be refreshed at the user selected interval.

This program is terminated by striking any printable character key followed by striking the return key.

The program can display up to 80 sensors. If more than 80 sensors are in the system, only the first 80 are displayed. There are four columns of sensor display. Each display lists the last value read in real world units, the status code, and the sensor number. The status codes are defined as follows:

- 1--Idle
- 2--Reading required (awaiting use of DVM and Scanner)
- 3--Reading in progress
- 4--Sensor put down by operator
- 5--Sensor down due to hardware fault
- 6--Sensor in recovery

A sensor display will be highlighted with inverse video if the last value read was out of range as defined in the low speed configuration table or if the sensor is downed by the operator or inoperative due to a hardware fault.

If a sensor is in status 3 (reading in progress) and is highlighted as well, this indicates that this sensor was being read at the time of a hardware fault on the DVM or extender. Typically, all other sensors associated with this DVM will be in status 5 (hardware fault).

Below is an example dialogue with the program and a sample display. This particular display shows the entire top line highlighted. The sensors 1, 2, 3 and 4 are all associated with DVM LU 34 which is down. Sensor 44 is also highlighted in this case because the last reading was out of the defined range.

RU,MO7AN

MO7AN: DYNAMIC LOW SPEED SENSOR DISPLAY

MO7AN: NOTE - THIS MUST BE RUN ON A 2647 TERMINAL

MO7AN: ENTER NUMBER OF SECONDS BETWEEN UPDATES (2-60) OR !! TO TERMINATE

MO7AN? 2

MO7AN: DYNAMIC DISPLAY OF LOW SPEED SENSORS - (READING, STATUS, SENSOR NUMBER)

1.35 3.001
1.35 1 041
1.35 1 081

501.65 5 002
1387.43 1 042
895.12 1 082

988.35 5 003
957.83 1 043
868.12 1 083

3.80 5 004
1.96 1 044
23.33 1 084

J00AN--PLOT LOW SPEED SENSOR READINGS

The program, J00AN, is used to generate plots of low speed sensor readings. Up to three sensors may be plotted together providing that they have the same units and allowable range (Y axis is the same for all three). Up to two sensors may be plotted for sensors whose units or allowable ranges differ.

This program may be run during an on-line test or after one is finished providing that the files and common are still intact or that the user has restored the files and common by running program M06RU using the low speed data stored on tape at the end of the desired on-line test.

The user has a wide range of options at his disposal with which he may define the plotting parameters. The user exercises these options via an interactive dialogue with the plot routine.

The user specifies the destination device in response to:

DO YOU WANT OUTPUT ON THE CRT OR LP (LINE PRINTER)

The user enters CRT to get a display at his console (which must be an HP2647A) or LP to get his plot in hard copy on the graphics line printer. If the user has chosen the CRT, he may still obtain a hard copy providing he is using the CRT to which the HP7310A printer is attached.

The user is then asked to specify which sensors he wants plotted:

PLEASE ENTER UP TO THREE SENSOR NUMBERS

The user enters up to three sensor numbers separated by commas. If two or three sensor numbers were entered, the program will ask if they have the same units. The user replies YES or NO. Answering NO will produce a plot with two separate axes, the left axis defining the first sensor and the right axis defining the second sensor. Answering YES produces a graph with one labeled Y axis on the left.

Labels for the units and the sensor are obtained from the information in the low speed configuration table which was used (or is in use) for this test.

The user is next asked to specify the type of Y axis to be used. He has a choice of a log/linear or a linear/linear plot:

ENTER LOG FOR LOG/LINEAR PLOT

LIN FOR LINEAR/LINEAR PLOT

The user enters LOG or LIN as desired. Note that if the user enters LOG for a plot which ends up with a Y axis range that includes negative numbers, the routine will alter his choice to LIN.

The user may specify a time range (X axis) over which the sensor is plotted or he may allow the routine to establish a time range for him. If he allows the program to compute the range, it will do so based on the data which exists in the low speed data file. All data will be plotted:

DO YOU WANT TO SPECIFY A TIME RANGE?

The user responds YES or NO as desired. If he responds YES, he will next be asked to enter the range:

PLEASE ENTER BEGINNING TIME, END TIME IN FORM HHMM

For example, if the user wanted to plot data from 11:00 PM through 1:30 AM he would enter:

2300,130

Note that midnight is 0000.

Once the time range has been established, the user is asked if he wants to specify the Y axis range:

DO YOU WANT TO SPECIFY Y AXIS SCALING?

The user answers YES or NO as desired. If the user responds NO, the program will obtain the scaling information from the high and low limits specified in the low speed configuration table. If the user answers YES, the program will request the low limit then the high limit of the left axis. These questions will be repeated if the double Y axis choice was implied:

PLEASE ENTER LOW LIMIT OF SENSOR nnn

where nnn is the sensor number followed by:

PLEASE ENTER HIGH LIMIT OF SENSOR nnn

etc.

The user is next asked:

ENTER 1 TO PLOT EVERY POINT

2 TO PLOT EVERY OTHER POINT, UP TO 100

Plots will proceed much faster for higher numbers entered and high numbers should be entered when the time scale is large.

The plot will now be generated. Below are two sample conversations and their resulting plots.

RU, JOOAN

JOOAN: PLOT READINGS FROM SENSORS

JOOAN: TERMINATE AT ANY TIME BY RESPONDING !!

JOOAN: DO YOU WANT OUTPUT ON THE CRT OR LP (LINE PRINTER)

JOOAN? CRT

JOOAN: PLEASE LIST UP TO THREE SENSOR NUMBERS

JOOAN? 2,3,42

JOOAN: DO THE SENSORS ALL HAVE THE SAME UNITS?

JOOAN? YES

JOOAN: ENTER LOG FOR LOG/LINEAR PLOT

JOOAN: LIN FOR LINEAR/LINEAR PLOT

JOOAN: LIN

JOOAN: DO YOU WANT TO SPECIFY A TIME RANGE?

JOOAN? YES

JOOAN: PLEASE ENTER BEGINNING TIME, END TIME IN FORM HHMM

JOOAN? 1345,1405

JOOAN: DO YOU WANT TO SPECIFY Y AXIS SCALING?

JOOAN? NO

JOOAN: ENTER 1 TO PLOT EVERY POINT

JOOAN: 2 TO PLOT EVERY OTHER POINT, UP TO 100

JOOAN? 1

RU, JOAN
JOAN: PLOT READINGS FROM SENSORS
JOAN: TERMINATE AT ANY TIME BY RESPONDING !!

JOAN: DO YOU WANT OUTPUT ON THE CRT OR LP (LINE PRINTER)
JOAN? CRT

JOAN: PLEASE LIST UP TO THREE SENSOR NUMBERS
JOAN? 82,44

JOAN: DO THE SENSORS ALL HAVE THE SAME UNITS?
JOAN? NO

JOAN: ENTER LOG FOR LOG/LINEAR PLOT
JOAN: LIN FOR LINEAR/LINEAR PLOT
JOAN: LOG

JOAN: DO YOU WANT TO SPECIFY A TIME RANGE?
JOAN? NO

JOAN: DO YOU WANT TO SPECIFY Y AXIS SCALING?
JOAN? YES

JOAN: PLEASE ENTER LOW LIMIT OF SENSOR 82
JOAN? 100

JOAN: PLEASE ENTER HIGH LIMIT OF SENSOR 82
JOAN? 10000

JOAN: PLEASE ENTER LOW LIMIT OF SENSOR 44
JOAN? .01

JOAN: PLEASE ENTER HIGH LIMIT OF SENSOR 44
JOAN? 100

JOAN: ENTER 1 TO PLOT EVERY POINT
JOAN: 2 TO PLOT EVERY OTHER POINT, UP TO 100
JOAN? 10

M06RU--LOAD LOW SPEED DATA FROM TAPE TO DISC

M06RU is used to load the low speed data from the tape produced during an on-line data acquisition run into the system so that the monitor and analysis routines may be run against the data. This program will configure the system on which it is run to look like an on-line test has just finished. After it has been run, the user may run the standard low speed monitor routines such as J00AN, plot low speed data, M05AN, list low speed data, and B01AN, display low speed configuration and status. M07AN, display dynamic status, may also be run, but its utility other than during an on-line test is highly limited.

This program will write the low speed data to the file HSDATA on cartridge LS, create and load the label file and configure real time common so that the system appears to have just completed an on-line test. For this reason, this program may only be run on a system which is not currently running an on-line test. Doing so will completely destroy the on-line test in progress.

The user is warned of the dangers of running this program and asked if he wants to continue. If the user responds YES, M06RU will ask for the LU of the tape drive being used. The data is then read in.

SECTION III
MONITOR AND ANALYSIS PROGRAMS--HIGH SPEED

M13AN--DISPLAY HIGH SPEED ACQUISITION CONFIGURATION AND STATUS

M13AN is used to display the current high speed data acquisition system configuration (including trigger check parameters) and the current status of the high speed disc event spaces. The user may direct the report to his terminal or to the line printer. The basic format of the report is similar to the result of the list request in M08AF (create or alter high speed configuration table).

The user specifies the LU of the list device as 1 (terminal) or 6 (line printer). The report is then listed on the selected device.

The report first gives the time of day and the amount of time the acquisition run has been in progress. Following this is a line for each defined high speed channel. Given is the channel number, the channel type (trigger channel, data channel, or down), the Level 1 trigger threshold, the Level 2 trigger threshold, and the label associated with the channel (from the high speed label file created via M08AF).

The Preston configuration and general trigger parameters are listed next. The aggregate sample rate in hertz, the channel sample rate in hertz, and the event length in seconds appear in the first line. The number of pretrigger points stored in number of 24.5 K blocks and the amount of time in seconds is given on the next line. The algorithm number,

number of points per quantum, number of quanta in a short term interval, number of quanta in a long term interval, and the skip (or density) parameter are detailed on line three. Finally, the number of disc event spaces on the high speed cartridge and the number of cylinders per event are given.

The next section lists four on-line counters which give information about the high speed activity so far. These are the number of high speed events logged by the high speed data acquisition system, the number of these events which are currently on magnetic tape, the number of events which the high speed system detected but which were not placed on disc because of lack of room or hardware faults, and the number of events logged because of operator demands.

The last section details the current disc event space statuses. There is one line for each disc event space. Each line lists the associated high speed Preston data file name, how long this particular event has been on disc, the channel number causing trigger, the current status of the disc event space and the position of the level 2 trigger if one existed. The channel number causing trigger field may contain a 99 (indicating it is the result of a demand trigger) or a \$\$ (indicating the field is meaningless). For those spaces containing an event passing the level 2 check, the trigger position in points in the trigger channel is given

Below is an example conversation between an operator and M13AN and the resulting report.

:RU,M13AN

M13AN: HIGH SPEED CHANNEL AND DISC STATUS

M13AN: PLEASE ENTER LU OF LIST DEVICE OR !! TO TERMINATE

M13AN? 1

M13AN: CURRENT TIME = 12:39:18

M13AN: TIME SINCE TEST START = 4:10:01

M13AF: HIGH SPEED DATA CONFIGURATION

M13AF: CH# TYPE LEVEL 1 LEVEL 2 LABEL

M13AF:	CH#	TYPE	LEVEL 1	LEVEL 2	LABEL
M13AF:	0	TRIG	1.150	1.200	X - SOUTH
M13AF:	1	DATA	0.000	0.000	Y - SOUTH
M13AF:	2	DATA	0.000	0.000	Z - SOUTH
M13AF:	3	TRIG	1.150	1.200	X - EAST
M13AF:	4	DATA	0.000	0.000	Y - EAST
M13AF:	5	DATA	0.000	0.000	Z - EAST
M13AF:	6	DATA	0.000	0.000	X - NORTH
M13AF:	7	DATA	0.000	0.000	Y - NORTH
M13AF:	8	TRIG	1.150	1.200	Z - NORTH
M13AF:	9	DATA	0.000	0.000	GEOPHONE
M13AF:	10	DATA	0.000	0.000	DUMMY
M13AF:	11	DATA	0.000	0.000	DUMMY

M13AF: SAMPLE RATE TOTAL: 100K SAMPLE RATE/CHANNEL: 8333. EVENT LENGTH: 8.847

M13AF: PRE-TRIGGER STORAGE: 4 24.5K BLOCKS (.98 SECONDS)

M13AF: ALGORITHM NUMBER: 0 Q: 8 S: 3 L: 10 SKIP: 1

M13AF: NUMBER OF DISC EVENT SPACES: 5 CYLINDERS/EVENT: 72

M13AN: NUMBER OF EVENTS RECEIVED: 41

M13AN: NUMBER OF EVENTS ON TAPE: 6

M13AN: NUMBER OF UNLOGGED TRIGGERS: 1

M13AN: NUMBER OF DEMAND TRIGGERS: 0

M13AN: FILE AGE CH# STATUS

M13AN:	FILE	AGE	CH#	STATUS
M13AN:	HS00	0:27:10	3	ON TAPE (OK TO FREE)
M13AN:	HS01	0:16:58	0	FAILED LEV 2(OK TO FREE)
M13AN:	HS02	0:03:35	8	LEVEL 2 CHECK IN PROG.
M13AN:	HS03	0:00:00	\$\$	SPACE IS FREE
M13AN:	HS04	0:00:00	\$\$	SPACE IS FREE

M13AN: PLEASE ENTER LU OF LIST DEVICE OR !! TO TERMINATE

M13AN? !!

M13AN: TERMINATED

M19AN--DYNAMIC DISPLAY OF HIGH SPEED DISC EVENT SPACE STATUS

M19AN is used to dynamically display the status of the high speed disc event spaces. This routine should be run at an HP2647A terminal during an on-line data acquisition run. The report is basically meaningless unless run during an on-line test.

The user specifies the refresh rate in number of seconds. He may cause the refresh to be as often as once per second or as slow as once per minute. Once the refresh rate has been established, the program will display the statuses of all disc event spaces and the four high speed counters. This display is refreshed to represent current status based on the operator selected refresh rate.

The report lists the file number (00-99), age of data, channel number causing trigger, and disc event space status for each disc event space. The four counters specify number of events received from the high speed system, the number of events currently on tape, the number of events detected by the high speed system but not logged to disc because of lack of space, and the number of events logged due to an operator demand request.

The user may terminate this program at any time by striking any printable character key and then striking the return key.

Below is an example conversation with M19AN and the resulting report.

:RU,M19AN

M19AN: DYNAMIC HIGH SPEED DISC EVENT SPACE DISPLAY

M19AN: NOTE - THIS MUST BE RUN ON A 2647 TERMINAL

M19AN: ENTER NUMBER OF SECONDS BETWEEN UPDATES (1-60) OR !! TO TERMINATE
M19AN? 2

DYNAMIC HSDS DISPLAY			
F#	AGE	CH#	STATUS
00	0:40:39	3	ON TAPE (OK TO FREE)
02	0:17:04	8	LEVEL 2 CHECK IN PROG.
04	0:00:00	\$\$	SPACE IS FREE
01	0:30:27	0	FAILED LEV 2 (OK TO FREE)
03	0:00:00	\$\$	SPACE IS FREE

RECEIVED: 41 ON TAPE: 6 UNLOGGED: 1 DEMAND: 0

B02AN--LOCK OR RELEASE A DISC EVENT SPACE

B02AN is used during an on-line data acquisition run to lock and subsequently release a disk event space. Placing a lock on a disc event space will prevent it from being freed to the high speed system and hence the user is guaranteed that it will not be overwritten by a new high speed event. This program should be run before running the high speed monitor programs which look at the data in a Preston event file. These are M20AN, plot high speed channel, M12AN, verify Level 1 trigger, and M22AN, verify Preston format.

The program will identify itself and ask the user for a request. The request may be to lock a disk event space:

LOCK,n where n is the disc event space to be
 locked (0-99)

Or it may be to release a disc event space:

REL,n where n is the disc event space number
 to be released.

Only one disc event space may be locked at one time. Allowing more than this will adversely impact throughput of the high speed system. The user should also take care to release a disc event space when he is finished with it.

A disc event space may be locked if it is being written to tape, has been written to tape (OK to free), or if it failed the Level 2 trigger check (OK to free). If high speed tape logging is not being used, a disc event space may be locked if its status is requires write to tape.

M20AN--PLOT HIGH SPEED PRESTON DATA

M20AN is used to plot a single channel of high speed Preston data. It may be run during an on-line test, immediately after an on-line test, or after preparing the system with taped Preston data using program M22RU. If the user is running this program during an on-line test, it is advisable to have locked the disc event space to be plotted using program, B02AN.

The user interactively specifies several parameters governing the plot. The user is first asked whether he wants the plot to appear on his CRT terminal or on the printer plotter. If he desires a CRT plot, he must run this program from a 2647 terminal. If he wants a copy of the CRT plot, he must run this program from the terminal with the 7310A printer attached.

Once the plotting device is established, the user will be asked to input the name of the high speed Preston file. The file name is always in the form HSnn, where nn ranges from 00 to 99.

M20AN will then inform the user how many points per channel exist on the specified file. The user is asked to specify how many points he wishes to plot and the point number at which the plot is to start. Note that the form of the response is point

numbers times 100, hence to plot 300 points starting at point number 48,000 would require a response of:

3,480

The user is then asked to specify the channel number (0-12) which will be plotted.

The Y axis of the plot will be labeled as percentages of the maximum and minimum possible signals. The user may limit the Y axis range by answering a number less than 100 to the request for Y axis scaling percentage.

Finally, the user is asked to specify if any points are to be skipped while collecting data for the plot. Answering 1 to this request will plot every point, answering 2 will plot every other point, etc.

The resultant plot will show a single Preston channel plotted over the specified range of points. The plot will be labeled using the high speed label file in effect at the time the data was collected. The channel number, date, and time also appear on the plot. The Y axis is labeled in percent of the minimum and maximum possible values. The X axis is labeled with point numbers for the selected channel. The total time represented by the plot appears under the channel number. In the lower left and lower right of the plot appear two numbers

labeled in seconds. These represent the starting time and ending time of the plot with time 0.0 being the start of the event.

Below is an example conversation with M20AN and the resulting plot.

```

:RU,M20AN
M20AN: PLOT A PRESTON CHANNEL
M20AN: TERMINATE BY RESPONDING !!

M20AN: DO YOU WANT OUTPUT ON THE CRT OR LP (LINE PRINTER)
M20AN? CRT

M20AN: PLEASE ENTER FILE NAME OF PRESTON DATA
M20AN? H500

M20AN: YOU HAVE      73728. POINTS PER CHANNEL
M20AN: ENTER N,S WHERE N IS THE NUMBER OF POINTS TO PLOT*100
M20AN:                AND S IS THE STARTING POINT NUMBER*100
M20AN? 3,13

M20AN: WHAT CHANNEL NUMBER DO YOU WANT?
M20AN? 0

M20AN: ENTER PERCENT OF SCALE FOR Y AXIS (10-100)
M20AN? 55

M20AN: ENTER 1 TO PLOT EVERY POINT
M20AN:        2 FOR EVERY OTHER POINT ETC. (MAX 100)
M20AN? 1

```

M12AN--VERIFY LEVEL 1 TRIGGER

M12AN is used to examine a high speed Preston data file to verify or deny the existence of a Level 1 trigger. This routine may be run on-line during an acquisition run or off-line providing that a valid high speed Preston data file exists on disc (cartridge HS). The user may provide the Level 1 parameters or he may instruct the program to obtain the parameters from real time common (as the on-line system does).

The intent of this routine is to ascertain that the high speed data acquisition system is properly performing the Level 1 trigger checks and as an aid in determining the proper parameters for later use in the high speed data acquisition system. This program uses the same algorithms as does the high speed system.

There are two available Level 1 algorithms. One compares a short term average absolute amplitude to a corresponding long term average. This is algorithm 0. Algorithm 1 compares the average absolute first differences of a short term versus a long term interval.

The required parameters are:

A--The algorithm number (0 or 1)

Q--The number of points per quantum

S--The number of quanta in a short term interval

L--The number of quanta in a long term interval

C--The channel number of the high speed data file

D--A density flag indicating what fraction of the
data points are to be examined (1--every point,
2--every other point, etc.)

T--The threshold defining a trigger (1.0-20.0) and

F--The file name of the high speed Preston data
file.

The user always specifies the name of the file and may specify everything else or allow the program to use the parameters currently in effect. This is done via an interactive conversation with the program.

Once the parameters have been established, the program begins reading the high speed file. It will read enough data points to establish the original long term and short term intervals. This is a total of $Q \cdot D \cdot L$ points. A check for a Level 1 trigger is then made. If it passes, the point at which the trigger was found and the magnitude of the trigger are displayed and the program terminates. If a trigger is not found, the long and short term intervals are updated by examining one more quantum ($Q \cdot D$ points) and the trigger check is made again.

This process continues until the file is exhausted or the operator breaks the program. If no trigger was found, the greatest ratio of short term average to long term average is listed.

If a problem occurs during the analysis, the associated FMP error is displayed. Three errors not listed in the RTE-IVB manual may appear in this message:

<u>ERROR CODE</u>	<u>MEANING</u>
-200	Incorrect file type (i.e., not Type 1)
-201	No coincidence bit in data file
-202	Incorrect channel number

Below is an example conversation between an operator and M12AN.

```

:RU,M12AN
M12AN: LEVEL 1 TRIGGER VERIFICATION
M12AN: TERMINATE AT ANY TIME BY RESPONDING !!

M12AN: DO YOU WANT TO SUPPLY THE LEVEL 1 PARAMETERS?
M12AN? YES

M12AN: ENTER LEVEL 1 PARAMETERS AS A,Q,S,L,C
M12AN:      A - ALGORITHM NUMBER
M12AN:      0 = AMPLITUDE COMPARISON
M12AN:      1 = 1ST DIFFERENCE COMPARISON
M12AN:      Q - NUMBER OF POINTS IN A QUANTUM
M12AN:      (2-512 - POWER OF 2)
M12AN:      S - NUMBER OF QUANTA IN SHORT TERM INTERVAL (1-10)
M12AN:      L - NUMBER OF QUANTA IN LONG TERM INTERVAL (2-100)
M12AN:      C - CHANNEL NUMBER
M12AN? 0,8,3,10,0

M12AN: ENTER 1 TO USE EVERY POINT FOR TRIGGER CHECK
M12AN:      2 FOR EVERY OTHER POINT, ETC. MAX 256
M12AN? 1

M12AN: ENTER THRESHOLD FOR LEVEL 1 CHECK (1.0-20.0)
M12AN? 1.3

M12AN: ENTER FILE NAME OF PRESTON DATA FILE
M12AN? HS00

M12AN: TRIGGER VERIFIED - T =      1.33 POINT = 2928.

M12AN: TERMINATED

```

M22AN--VERIFY FORMAT OF HIGH SPEED PRESTON DATA FILE

M22AN will verify that a Preston high speed data file is in the correct format. This should be run if the user suspects there are problems with high speed data logging process. It is primarily a program for paranoids. This program may be run during an on-line test, after an on-line test has been completed, or after running M21RU to obtain high speed Preston data from tape. If the user is running this program during an on-line test, it is advisable to first lock the disc event space in question with program B02AN.

M22AN will identify itself and then request the name of a high speed Preston data file. The form of the file name is always HSnn where nn ranges from 00 to 99. M22AN will begin looking at the file. It will inform the user of the number of channels on the file and of any problem which it detects as well as the position in the file at which the problem was detected. If the file is formatted correctly, M22AN will so state.

This program may be prematurely halted using the system break command.

M21RU--LOAD HIGH SPEED PRESTON DATA FROM TAPE TO DISC

M21RU is used to load the high speed Preston data from tape to disc. These tapes are produced during an on-line data acquisition run. This program is run in order to run the high speed monitor and analysis programs against the high speed data. This program will configure the system on which it is run to look like an on-line test has just finished. After it has been run, the user may run the standard high speed monitor programs such as M20AN, plot high speed data, M13AN, display high speed configuration and status; M22AN, verify format of high speed data file; and M12AN, verify Level 1 trigger.

The program will interactively help the user find the specific high speed events he wants to examine. The high speed events are written to disc, a high speed label file is created and written to disc and the real time common is configured to look like an on-line test has just finished. For this reason, this program may be run only on a system which is not currently running an on-line test. Doing so will completely destroy the on-line test which is in progress.

The user is first warned of the dangers of running this program and asked if he wishes to continue. If the user answers YES, M21RU will ask the user for the LU of the tape drive he is going to use.

Once the drive is established, M21RU will position the tape to the first high speed event. Information pertaining to this event is displayed to the user. This information details the test date, test start time, tape volume, event number, elapsed time into test for this event, time of day for this event, and the channel causing the trigger (99 indicates a demand trigger occurred).

The user is then asked for his request. He may respond with SKIP, COPY, HELP, REWIND, UNLOAD, BACK, or !.

SKIP will position the tape to the next event and display the event details. Should the end of volume be detected, the user is informed and may respond with BACK, REWIND, or UNLOAD.

COPY,n (where n is a disc event space number) will copy this event to the specified disc event space. If the disc event space already contains an event, the user is informed and given the option to overwrite it or input a new command. The number of available disc event spaces is equal to the number of disc event spaces when the on-line test was originally run.

HELP will display a list of legal responses to the program.

REWIND will position the tape to the first event on the volume.

UNLOAD will rewind the tape and put it off-line. The user may now mount a new volume (from the same test) and inform M21RU of the LU being used and continue the above described process.

BACK will position the tape to the previous event. Specifying BACK when the tape is positioned at the first event will reposition the tape to the first event.

Responding !! will terminate the program.

Below is an example conversation between a user and M21RU. In this example, the user winds up with Event 14 on file HS00, Event 17 on file HS01, and Event 7 on file HS02.

```

:RU,M21RU
M21RU: LOAD PRESTON EVENTS FROM TAPE TO DISC
M12RU: TERMINATE AT ANY TIME BY RESPONDING !!

M21RU: WARNING - THIS PROGRAM WILL DESTROY ALL FILES ON CARTRIDGE HS
M21RU:           IT WILL KILL AN ON-LINE TEST IF ONE IS IN PROGRESS
M21RU:           DO YOU WISH TO CONTINUE?
M21RU? YES

M21RU: PLEASE ENTER THE LU OF THE TAPE YOU ARE USING
M21RU? 8

M21RU: DATE: SEP 9      TEST START TIME: 9:26:56      TAPE VOLUME: 3

M21RU: TAPE IS POSITIONED AT EVENT NUMBER      13
M21RU: ELAPSED TIME INTO TEST WAS              0:14:04
M21RU: TIME OF DAY FOR EVENT WAS              9:41:00
M21RU: CHANNEL CAUSING TRIGGER WAS            4

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? HELP

M21RU: -----FORM-----      -----MEANING-----
M21RU: SK(IP)                  SKIP THIS EVENT - GO TO NEXT
M21RU: CO(PY),N                COPY THIS EVENT TO EVENT SPACE N
M21RU: HE(LP)                  LIST LEGAL RESPONSES
M21RU: RE(WIND)                REWIND TAPE TO FIRST EVENT
M21RU: UN(LOAD)                REWIND AND UNLOAD TAPE
M21RU: BA(CK)                  POSITION TO PREVIOUS EVENT
M21RU: !!                      TERMINATE

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? SKIP

M21RU: DATE: SEP 9      TEST START TIME: 9:26:56      TAPE VOLUME: 3

M21RU: TAPE IS POSITIONED AT EVENT NUMBER      14
M21RU: ELAPSED TIME INTO TEST WAS              0:15:09
M21RU: TIME OF DAY FOR EVENT WAS              9:42:05
M21RU: CHANNEL CAUSING TRIGGER WAS            3

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? COPY,0

M21RU: DATE: SEP 9      TEST START TIME: 9:26:56      TAPE VOLUME: 3

M21RU: TAPE IS POSITIONED AT EVENT NUMBER      15
M21RU: ELAPSED TIME INTO TEST WAS              0:16:14
M21RU: TIME OF DAY FOR EVENT WAS              9:43:10
M21RU: CHANNEL CAUSING TRIGGER WAS            99

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? SKIP

M21RU: DATE: SEP 9      TEST START TIME: 9:26:56      TAPE VOLUME: 3

M21RU: TAPE IS POSITIONED AT EVENT NUMBER      16
M21RU: ELAPSED TIME INTO TEST WAS              0:17:19
M21RU: TIME OF DAY FOR EVENT WAS              9:44:15
M21RU: CHANNEL CAUSING TRIGGER WAS            0

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? COPY,1

M21RU: DATE: SEP 9      TEST START TIME: 9:26:56      TAPE VOLUME: 3

```

M21RU: TAPE IS POSITIONED AT EVENT NUMBER 17
M21RU: ELAPSED TIME INTO TEST WAS 0:18:24
M21RU: TIME OF DAY FOR EVENT WAS 9:45:20
M21RU: CHANNEL CAUSING TRIGGER WAS 4

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? COPY,1

M21RU: THIS DISC EVENT SPACE IS ALREADY BEING USED
M21AN: DO YOU WANT TO OVERLAY IT?
M21RU? YES

M21RU: END OF VOLUME DETECTED
M21RU: SPECIFY REWIND TO REWIND TAPE TO FIRST EVENT
M21RU: UNLOAD TO REWIND AND UNLOAD TAPE OR
M21RU: BACK TO POSITION TAPE TO PREVIOUS EVENT
M21RU? UNLOAD

M21RU: PLEASE ENTER LU OF NEXT TAPE DRIVE TO BE USED
M21RU? 9

M21RU: DATE: SEP 9 TEST START TIME: 9:26:56 TAPE VOLUME: 2

M21RU: TAPE IS POSITIONED AT EVENT NUMBER 7
M21RU: ELAPSED TIME INTO TEST WAS 0:07:34
M21RU: TIME OF DAY FOR EVENT WAS 9:34:30
M21RU: CHANNEL CAUSING TRIGGER WAS 0

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? COPY,2

M21RU: DATE: SEP 9 TEST START TIME: 9:26:56 TAPE VOLUME: 2

M21RU: TAPE IS POSITIONED AT EVENT NUMBER 8
M21RU: ELAPSED TIME INTO TEST WAS 0:08:39
M21RU: TIME OF DAY FOR EVENT WAS 9:35:35
M21RU: CHANNEL CAUSING TRIGGER WAS 4

M21RU: PLEASE ENTER REQUEST (HELP FOR LIST OF LEGAL RESPONSES)
M21RU? !!

M21RU: TERMINATED

SECTION IV
MAINTENANCE PROGRAMMING INFORMATION

HARDWARE ENVIRONMENT

The Strategic Petroleum Reserve data acquisition system has been written to run in a specific hardware environment. The on-line system runs in two CPUs which communicate via a distributed systems (DS) link. The CPU in which the controlling functions and the low speed collection system runs is an HP-1000 model F with 768,000 bytes of main memory. The high speed data collection system runs in an HP-1000 model E with 768,000 bytes of main memory.

Both CPUs have access to an HP7906 disc system. The high speed system can demand absolute priority for disc use as it needs uninterruptable disc access while writing high speed data to the Preston data files.

The on-line software assumes that the top platter (surfaces 0 and 1) contain two cartridges for on-line data storage and the pre-defined configuration tables. The high speed system stores its data on cartridge HS which must be LU 20. Cartridge HS must be 370 tracks in length and must start at track 0. It has 4 spare tracks. The rest of the top platter is reserved for cartridge LS which is LU 21. This cartridge has 76 tracks with 2 spare tracks. The low speed data and the configuration tables are stored on cartridge LS.

As this fills up the top platter, the bottom platter must contain a supervisor for both CPUs as well as the development and production program space. The only assumption concerning the bottom platter is that the cartridge reference of the model F supervisor cartridge is SY.

The peripherals assumed to be attached to the model F and their LUs are given below:

<u>PERIPHERAL</u>	<u>LU</u>	<u>DESCRIPTION</u>
TI SIL 700	1	Hard copy system console
HP 7906	2	Model F supervisor cartridge
HP 7906	16	Development area 1
HP 7906	17	Development area 2
HP 7906	18	Development area 3
HP 7906	19	Production program library
HP 7906	20	High speed data area
HP 7906	21	Low speed data and configuration tables
HP 2608A	6	Line printer
HP 7970B	8	Mag tape
HP 7970B	9	Mag tape
HP 12771A	12	DS/1000 link (to node 101 and 102)
HP 2608A	14	Line printer (graphics)
HP 2647A	22	CRT terminal (keyboard)
HP 2647A	23	CRT terminal (left tape)
HP 2647A	24	CRT terminal (right tape)
HP 2647A	25	CRT terminal (graphics)

HP 2647A	26	CRT terminal (keyboard)
HP 2647A	27	CRT terminal (left tape)
HP 2647A	28	CRT terminal (right tape)
HP 2647A	29	CRT terminal (graphics)
HP 59310B	30	HP-IB #1
HP 37201A	31	HP-IB extender
HP 37201A	32	HP-IB extender
HP 3455A	33	DVM (spare)
HP 3455A	34	DVM (used)
HP 3495A	35	Scanner
HP 59310B	40	HP-IB #2
HP 37201A	41	HP-IB extender
HP 37201A	42	HP-IB extender
HP 3455A	43	DVM (spare)
HP 3455A	44	DVM (used)
HP 3495A	45	Scanner
HP 59310B	50	HP-IB #3
HP 37201A	51	HP-IB extender
HP 37201A	52	HP-IB extender
HP 3455A	53	DVM (spare)
HP 3455A	54	DVM (used)
HP 3495A	55	Scanner

When running under session, the session LUs are:

<u>LU</u>	<u>DESCRIPTION</u>
1	CRT terminal (keyboard)
4	CRT terminal (left tape)
5	CRT terminal (right tape)
7	CRT terminal (graphics)

All others: same as system LUs.

The peripherals assumed to be attached to the model E and their LUs are given below:

<u>PERIPHERAL</u>	<u>LU</u>	<u>DESCRIPTION</u>
TI SIL 700	1	Hard copy system console
HP 7906A	2	System cartridge
HP 7906A	19	Program production library cartridge
HP 7906A	20	High speed data cartridge
HP 7906A	21	Low speed data cartridge
TI SIL 700	6	Same as LU 1 - acts as printer
HP 93596L	7	Preston analog to digital converter
HP 13197A	10	Lower 512 words of write control storage
HP 13197A	11	Upper 512 words of write control storage
HP 13197A	14	High speed throughput dummy driver

For more detailed descriptions of the hardware configurations, see the most recent listings from the system generations (RT4GN).

A third CPU for analysis functions is attached via DS to the Model E. The analysis CPU is a model F with an as yet unspecified configuration of terminals, tapes and discs. The DS node numbers for the three CPUs are listed below:

<u>NODE</u>	<u>CPU</u>
100	Controller (model F)
101	High speed system (model E)
102	Analysis system (model F)

Figure 1 shows the basic layout of the three CPUs including the anticipated peripherals for the analysis CPU.

FIGURE 1

STRUCTURE OF THE LOW SPEED ON-LINE SYSTEM

The on-line programs which comprise the low speed system are permanently loaded with the DC (don't copy) option. All have access to real time common via the RC (reverse common) option. M01AN, the on-line scheduler, controls (directly or indirectly) the execution of all the permanently loaded on-line programs. Low speed programs subservient to M01AN are M00AN, the on-line timer; M03AN, the low speed data collector; M04AN, the low speed disc manager; and FMGR, the file manager.

M01AN, after obtaining the names of the configuration files from the user will schedule FMGR passing it the name of a transfer file, PREPLS. This transfer file will cause the file manager to create the largest possible low speed data file, LSdata::LS, but still leave 400 free blocks for future configuration tables. The file LSdata is preset to all ones so that later programs can easily detect end of data.

M01AN is responsible for setting up the low speed configuration tables in common. This is done by extracting information from the low speed configuration files and placing this information in the Low Speed Configuration Table, LSCT, and the Low Speed Configuration Table Extension, LSCTX. Both LSCT and LSCTX reside in real time common and are accessible to all on-line programs. LSCT and LSCTX are described in detail in the data structure definition section of this report. In

general, LSCT details the configuration of the sensors in the low speed system sensor by sensor. There is room for 120 sensors numbered 1 through 120. Statuses, DVM programming specifications, real world units conversion numbers, range limits, scanner configurations, last values read, rates of readings, and times of next readings are all found in this table.

LSCTX contains the shut down list, test start time, current test time, the low speed data buffer, and the buffer and disc pointers.

Once the configuration tables are set up and the disc has been conditioned, M01AN schedules M03AN, the low speed data collector. M03AN will schedule M04AN, the low speed disc manager. M01AN also schedules M00AN, the on-line timer. Communications among the programs in the on-line system are effected by class I/O messages and modifications to real time common.

M01AN terminates its subservient programs by turning on a bit for each program in the shutdown list in LSCTX. Each subservient program, on detecting that its shutdown bit has been turned on, will acknowledge the shutdown request by turning off its shutdown bit and performing an orderly shutdown. The shutdown list is protected via a system resource number which it obtained at schedule time.

M00AN, the on-line timer, will update the current test time once each half second. Current test time is located in LSCTX. This is a two word entry, the first word being the number of hours since start of test and the second word being the number of half seconds since start of test (Module 7200). M00AN is the highest priority program in the system. Since it is possible for a lower priority program to be interrupted in the middle of examining the current test time, it is imperative that those programs reference the double word in a single, noninterruptable, instruction. This is done by equivalencing the current test time integer pair to a real number. When the real number is loaded, the pair is picked up by a single instruction, hence there is no danger of the current test time changing in the middle of the reference. M00AN looks at the shutdown list once each half second.

M04AN is scheduled by M03AN. M04AN is responsible for writing the low speed data buffers to disc. M03AN will send a class I/O message to M04AN which contains the entire buffer. M04AN, which has put itself in the time list, watches for the arrival of class I/O message several times per second. It also looks at the shutdown list at this interval. When it receives a request to write a buffer to disc, it does so. Since the high speed system can lock the disc, it is possible for a few of these messages to be stacked up in System Available Memory. They will, however, get to disc at some point.

M03AN is responsible for collecting the low speed data. This program is scheduled in the time list waiting for a fraction of a second between cycles. M03AN initially configures the DVMs and the HP-IB driver so that the DVMs are in remote and the driver will allow M03AN to handle its own HP-IB errors. The primary function of M03AN is to scan the Low Speed Configuration Table looking for a sensor which requires reading. When it finds one, it programs the DVM based on the programming information found in LSCT. The scanner is set to the correct channel (or channel pair for 4-wire ohm readings) and a reading is taken. Readings of the DVMs are effected by a class read. There is a class number for each DVM-Scanner pair. This allows the reading of all three DVMs concurrently. Also, if a DVM read times out for some reason, there will be no delay in the reading of the other two.

When a reading is returned from a DVM, M03AN converts it to real world units using the conversion code found in LSCT. The value along with the current test time and sensor number are placed in the low speed disc buffer. When the buffer is full, M03AN sends a disc write request to M04AN. The reading is placed in the last value read field for the sensor in LSCT. The value is also compared against the high and low limits for the sensor. If the value exceeds a limit, the operator is alerted on the system console but is not alerted more often than once every five minutes for each sensor.

If a DVM should fail to respond, the DVM-Scanner pair is put down along with any sensor associated with the pair. The operator is alerted on the system console. If the problem is fixed, M03AN will be alerted to this by M01AN via a class I/O message. M03AN will attempt error recovery by reinitializing the affected DVM and attempting a read. The next value read is discarded and if everything worked, normal readings recommence. The operator is informed of the success or failure of the error recovery attempt. M03AN will inform M01AN when a DVM has failed. This is done by a class I/O message, the class I/O number being a scheduling parameter to M03AN. In order that M01AN may send class I/O messages to M03AN, M03AN obtains a class number and then sends it to M01AN soon after scheduling.

M01AN, the on-line scheduler, after scheduling the subservient on-line programs places itself in the time list. It is scheduled several times per second. When it is scheduled it looks for messages from subservient programs and for operator intervention messages. The operator gains the attention of M01AN by breaking the program. The operator may instruct M01AN to shut down, or he may down a sensor, up a sensor, or inform M01AN that a DVM has been fixed.

When M01AN is instructed to shut down, it waits for all subservient programs to shut down. It then asks the operator to mount a magnetic tape and then proceeds to write the low speed data and associated configuration files to tape for future off-line analysis.

The detailed and definitive documentation which describes how all these programs work is found as machine readable comments in the source listings of the programs. Other pertinent information is found in the functional description at the head of each source listing. The data structure definitions are found in the data structure definition section of this manual.

Figure 2 is a simplified block diagram of the low speed on-line system. Information flow is detailed.

FIGURE 2

STRUCTURE OF THE HIGH SPEED ON-LINE SYSTEM

The on-line programs which comprise the high speed system are permanently loaded with the DC (don't copy) option. All have access to real time common via the RC (reverse common) option. M01AN, the on-line scheduler, controls (directly or indirectly) the execution of all the permanently loaded on-line programs. High speed programs subservient to M01AN are M00AN, the on-line timer, M09AN, the high speed DS master, M10AN, the high speed DS slave, M14AN, the high speed disc manager, M15AN, the high speed level 2 trigger checker, M16AN, the high speed tape manager and M18AN, the high speed end of volume processor.

M01AN, after obtaining run information from the user will clear the entirety of cartridge HS for use in high speed data logging. M01AN is responsible for setting up the real time common to reflect the configuration in the high speed configuration table supplied by the user. The high speed areas are HSCT (high speed configuration table), HSCTX, high speed configuration table extension, HSDES, the high speed disc event space table and HSDESX the high speed disc event space table extension. These are all defined in detail in the data structure definition section of this report.

In general, HSCT and HSCTX define the environment under which high speed data is collected and analyzed for triggers. HSDES and HSDESX are used to manage the disc event space on cartridge HS.

The high speed system will use some information in LSCTX, the low speed configuration table extension, as well.

Once the configuration tables have been set up and the high speed disc has been conditioned, M01AN will schedule M00AN, the on-line timer, and M09AN, the DS master. M09AN, the DS master, will schedule S01AN in the high speed CPU via the DS network. The programs in the high speed CPU will schedule M10AN, the DS clavo via the DS network. M09AN is used to send messages to the high speed system and M10AN is used to receive messages from the high speed system.

When M10AN has been scheduled by the high speed system, it informs M01AN that it is up and running. M01AN now schedules M14AN, the high speed disc manager, M15AN, the high speed level 2 trigger checker and M16AN, the high speed tape handler. When end of volume is detected on a high speed data tape, M16AN will schedule M18AN for end of volume processing.

The programs in the high speed system communicate among each other via real time common and class I/O messages. Of particular interest in real time common is the status information in HEDES. Changes in status of disc event spaces will cause trigger checks, tape writes and the freeing of disc space by the on-line programs. The shut down list in LSCTX controls the normal termination of most of the high speed programs.

Class I/O is used by M01AN and M14AN to send messages to M09AN. These are requests to relay messages to the high speed CPU. M01AN is always listening for operator requests, many of which are requests involving the high speed CPU. When such a request is received, it is sent via M09AN. M14AN, the high speed disc manager, watches the status of the disc event spaces. When it detects that there are two or fewer free spaces for the high speed system, it will attempt to find a freeable space. If it can, it sends a free event message to the high speed system via M09AN. If M10AN ever receives a message it cannot process, it relays this message to M01AN via class I/O.

The communication between the two CPUs is effected with DS PTOP calls. The messages sent to the high speed system by M09AN control setting up or changing the high speed configuration tables, setting the time of day, starting and stopping data collection, freeing event spaces, demanding triggers and shut down. The messages from the high speed system inform the controller of high speed data placement on disc, unlogged triggers, hardware malfunctions and shut down acknowledgments. The format and more detailed explanations of these messages appear in the data structure definitions section of this report under PTOP messages.

Under normal high speed operations, the high speed system is reading Preston high speed data and applying a level 1 trigger check on the incoming data based on the parameters in the high speed configuration table. When it detects a trigger, it logs a specified amount of high speed data to a free disc event space on cartridge HS and informs M10AN it has done so. M10AN will change the status of the appropriate disc event space (in HSDES) to "requires level 2 check". M15AN, which checks these statuses several times per second, will begin a level 2 check based on the parameters in the high speed configuration table. If it fails the level 2 check, it sets the disc event space status to "failed level 2, OK to free". If it passes the level 2 check, it sets the status to "requires write to tape".

M16AN, which checks these statuses several times a second, will begin a write to tape when it detects an appropriate change of status. After the tape write is complete, it sets the disc event status to "on tape, OK to free".

M14AN also checks these statuses several times per second. It is looking for the condition where there are 2 or fewer disc event spaces which are free. If it detects this condition, it will look for the oldest disc event space whose status is OK to free. If it finds one, it sends a free event message to the high speed system (via M09AN) and changes the disc event space status to "free".

The operator, by interacting with M01AN, can request that a high speed event be logged to disc without a trigger check. This is a demand trigger. M01AN informs M09AN who informs the high speed system. The high speed system logs the event and informs M10AN. M10AN immediately changes the disc event status to "requires write to tape" hence bypassing M15AN and activating M16AN.

When the operator requests shutdown, M01AN informs M09AN who informs the high speed system. The high speed system informs M10AN and shuts down. M10AN shuts down. The other programs in the high speed on-line system are requested to shut down via the shut dow list in LSCTX. M15AN, the high speed tape handler, will produce a report on the line printer which gives details concerning all the events which were written to tape.

The operator may change several of the trigger checking parameters on-line. When this is done, M01AN informs M09AN who informs the high speed system. The high speed system will then check for triggers based on the new parameters. Pausing high speed data collection and restarting it utilizes the same information path.

The detailed and definitive documentation which describes how all these programs work is found as machine readable comments in the source listings of the programs. Other

pertinent information is found in the function descriptions at the head of each source listing. Data structure definitions and file descriptions are found at the end of this report.

Figure 3 is a block diagram of the high speed system which resides in the controlling CPU.

FIGURE 3

STRUCTURE OF THE PROGRAMS IN THE HSDAS CPU

The programs in the High Speed Data Acquisition System (HSDAS) CPU were implemented by Larry Smith of Hewlett Packard under a System Engineering contract.

These programs are responsible for collecting the high speed Preston data, analyzing the input in real time for the existence of level 1 triggers and to log Preston events to free disc event spaces on cartridge HS of the shared disc.

Communications between the HSDAS and the DAC CPU is performed using the Distributed System (DS) network. A list of legal inter-CPU messages may be found under PTOp messages at the end of this manual.

The HSDAS may look at up to 12 channels of data simultaneously. The aggregate sample rate has an upper limit of 100,000 data points per second. An individual channel's sample rate has an upper limit of 10,000 data points per second. Up to three channels may be used as potential trigger channels at one time.

There are six programs in the HSDAS involved with high speed data collection. S01HN is a DS slave program scheduled by M09AN in the DAC CPU. S01HN controls the remaining programs

in the HSDAC. S01HN will schedule S00HN to initialize system common. S01HN will then schedule S02HN which is a DS master program.

S01HN receives messages from the DAC and S02HN sends messages to the DAC.

S02HN will schedule M10AN via DS. This establishes the complete two way DS communication link. From this point on, S01HN will react to DS messages from M09AN.

When S01HN receives information messages such as threshold and configuration messages, it will adjust the trigger parameters in system common. When S01HN receives a start message, it will schedule S04HN if algorithm 0 is in effect or S05HN if algorithm 1 is in effect. S04HN or S05HN performs the Preston data collection, trigger analysis and event logging tasks. When S01HN receives a message which indicates that high speed data collection should stop (Pause, Shut Down or Demand Trigger), S01HN will terminate S04HN by setting its break flag.

When S01HN receives a Demand Trigger request, S01HN schedules S03HN which performs the demand trigger function. Further, if the Demand Trigger request contained a Continue option, S01HN will reschedule S04HN or S05HN at completion of S03HN.

When S04HN detects a trigger and either logs it to disc or detects that there is no disc space available, it will send a class I/O message to S02HN. On receipt of this class I/O message, S02HN will send the appropriate DS message to M10AN in the DAC.

When a Shut Down message is received by S01HN, S04HN or S05HN is terminated and a class I/O message is sent to S02HN, S02HN will then acknowledge the shut down request via a DS message to M10AN causing M10AN to shut down.

S00HN, S01HN and S02HN are FORTRAN routines and are eminently maintainable. S03HN is written in assembler and is maintainable. S04HN and S05HN are written in assembler and are the heart of the high speed system. Both make use of a microcode routine called CALC which forms the innermost loop of the trigger analysis routine. S04HN and S05HN are both at their memory limit so that any addition to either program will require condensing the existing code. They are both extremely time critical. Any change to these routines should not be made lightly. Alterations to CALC should be made only in a documentable emergency.

The DS routine, UPLIN, adversely affects the operation of S04HN and S05HN. After running LSTEN, UPLIN must be taken out of the time list using the IT command.

The detailed and definitive documentation of the programs in the HSDAS exists as machine readable source code within the program listings. HP has made a reasonable attempt to follow the published programming standards for this project.

THE SPR UTILITY LIBRARY

The SPR utility library contains subroutines and functions which can be used in writing on-line, monitor or analysis programs. Detailed descriptions of their use are found in the function blocks in the comments of the specific routine. Below is a general description of the routines currently available for use.

GETRN AND PUTRN:

The on-line system contains a real time common area which includes an array, LSCT, which has both integer and real variables stored in it. The function subprogram, GETRN, extracts a real number from an integer array and the subroutine, PUTRN, places a real number into an integer array.

CMPST:

The integer function subprogram, CMPST, will compare two ASCII strings for equality.

FPCHK:

The integer function subprogram, FPCHK, will check an ASCII string to see if a properly formatted real number in F-type notation exists as the first token of the string.

PTIME:

The subroutine, PTIME, will print a 6 character program identifier and the time of day based on the current test time in LSCTX.

REPLY:

The subroutine, REPLY, implements the SPR user input standard by prompting with the program name and leaving the cursor on that line. The reply is returned in ASCII as well as a parsed response using the subroutine PARSE. A time out flag is also returned.

GETLS:

The subroutine, GETLS, will return low speed data from file LSDATA. This routine uses a variable length user buffer and is requested to return data for a specified sensor over a specified time range.

GETHS:

The subroutine, GETHS, returns high speed Preston data from a disc event space into a variable length user buffer. Data is returned for a specified high speed channel.

ADATE:

The subroutine, ADATE, returns the ASCII month and an integer day of the month when passed the year and Julian day.

LOK:

The subroutine LOK and UNLOK are used to place an LU lock and to release that LU lock on LU 1.

Routines residing in the utility library, file %UTILS::PL, are linked into a user program with the loader command:

SEA,%UTILS::PL

This package is maintained as part of the production program library.

PROGRAMMING STANDARDS

It is intended that the detailed and definitive documentation reside as machine readable comments in the source code of all the programs in the SPR data acquisition system. This is so that as the system is modified to incorporate new goals, the documentation will be readily updatable and always represent what is current (as opposed to what once was).

The programming standards reflect this goal as well as that of ease of maintenance. The utility of the system will be enhanced in large part by the careful adherence to these standards.

The following are the standards:

1. Programs will be commented profusely. The reader should be able to follow the flow of the code by the comments alone.
2. Each program, subroutine, and function subprogram will be preceded by a functional description which includes but is not limited to the following:

- A. Name--Name of routine and a list of any passed parameters.
- B. CPU--A list of CPUs on which this program is intended to run.
- C. Type--Type of program (on-line, off-line, utility, etc.).
- D. Variables--A list of all variables used, their types, sizes, and ranges (where appropriate). Exception: The standard variables used to index real time common arrays need not be listed.
- E. Input--A list of input to the routine.
- F. Output--A list of output from the routine.
- G. Calls--A list and description of each subroutine and function subprogram called by the routine. EXEC calls are further listed by value of first parameter.
- H. Load--(For main programs only) The LOADR commands necessary to load this program.
- I. Date--The date this routine was first included in the system.
- J. Author--The primary author(s) and their affiliation.
- K. Checker--The programmer responsible for checking the code and the date of the check.

3. Each main program contains a record of updates section following the functional description. This is used to record every modification which has been made since the routine was placed in the production program library. The first entry specifies the date of the original inclusion. Each entry thereafter specifies the name of the programmer making the modification, the date he received it from the production library, the list of changes, and a six-character identifying string to be used in the comments in the body of the code where the modification was made.
4. Each routine will have a LOADR message field in the following form:

-fl- mm/dd/yy description

where: fl are the first and last initials
of the programmer making the last
change,
mm/dd/yy is the date the last change
was sent back to the production
program library and
description is a brief description
of what the routine does.

5. FORTRAN programs will declare all variables implicitly as integers explicitly declaring any other types.
6. Reference to arrays in real time common will be made via indices which are descriptively named integer variables declared in a data statement immediately following the common declaration.
7. Unless there is an overwhelming reason not to, variables will be used for only one definable function per routine.
8. Message printed on terminals or the line printer will be preceded with an identifying string in the form:

pname: where pname is the program
 name.

9. All requests for operator response will be preceded by a prompt in the form:

pname? where pname is the program
 name.

Additionally, the cursor will remain on the same line as the prompt.

10. Anytime a modification is made to the routine, the six-character identifying string appearing in the record of updates section will be used in the comment immediately preceding the modification. Exception: Changes to comments and deletion of code need not be annotated.
11. All programs will be compiled and assembled with a cross reference listing. FORTRAN programs will also utilize the Q option.
12. FORTRAN labels will be (to a reasonable extent) in numerical order.
13. Programs which interact with an operator will identify themselves as to their function in their first message.
14. "Clever" code is to be avoided in place of easily understood code unless there is an overwhelming reason to the contrary. "Clever" code requires even more comments than usual.
15. Anything to enhance readability will be done; anything which detracts from readability will not.
16. Programs will be named in accordance with the program naming convention.

17. Operator input will be thoroughly checked. (An IQ of 50 and marginal literacy levels may be assumed.) The operator is assumed to be familiar with RTE-IVB and its related terminology.

THE PRODUCTION PROGRAM LIBRARY

The production program library resides on cartridge PL (LU 19) of the data acquisition controller (DAC). Its function is to provide a formally maintained disc area for all programs involved in the SPR data acquisition system. Correct maintenance of this library is of critical importance to the continued utility of the SPR data acquisition system. With the exception of periodic backup tapes, this library contains the only maintained versions of the programs in the system.

The production library contains:

1. Source code of all programs, subroutines, and function subprograms written for the SPR data acquisition system.
2. Relocatable object code of the above.
3. Transfer and answer files for the maintenance of the library.
4. The utilities library (%UTILS) and
5. Documentation files.

To augment the maintenance of this library, use is made of a production program library log book. This log book details all updates to and all backups of the library. Listings of current compilations and assemblies are kept in the current listings binders along with their current loader maps. These listings and maps reflect the current configurations of all the programs which are permanently loaded or which exist as Type 6 files.

Listings which are no longer current are kept in the historical listings binder in chronological order.

The program production log book is organized as follows:

1. Table of contents by program, subroutine, or function subprogram name.
2. A page for each program, subroutine, or function subprogram in the system. An entry is made each time a module is placed in the library, sent to a systems programmer for updates, or returned with updates having been made. The date of the transfer, type of transfer, reason for transfer are all part of the entry.
3. A record of backups. Each time a backup to tape is made, an entry is placed in the log book. The

entry specifies when the backup was made, what was backed up, what backup tape was used, and what backup routine created the tape.

The listings library consists of one binder for each author code, one binder for utility subroutines and function subprograms, one binder for operating system related documents, and a series of historical binders. Binders containing compiled source code are organized alphabetically by program or subroutine name.

Programs on the library are never updated directly. To update source or object, the programmer must first get the source and work with it on his own private cartridge. When it has been tested to the development group's satisfaction, it is sent back to the production library along with its relocatable object code. The production program librarian will acquire the files, make the required entries into the log, and place the new version into the system as an element of the utilities library, a Type 6 file, or a permanently loaded program. All associated listings are appropriately filed.

The following are detailed steps required in the various kinds of transfers.

NEW PROGRAMS:

1. Compile or assemble the source on the programmers cartridge and get a listing.
2. Verify that the commenting complies with the programming standards.
3. Check that the dates in the loader message fields are correct.
4. Transfer the source and object files to the program production library using "ST" for the move and "/RXT" to remove extents:

```
:ST,&pname::cr,&pname:LI:PL
:ST,%pname::cr,%pname:LI:PL
:./RXT,&pname,LI,PL
:./RXT,%pname,LI,PL
:PK,PL
```

where: pname is the name of the program and
cr is the cartridge reference of the
programmers disc.

5a. If the program is to be permanently loaded:

Clear the ID segment for this program
(OF,pname)

Run the loader (at the system console,
nonsession) according to the comments in the
LOAD section of the program.

5b. If the program is to be a Type 6 file:

Clear the ID segment for this program
(OF,pname).

Check to see if the programmer has already
made this a Type 6 file and if so, purge it
(PU,pname:LI:SY).

Run the loader according to the comments in
the LOAD section of the program.

Create a Type 6 file:

SP,pname:LI:SY

5c. If the subroutine or function subprogram is to be a
utility.

Use JEDIT to modify the MERGE answer file,

MUTILS:LI:PL Add the name of this
routine to the bottom of the list.

Run MERGE. Answer %UTILS:LI:PL and MUTILS to
the two questions.

6. File the listings (compilation and load map, if any)
in the appropriate binder.
7. Ensure the log book has been properly updated.
8. Examine the source file on the production library to
ensure everything went as planned.
9. Run a test on the new version of the program.

SENDING MODULES TO PROGRAMMERS FOR UPDATE:

1. Check the log book to ensure that no programmer
currently has this module.
2. Verify that the programmer does not have an old copy.
(If he does, have him purge it from his cartridge.)
3. Send the programmer the source using transfer file
SEND:

::\$END,&pname,cr

where: pname is the program name and
cr is the programmer's disc
reference.

4. Enter the transaction (specifying the reason) in the log book.

RECEIVING UPDATED MODULES FROM PROGRAMMERS:

1. Compile or assemble the source on the programmer's cartridge and get a listing.
2. Verify that the updates have been annotated in the listing and that the dates in the loader message files are current.
3. Verify that sufficient testing has been done to warrant the transfer.
4. Ensure that any affected documentation has been updated.
5. Transfer the source and object files to the production library using the transfer file, GET:

```
::GET,&pname,cr  
::GET,%pname,cr  
:PK,PL
```

where pname is the program name and
cr is the programmer's cartridge
reference.

6a. If the program is to be permanently loaded:

Clear the ID segment for this program. If it is
not currently loaded permanently use:

```
OF,pname
```

If it is permanently loaded use:

```
RU,LOADR,,pname,l,PU
```

at the nonsession system console.

Run the loader at the nonsession system
console according to the comments in the LOAD
section of the program.

6b. If the program is to be a Type 6 file:

Clear the ID segment of the program

(OF,pname).

Check to see if it is still loaded as a Type 6
file and if it is, purge it:

PU,pname:LI:SY

Run the loader according to the comments in the
LOAD section of the program.

Create a Type 6 file:

SP,pname:LI:SY

6c. If the program is a utility subroutine or function
subprogram:

RU,MERGE.

Answer %UTILS:LI:PL and MUTILS to
the two questions.

Depending on the change which was made to the utility, it may be necessary to reload any program which references it. If this is the case, all new loader maps must be filed in the current listings binders.

7. File the listings (compilation and loader map) in the appropriate binder. The old listings are then moved to the historical listings binder.
8. Ensure the log book has been properly updated.
9. Examine the source file on the production library to make sure it is as expected.
10. Test the new version of the program.

After files have been transferred from a programmer's cartridge to the production library, the programmer may (and is advised to) purge his work copies from his own cartridge. It is probably a good idea to back up the private and production library cartridges before this is done, particularly if a large number of updates have been made. If a problem is found later, this is often an excellent backup point for recovery since both the programmer's private cartridge and the production library may contain files in the correct state.

Typically programs may be worked on and tested independently of the current system and its operational needs. There may have to be some careful establishment of testing rules when a programmer is modifying and testing a normally permanently loaded program. These situations may be taken care of on a case by case basis.

DATA STRUCTURE DEFINITION

NAME: LSCT 05-29-80 PM (MODIFIED 7/3/80)

DESCRIPTION: LOW SPEED CONFIGURATION TABLE

LOCATION: REAL TIME COMMON (DAC)--FIRST ENTRY

USED BY: ALL ON-LINE DAC LOW SPEED DATA ACQUISITION ROUTINES

PURPOSE: TO DESCRIBE THE CONFIGURATION AND STATUS OF THE LOW SPEED SENSORS AND INPUT DEVICES

LSCT IS AN INTEGER ARRAY IN REAL TIME COMMON. IT IS 1,800 WORDS LONG PROVIDING SPACE FOR 120 ENTRIES (ONE FOR EACH POSSIBLE SENSOR) EACH ENTRY BEING 15 WORDS IN LENGTH. IT IS USED IN CONJUNCTION WITH THE LOW SPEED CONFIGURATION TABLE EXTENSION. REFERENCE TO THE COMMON IS EFFECTED VIA THE FOLLOWING FORTRAN DEFINITION:

```
COMMON // LSCT (15,120),LSCTX(141)
DATA STATUS/ 1/, TYPER / 2/, CVCODE/ 3/, HILIM / 4/,
1  LOLIM / 6/, SCNLU / 8/, CH1 / 9/, CH2 /10/,
2  LVR /11/, RATE /13/, TNR /14/, SDL / 1/,
3  TSTM / 2/, CTIME / 7/, LABFL / 9/, BPTR /12/,
4  BADR /13/, LEBUFF/14/
```

EACH SENSOR (1 THROUGH 120) HAS AN ENTRY OF 15 WORDS AS FOLLOWS:

ENTR.	LOC.	SIZE	NAME	DEFINITION
1.	1	1	STATUS	STATUS OF SENSOR = 0--THIS SENSOR ENTRY NOT USED = 1--IDLE = 2--READING REQUIRED = 3--READING IN PROGRESS = 4--PUT DOWN BY OPERATOR = 5--DOWN DUE TO BAD DVM OR SCANNER = 6--IN RECOVERY
2.	2	1	TYPER	RESOLUTION, TYPE, AND RANGE (FORM 100H + 10T + R) H = RESOLUTION = 0--LOW RESOLUTION = 1--HIGH RESOLUTION T = TYPE = 1--DC VOLTS = 4--2 WIRE OHMS

<u>ENTR.</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DEFINITION</u>
				= 5--4 WIRE OHMS R = RANGE = 1-- .1 = 2-- 1.0 = 3-- 10.0 = 4-- 100.0 = 5-- 1000.0 = 6--10000.0 = 7--AUTO RANGE
3.	3	1	CVCODE	CONVERSION CODE THIS INTEGER IS PASSED TO THE REAL WORLD UNITS CONVERSION ROUTINE, CVTRW, FOR CONVERSION FROM VOLTS OR OHMS TO REAL WORLD UNITS. IMPLICITLY DEFINES TYPE OF SENSOR.
4.	4	2	HILIM	HIGH LIMIT THIS REAL NUMBER INDICATES A MAXIMUM READING IN REAL WORLD UNITS ALLOWED. A HIGHER READING PRODUCES AN OPERATOR ALERT.
5.	6	2	LOLIM	LOW LIMIT THIS REAL NUMBER INDICATES A MINIMUM READING IN REAL WORLD UNITS ALLOWED. A LOWER READING PRODUCES AN OPERATOR ALERT.
6.	8	1	SCNLU	SCANNER LU AN INTEGER INDICATING THE LU OF THE SCANNER TO WHICH THE SENSOR IS CONNECTED.
7.	9	1	CH1	CHANNEL 1 AN INTEGER SPECIFYING THE CHANNEL TO WHICH THE SENSOR IS CONNECTED.
8.	10	1	CH2	CHANNEL 2 FOR 4-WIRE OHM SENSORS ONLY. AN INTEGER SPECIFYING THE CHANNEL TO WHICH THE CURRENT SOURCE IS CONNECTED.

<u>ENTR.</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DEFINITION</u>
9.	11	2	LVR	LAST VALUE READ A REAL NUMBER INDICATING THE LAST VALUE READ IN REAL WORLD UNITS.
10.	13	1	RATE	RATE AN INTEGER SPECIFYING THE NUMBER OF HALF SECONDS TO WAIT BETWEEN READINGS.
11.	14	2	TNR	TIME OF NEXT READING TWO INTEGERS SPECIFYING THE TIME THE NEXT READING IS DUE. FORMAT IS ELAPSED TIME SINCE START OF TEST. 1ST WORD--HOURS 2ND WORD--HALF SECONDS

DATA STRUCTURE DEFINITION

NAME: LSCTX 05-29-80 PM (MODIFIED 7/3/80)

DESCRIPTION: LOW SPEED CONFIGURATION TABLE EXTENSION

LOCATION: REAL TIME COMMON (DAC) - SECOND ENTRY

USED BY: ALL ON-LINE DAC LOW SPEED DATA ACQUISITION ROUTINES

PURPOSE: TO SPECIFY THE GLOBAL ASPECTS OF THE LOW SPEED SYSTEM

LSCTX IS AN INTEGER ARRAY IN REAL TIME COMMON. IT IS 141 WORDS LONG PROVIDING SPACE FOR SEVERAL LOW SPEED VARIABLES PLUS THE LOW SPEED CURRENT BUFFER. THIS IS USED IN CONJUNCTION WITH THE LOW SPEED CONFIGURATION TABLE. REFERENCE TO THE COMMON IS EFFECTED VIA THE FOLLOWING FORTRAN DEFINITION:

```
COMMON // LSCT (15,120),LSCTX(141)
DATA STATUS/ 1/, TYPER / 2/, CVCODE/ 3/, HILIM / 4/,
1  LOLIM / 6/, SCNLU / 8/, CH1 / 9/, CH2 /10/,
2  LVR /11/, RATE /13/, TNR /14/, SDL / 1/,
3  TSTM / 2/, CTIME / 7/, LABFL / 9/, BPTR /12/,
4  BADR /13/, LSBUFF/14/
```

THE FORMAT OF THE TABLE IS AS FOLLOWS:

ENTRY	LOC.	SIZE	NAME	DEFINITION
1.	1	1	SDL	<p>SHUTDOWN LIST (RESOURCE NUMBER PROTECTED)</p> <p>= 0--ON-LINE SYSTEM OPERATING</p> <p>= OTHER--ON-LINE SYSTEM IN SHUTDOWN PHASE</p> <p>A BIT IS USED FOR EACH PROGRAM WHICH SHUTS DOWN. WHEN THE PROGRAM IS SHUTDOWN, IT TURNS ITS BIT OFF.</p> <p>BIT 0 = 1--M00AN--ON-LINE TIMER</p> <p>BIT 1 = 1--M03AN--LOW SPEED DATA COLLECTOR</p> <p>BIT 2 = 1--M04AN--LOW SPEED DISC HANDLER</p> <p>BIT 3 = 1--M09AN--DS MASTER</p> <p>BIT 4 = 1--M10AN--DS SLAVE</p> <p>BIT 5 = 1--M14AN--HS DISC MANAGER</p> <p>BIT 6 = 1--M15AN--LEVEL 2 CHECK</p> <p>BIT 7 = 1--M16AN--HIGH SPEED TAPE WRITER</p>

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
2.	2	5	TSTM	TEST START TIME 5 INTEGERS--YEAR, DAY, HOUR, MINUTE, SECOND
3.	7	2	CTIME	CURRENT TIME 2 INTEGERS SPECIFYING THE ELAPSED TIME SINCE START OF TEST 1ST WORD--HOURS 2ND WORD--HALF SECONDS
4.	9	3	LABFL	LABEL FILE NAME 6 ASCII CHARACTERS SPECIFYING THE NAME OF THE FILE ON CARTRIDGE LS WHICH CONTAINS THE ALPHANUMERIC DATA FOR EACH SENSOR.
5.	12	1	BPTR	BUFFER POINTER AN INDEX INTO THE LOW SPEED BUFFER, LSBUFF, SPECIFYING THE NEXT LOCATION INTO WHICH A LOW SPEED READING IS PLACED. (0-255)
6.	13	1	BADR	BUFFER ADDRESS THE RECORD NUMBER OF FILE LSDATA (ON CARTRIDGE LS) FOR THE NEXT WRITE OF BUFFER, LSBUFF.
7.	14	128	LSBUFF	THE LOW SPEED DATA BUFFER

DATA STRUCTURE DEFINITION

NAME: HSCT 07-08-80 PM

DESCRIPTION: HIGH SPEED CONFIGURATION TABLE

LOCATION: REAL TIME COMMON (DAC)--THIRD ENTRY

USED BY: ALL ON-LINE DAC HIGH SPEED DATA ACQUISITION ROUTINES

PURPOSE: TO DESCRIBE THE CONFIGURATION AND STATUS OF THE HIGH SPEED PRESTON CHANNELS

HSCT IS AN INTEGER ARRAY IN REAL TIME COMMON. IT IS 72 WORDS LONG PROVIDING SPACE FOR 12 ENTRIES (ONE FOR EACH POSSIBLE CHANNEL) EACH ENTRY BEING 6 WORDS IN LENGTH. IT IS USED IN CONJUNCTION WITH THE HIGH SPEED CONFIGURATION TABLE EXTENSION. REFERENCE TO THE COMMON IS EFFECTED VIA THE FOLLOWING FORTRAN DEFINITION:

```
COMMON // LSCT (15,120),LSCTX(141)
2      HSCT(6,12),HSCTX(19),HSDES(3,100)
DATA STATUS/ 1/, TYPER / 2/, CVCODE/ 3/, HILIM / 4/,
1      LOLIM / 6/, SCNLU / 8/, CH1 / 9/, CH2 /10/,
2      LVR /11/, RATE /13/, TNR /14/, SDL / 1/,
3      TSTM / 2/, CTIME / 7/, LABFL / 9/, BPTR /12/,
4      BADR /13/, LSBUFF/14/, THRES / 2/, FLAGS / 3/,
5      SAMPL / 1/, EVNTL / 2/, PTS / 3/, MCN / 4/,
6      Q / 5/, SI / 6/, LI / 7/, NDES / 8/,
7      NCPE / 9/, TALG /10/, SKIP /11/, HSLF /12/,
8      SPARE /15/, ETIME / 2/
```

EACH CHANNEL (Ø THROUGH 11) HAS AN ENTRY OF 6 WORDS AS FOLLOWS:

ENTRY	LOC.	SIZE	NAME	DEFINITION
1.	1	1	STATUS	STATUS OF CHANNEL = 0--THIS SENSOR ENTRY NOT USED = 1--DATA CHANNEL ONLY = 2--THIS CHANNEL PRODUCES TRIGGER = 5--DOWN DUE TO HARDWARE FAULT
2.	2	1	THRES	TRIGGER THRESHOLD * 1000--LEVEL 1
3.	3	4	FLAGS	WORD 1--TRIGGER THRESHOLD * 1000--LEVEL 2 WORD 2--SPARE WORD 3--SPARE WORD 4--SPARE

DATA STRUCTURE DEFINITION

NAME: HSCTX 07-08-80 PM

DESCRIPTION: HIGH SPEED CONFIGURATION TABLE EXTENSION

LOCATION: REAL TIME COMMON (DAC)--FOURTH ENTRY

USED BY: ALL ON-LINE DAC HIGH SPEED DATA ACQUISITION ROUTINES

PURPOSE: TO DESCRIBE THE GLOBAL PARAMETERS FOR THE HIGH SPEED DATA ACQUISITION TRIGGER DETECTION AND EVENT STORAGE

HSCTX IS AN INTEGER ARRAY IN REAL TIME COMMON. IT IS 19 WORDS LONG. IT CONTAINS THE INFORMATION REQUIRED TO PROCESS EVENT TRIGGER DETECTION AND EVENT STORAGE ON DISC.

```
COMMON // LSCT (15,120),LSCTX(141)
2      HSCT(6,12),HSCTX(19),HSDES(3,100)
DATA STATUS/ 1/, TYPER / 2/, CVCODE/ 3/, HILIM / 4/,
1  LOLIM / 6/, SCNLU / 8/, CH1 / 9/, CH2 /10/,
2  LVR /11/, RATE /13/, TNR /14/, SDL / 1/,
3  TSTM / 2/, CTIME / 7/, LABFL / 9/, BPTR /12/,
4  BADR /13/, LSBUFF/14/, THRES / 2/, FLAGS / 3/,
5  SAMPL / 1/, EVNTL / 2/, PTS / 3/, MCN / 4/,
6  Q / 5/, SI / 6/, LI / 7/, NDES / 8/,
7  NCPE / 9/, TALG /10/, SKIP /11/, HSLF /12/,
8  SPARE /15/, ETIME / 2/
```

THE ENTRIES ARE AS FOLLOWS:

ENTRY	LOC.	SIZE	NAME	DEFINITION
1.	1	1	SAMPL	AGGREGATE SAMPLE RATE OF PRESTON CHANNELS IN SAMPLES PER SECOND (TIMES 1000) (1-100)
2.	2	1	EVNTL	EVENT LENGTH IN CENTISECONDS (500-20000)
3.	3	1	PTS	PRETRIGGER STORAGE REQUIREMENT IN NUMBER OF 24576 POINT BLOCKS (0-8)
4.	4	1	MCN	MAXIMUM CHANNEL NUMBER (0-11)
5.	5	1	Q	NUMBER OF POINTS IN A QUANTUM (8-64 (POWER OF 2))
6.	6	1	SI	NUMBER OF QUANTA IN A SHORT TERM INTERVAL (1-10)

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
7.	7	1	LI	NUMBER OF QUANTA IN A LONG TERM INTERVAL (2-100)
8.	8	1	NDES	NUMBER OF DISC EVENT SPACES (1-100)
9.	9	1	NCPE	NUMBER OF CYLINDERS PER EVENT (EVEN NO.) (2-370)
10.	10	1	TALG	LEVEL 1 ALGORITHM NUMBER 0 = AMPLITUDE COMPARISON 1 = FIRST DIFFERENCE COMPARISON
11.	11	1	SKIP	DATA DENSITY FOR TRIGGER DENSITY 1--EXAMINE EVERY POINT 2--EXAMINE EVERY OTHER POINT ETC. (MAX 256)
12.	12	3	HSLF	6 ASCII CHARACTERS--NAME OF HS LABEL FILE
13.	15	5	SPARE	5 SPARE WORDS WORD 1--NUMBER OF RECEIVED HIGH SPEED EVENTS WORD 2--NUMBER OF TAPE LOGGED EVENTS WORD 3--NUMBER OF UNLOGGED TRIGGERS WORD 4--NUMBER OF DEMAND TRIGGERS WORD 5--INHIBIT TAPE WRITE (0 = WRITE, 1 = DON'T)

DATA STRUCTURE DEFINITION

NAME: HSDDES 07/08/80 PM
 DESCRIPTION: HIGH SPEED DISC EVENT SPACE TABLE
 LOCATION: REAL TIME COMMON (DAC)--FIFTH ENTRY
 USED BY: ON-LINE DAC HIGH SPEED DATA ACQUISITION ROUTINES
 PURPOSE: TO DESCRIBE STATUS OF THE DISC EVENT SPACES ON
 DISC HRS

HSDDES IS AN INTEGER ARRAY IN REAL TIME COMMON. IT IS 300 WORDS LONG PROVIDING SPACE FOR 100 ENTRIES (ONE FOR EACH POSSIBLE DISC EVENT SPACE) EACH ENTRY BEING 3 WORDS IN LENGTH. REFERENCE TO THE COMMON IS EFFECTED VIA THE FOLLOWING FORTRAN DEFINITION:

```
COMMON // LSCT (15,120),LSCTX(141)
2      HSCT(6,12),HSCTX(19),HSDDES(3,100)
DATA STATUS/ 1/, TYPER / 2/, CVCODE/ 3/, HILIM / 4/,
1      LOLIM / 6/, SCNLU / 8/, CH1 / 9/, CH2 /10/,
2      LVR /11/, RATE /13/, TNR /14/, SDL / 1/,
3      TSTM / 2/, CTIME / 7/, LABFL / 9/, BPTR /12/,
4      BADR /13/, LSBUFF/14/, THRES / 2/, FLAGS / 3/,
5      SAMPL / 1/, EVNTL / 2/, PTS / 3/, MCN / 4/,
6      Q / 5/, SI / 6/, LI / 7/, NDES / 8/,
7      NCPE / 9/, TALG /10/, SKIP /11/, HSLF /12/,
8      SPARE /15/, ETIME / 2/
```

EACH DISC EVENT SPACE ENTRY CONTAINS 3 WORDS AS FOLLOWS:

ENTRY	LOC.	SIZE	NAME	DEFINITION
1.	1	1	STATUS	STATUS OF DISC EVENT SPACE AND THRESHOLD S = STATUS = 0--EVENT SPACE IS FREE = 1--EVENT REQUIRES LEVEL 2 TRIGGER CHECK = 2-- LEVEL 2 CHECK IN PROGRESS = 3--EVENT REQUIRES WRITE TO TAPE = 4--EVENT IS BEING WRITTEN TO TAPE = 5--EVENT WRITTEN TO TAPE (OK TO FREE) = 6--EVENT DID NOT PASS LEVEL 2 (OK TO FREE) = 7--HARDWARE FAULT = 8--HELD BY OPERATOR (WAS 5) = 9--HELD BY OPERATOR (WAS 6)

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
2.	2	2	ETIME	TIME EVENT STARTED AND CHANNEL NUMBER 1ST WORD--100*C+H C = CHANNEL NO. CAUSING TRIGGER (99 DEMAND TRIGGER) H = HOURS SINCE TEST START 2ND WORD--1/2 SECONDS SINCE TEST START

DATA STRUCTURE DEFINITION

NAME: HSDSX 09/10/80 PM

DESCRIPTION: HIGH SPEED DISC EVENT SPACE TABLE EXTENSION

LOCATION: REAL TIME COMMON (DAC)--SIXTH ENTRY

USED BY: M15AN and M16AN

PURPOSE: TO SPECIFY THE TRIGGER POSITION IN A HIGH SPEED EVENT FILE

HSDSX IS AN INTEGER ARRAY IN REAL TIME COMMON. IT IS 100 WORDS LONG PROVIDING SPACE FOR 100 ENTRIES, ONE FOR EACH POSSIBLE DISC EVENT SPACE. EACH ENTRY SPECIFIES THE TRIGGER POSITION WITHIN THE HIGH SPEED FILE AS DETECTED BY M15AN, THE LEVEL 2 TRIGGER VERIFICATION PROGRAM.

```
COMMON // LSCT (15,120),LSCTX(141)
2      HSCT(6,12),HSCTX(19),HSDSX(3,100),HSDSX(100)
DATA STATUS/ 1/, TYPER / 2/, CVCODE/ 3/, HILIM / 4/,
1      LOLIM / 6/, SCNLU / 8/, CH1 / 9/, CH2 /10/,
2      LVR /11/, RATE /13/, TNR /14/, SDL / 1/,
3      TSTM / 2/, CTIME / 7/, LABFL / 9/, BPTR /12/,
4      BADR /13/, LSBUFF/14/, THRES / 2/, FLAGS / 3/,
5      SAMPL / 1/, EVNTL / 2/, PTS / 3/, MCN / 4/,
6      Q / 5/, SI / 6/, LI / 7/, NDES / 8/,
7      NCPE / 9/, TALG /10/, SKIP /11/, HSLF /12/,
8      SPARE /15/, ETIME / 2/
```

EACH DISC EVENT SPACE ENTRY CONTAINS 1 WORD AS FOLLOWS:

ENTRY	LOC.	SIZE	NAME	DEFINITION
1.	1	1	TPOS	LEVEL 2 TRIGGER POSITION IN FILE/100. HENCE POSITION 12345 IS RECORDED AS 123.

FILE DEFINITIONS

FILE DEFINITION

NAME: LSCTF 09/15/80 PM

DESCRIPTION: LOW SPEED CONFIGURATION FILE

LOCATION: CARTRIDGE LS (WRITTEN BY M02AF FOR USE IN ON-LINE TEST)

USED BY: M01AN TO CONFIGURE LOW SPEED SYSTEM

SECURITY: -111

TYPE: 1 (128 words per record)

PURPOSE: TO STORE THE LOW SPEED CONFIGURATION TABLE AND ITS EXTENSION FOR LOADING COMMON IN PREPARATION FOR AN ON-LINE TEST

This file contains the low speed configuration table and the low speed configuration table extension and is organized as sixteen 128 word records:

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
1.	1	1800	LSCT	LOW SPEED CONFIGURATION TABLE (SEE LSCT IN THE DATA STRUCTURE DEFINITION SECTION)
2.	1801	141	LSCTX	LOW SPEED CONFIGURATION TABLE EXTENSION (SEE LSCTX IN THE DATA STRUCTURE DEFINITION SECTION)
3.	1942	107	DUMMY	PAD (MEANINGLESS)

		2048		

FILE DEFINITION

NAME: LSLBL 09/15/80 PM

DESCRIPTION: LOW SPEED LABEL FILE

LOCATION: CARTRIDGE LS (WRITTEN BY M02AF)

USED BY: ON-LINE ANALYSIS PROGRAMS

SECURITY: -111

TYPE: 1 (128 WORDS PER RECORD)

PURPOSE: TO STORE THE LOW SPEED LABEL FILE FOR USE BY THE
LOW SPEED ON-LINE ANALYSIS AND MONITOR PROGRAMS

This file contains the alphanumeric labels for each low speed sensor in the system as well as a units label for each sensor. It is used primarily to label monitor and analysis reports.

The file is 30 records (128 words per record) long. Each record contains four sensor entries organized as follows:

ENTRY	LOC.	SIZE	NAME	DESCRIPTION
1.	1	20	SLABL	A 40 CHARACTER LABEL FOR THE SENSOR
2.	21	12	ULABL	A 24 CHARACTER UNITS LABEL FOR THE SENSOR
		--		
		32		

FILE DESCRIPTION

NAME: LSDATA 09/15/80 PM

DESCRIPTION: LOW SPEED DATA

LOCATION: CARTRIDGE LS (WRITTEN BY M04AN DURING ON-LINE TEST)

USED BY: ON-LINE ANALYSIS ROUTINES

SECURITY: NONE

TYPE: 1 (128 words per record)

PURPOSE: TO STORE THE LOW SPEED DATA COLLECTED DURING AN ON-LINE RUN FOR ON-LINE ANALYSIS AND WRITE TO TAPE

This file contains the low speed data collected during the on-line test. Its length is dependent on the value in LSCTS(BADR) which is the 13th element of LSCTX. This file is initialized to all ones by M01AN. LSCTX(BADR) is the number of records written so far. The file is organized as follows:

The first eight words of the first record contain header information. The rest of the file is 4 word data items packed 32 per record (30 in the first record).

ENTRY	LOC.	SIZE	NAME	DESCRIPTION
1.	1	5	TSTM	WORD 1 - YEAR OF TEST START WORD 2 - DAY (JULIAN) OF TEST START WORD 3 - HOUR OF TEST START WORD 4 - MINUTE OF TEST START WORD 5 - SECOND OF TEST START
2.	6	3	LSLAB	6 ASCII CHARACTER NAME OF LOW SPEED CONFIGURATION FILE ON CARTRIDGE LS
REMAINING		4	DATA	WORD 1 - SN*100 + HR WHERE SN IS THE SENSOR NUMBER AND HR IS HOURS SINCE TEST START WORD 2 - NUMBER OF HALF SECONDS SINCE TEST START MAXIMUM VALUE = 7199 WORD 3-4 - READING AS REAL NUMBER IN REAL WORLD UNITS
LAST ENTRY		4	EOD	THE UNUSED DATA ENTRIES IN THE LAST RECORD ARE ALL ONES (OCTAL 177777)

FILE DEFINITION

NAME: LSTAP 09/15/80 PM
 DESCRIPTION: LOW SPEED DATA
 LOCATION: MAGNETIC TAPE (REEL TO REEL)
 USED BY: OFF-LINE ANALYSIS ROUTINES
 PURPOSE: TO STORE THE LOW SPEED DATA COLLECTED DURING AN ON-LINE RUN FOR FURTHER ANALYSIS

This tape contains the low speed configuration table, the low speed label file and all the data collected during an on-line test.

The first file on each tape is a copy of the low speed configuration table as it existed at the end of test. It is 2048 words in length organized as follows:

ENTRY	LOC.	SIZE	NAME	DESCRIPTION
1.	1	1800	LSCT	LOW SPEED CONFIGURATION TABLE (SEE LSCT IN THE DATA STRUCTURE DEFINITION SECTION)
2.	1801	141	LSCTX	LOW SPEED CONFIGURATION TABLE EXTENSION (SEE LSCTX IN THE DATA STRUCTURE DEFINITION SECTION)
3.	1942	107	DUMMY	PAD (MEANINGLESS)

		2048		

This file is followed by an end of file marker.

The second file contains the low speed data collected during the on-line test. Its length is dependent on the value in LSCTX(BADR) which is the 13th element of LSCTX. This file is a track by track copy of LSDATA. One record is used per track. LSCTX(BADR) is the number of records. The file is organized as follows:

The first eight words of the first record contain header information. The rest of the file is 4 word data items:

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
1.	1	5	TSTM	WORD 1 - YEAR OF TEST START WORD 2 - DAY (JULIAN) OF TEST START WORD 3 - HOUR OF TEST START WORD 4 - MINUTE OF TEST START WORD 5 - SECOND OF TEST START
2.	6	3	LSLAB	6 ASCII CHARACTER NAME OF LOW SPEED CONFIGURATION FILE ON CARTRIDGE LS
REMAINING		4	DATA	WORD 1 - SN*100 + HR WHERE SN IS THE SENSOR NUMBER AND HR IS HOURS SINCE TEST START WORD 2 - NUMBER OF HALF SECONDS SINCE TEST START MAXIMUM VALUE = 7199 WORD 3-4 - READING AS REAL NUMBERS IN REAL WORLD UNITS
LAST ENTRY		4	EOD	THE UNUSED DATA ENTRIES IN THE LAST RECORD ARE ALL ONES (OCTAL 177777)

This file is followed by an end of file marker.

The third and last file is a copy of the low speed label file. This file contains an alphanumeric description of each sensor in the system as well as a label for the units of the sensor. Each record is 128 words long and comprises labels for 4 sensors. There are 30 records in this file. The 32 word entry for each sensor consists of:

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
1.	1	20	SLABL	A 40 CHARACTER LABEL FOR THE SENSOR
2.	21	12 --- 32	ULABL	A 24 CHARACTER UNITS LABEL FOR THE SENSOR

There are two end of file markers at the end of this file.

FILE DEFINITION

NAME: HSCTF 09/15/80 PM

DESCRIPTION: HIGH SPEED CONFIGURATION FILE

LOCATION: CARTRIDGE LS (WRITTEN BY M08AF)

USED BY: M01AN TO CONFIGURE SYSTEM FOR ON-LINE TEST

SECURITY: -111

TYPE: 1 (128 WORDS PER RECORD)

PURPOSE: TO STORE THE HIGH SPEED CONFIGURATION TABLES
GENERATED BY THE USER SO THAT M01AN MAY CONFIGURE
THE HIGH SPEED COMMON AREAS FOR AN ON-LINE TEST.

This file contains the high speed configuration table (HSCT) and the high speed configuraiton table extension (HSCTX). They are exact copies of the way HSCT and HSCTX will look at the beginning of an on-line test. It is created by M08AF and represents the user's desired high speed configuration. The file is a single 128 word record as a type 1 file. The file is organized as follows:

ENTRY	LOC.	SIZE	NAME	DESCRIPTION
1.	1	72	HSCT	HIGH SPEED CONFIGURATION TABLE (SEE HSCT IN THE DATA STRUCTURE DEFINITION SECTION)
2.	73	19	HSCTX	HIGH SPEED CONFIGURATION TABLE EXTENSION. (SEE HSCTX IN THE DATA STRUCTURE DEFINITION SECTION)
3.	92	37	DUMMY	PAD (MEANINGLESS)

		128		

FILE DEFINITION

NAME: HSLBF 09/15/80 PM
 DESCRIPTION: HIGH SPEED LABEL FILE
 LOCATION: CARTRIDGE LS (WRITTEN BY M08AF)
 USED BY: HIGH SPEED ON-LINE MONITOR AND ANALYSIS PROGRAMS
 SECURITY: -111
 TYPE: 1 (128 WORDS PER RECORD)
 PURPOSE: TO STORE THE LABELS OF THE HIGH SPEED CHANNELS
 FOR USE BY THE ON-LINE MONITOR PROGRAMS.

This file contains labels for the high speed channels. It consists of three 128 word records. Each record contains the labels for four channels. Each label entry consists of:

ENTRY	LOC.	SIZE	NAME	DESCRIPTION
1.	1	20	HSLBL	A 40 CHARACTER CHANNEL LABEL
2.	21	12	DUMMY	12 PAD WORDS (MEANINGLESS)
		--		
		32		

FILE DEFINITION

NAME: HSNN 09/15/80 PM

DESCRIPTION: HIGH SPEED PRESTON DATA FILE

LOCATION: CARTRIDGE HS (WRITTEN BY HIGH SPEED SYSTEM)

USED BY: HIGH SPEED ON-LINE, MONITOR AND ANALYSIS PROGRAMS

SECURITY: NONE

TYPE: 1 (128 WORDS PER RECORD)

PURPOSE: TO STORE THE HIGH SPEED PRESTON DATA FOR LEVEL 2 TRIGGER ANALYSIS, HIGH SPEED WRITE TO TAPE, AND HIGH SPEED MONITOR AND ANALYSIS PROGRAMS.

This file contains the raw Preston high speed data. The file is an even number of cylinders in length (multiple of 96 records). The number of cylinders in the file is contained in HSCTX(NCPE). Each entry is a single high speed data point and is a two's complement integer ranging from -32766 to 32766. The least significant bit is a coincidence bit and appears in all data points from the highest numbered Preston channel. The highest numbered Preston channel is contained in HSCTX(MCN).

These file are all named in the form HSnn where nn is the disc event space number (00-99), the number of disc event spaces (and hence the number of this type of file) is found in HSCTX(NDES).

ENTRY	LOC.	SIZE	NAME	DESCRIPTION
1.	1	1	HSDAT	BITS 15-1 PRESTON DATA POINT BIT 0 COINCIDENCE BIT (HIGHEST CHANNEL ONLY)

FILE DEFINITION

NAME: HSTAP 08/11/80 PM
 DESCRIPTION: HIGH SPEED SEISMIC DATA (EVENTS ONLY)
 LOCATION: MAGNETIC TAPE (REEL TO REEL)
 USED BY: OFF-LINE ANALYSIS ROUTINES
 PURPOSE: TO STORE PRESTON EVENTS COLLECTED DURING AN OFF-LINE MODE

This collection of events is a multivolume set of tapes. Each tape contains a volume header as a file followed by as many Preston data files as will fit on the remainder of the tape. Usually, these are 2400 foot reels.

The first file on each tape is the volume header and contains:

ENTRY	LOC.	SIZE	NAME	DEFINITION
1.	1	1	VOLID	VOLUME NUMBER (FIRST IS 1)
2.	2	5	DATE	DATE AND TIME OF THE FIRST WRITE TO THIS VOLUME WORD 1 = YEAR WORD 2 = DAY (JULIAN) WORD 3 = HOUR (24 HOUR CLOCK) WORD 4 = MINUTE WORD 5 = SECOND
3.	7	5	TSTM	TEST START TIME OF ON-LINE TEST WORD 1 = YEAR WORD 2 = DAY (JULIAN) WORD 3 = HOUR (24 HOUR CLOCK) WORD 4 = MINUTE WORD 5 = SECOND
4.	12	384	HSLAB	HIGH SPEED CONFIGURATION TABLE LABEL FILE INTEGER TXT(12,32) CONSISTS OF TWELVE 64 BYTE ASCII LABELS, 1 PER CHANNEL

395

The volume header is followed by an end of file mark.

The remaining files (as many as will fit) are the seismic data files. Each file consists of a data header and data. The data header consists of:

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DEFINITION</u>
1.	1	72	HSCT	THE HIGH SPEED CONFIGURATION TABLE (SEE DATA STRUCTURE DEFINITION, HSCT)
2.	73	11	HSCTX	THE FIRST 11 WORDS OF THE HIGH SPEED CONFIGURATION TABLE EXTENSION (SEE DATA STRUCTURE DEFINITION, HSCTX)
3.	84	1	CHCT	CHANNEL NUMBER CAUSING TRIGGER (0-11 OR 99) 99 INDICATES DEMAND TRIGGER
4.	85	2	EVTM	EVENT TIME AS DISPLACEMENT FROM START OF TEST WORD 1 = HOUR WORD 2 = HALF SECONDS
5.	87	1	EVNO	EVENT NUMBER (1-??)

87

The remaining records of these files contain the raw Preston data:

<u>ENTRY</u>	<u>LOC.</u>	<u>SIZE</u>	<u>NAME</u>	<u>DEFINITION</u>
1.	1	12288	DATA	12,288 WORDS (ONE CYLINDER WORTH) OF PRESTON DATA

There is an end of file marker at the end of each Preston data file.

There is another end of file marker at the end of the volume.

CPU TO CPU MESSAGES

Messages from the DAC to the HSDAS and messages from the HSDAS to the DAS are sent via DS using PTOp calls. M09AN in the DAC will schedule S01HN in the HSDAS. S01HN is the DS slave to M09AN. Communications from the DAC to the HSDAS follow this path. S01HN will then schedule S02HN in the HSDAS. S02HN then schedules M10AN in the DAC. M10AN is the DS slave to S02HN. Communications from the HSDAS to the DAC follow this path.

All PTOp messages will either be POPEN calls or PCONT calls. In either case the tag field will contain in the first word a message ID and may use up to the remaining 19 words for data. The message ID is a 2 ASCII character code. The various message types are defined below.

Messages from DAC to HSDAS:

<u>ID</u>	<u>TYPE</u>	<u>PARAMETERS</u>	<u>WORD CONTENTS</u>
SC	SCHEDULE		REQUESTS THAT M10AN BE SCHEDULED IN THE DAC
		2	CLASS NUMBER M10AN USES TO SEND MESSAGES TO M01AN
		3	RESOURCE NUMBER FOR M10AN USE
CC	CHAN. CONFIG.		SPECIFIES WHICH CHANNELS MAY CAUSE TRIGGERS
		2	CHANNEL 0 STATUS 0 = NOT USED 1 = DATA CHANNEL ONLY 2 = CAN CAUSE TRIGGER
		3	CHANNEL 1 STATUS
			.
			.
		13	CHANNEL 11 STATUS
TL	TRIGGER LEVEL		ESTABLISHES TRIGGER LEVEL FOR CHANNELS
		2	CHANNEL 0 TRIGGER LEVEL (TIMES 1000)
		3	CHANNEL 1 TRIGGER LEVEL (TIMES 1000)
			.
			.
		13	CHANNEL 11 TRIGGER LEVEL (TIMES 1000) NOTE: AT MOST 3 ENTRIES WILL BE NON-ZERO
GV	GLOBAL VARIABLES		SETS UP THE HIGH SPEED CONFIG. TABLE EXTENSION
		2	SAMPLE RATE IN SAMPLE PER SECOND (TIMES 1000)
		3	EVENT LENGTH IN CENTISECONDS
		4	PRE-TRIGGER STORAGE IN 24576 POINT BLOCKS

ID	TYPE	PARAMETERS	WORD CONTENTS
		5	MAXIMUM CHANNEL NUMBER
		6	NUMBER OF POINTS IN A QUANTUM
		7	NUMBER OF QUANTA IN A SHORT TERM INTERVAL
		8	NUMBER OF QUANTA IN A LONG TERM INTERVAL
		9	NUMBER OF DISC EVENT SPACES
		10	NUMBER OF CYLINDERS PER EVENT (EVEN)
		11	ALGORITHM NUMBER (0 = AMPLITUDE, 1 = 1ST DIFFERENCE)
		12	DATA DENSITY FOR TRIGGER (1 FOR EVERY POINT, 2 FOR EVERY OTHER POINT, ETC.)
		13-15	6 ASCII CHARACTERS - NAME OF HS LABEL FILE
		16-20	5 SPARE ENTRIES
TS	TEST START TIME		ESTABLISHES TEST START TIME (CURRENT TIME)
		2	YEAR
		3	DAY
		4	HOUR
		5	MINUTE
		6	SECOND
AK	ACKNOWLEDGE		SEND ACK RESPONSE TO M10AN
ST	START		START (OR RE-START) TRIGGER ANALYSIS AND LOGGING
PA	PAUSE		STOP TRIGGER ANALYSIS (WAIT FOR ST MESSAGE)
DT	DEMAND TRIGGER		LOG AN EVENT AS IF A TRIGGER WAS DETECTED
		2	NUMBER OF EVENTS TO LOG
		3	FLAG: 0 CONTINUE NORMALLY AFTER LOG 1-STOP TRIGGER ANALYSIS AFTER LOGGING
FE	FREE EVENT		FREE DISC EVENT SPACE
		2	EVENT SPACE NUMBER (1-100)
		3	CYLINDER NUMBER OF DISC EVENT SPACE
SD	SHUT DOWN		TERMINATE HSDAS SYSTEM

MESSAGES FROM HSDAS TO DAC:

<u>ID</u>	<u>TYPE</u>	<u>PARAMETERS</u>	<u>WORD CONTENTS</u>
SC	SCHEDULE		SCHEDULE M10AN
		2	CLASS NUMBER M10AN USES TO SEND
			MESSAGES TO M01AN
		3	RESOURCE NUMBER FOR M10AN
AR	ACK RESPONSE		RESPONSE TO AK MESSAGE
EV	EVENT LOG		INDICATES AN EVENT WAS LOGGED TO DISC
		2	EVENT START TIME (HOUR)
		3	MINUTE
		4	SECOND
		5	TRIGGER LEVEL (TIMES 1000)
		6	CHANNEL NUMBER CAUSING TRIGGER (-1 =
			DT)
		7	DISC EVENT SPACE NUMBER
		8	CYLINDER NUMBER OF EVENT DIS SPACE
UT	UNLOGGED TRIGGER		INDICATES TRIGGER DETECTED BUT NOT
			LOGGED
		2	EVENT START TIME (HOUR)
		3	MINUTE
		4	SECOND
		5	TRIGGER LEVEL (TIMES 1000)
		6	CHANNEL NUMBER CAUSING TRIGGER (-1 =
			DT)
DF	DEVICE FAIL		INDICATES PROBLEM
		2	PROBLEM TYPE FLAG
			0 = RECEIVED IMPROPERLY FORMATTED
			REQUEST
			1 = DISK FAILED
			2 = TRACK FAILED
			3 = PRESTON FAILED
		3	FOR CODE 0 - ID OF BAD REQUEST
			FOR CODE 2 - DISC EVENT SPACE NUMBER
			AFFECTED
SA	SHUTDOWN ACK		ACKNOWLEDGES SHUTDOWN REQUEST

PROGRAM NAMING CONVENTION

PROGRAM NAMES FOLLOW A NAMING CONVENTION TO ENSURE THAT NO DUPLICATIONS OCCUR AND TO PROVIDE AN ORDERLY METHOD OF DOCUMENTATION AND OTHER RELATED PRODUCTION PROGRAM LIBRARIAN FUNCTIONS.

PROGRAMS NAMES ARE OF THE FORM: AnnDT

WHERE: A IS AN AUTHOR CODE
B: ALFRED BAUER
J: JOINT EFFORT
M: PAUL MERILLAT
S: LARRY SMITH

nn IS A SEQUENCE NUMBER BY AUTHOR CODE RANGING FROM 00-99

D IS A DESTINATION CODE

A: DATA ACQUISITION CONTROLLER (DAC)
H: HIGH SPEED DATA ACQUISITION SYSTEM
(HSDAS)
R: ROCK MECHANIC SYSTEM (RMS)
G: NO RESTRICTION

T IS A PROGRAM TYPE CODE

N: ON-LINE
F: OFF-LINE
U: UTILITY

SUBPROGRAMS AND FUNCTION SUBPROGRAMS ARE GIVEN (AS BEST AS POSSIBLE) MEANINGFUL FIVE-CHARACTER NAMES.

Distribution:

U. S. Department of Energy
Strategic Petroleum Reserve
Project Management Office
900 Commerce Road East
New Orleans, LA 70123
Attn: R. F. Mazurkiewicz
Mail Stop RA-681

Hewlett Packard
11300 Lomas Blvd. NE
Albuquerque, NM 87123
Attn: Bob Curtis
Dennis Spanogle

Hewlett Packard
23855 Research Drive
Farmington Hills, MI 48024
Attn: Larry Smith

1759 M. J. Eaton
1759 P. D. Merillat (5)
4500 E. H. Beckner
4540 M. L. Kramm
4541 M. W. Sharp
4543 A. G. Bauer
4543 J. G. Deasy
4543 R. P. Fleming
4543 P. B. Herrington
4543 J. P. Holmes
4543 J. F. Ney (25)
3141 T. L. Werner (5)
3151 W. L. Garner (3)
3154-3 R. P. Campbell (26)
For DOE/TIC
8266 E. A. Aas

DO NOT MICROFILM
COVER