About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual is the best copy we could find; it may be incomplete or contain dated information. If we find a more recent copy in the future, we will add it to the Agilent website.

Support for Your Product

Agilent no longer sells or supports this product. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available. You will find any other available product information on the Agilent Test & Measurement website, www.tm.agilent.com.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. In other documentation, to reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product number/name was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Printed in USA March 2000

Installation, Operation, Programming, and Service Guide

HP 85620A Mass Memory Module

HP Part No. 85620-90041 Supersedes 85620-90040
Printed in USA October 1996

1400 Fountaingrove Parkway, Santa Rosa, CA 95403-1799, USA

Certification

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Hewlett-Packard. Buyer shall prepay shipping charges to Hewlett-Packard and Hewlett-Packard shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Hewlett-Packard from another country.

Hewlett-Packard warrants that its software and firmware designated by Hewlett-Packard for use with an instrument will execute its programming instructions when properly installed on that instrument. Hewlett-Packard does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HEWLETT-PACKARD SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HEWLETT-PACKARD SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY

Assistance

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Rzckard products.

For any assistance, contact your nearest Hewlett-Rzckard Sales and Service Office.

Safety Notes

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument.

Caution The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a *caution* sign until the indicated conditions are fully understood and met.

Warning **The *warning* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a** warning **sign until the indicated conditions are fully understood and met.**

General Safety Considerations

Warning *Before this instrument is switched on, make* **sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.**

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

Warning **There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful.**

Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

Caution *Before this instrument is switched* on, make sure its primary power circuitry has been adapted to the voltage of the ac power source.

Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

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Figures

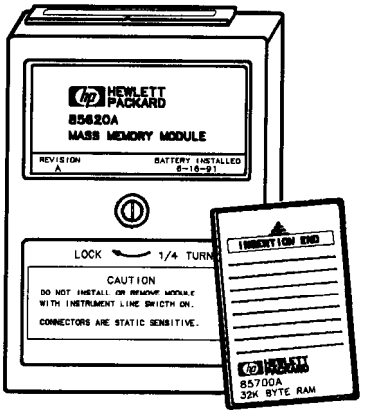
Tables

1

Installation

Introduction

This chapter describes the HP 85620A Mass Memory Module, provides specifications and characteristics, and illustrates accompanying accessories. The serial numbers covered by this document are also listed here.



DF246

Figure 1-1.
HP 85620A Mass Memory Module and HP 85700A Memory Card (Option T01 does not include memory card capability.)

HP 85620A Mass Memory Module Description

Note

The spectrum analyzer save-trace registers 5, 6, and 7 are overwritten when the module is connected to the its rear panel OPTION MODULE CONNECTOR. These registers are used for module data and are not available for spectrum analyzer operation. If you attempt to store data to these registers while the module is attached, module operating memory is corrupted.

The mass memory module is an optional memory package that is attached to Hewlett-Packard portable spectrum analyzers. It provides substantially greater user memory than other spectrum analyzer products. This general-purpose memory may be used to store trace data, downloadable programs (DLPs), limit lines, and variables. The module memory is battery-backed. The battery needs to be checked at least annually. Refer to Chapter 5, "Service," for information on how to check the battery voltage.

The module is attached to the OPTION MODULE connector (J3) on the spectrum analyzer rear panel and locked into place with a 1/4-turn fastener. The module interface with the spectrum analyzer is established through this connector.

Caution

You must turn the spectrum analyzer OFF before attaching or removing **the** mass memory module. Connecting the module while the spectrum analyzer is ON can damage both the spectrum analyzer and the module circuitry.

The connector pins on the module and on the spectrum analyzer are electrostatic discharge (ESD) sensitive. Do not touch the pins on either instrument unless you are adequately protected against ESD.

You may also store data on memory cards that are compatible with the module. Memory cards contain lithium batteries which must be checked at least annually. Refer to Chapter 5, "Service," for how to check the battery. Instructions for installing memory cards and batteries are in "Installing Memory Cards" in this chapter. (Option T01 does not include memory card capability.)

Modules Covered by This Manual

Serial Numbers

The serial-number label is on the rear cover (connector side) of the mass memory module. The first five characters make up the serial number prefix; the last five are the suffix. The only time the serial prefix changes is when there are substantial changes to the module. Suffix numbers are different for each module.

Firmware Revisions

Mass memory module operation is controlled by ROM (read-only memory) firmware. The module firmware version is displayed after pressing the [MODULE) key on the spectrum analyzer. Refer to Table l-l for firmware versions of the module that are compatible with the different portable spectrum analyzers

It is possible to get a different set of functions from a given mass memory module, depending on the firmware revision of the host spectrum analyzer. In spectrum analyzers with firmware revision 960401 and later, the firmware that controls the mass memory module actually resides in the host spectrum analyzer and contains a more recent set of features and functionality. If that same mass memory module is installed on a host spectrum analyzer with firmware revision 941028 or earlier, the firmware that resides in the mass memory module (revision A, B, or C) will control the features and functionality of the module.

Table 1-1.
HP 85620A and HP 856X Firmware Compatibility

Spectrum Analyzer	HP 85620A Firmware Revision		
	890214 (Rev A)	890524 (Rev B)	910116 (Rev C)
HP 8560A	Not supported	890720 and later firmware revisions	890720 and later firmware revisions
HP 8560E	Not supported	941028 and earlier firmware revisions	All revisions of firmware
HP 8561A	All revisions of firmware	All revisions of firmware	All revisions of firmware
HP 8561B	Not supported	890720 and later firmware revisions	890720 and later firmware revisions
HP 8561E	Not supported	941028 and earlier firmware revisions	All revisions of firmware
HP 8562A	870728 and later firmware revisions	870728 and later firmware revisions	870728 and later firmware revisions
HP 8562B	870728 and later firmware revisions	870728 and later firmware revisions	870728 and later firmware revisions
HP 8562E	Not supported	Not supported	All revisions of firmware
HP 8563A	Not supported	All revisions of firmware	All revisions of firmware
HP 8563E	Not supported	941028 and earlier firmware revisions	All revisions of firmware
HP 8564E	Not supported	941028 and earlier firmware revisions	All revisions of firmware
HP 8565E	Not supported	941028 and earlier firmware revisions	All revisions of firmware

Mass memory module firmware revision 950829 is in spectrum analyzers having instrument firmware revision 960401.

Mass memory module firmware revision 960830 is in spectrum analyzers having instrument firmware revision 960830.

Specifications and Characteristics

Specifications describe the warranted HP 85620A Mass Memory Module performance over the indicated temperature range. Characteristics provide useful information in the form of typical, nominal, or approximate values. Table 1-2 lists specifications and characteristics of the module. Refer to Table 1-5 for specifications and characteristics of the RAM memory card and its battery. (Option T01 does not include memory card capability.)

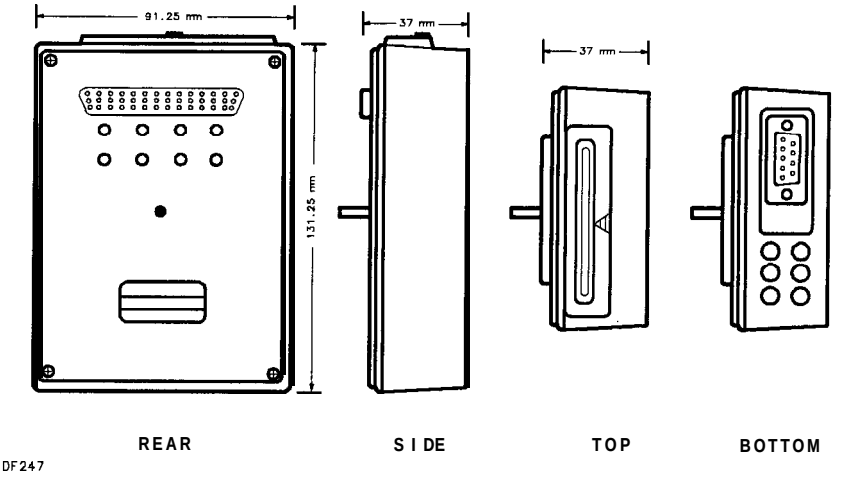


Figure 1-2. HP 85620A Dimensions

Table 1-2.
HP 85620A Mass Memory Module Specifications and Characteristics

Electrical Specifications	General Specifications	Characteristics
Operating Power Requirement 5.0 W at +5 Vdc, supplied by the analyzer, not by the battery. Read Only Memory (ROM) 256 kilobytes User Memory 128 kilobytes (battery-backed RAM) Real-Time Clock + 50, – 120 ppm over temperature	Environmental Military Specification: per MIL-T-28800C, Type III, Class 3 Temperature Range Operating –10°C to +55°C Storage –62°C to +85°C	Module Battery Lithium Iodine 2.8 V, 1 A-hour capacity See Table 5-3 for the battery part number. Battery Life Worst Case: 1.0 year Typical: 6.5 years Module Weight Net: 453 g (1 lb) Shipping: 1.59 kg (3.5 lb) Module Dimensions (See Figure *1-2)* Height: 131.25 mm (5.25 in) Width: 91.25 mm (3.65 in) Depth: 37 mm (1.48 in)

Auxiliary Interface Connector

The auxiliary interface connector allows the user, by way of the spectrum analyzer, a method of providing minimal power to external devices and to control or receive inputs from external devices. This interface is to provide an alternative to HP-IB in the control of simple switches in "Logic" mode and to control external devices in "Serial Bit" mode. The "Serial Bit" mode is especially useful for Automated Test Equipment (ATE) applications.

The Auxiliary Interface Connector has four output control lines and one input line. In the "Serial Bit" mode one of the outputs is designated as the serial line and another as the strobe. There are actually two serial modes: "OUTPUT 99" sends out the data most significant bit (MSB) first, and "OUTPUT 98" sends out the least significant bit (LSB) first.

As implemented the Auxiliary Interface Connector runs open loop. The serial data is clocked out as fast as the software can toggle the data lines as illustrated in Figure 1-3.

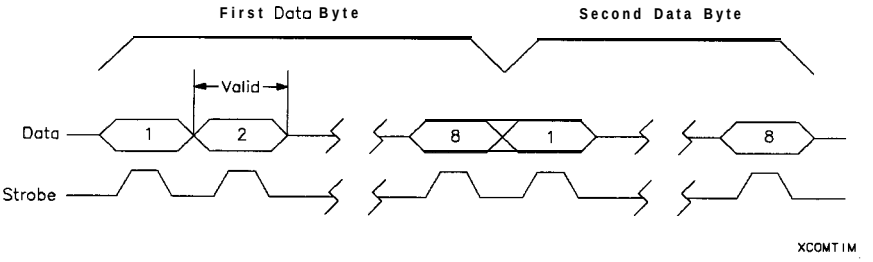


Figure 1-3.
Command Timing
OUTPUT 98-LSB First or OUTPUT 99-MSB First

Table 1-3. Subminiature "D" (g-pin) Connector Pinout

Pin Number	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A		TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B		TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C		TTL Output Hi/Lo	Strobe
4	Control D		TTL Output Hi/Lo	Serial Data
5	Control I		TTL Input Hi/Lo	TTL Input Hi/Lo
6	Ground		Ground	Ground
7	-15 Vdc ±5%	150 ma		
8	+5 Vdc ±5%	150 ma		
9	+ 15 Vdc ±5%	150 ma		

Note

The current drawn by devices using the Auxiliary Interface connector must be limited to 150 ma since this is the limit of the power supply.

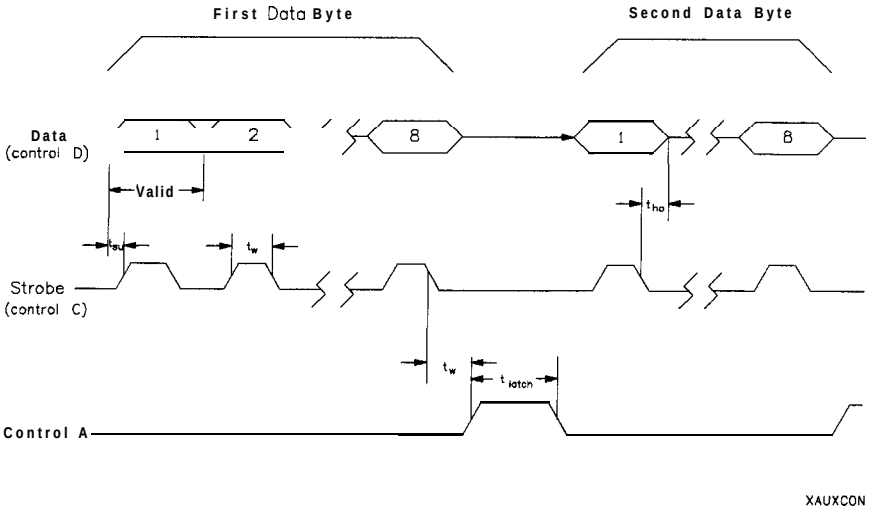


Figure 1-4.
Auxiliary Connector Timing
OUTPUT 98/OUTPUT 99

Table 1-4.
Auxiliary Connector Timing Parameters
OUTPUT 98/OUTPUT 99

Symbol	Parameter	Limit
t_{su}	Minimum setup time, data to strobe	250 ns
t_{ho}	Minimum hold time, strobe to data	250 ns
t_w	Minimum pulse width, strobe	500 ns
t_d	Maximum delay, strobe to data not read	250 ns
t_{latch}	Minimum pulse width, latch	150 μs

Memory Card Specifications and Characteristics

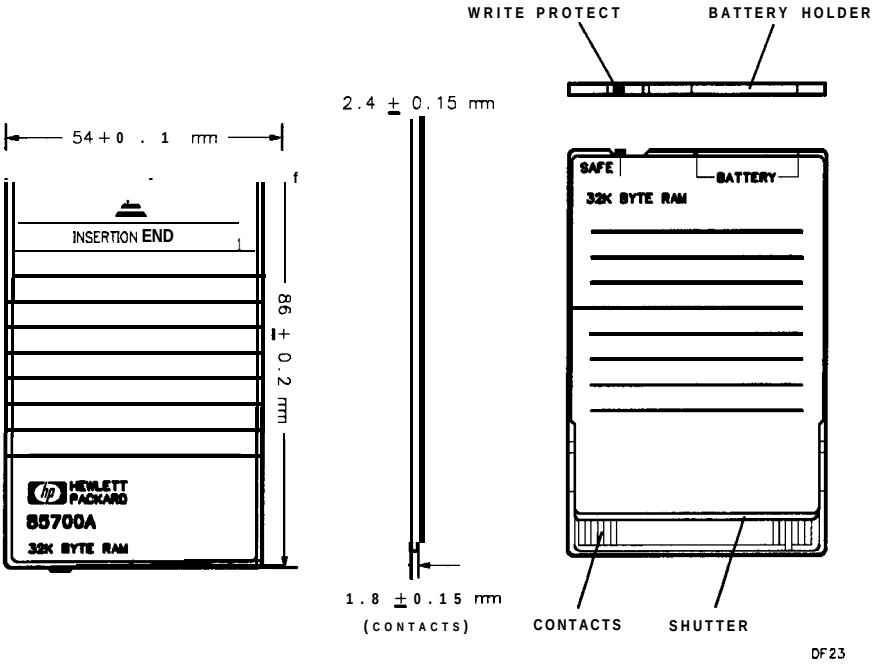


Figure 1-5.
Memory Card Dimensions
(Option T01 does not include memory card capability.)

Table 1-5.
BP 85700A RAM Memory Card Specifications and Characteristics
(Option T01 does not include memory card capability.)

Electrical Specifications	General Specifications	Characteristics
Operating Voltage (supplied by the spectrum analyzer) +5 Vdc (nominal) Battery Voltage (RAM back-up) 3 Vdc (nominal)	Operating Temperature 0°C to +60°C Storage Temperature −20°C to +60°C Memory Size 32 kilobyte, battery-backed RAM Type CMOS	Card Weight with battery: 20.9 grams without battery: 19.0 grams Card Dimensions *(Figure 1-5)* Length: 86 mm ±0.2 mm Width: 54 mm ±0. 1 mm Thickness: 2.4 mm ±0.15 mm Battery Type Lithium Commercial Part Number: CR2016 HP Part Number: 1420-0383

Preparation for Use

In this section, we cover initial inspection of the module and the shipping container, installing the module, and module operation.

Initial Inspection

Inspect the shipping container upon receipt. Retain it and the cushioning materials for future use. If you need to ship the module to another location or return it to Hewlett-Packard for service, refer to the repackaging and shipping instructions in this section.

If the container or the cushioning materials are damaged, keep them until you have verified that the contents are complete and the module is functioning properly. If the contents are incomplete or the module does not function properly, notify one of the HP Sales and Service Offices listed in Table 1-7. The HP Sales and Service Office will arrange for repair or replacement without waiting for a claim settlement. Also, notify the carrier about container damages, then show the damaged items to the carrier for inspection.

Refer to Figure 1-9 for an illustration of the shipping container, packaging materials, and associated HP part numbers.

Installing the Module

Caution

The portable spectrum analyzer must be turned OFF before the module is connected. Connecting the module while the spectrum analyzer is ON can damage both the spectrum analyzer and the module circuitry.

The connector pins on the module and on the spectrum analyzer are ESD-sensitive. Do not touch the pins on either instrument unless you are adequately protected against ESD.

Refer to the following steps to install your HP 85620A Mass Memory Module properly and safely onto a portable spectrum analyzer.

1. With the spectrum analyzer set to OFF, line the 50-pin connector on the module up with the OPTION MODULE connector (J3) on the rear panel of the analyzer. See Figure 1-6.
2. Press the module into place.
3. Using a flat-blade screwdriver, tighten the 1/4-turn fastener that holds the module in place.

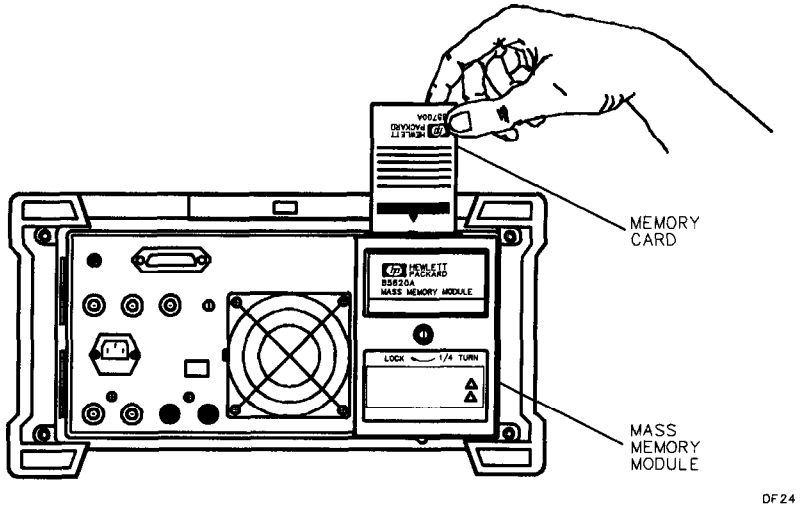


Figure 1-6.
Installing an HP 85620A Mass Memory Module and Memory Card
(Option T01 does not include memory card capability.)

Installing Memory Cards

(Option T01 does not include memory card capability.)

Use the following information to ensure that the memory card is inserted correctly. Improper insertion causes error messages to occur, but generally does not damage the card or the module. Care must be taken, however, not to force the card into place. The cards are easy to insert when installed properly.

1. Locate the arrow printed on the card label.
2. Insert the card with its arrow matching the raised arrow on the bezel around the card-insertion slot. See Figure 1-6.
3. Press the card into the slot. When correctly inserted, about 4 **cm (1.6** in) of the card is exposed above the slot.

Changing the Memory Card Battery

The battery is located beside the card write-protect switch on the end opposite the connector. Refer to Table 1-5 for memory-card battery specifications and characteristics.

Caution

Memory-card data is retained by the battery in the card. You can lose the data when the battery is removed. Replace the battery while the card is installed in a powered-up module. Memory-card data may be backed up in module memory before beginning the battery replacement procedure that follows.

1. Locate the groove along the edge of the battery clip. See Figure 1-7.
2. Gently pry the battery clip out of the card. The battery fits within this clip.
3. Replace the battery, making sure the plus (+) sign on the battery is on the same side as the plus (+) sign on the clip.
4. Insert the battery clip into the memory card, holding the clip as oriented in Figure 1-7. (Face the "open" edge of the clip toward the write-protect switch **on** the memory card.)

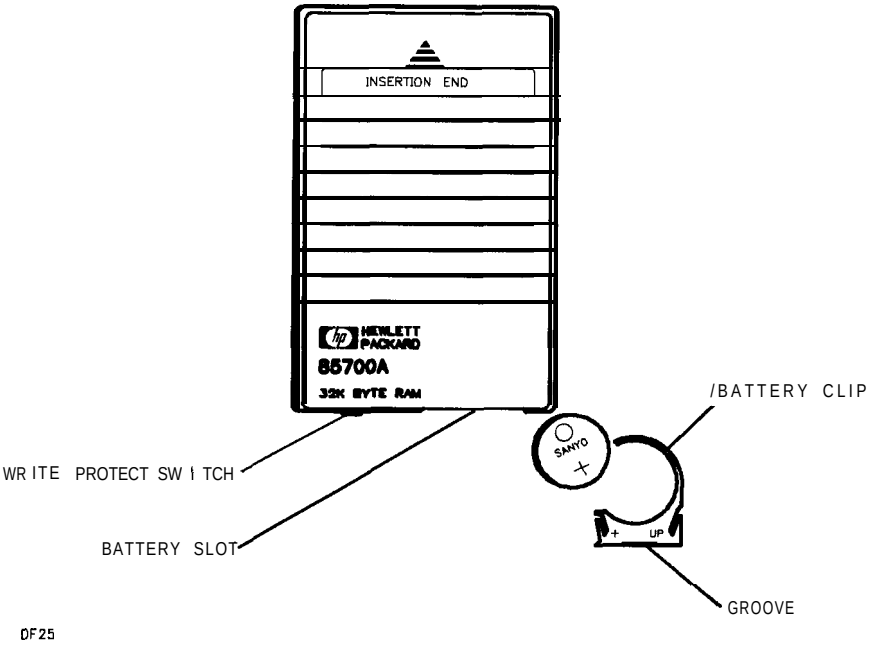


Figure 1-7.
Memory Card Battery Replacement
(Option T01 does not include memory card capability.)

Memory Card Demonstration Programs

lb introduce the concept of downloadable programs (DLP) and demonstrate other features of the module, Hewlett-Packard has installed demonstration DLPs onto the HP 85700A 32-kilobyte RAM memory card shipped with each HP 85620 Mass Memory Module.

Caution To prevent possible damage to the spectrum analyzer or module circuits, the analyzer must be turned off before installing or removing the module.

To load and execute these demonstration DLPs, perform the following steps:

1. Turn the analyzer off and plug the mass memory module into the OPTION MODULE connector on the rear panel of the analyzer. Tighten the locking screw to secure the module.
2. Turn on the analyzer and wait for the alignment to complete. Press the [MODULE) key on the front panel of the instrument. You will now see the module main menu on the display.
3. Press the **UTILITY softkey.**
4. Insert the HP 85700A RAM card into the mass memory module. Be sure the card is oriented properly by matching the arrow on the card to the arrow **on** the module bezel.
5. Press **CATALOG MEM CARD softkey** to underline CARD. Make sure the cursor is located beside DEMOS on the display (use the analyzer RPG knob or step keys to move the cursor if necessary), then press **COPY** TO **MEM** . After approximately 10 seconds, the programs are copied into the module. During this time the front-panel keys are inoperable.
6. Press the (MODULE) key, then the **KEYDEF softkey.** Now press **CHOOSE DLP** and position the cursor beside DEMOS.
7. Press **EXECUTE NOW** to begin the DLP demonstrations. Use the information on the display to complete the programs.

Module Operation

Introduction

This operating information is a brief introduction to the main menu of the HP 85620A Mass Memory Module. For detailed operating information, refer to Chapter 2.

Menu Structure

With the spectrum analyzer in normal operation mode, press the spectrum analyzer (MODULE) key to display the main menu of the HP 85620A Mass Memory Module. See Figure 1-8. The menu is friendly enough for the first-time user, but structured so that an experienced user can get going quickly. Generally, there are no more than three menu levels nested below the main menu level.

lb exit the module functions, press any of the front-panel keys on the analyzer.

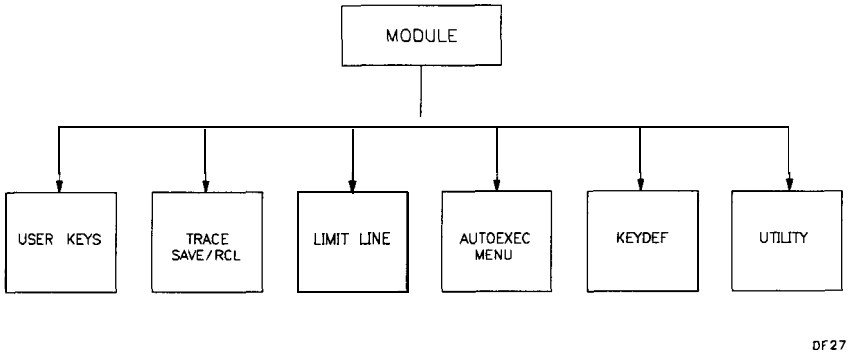


Figure 1-8. HP 85620A Main Menu Softkeys

Main Menu Softkey Descriptions

USER KEYS

accesses 10 user-definable softkeys. These keys, when defined using the User Entry Menu, activate DLPs assigned to them. You can also assign DLPs to softkeys remotely.

TRACE SAVE/RCL

enables you to save and recall traces. You can also create trigger criteria (data specifying when an event starts and stops) and automatically store traces.

LIMIT LINE

accesses features for you to create or edit limit lines. Limit lines can be specified by up to 18 points. Each point is composed of a frequency and at least one amplitude value. Trace data can be compared against limit lines.

AUTOEXEC MENU

accesses features for you to execute a DLP automatically. You select the criteria that determines when the DLP starts to run.

KEYDEF

accesses the 10 user-definable softkeys and the DLP Directory so that you can load DLPs onto the module User Keys Menu softkeys.

UTILITY

accesses the module utility functions. You can set the current time and date, catalog the module or memory card contents, copy data between the memory card and the module memory, and delete any memory contents. (Option T01 does not include memory card capability.)

Packaging

Original Packaging

Save the original packaging materials. If the original materials have been discarded, identical materials may be ordered from HP Sales and Service Offices for shipping or transporting purposes. Refer to Figure 1-9 and Table 1-6 for these shipping container materials.

On the outside of the container, write clearly, FRAGILE, HANDLE WITH CARE. If the module is being returned to Hewlett-Packard for servicing, include one of the blue repair tags along with the information listed below:

- Type of service required, including a description of the problem.
- Return address, phone number, and person to contact for more information.
- Model number and serial number of the module.
- List of any accessories accompanying the module.

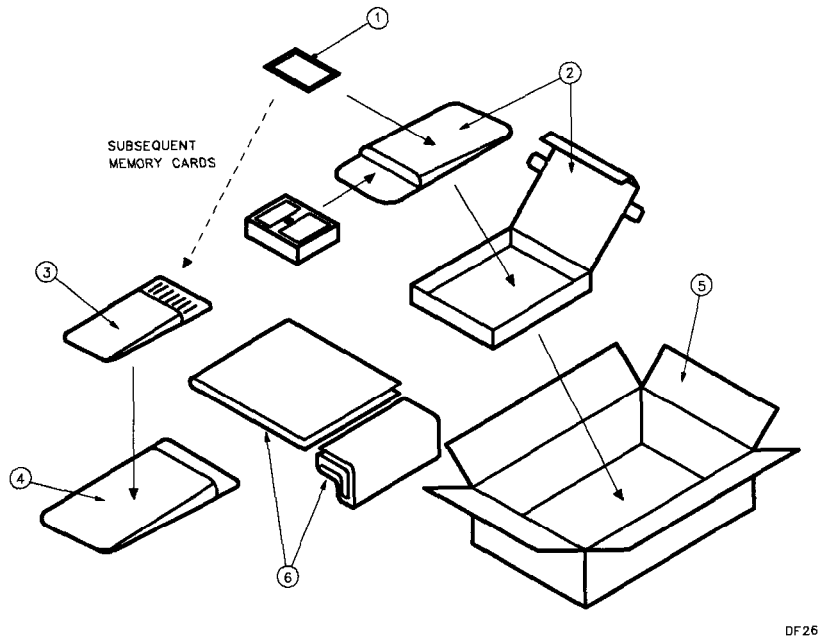


Figure 1-9.
HP 85620A Shipping Container Materials
(Option T01 does not include memory card capability.)

Table 1-6. HP 85620A Shipping Container Materials Contents

Item	Description	HP Part Number	Check Digit	Qty
1	Memory card with slip case (Option T01 does not include memory card capability.)	85700A	3	1
2	Envelope and inner carton	9211-4916	3	1
3	Bubble-pack bag (with separate card orders)	9222-0784	8	1
4	Envelope (with separate card orders)	9222-1219	6	1
5	Carton, outer	9211-5570	7	1
6	Styrene sheets	9223-0476	7	2

Other Packaging

Use the steps below if you plan to use materials other than the ones specified as original packaging.

Caution

Do not use packaging materials other than those specified. Improper packaging can damage the module. Never use styrene pellets in any shape as packaging materials. Their cushioning ability may not be adequate enough prevent the module from shifting within the carton. They also generate static electricity and can cause ESD damage to the module.

1. Wrap the module in two or three inches of static-shielding cushioning materials (for example, S.D.-240 Air Cap™ from Sealed Air Corporation, Commerce, CA, 90001).
2. If the module is being returned to Hewlett-Packard, include a blue repair tag with the information listed in "Original Packaging."
3. Place the module in a strong shipping container. Make sure there is enough cushioning material to prevent the module from shifting within the container. Securely seal the shipping container.
4. Print `FRAGILE, HANDLE WITH CARE` clearly on the shipping container.

Error Messages

Error messages and recovery information are included in this section. If you are unable to recover from an error, contact an HP Sales and Service Office. These offices are listed in Table 1-7.

`CHK CARD INSERTION`
: The memory card is either inserted incorrectly or not inserted at all. Make sure the arrow printed on the card label and the arrow on the module match up. Press the card into place firmly, but do not use excessive force. (Option T01 does not include memory card capability.)

`INSUFFICIENT MEMORY`
: There is not enough user memory available to save the data you are attempting to save. You can either relocate some of the contents in the destination you have selected, or purge some of the contents.

`READ ONLY CARD`
: The card inserted in the module is a ROM card. Replace the ROM card with a RAM card and be sure the write-protect switch is *not* set in the SAFE position. (Option T01 does not include memory card capability.)

`No applicable entries`
: You attempted to access data from a memory location that contained no DLPs, limit-lines, or traces.

Error Codes

Error-code numbers for the module range from 800 to 899.

Note

Pressing (MODULE) then (PRESET) on the analyzer, or sending the command IP over HP-IB, will clear module errors reported in the lower left-hand corner of the display. After using the ERR command over HP-IB, an IP command must be used to clear mass memory module errors.

800 U1 EPROM Check Sum Error, hardware failure.

801 U2 EPROM Check Sum Error, hardware failure.

802 U3 EPROM Check Sum Error, hardware failure.

803 U4 EPROM Check Sum Error, hardware failure.

804 Mass Memory Initialized. RAM data has been erased. Hardware failure or the module battery is intermittent or has failed.

805 Mass Memory Module Usage Error. The command used was invalid and cannot be executed.

806 Mass Memory RAM full. Available memory is insufficient for command execution.

807 Symbol Define Error. There was an attempt to define something illegal, or not of the correct type.

808 Symbol Read Error. There was an attempt to read something that was not there.

809 Symbol Write Error. There was an attempt to write something that was not defined.

810 Symbol Delete Error. There was an attempt to delete something that did not exist.

850 Symbol Table Corrupt. The file apparently exists but cannot be accessed.

851 Memory Card Not Inserted. The module cannot recognize the memory card. It may be inserted incorrectly or the contacts are damaged. (Option T01 does not include memory card capability.)

852 Write to ROM Card or a Write-Protected RAM card. You must use a RAM card with the write-protect switch *not* set to SAFE. (Option T01 does not include memory card capability.)

853 Memory Card Operation Error. There was an attempt to do an illegal operation. For example, a write-to attempt was made with the memory card removed, or the filename used for the store operation contained non-alphanumeric characters. (Option T01 does not include memory card capability.)

854 Memory Card Memory Full. (Option T01 does not include memory card capability.)

855 Memory Card File Not Found. (Option T01 does not include memory card capability.)

856 Reserved Word. There was an attempt to use a word in a filename that is reserved for a command.

857 Syntax Error.

858 Type Error. The defined type does not match the requested type.

859 Command Error. Destination invalid or improperly defined.

860 Reserved.

Table 1-7. Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS

Headquarters
Hewlett-Packard Co.
19320 Pruneridge Avenue
Cupertino, CA 96014
(800) 752-0900

California, Northern
Hewlett-Packard Co.
301 E. Evelyn
Mountain View, CA 94041
(415) 694-2000

California, Southern
Hewlett-Packard Co.
1421 South Manhattan Ave.
Fullerton, CA 92631
(714) 999-6700

Colorado
Hewlett-Packard Co.
24 Inverness Place, East
Englewood, CO 80112
(303) 649-5512

Atlanta Annex
Hewlett-Packard Co.
2124 Barrett Park Drive
Kennesaw, GA 30144
(404) 648-0000

Illinois
Hewlett-Packard Co.
5201 Tollview Drive
Rolling Meadows, IL 60008
(708) 255-9800

New Jersey
Hewlett-Packard Co.
150 Green Pond Rd.
Rockaway, NJ 07866
(201) 686-6400

Texas
Hewlett-Packard Co.
930 E. Campbell Rd.
Richardson, TX 75081
(214) 231-6101

EUROPEAN FIELD OPERATIONS

Headquarters
Hewlett-Packard S.A.
160, Route du Nant-d'Avril
12 17 Meyrin 2/Geneva
Switzerland
(41 22) 780.8111

France
Hewlett-Packard France
1 Avenue Du Canada
Zone D'Activite De Courtaboeuf
F-91947 Les Ulis Cedex
France
(33 1) 69 82 60 60

Germany
Hewlett-Packard GmbH
Hewlett-Packard Strasse
61362 Bad Homburg v.d.H
Germany
(49 6172) 16-0

Great Britain
Hewlett-Packard Ltd.
Eskdale Road, Winnersh Triangle
Wokingham, Berkshire RG41 5DZ
England
(44 734) 696622

INTERCON FIELD OPERATIONS

Headquarters
Hewlett-Packard Company
3495 Deer Creek Road
Palo Alto, California, USA
94304-1316
(415) 857-5027

Australia
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
(61 3) 896-2895

Canada
Hewlett-Packard (Canada) Ltd.
17600 South Service Road
Trans-Canada Highway
Kirkland, Quebec H9J 2X8
Canada
(614) 697-4232

China
China Hewlett-Packard Company
38 Bei San Huan X1 Road
Shuang Yu Shu
Hai Dian District
Beijing, china
(86 1) 266-6888

Japan
Hewlett-Packard Japan, Ltd.
1-27-15 Yabe, Sagamihara
Kanagawa 229, Japan
(81 427) 59-1311

Singapore
Hewlett-Packard Singapore (Pte.) Ltd.
150 Beach Road
#29-00 Gateway West
Singapore 0718
(65) 291-9088

Taiwan
Hewlett-Packard lbiwan
8th Floor, H-P Building
137 Fu Hsing North Road
Taipei, lbiwan
(886 2) 712-0404

2

Operation

Introduction

This chapter introduces you to the operation of the HP 85620A Mass Memory Module. The module is designed to enhance the memory and capabilities of Hewlett-Packard portable high performance spectrum analyzers. Figure 2-1 illustrates the main menu display which appears after you press the (MODULE) key on the spectrum analyzer front panel. Refer to Chapter 1, "Installation, " for information about connecting the module to the spectrum analyzer or inserting a memory card into the module.

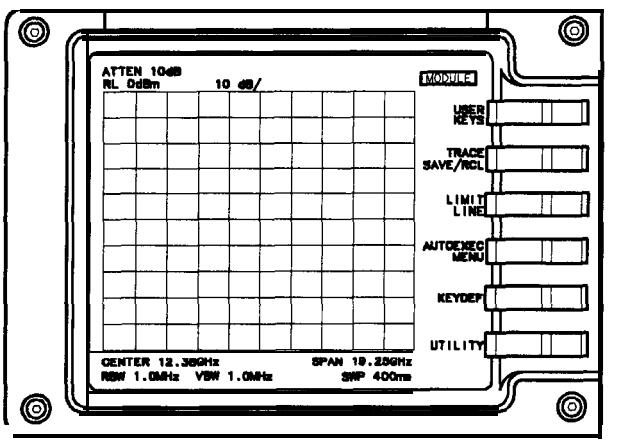


Figure 2-1. HP 856208 Main Menu Softkeys

Module Features

The module provides the spectrum analyzer with 128 kilobytes of available memory. With this memory you can store and recall trace data, define and store variables, use downloadable programs (called DLPs or personalities), create and store limit lines, or define user softkeys so that you can activate DLPs from the front panel.

Features provided to the portable spectrum analyzer by the mass memory module include:

- DLP execution remotely over HP-IB or using the module softkeys. There are ten softkeys you can assign to activate DLPs you purchase through Hewlett-Packard or create yourself. These softkeys are defined remotely with the KEYDEF command or locally in the KEYDEF menu.
- Trace Save/Recall capability. With the module built-in real-time clock and calendar, you can set up automatic-save conditions to save trace data at specified times and dates, and specified intervals.
- Limit-line generation. You enter the frequency and amplitude parameters to generate a limit line, then activate it with the press of a key. It tracks changes in the spectrum analyzer state and adjusts the displayed line accordingly.
- Automatic execution of DLPs. You can enter up to seven operations or DLPs in the AUTOEXEC/AUTOSAVE SCHEDULE that will execute automatically according to the criteria you define. The location of the operation name in the schedule and the operation start- and stop-times determine its priority for execution. As an example, if a program listed beside the number 1 has an earlier start time than the program listed beside the number 2, program number 1 is executed first.
- Memory card capability (except Option T01). With the mass memory module, you are able to use RAM and ROM memory cards. RAM cards are primarily used for read/write data storage, while the one-time programmable (OTP) ROM cards are used for personality DLPs available from Hewlett-Packard. RAM card memory is maintained by a lithium battery when the card is removed from a powered-up module. Check the battery voltage at least annually to be assured of data retention.

Note When mass memory module functions are used, the analyzer save-trace registers 5, 6, and 7 are overwritten with module data. Therefore, these registers are not available for spectrum analyzer operations. If you attempt to store data to these registers while the module is active, it corrupts the module operating memory.

Note To perform a complete instrument preset from the front panel of the spectrum analyzer, you must first press (MODULE), then [PRESET). If you do not press (MODULE) first, some module error codes will not clear.

Using the Mass Memory Module

This section provides descriptions of the module menus and operation information to help you learn to use the HP 85620A Mass Memory Module. It begins with the first menu that appears after you press the (MODULE) key on the spectrum analyzer, then moves through the various levels of menu. Generally, there are no more than three menus nested beneath the (MODULE) key. Press (MODULE) to activate the module main menu.

Note You should not attempt to perform multiple mass-memory module/spectrum analyzer operations simultaneously. Doing so can produce improper or unexpected results. For example, you should not perform signal identification or attempt to download a DLP while an autoexec/autosave operation is in progress.

Main Menu Keys Descriptions

The main menu offers six softkey selections. Press any one of the keys to access their lower-level menus. Refer to each menu section for specific information. A brief description of the main-menu softkeys is provided below.

- Press USER KEYS to access the module ten user-definable softkeys. After you have loaded a program onto one of these softkeys, you can activate it from this menu by pressing its softkey. There are two menu pages: one appears when you press USER KEYS and the other is accessed by pressing MORE.

- Press TRACE SAVE/RCL to access softkeys for saving or recalling a spectrum analyzer trace. Trace A or trace B may be stored in either the battery-backed RAM of the module or on a memory card. (Option T01 does not include memory card capability). Traces can be saved manually or automatically using the Autosave function.

- Press LIMIT LINE to access the softkeys that allow you to create, review, save, recall, or edit limit lines. You can turn an active limit line on or off in this menu as well.

- Press AUTOEXEC MENU to access the AUTOEXEC/AUTOSAVE SCHEDULE. Use the softkey of the Autoexec menu to set up automatic-execution conditions for DLPs. You can modify conditions and priority, or eliminate functions (DLPs) that are scheduled to execute, in this menu.

- Press KEYDEF to assign a DLP to one of the User Keys menu softkeys. Display the softkey labels by pressing USER KEYS.

- Press UTILITY to access the various Utility menu features of the module. A few of these are the time/date settings, cataloging the module or card memory, and deleting DLPs, limit lines, variables, or traces from memory.

USER KEYS Menu

Press USER KEYS to access five user-definable softkeys and a sixth one labeled MORE ; press MORE to access five additional user-definable softkeys and a sixth one labeled PREV MENU . Press PREV MENU to return to the first set of user-definable softkeys.

There are 10 user-definable softkeys that can be labeled through the Keydef menu. Softkeys that have not been assigned a program name display the default label EMPTY . DLPs can be written so that they redefine softkeys for specified functions within the program.

Once you have loaded a program onto one of the User Keys menu softkeys, you can activate its operation simply by pressing its softkey. Labeling the softkeys is defined in the Keydef menu section of this chapter.

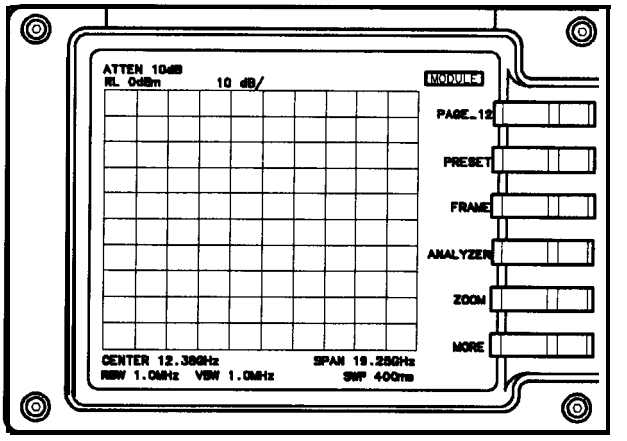


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Figure 2-2. User Keys Menu with DLP Label Examples

TRACE SAVE/RCL Menu

TRACE SAVE/RCL activates the Trace Save/Recall functions menu. See Figure 2-3. In this menu you can access the features that allow you to manually or automatically save spectrum analyzer traces, or recall traces from memory. If you save a trace without specifying a unique name, it is given the default name "TR" and a time/date stamp when traces are saved on a memory card, or "TRACE" and a time/date stamp **when** saved to module memory. To create a trace title, you can use the spectrum analyzer screen-title function or the remote command, TITLE. Press the (DISPLAY) key, then MORE to access the SCREEN TITLE softkey. Memory cards are LIF formatted (Logical Interchange Format). LIF entries are from 1 to 10 ASCII characters long. The module reserves one of the 10 for file encoding purposes, such as .LMT, .TRC, or .DLP. The user, therefore provides 1 to 9 of the ASCII characters for memory card entries. (Refer to the LIF Document, HP part number 5955-2676.)

The information saved by the save-trace operation includes trace data, spectrum analyzer state, the trace name, if one is created, and the time/date that the trace was stored. The date and time format is YYMMDDHHMMSS.

Note

Traces stored on memory cards using a mass-memory module with firmware **datecode** 910116 or later cannot be read into a module with an earlier firmware **datecode** (for example, 890524). Traces stored on cards using modules with firmware **datecode** 890524 or earlier can be read into a module with firmware **datacode** 910116 or later.

If available memory is insufficient, the save-trace operation is aborted. The message INSUFFICIENT MEMORY appears momentarily in the active function block of the CRT.

The first step in saving traces is to name the trace, if you choose to, and select where you want the trace saved. Choose module or card memory by underlining your preference with SAVE IN MEM CARD . (Option T01 does **not** include memory card capability.) Manually save trace A or B by selecting SAVE TRACE A or SAVE TRACE B . These last two **softkeys** are immediate-execute function keys. Immediate-execute means that pressing the **softkey** immediately activates its function.

If you want to save traces automatically, select AUTOSAVE TRACE , determine whether to save, trace A or B by underlining your preference with the AUTOSAVE TRA TRB **softkey.** Move the cursor to the position of **priority you desire in the** AUTOEXEC/AUTOSAVE SCHEDULE (placing the trace at position one makes it the first priority), then press EDIT AUTOSAVE . In this menu, enter start- and stop-time/date values with the **spectrum** analyzer data keys and set up save-triggering conditions by pressing SAVE TRIGGER . Refer to the **softkeys** described in the following pages for more information.

Note A maximum of one trace per second can be saved.

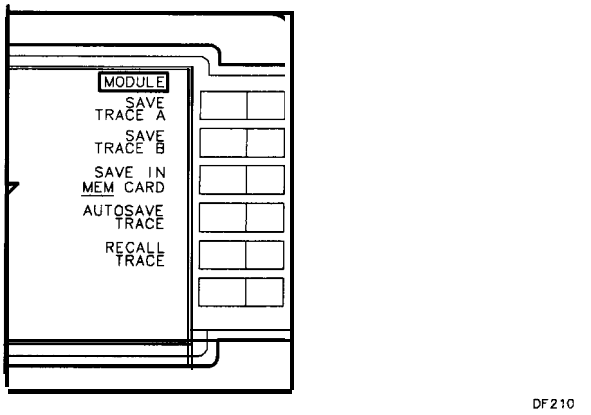

Figure 2-3. Trace Save/Recall Menu Softkeys

SAVE TRACE A
highlights and immediately; stores trace ,A and the instrument state in the memory location you selected using the **SAVE IN MEM CARD** softkey. (Option **T01** does not include memory card capability.)

SAVE TRACE B
highlights and immediately stores, trace B and the instrument state in the memory location you selected using the **SAVE IN MEM CARD** softkey. (Option **T01** does not include memory card capability.)

SAVE IN MEM CARD
toggles between memory locations. The default setting is MEM, which stores the trace in the internal, battery-backed RAM of the module. Choose CARD to save the trace on a memory card. If CARD is selected and the write-protect switch is set to SAFE, an error message appears on the display. If the card is inserted incorrectly, or not at all, the message CHECK CARD INSERTION is displayed in the active function block of the spectrum analyzer display.

Note The memory card must be inserted correctly. Match the black arrow on the memory-card label with the raised arrow on the module bezel, then insert the card into the slot. Also be aware of whether the write-protect switch on the RAM card is switched to the write position or to SAFE.

AUTOSAVE TRACE
displays the **AUTOEXEC/AUTOSAVE** SCHEDULE and accesses another menu from which you can set up conditions that save a trace automatically.

Note The default name "TRACE" is assigned to traces saved in module memory without unique names. When saving to a card, the default name "TR" and a time/date stamp is assigned to the saved trace unless you create and assign a unique name using the spectrum analyzer **SCREEN TITLE** function key. Memory cards are LIF formatted (Logical Interchange Format). LIF entries are from 1 to 10 ASCII

characters long. The module reserves one of the 10 for file encoding purposes, such as .LMT, .TRC, or .DLP. The user, therefore, provides 1 to 9 of the ASCII characters for memory card entries. (Refer to the LIF Document, HP part number 5955-2676.) In either case, the time and date are saved along with the trace data. Return to the Trace Save/RCL menu by pressing (MODULE), TRACE SAVE/RCL .

Note

Traces stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). Traces stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datacode 910116 or later.

The following steps may be used to set up the Autosave operation.

1. Determine where you want the trace saved, either the module memory or card memory. Press SAVE IN MEM CARD until your preference is underlined.
2. Press AUTOSAVE TRACE . Move the cursor, using the RPG knob or STEP keys, to one of the seven FUNCTION NAME positions in the schedule. This position helps determine the priority of the trace-saving operation in relation to other operations scheduled here.
3. Press AUTOSAVE TRA TRB until your preference is underlined.
4. Press EDIT AUTOSAVE and define the criteria to save traces automatically. Refer to Table 2-1 in this chapter for Autosave function settings and results information. The label AUTOSAVE is loaded into the AUTOEXEC/AUTOSAVE SCHEDULE in the position you selected.
5. Complete the sequence by pressing PREV MENU , then AUTOSAVE ON OFF to ON. This activates the Autosave function.

The trace is stored by its assigned name and according to your start/stop time settings and trigger conditions. Recall stored traces by using the RECALL TRACE softkey. Autosave Trace menu softkeys are illustrated in Figure 2-4.

Note

If Autosave is set to ON and there are no DLPs currently running, then you select EDIT AUTOSAVE , any currently running Autosave operation is suspended until you have completed your edits and exited the Edit Autosave menu. (PRESET) sets Autosave to OFF.

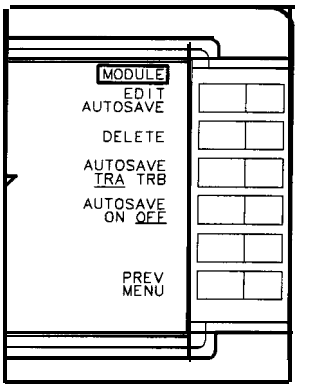

Figure 2-4. Autosave Trace Menu Softkeys

EDIT AUTOSAVE

displays the AUTOEXEC/AUTOSAVE SCHEDULE and the start/stop times and dates and trigger selections that you can set up for Autosave operations. Press either the start- or stop-time **softkey** to set up these conditions. Use the spectrum analyzer data keys to enter time values in **24-hour** clock mode. The **SAVE TRIGGER softkey** operation is described below.

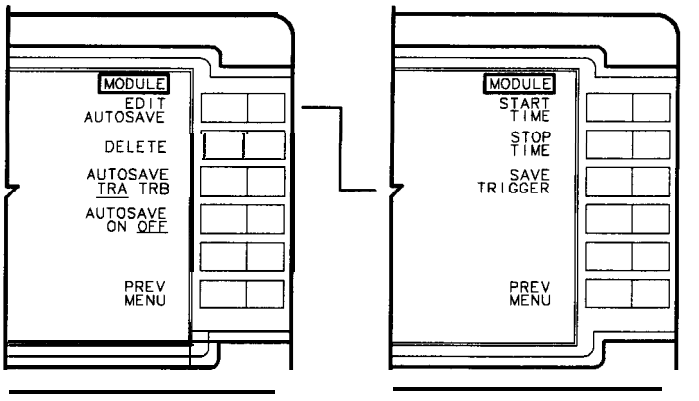

Figure 2-5. Edit Autosave Menu Softkey

START TIME

allows entry of the start-time value which determines the time, as well as the date, that the Autosave function begins operation. Use the spectrum analyzer data keys and terminate the entry with any units key. After being entered, the time and date appear beside START TIME in the AUTOEXEC/AUTOSAVE SCHEDULE. The default value is negative infinity.

STOP TIME

allows entry of the stop-time value which determines the time, as well as the date, that the Autosave function ends. Use the spectrum analyzer data keys and terminate the entry with any units key. After being entered, the time and date appear beside STOP TIME in the AUTOEXEC/AUTOSAVE SCHEDULE. If you do not enter a stop-time, or you enter a stop-time that is earlier than the start-time, the stop-time entry is ignored, and when Autosave is active, the function stops only when the memory location is full. The default value is positive infinity.

SAVE TRIGGER

accesses a menu in which conditions that automatically save a trace may be selected. Select the conditions you want using the softkeys illustrated in Figure 2-6 and described below. The default setting is ON EOS (on end of sweep).

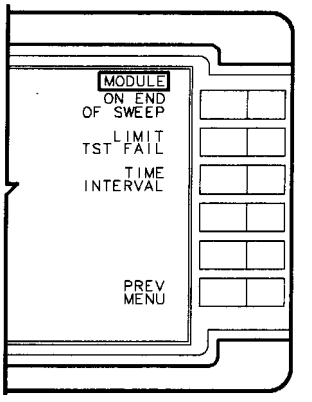

Figure 2-6. Save-Trigger Menu Softkeys

ON END OF SWEEP

saves the trace at the end of the next sweep to occur after the start-time you provided. ON EOS appears next to TRIGGER in the schedule display.

LIMIT TST FAIL

saves the active trace at the end of the sweep any time the trace exceeds the parameters of an active limit line. LIMIT TEST appears next to TRIGGER in the schedule.

Note The default name "TRACE" is assigned to traces saved in module memory without unique names. When saving to a card, the default name "TR" and a time/date stamp is assigned to the saved trace unless you create and assign a unique name using the spectrum analyzer

SCREEN TITLE function key. Trace data is saved any time the trace exceeds the active limit-line parameters.

Note If a file has been stored into memory using a 16-character title, the first 9 characters must be unique to avoid writing over an existing file. If a file name is longer than 9 characters or if lower-case letters are used, the file name will be converted, if possible, to an LIF compatible file name using only the first 9 characters.

TIME INTERVAL

displays INTERVAL (HHMMSS) next to TRIGGER in the schedule. Use the spectrum analyzer data keys to enter the time interval you want the Autosave function to use. Trace data is stored in the memory location you selected after the end of a sweep is reached and at the first interval specified. The last time trace data is saved is when the stop-time, minus the time interval, is reached.

PREV MENU

returns you to the Edit Autosave menu softkeys in Figure 2-6. Press PREV MENU again to return to the Autosave Trace menu.

DELETE

deletes the function name you have highlighted by locating the cursor beside its number in the AUTOEXEC/AUTOSAVE SCHEDULE.

AUTOSAVE TRA TRB

toggles between saving trace A or trace B. Press the softkey until your preference is underlined. The default setting is TRA.

AUTOSAVE ON OFF

toggles to set the Autosave function to on or off. AUTOSAVE OFF deactivates all Autosave functions. Before turning the Autosave function on, you must determine which memory location trace data is to be stored in, either module memory or on the memory card. If stop/start times or trigger conditions have not been specified, AUTOSAVE ON will set default conditions and begin storing traces. Refer to Table 2-1 which lists the results of setting start/stop times or trigger conditions. Autosave remains activated until the stop-time is reached or until the memory location is full. When memory is full, Autosave stops and INSUFFICIENT MEMORY is displayed on the spectrum analyzer screen.

PREV MENU

displays the main menu of TRACE SAVE/RCL.

Table 2- 1. Autosave-Function Settings and Results

Trigger	Start Time	Stop Time	Autosave Results
Unspecified	Unspecified	Unspecified	Autosave off.
Unspecified	Unspecified	Specified	Autosave data now. Save at the end of each sweep. Autosave until specified stop time is reached or memory is full.
Unspecified	Specified	Unspecified	Start at specified time. Save at the end of each sweep, then until memory is full.
Specified	Specified	Specified	Auto save when start time is reached. Save when the specified trigger condition is met, then until memory is used up or the specified stop time is reached.
Specified	Unspecified	Unspecified	Autosave data when trigger is reached and until memory is full.

RECALL TRACE

accesses the TRACE/ARRAY DIRECTORY. From here you can retrieve a saved trace and state for review. Select the memory location, either the default module memory or card memory, from which to recall a stored trace. The default setting is **FROM MEMORY**. If no trace is available from the location you selected, the message No applicable entries is displayed. Display the stored trace and state in trace A or trace B, according to your **RECALL→TRACE** selection. Traces are displayed with their associated state in the spectrum analyzer view" mode.

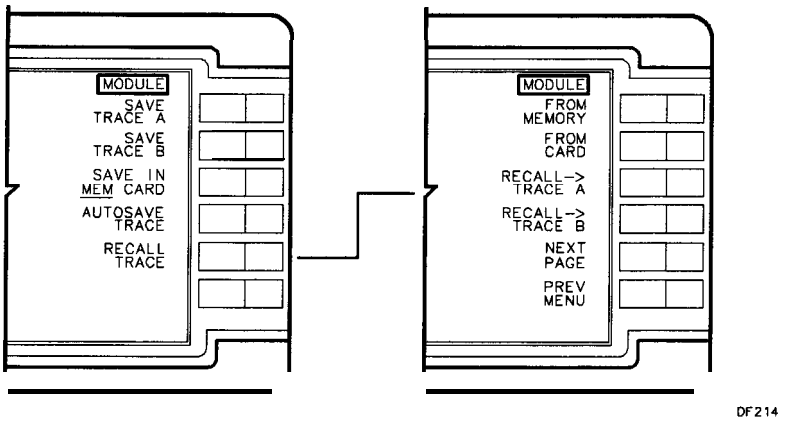

Figure 2-7. Recall Trace Menu Softkeys

FROM MEMORY

displays the TRACE/ARRAY DIRECTORY and all traces stored in the battery-backed RAM of the HP 85620A Mass Memory Module. The date and time that the trace was saved is displayed in the lower box of the directory when you highlight the trace in the directory with the cursor. Use either the RPG knob or STEP keys on the spectrum analyzer to highlight your selection,

FROM CARD

displays the MEMORY CARD DIRECTORY and all traces stored on the card currently inserted into the module. Traces saved without created names are labeled TR and an encoded date code. If the card is improperly inserted, missing, or empty, the message No applicable entries appears. Highlight your trace selection using either the RPG knob or STEP keys. (Option T01 does not include memory card capability.)

Note Traces stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). Traces stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datacode 910116 or later.

RECALL+ TRACE A

immediately recalls the trace and its associated spectrum analyzer state from the specified location. The state is changed to that of the recalled trace and trace A is placed in the view mode.

RECALL→ TRACE B

immediately recalls the trace and its associated spectrum analyzer state from the specified location. The state is changed to that of the recalled trace and trace B is placed in the view mode.

NEXT PAGE

displays the subsequent page(s) of the directory. There can be up to 54 entries per page of directory.

PREV MENU

displays the TRACE SAVE/RCL main menu.

LIMIT LINE Menu

A limit line is a display line specified by a set of coordinate points, each point consists of a frequency component, an amplitude value, and, optionally, a second amplitude value. The amplitude values represent either upper/lower or middle/delta amplitude limits for the corresponding frequency component. Limit lines work only when the spectrum analyzer vertical scaling is in the log mode, not the linear mode. One of the advantages of using the HP 85620A Mass Memory Module limit-line feature is that, coupled with its Autosave function, trace data can be stored automatically any time a signal fails a specified limit.

A set of limit-line coordinates makes up a segment. These segments are entered into a limit-line table. There can be up to 18 segments per limit line. You may enter amplitude values in one of the two following formats.

- Upper/Lower: input upper and/or lower amplitude values. If an upper-limit value is not entered, the upper limit assumes a default value of +50 dBm. If a lower-limit value is not entered, the lower limit assumes the default value of -175 dBm. If the lower-limit value is greater than the upper-limit value, the two values are set equal to the value entered last.
- The middle/delta format requires the input of a middle amplitude value. You may also specify a deviation (positive and negative values) from either side of this value. If no deviation is entered, the deviation defaults to zero.

The limit line is displayed according to the spectrum analyzer settings (instrument state). If the spectrum analyzer is in single-sweep mode and you change the settings, the limit line is not updated until another sweep is initiated.

The two types of limit lines that you can generate are relative and absolute limit lines. Relative limit lines consist of frequency components referenced to a center frequency, and amplitude components relative to the reference level. A frequency component of 0 Hz corresponds to the current center frequency of the signal. An amplitude component of -10 dB indicates that -10 dB is added to the reference level value to obtain the amplitude of the given component (reference level offset included).

Absolute limit lines contain only absolute amplitude and frequency values. The amplitude and frequency offsets of the spectrum analyzer (FOFFSET and ROFFSET) do, however, affect the absolute displayed amplitude and frequency. This then influences the actual location of the limit line on the screen.

Limit lines are generated from a set of coordinates, interpolated between any two points the user has entered in the limit-line table for a given segment. With a relative limit line, the line is mapped to the screen based on the spectrum analyzer span. Absolute limit-line displays are influenced by the span, center frequency, and reference level. Figure 2-8 illustrates the Limit-line menu softkeys.

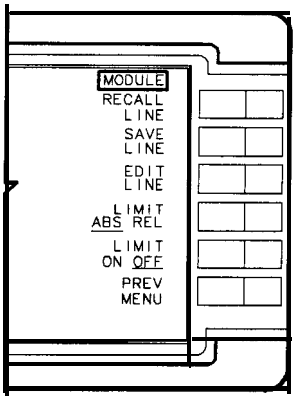

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Figure 2-8. Limit-line Menu Softkeys

RECALL LINE

activates the menu from which you can recall a limit line. The first two softkeys specify the memory location from which to recall a limit line. The RAM memory of the module is the default location. If no limit lines exist in your selected location, the message No applicable entries is displayed on the CRT. If there are several limit lines, notice in the upper right-hand comer of the directory the message PAGE 1 of ?. Press the **NEXT PAGE** softkey to review subsequent pages of the directory. The Recall Line menu softkeys are illustrated in Figure 2-9 and explained after the figure.

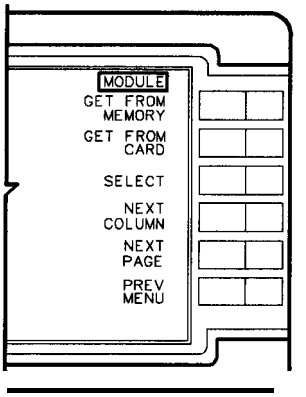

Figure 2-9. Recall Line Menu Softkeys

GET FROM MEMORY
displays the limit lines stored in the battery-backed RAM of the module. Use the RPG knob or STEP keys to move the cursor to the limit line you want to recall. Its full name is displayed in the lower box of the directory. Press SELECT to activate the limit line.

GET FROM CARD
displays limit lines stored on a memory card. If the card is empty, improperly installed, or not installed at all, the message No applicable entries is displayed on the CRT. Press SELECT to activate the limit line. (Option T01 does not include memory card capability.)

Note Limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). Limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

SELECT
selects the limit line that you have highlighted. Highlight the limit-line title by using the STEP keys or RPG knob to move the cursor to the title.

NEXT PAGE
displays the subsequent page(s) of the directory. There can be up to 54 items per page of menu.

PREV MENU
displays the main menu for limit lines.

SAVE LINE
displays the Save-Line menu softkeys. You select where to store a limit line. See Figure 2-10. Limit lines are stored by their titles. The program generates and attaches the default title "LIMIT-LINE" if you do not create one. Remotely create or edit a title using the TITLE command. Select (DISPLAY), MORE , then SCREEN TITLE and enter your title.

Note If remote mode is active and another limit line is stored without specifying a unique title, the program automatically gives the new limit line the same default title and overwrites the old limit line without warning. If you are saving a line under the default title using the front-panel keys, you are asked whether the old line should be overwritten. Titles you specify are overwritten if they are saved under the same name.

Note If a file has been stored into memory using a 16-character title, the first 9 characters must be unique to avoid writing over an existing file. If a file name is longer than 9 characters or if lower-case letters are used, the file name will be converted, if possible, to an LIF compatible file name using only the first 9 characters.

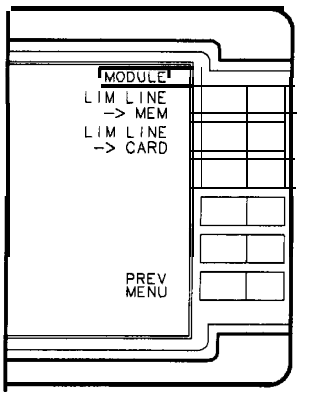

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Figure 2-10. Save Line Menu Softkeys

LIM LINE →MEM
highlights as the program stores the table of limit-line data in the battery-backed RAM of the module.

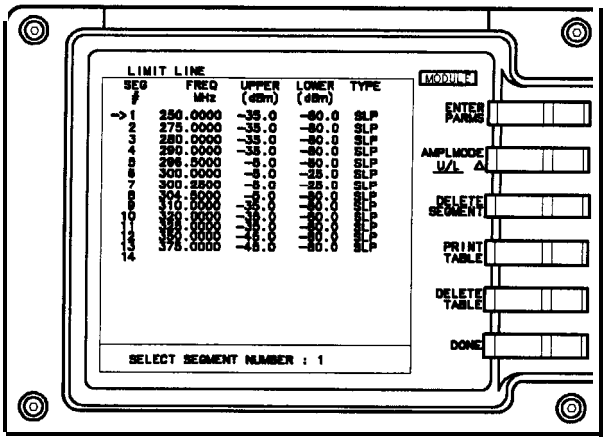
LIM LINE →CARD
highlights as the program stores the table of limit-line data on a RAM card, if one is installed and not set to safe. (Option T01 does not include memory card capability.)

Note Limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). Limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

PREV MENU
returns you to the previous menu displaying the SAVE LINE softkey.

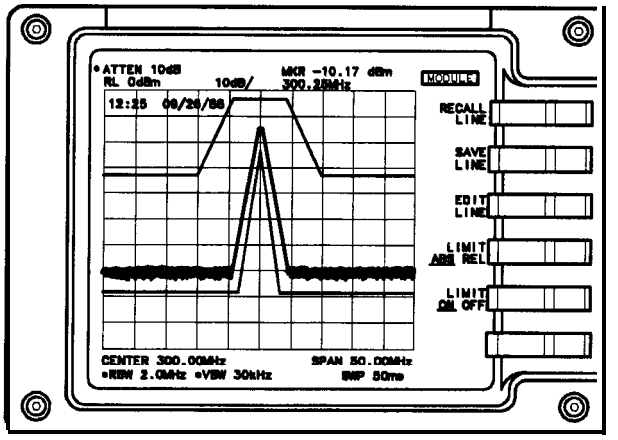
EDIT LINE
displays the table of limit-line segments and the menu of softkeys illustrated in Figure 2-11. The softkeys are explained below. Refer to Figure 2-12 for the screen display of the limit line. You can create up to 18 limit-line segments per table. Determine whether you want a relative or absolute limit line then begin creating or editing limit lines using the following steps:

1. Choose either upper/lower or middle/delta amplitude parameters.
2. Enter the parameter data into the table for each segment.
3. Select the segment type.
4. Name the limit line using the Display menu keys.
5. Return to the module Limit-line menu to save the limit line. The limit-line information you enter into the table is volatile; therefore, be sure to save the information with the SAVE LINE softkey.



DF218

Figure 2-1 1. Edit Line Menu Softkeys and Table Example



DF219

Figure 2-12. Sample Limit Line Using Figure 2-11 Table Data

ENTER PARMS

displays the softkeys you use to edit or create limit lines. To create a line, press **SELECT SEGMENT** followed by one of the other softkeys. Enter the parameter value using the RPG knob, STEP, or data keys. Use the spectrum analyzer (BK SP) key to correct errors. Press an appropriate units key to complete the data entry. Select the remaining parameters and enter their values by pressing the appropriate softkey and data keys. When all segments are defined, press **PREV MENU** and **DONE** , then, title the line using the (DISPLAY) function keys. Press **SAVE LINE** to store the limit-line parameters in a table. If you are editing the parameters of an existing limit line, you can select which segment you want to activate for editing. Press **SELECT SEGMENT** , then using the keypad or the RPG select the segment you want to edit. If using the keypad, follow the number with any units key. The cursor moves to the segment you have specified. Figure 2-13 illustrates the softkeys described below.

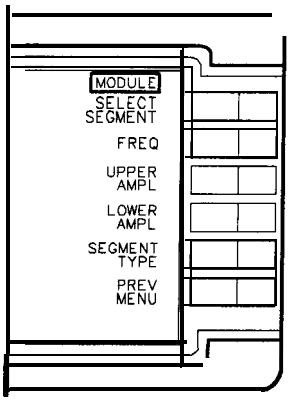


Figure 2-13. Enter Parameters Menu Softkeys

SELECT SEGMENT
allows you to choose a segment number. You may either create new parameters for another segment or edit the parameters of an existing segment. Locate the cursor at the segment number by using the RPG knob or step keys, or enter a numeric key corresponding to the segment number you want, followed by any units key. The cursor moves to the segment you have specified.

Note

The number of characters accepted for frequency values is to the nearest 100 Hz over the full range of spectrum analyzer frequencies. The number of characters accepted for amplitude values is to the nearest tenth of a **dB** over the full range of spectrum analyzer amplitudes.

FREQ

highlights and allows you to enter up to 12 characters (10 plus the decimal point and sign) for a frequency value using the data keys, RPG knob, or STEP keys. Terminate the data entry by pressing a units key, then any other parameter **softkey** to continue creating or editing a limit-line segment.

MID or UPPER AMPL

highlights and allows you to enter up to six characters (plus or minus sign, four digits, and a decimal point) for the upper- or mid-amplitude value using the data keys, RPG knob, or STEP keys. Terminate the data entry by pressing an appropriate units terminator key, then any other parameter **softkey** to continue creating or editing a limit-line segment.

DELTA or LOWER AMPL

highlights and allows you to enter up to six characters (plus or minus sign, four digits, and a decimal point) for the lower or delta amplitude value using the data keys, RPG knob, or STEP keys. Terminate the data entry by pressing the appropriate units key, then any other parameter **softkey** to continue creating or editing a limit-line segment.

SEGMENT TYPE

accesses the **SLOPE w/LIN FREQ** (default setting) or FLAT segment type **softkeys and PREV MENU softkey.** See Figure 2-14. Choose a line type, or return to the previous menu.

Note

Limit-line data is sorted in frequency order in the limit-line table. The sorting occurs after you have pressed the **PREV MENU** key. If two data points are at the same frequency, they are sorted by the order in which they were entered.

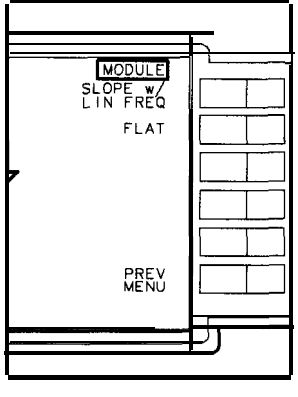


Figure 2-14. Segment Type Menu Softkey

SLOPE w/ LIN FREQ

draws lines by connecting all frequency/amplitude pairs in the order determined by the sorting operation previously explained. The data is displayed with a linear slope in frequency and a logarithmic slope in amplitude.

FLAT

draws a flat line, connecting frequency/amplitude pairs point to point until the line encounters another frequency whose amplitude is different, then the line is drawn vertically to the next amplitude value. The limit line is drawn without the logarithmic slope in amplitude.

PREV MENU

returns you to the previous menu displaying the **SEGMENT** 'TYPE softkey.

PREV MENU

returns you to the previous menu displaying the **ENTER PARAMS** softkey. Pressing this key also performs the sorting of the limit-line segments in frequency order in the limit-line table.

AMPL MODE U/L A

select upper/lower to enter amplitude values that display a limit line above or below an active trace. Use the delta (A) amplitude mode to create a dual limit line with an upper limit of MID plus **DELTA,** and a lower limit of MID minus DELTA. The delta should be positive.

DELETE SEGMENT

deletes the limit-line segment highlighted with the cursor. When the table is empty (no limit-line segments defined), only 1 appears under SEG **#.**

PRINT TABLE

This softkey label exists only if your spectrum analyzer has printer capability. Pressing this key prints the currently selected limit-line table on an HP-IB printer. The output format is tabular Pressing the **PRINT** softkey prints the table only; softkey labels, graticule, or other characters and symbols are not printed. If the printer is disconnected or off, the print function must be repeated after you connect or turn the printer on.

Note The limit-line table cannot be printed while the instrument is operating with Trace A in VIEW or BLANK mode. Pressing the **PRINT TABLE** key under these conditions will have no effect until the Module menu is exited, at which time the current trace and display will be printed.

DELETE TABLE

displays CONFIRM DELETE CANCEL DELETE softkeys. Select CANCEL DELETE if you do not want the contents of the table deleted. Select CONFIRM DELETE if you wish to delete all table contents.

DONE

restores the menu containing the EDIT LINE softkey.

LIMITS ABS REL

uses the current limit line as a reference for absolute frequency and amplitude values when the default ABS mode is activated. The REL setting causes the current limit-line value to be relative to the displayed center frequency and reference-level amplitude values.

LIMITS ON OFF

allows you to turn the currently selected limit-line function on or off. With limit lines set to ON, a limit-line test is made at the end of each sweep. If the active trace falls outside any point of the upper or lower limit, the message LIMIT FAILED is displayed on the screen. If limits are set to OFF, the active trace is not tested. Press the (MODULE) key on the spectrum analyzer to return to the module main menu.

AUTOEXEC Menu

Accessing this menu displays the AUTOEXEC/AUTOSAVE SCHEDULE. From here, you can define the criteria to execute DLPs automatically. Up to seven DLPs may be scheduled. These may be interleaved with the Autosave operations. The schedule can be revised in this menu by using the RPG knob or STEP keys and other softkeys for editing described below.

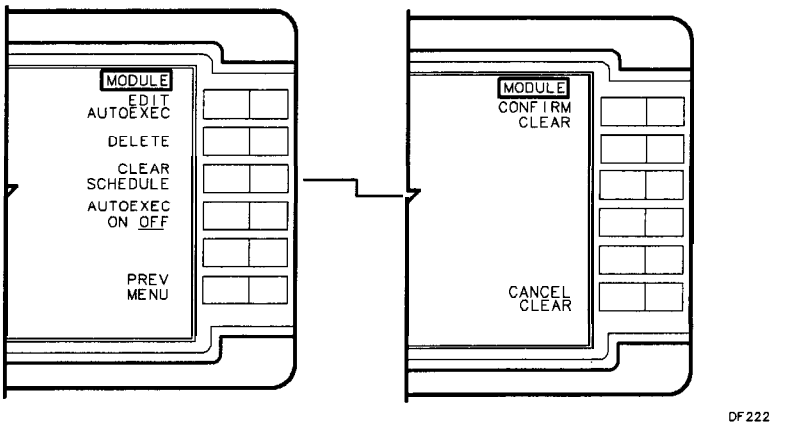


Figure 2-15. Autoexec Menu Softkeys

EDIT AUTOEXEC

uses RPG knob or STEP keys to move cursor to the position, based on numeric hierarchy, in which you want the DLP scheduled. The softkeys of the menu illustrated in Figure 2-16 are described below.

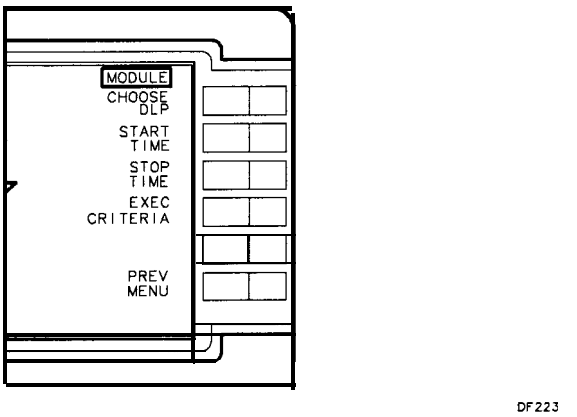


Figure 2-16. Edit Autoexec Softkeys

CHOOSE DLP

displays the DLP directory and suspends any running DLPs until you exit this menu. See Figure 2-17 for an example of the directory. If no DLPs are stored in memory, the message No applicable entries is displayed. Otherwise, use the RPG knob or STEP keys to move the cursor to the entry you wish to choose. Notice that there is a NEXT PAGE softkey. If your DLP is not listed in the first page of entries, check the subsequent pages. DLPs stored only on memory cards are not listed in the directory. (Option T01 does not include memory card capability.) They must be stored in the module RAM before they appear in the directory. Do this through the Utility menu. Press UTILITY and CATALOG MEM CARD until card is underlined. Move the cursor to the DLP you want to copy, press COPY TO MEMORY . Now return to the Autoexec menu, press EDIT AUTOEXEC, then CHOOSE DLP. With the cursor located by your selection, press one of the Choose DLP menu softkeys listed below.

Note

DLPs stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). DLPs stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

SELECT

loads the DLP into one of the seven positions of the schedule. The position the DLP occurs in the schedule determines its priority in execution.

EXECUTE NOW

initiates the selected DLP immediately.

NEXT PAGE

accesses the subsequent page of the directory.

PREV MENU

returns you to the preceding menu.

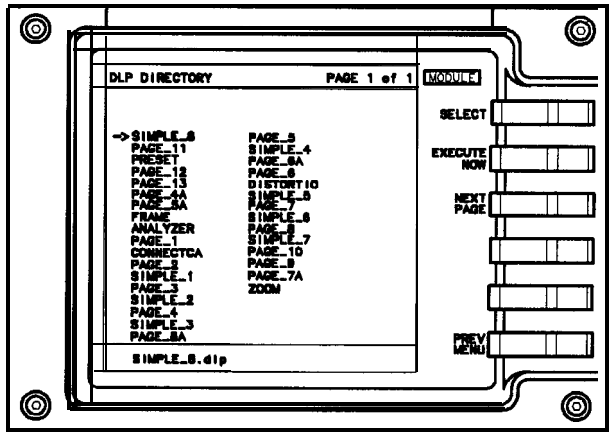


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Figure 2-17. DLP Directory Example

START TIME

allows you to enter the date and time you want the Autoexecute function to begin. Enter the date and time in the format shown in the lower box of the schedule display. Any DLPs which were running when you selected EDIT AUTOEXEC are suspended during the editing process.

STOP TIME

allows you to enter the date and time you want the Autoexecute function to end. Enter the time and date in the format shown in the lower box of the schedule display. If the stop time is less than the start-time, the stop-time is left undefined.

EXEC CRITERIA

accesses the menu for you to define the criteria, or conditions, that will activate the Autoexec function. Execute criteria defaults to ON EOS (on end of sweep). Select one of the softkeys illustrated in Figure 2-18.

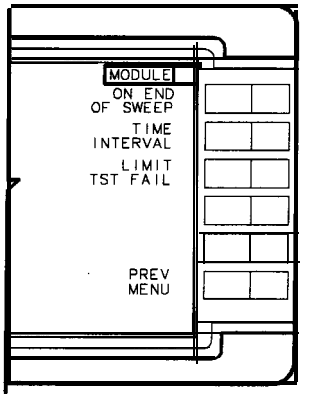


Figure 2-18. Execute Criteria Softkeys

ON END OF SWEEP

executes the selected DLP at the end of every normal sweep. This is the default criteria if no other is selected. If the DLP operation is incomplete at the end of the sweep, the DLP completes before more data is evaluated.

TIME INTERVAL

displays HHMMSS in the lower box of the **AUTOEXEC/AUTOSAVE** SCHEDULE display. Use the data keys to enter a time interval in its displayed format. The program executes the selected DLP at the specified intervals. (If you enter an interval value of zero, the module defaults to the ON EOS setting.)

LIMIT TST FAIL

causes the module to execute a DLP when an active limit line is exceeded. The first step in setting up a limit-test fail function is to have an active signal with all the spectrum analyzer settings determined. Next, build or recall a limit line, select a start/stop time, then press **LIMIT TST FAIL** .

PREV MENU

returns you to the previous menu displaying the **EXEC CRITERIA** softkey. Press **PREV MENU** again to return to the menu displaying the EDIT **AUTOEXEC** softkey.

DELETE

deletes the function name you have selected using the RPG knob or STEP keys.

CLEAR SCHEDULE

displays the **CONFIRM CLEAR CANCEL CLEAR** softkeys. Select **CONFIRM CLEAR** if you wish to remove all entries from the **AUTOEXEC/AUTOSAVE** SCHEDULE. Otherwise, press **CANCEL CLEAR** to return to the previous menu.

Al 'TOEXEC ON OFF

turns the Autoexec schedule on or off. While you are in this menu, no DLPs are allowed to execute. If AUTOEXEC is set to ON, DLP execution priority is determined by its location in the schedule. If a DLP is activated as soon as you turn Autoexec on, you will have to press (PRESET) on the spectrum analyzer to interrupt the DLP and regain control of any module or spectrum analyzer front panel keys.

PREV MENU

returns you to the previous menu displaying the **AUTOEXEC MENU** softkey, if there are no DLPs running. If a DLP is activated as soon as you turn Autoexec on, you will have to press (PRESET) on the spectrum analyzer to interrupt the DLP and regain control of any module or spectrum analyzer front panel keys. (PRESET) turns the Autoexec schedule off.

KEYDEF Menu

Press KEYDEF to display the User Key *Definitions* table. The 10 user-definable softkeys that can be labeled to activate DLPs stored in the module are listed here. Use the RPG knob or STEP keys to place the cursor beside one of the 10 user-definable softkeys in this menu. The DLP name you select from the module memory is loaded onto this softkey. lb load a DLP stored on the memory card onto a user softkey, you must first copy it into the module memory. (Option T01 does not include memory card capability.) Do this remotely with the CARDLOAD command or locally using the Utility menu softkeys. Figure 2-19 illustrates the softkeys described below.

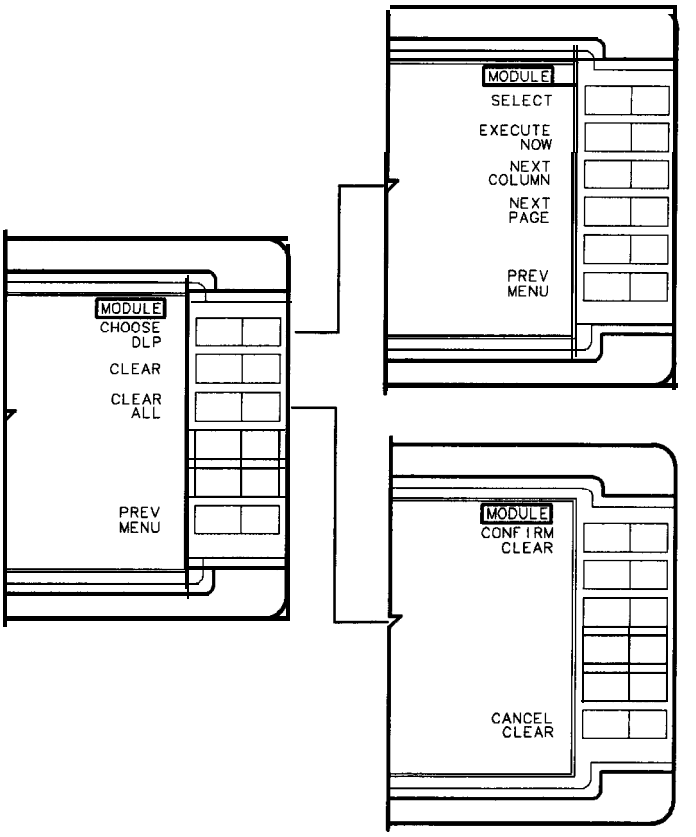


Figure 2-19. Keydef Menu Softkeys

CHOOSE DLP

displays the DLP directory. If no DLPs are stored in memory, the message No applicable entries is displayed. Otherwise, use the RPG knob or STEP keys to move the cursor to the entry you wish to choose. Notice that there is a NEXT PAGE softkey. If your DLP is not listed in the first page of entries, check the subsequent page. Either run it by pressing EXECUTE NOW to start the operation, or press SELECT to load it onto the selected key.

Note DLPs stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). DLPs stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

SELECT

assigns the DLP you have highlighted to a User Key menu key. Use the RPG knob or STEP keys to move to the DLP you want to assign to a key.

EXECUTE NOW

executes the highlighted DLP immediately.

NEXT PAGE

accesses the subsequent page of the directory.

PREV MENU

returns you to the previous menu displaying the CHOOSE DLP softkey.

CLEAR

clears the DLP name from the user-key you have highlighted. Move the cursor to the user-key number with the RPG knob or STEP keys.

CLEAR ALL

accesses the CONFIRM CLEAR CANCEL CLEAR softkeys. Press CONFIRM CLEAR to clear all the DLPs from the user keys. Otherwise, press CANCEL CLEAR to return to the previous menu displaying the CLEAR ALL softkey.

PREV MENU

returns you to the previous menu displaying the module main menu.

UTILITY Menu

Press UTILITY to gain access to the utility functions available with the HP 85620A Mass Memory Module. See Figure 2-20.

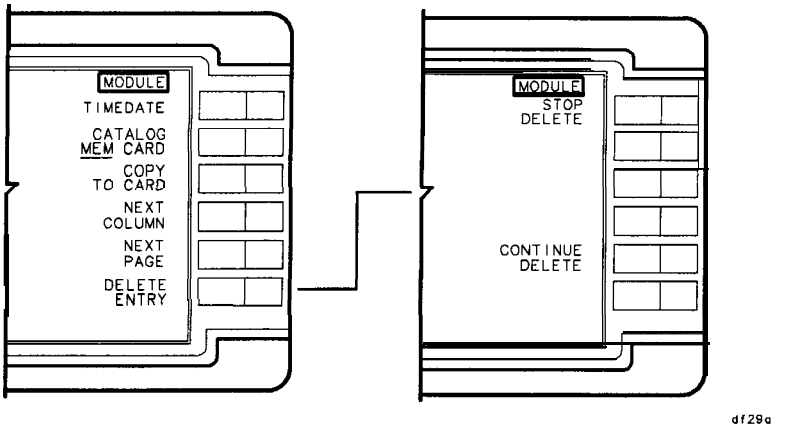


Figure 2-20. Utility Menu Softkeys (MEM selected)

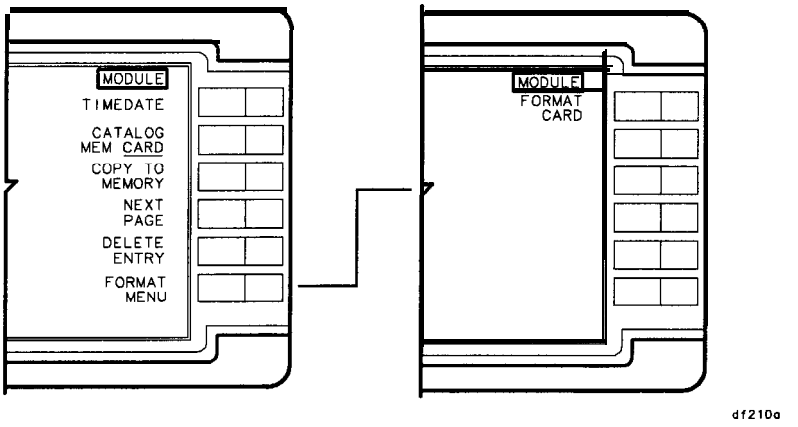


Figure 2-21. Utility Menu Softkeys (CARD selected)

TIMEDATE

activates menu selections for setting the time and date. See Figure 2-22 for the softkeys defined below.

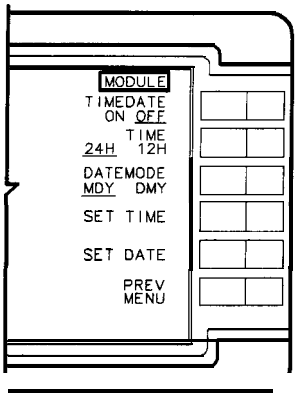


Figure 2-22. Timedate Menu Softkeys

TIMEDATE ON OFF

displays the time and date in the active function block of the spectrum analyzer display when set to ON. The default setting is OFF. The date display format is a function of the DATEMODE softkey. The time display can be formatted for a 24-hour or 12-hour clock. The clock is updated every minute. Seconds are not displayed.

TIME 24H 12H

toggles the time display to either 24-hour (International) mode or 12-hour (AM/PM) mode. Press the TIME softkey until your preference is underlined. The default format is the 24-hour mode.

DATEMODE MDY DMY

toggles the format of the date displayed on the CRT. Select MDY (month, day, year) or DMY (day, month, year) by pressing the DATEMODE MDY DMY softkey until your preference is underlined. The default setting is MDY.

SET TIME

sets the real-time clock to the time you specify. Enter the 24-hour time in the HHMMSS format (the time display format is a function of the TIME 24H 12H softkey). Valid hour (HH) values are from 00 to 23. Valid minute (MM) and second (SS) values are from 00 to 59.

SET DATE

initializes the real-time clock to the date you specify. Enter the date in the MMDDYY or DDMMYY format, depending on the date format you have selected. The default format is MDY. Valid data entry for the month is MM (values 01 through 12), DD (values 01 through 31), and YY (values 00 through 99).

PREV MENU

returns you to the previous menu containing the TIMEDATE softkey.

CATALOG MEM CARD

toggles between the catalogs of the contents of the module battery-backed memory or contents of the memory card, if one is installed. If CARD is selected, the card format menu key is made available by pressing FORMAT MENU on later firmware revisions, or by pressing the blank softkey on earlier firmware revisions. (Option T01 does not include memory card capability.) If the card is missing, empty, or incorrectly installed the message No applicable entries is displayed in the MEMORY CARD DIRECTORY. Memory cards are LIF formatted (Logical Interchange Format). LIF entries are from 1 to 10 ASCII characters long. The module reserves one of the 10 characters for file encoding purposes, such as .LMT, .TRC, or .DLP. The user, therefore provides 1 to 9 ASCII characters for titling memory card entries. (Refer to the LIF Document, HP part number 5955-2676.) The default setting is MEM.

COPY TO MEMORY CARD

toggling the CATALOG MEM CARD key automatically toggles the copy key between memory and card to allow you to copy any of the directory entries to module memory or to a card. (Option T01 does not include memory card capability.) The card must be properly installed and not write-protected. Use the RPG knob or STEP keys to move the cursor to your selection. Press the COPY TO MEMORY CARD softkey to activate the copy function.

Note DLPs, traces, and limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example 890524). DLPs, traces, and limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

NEXT PAGE

accesses any subsequent page(s) of the directory.

DELETE ENTRY

press this softkey after using the RPG knob or STEP keys to move the cursor to the entry you wish to delete. The STOP DELETE and CONTINUE DELETE softkeys are then displayed.

STOP DELETE

returns you to the directory.

CONTINUE DELETE

immediately deletes the highlighted entry.

FORMAT MENU (firmware revision 950829 and later)

accesses the card formatting key.

FORMAT CARD

requests you to enter the number of directory entries. The number of entries MUST be a multiple of 8 (for example, 8, 16, 24, 32, 40, and so on). Optimum memory utilization is obtained when one directory per kilobyte of memory is selected. For example, enter 32 for a 32 kilobyte RAM card, or 128 for a 128 kilobyte RAM card.

3

Softkey Menu

Introduction

The menus of the HP 85620A Mass Memory Module are graphically represented in this chapter. The Main Menu keys are labeled in the upper right-hand corner of each grouping. Main Menu keys are listed below:

- USER KEYS
- TRACE SAVE/RCL
- LIMIT LINE
- AUTOEXEC MENU
- KEYDEF
- UTILITY

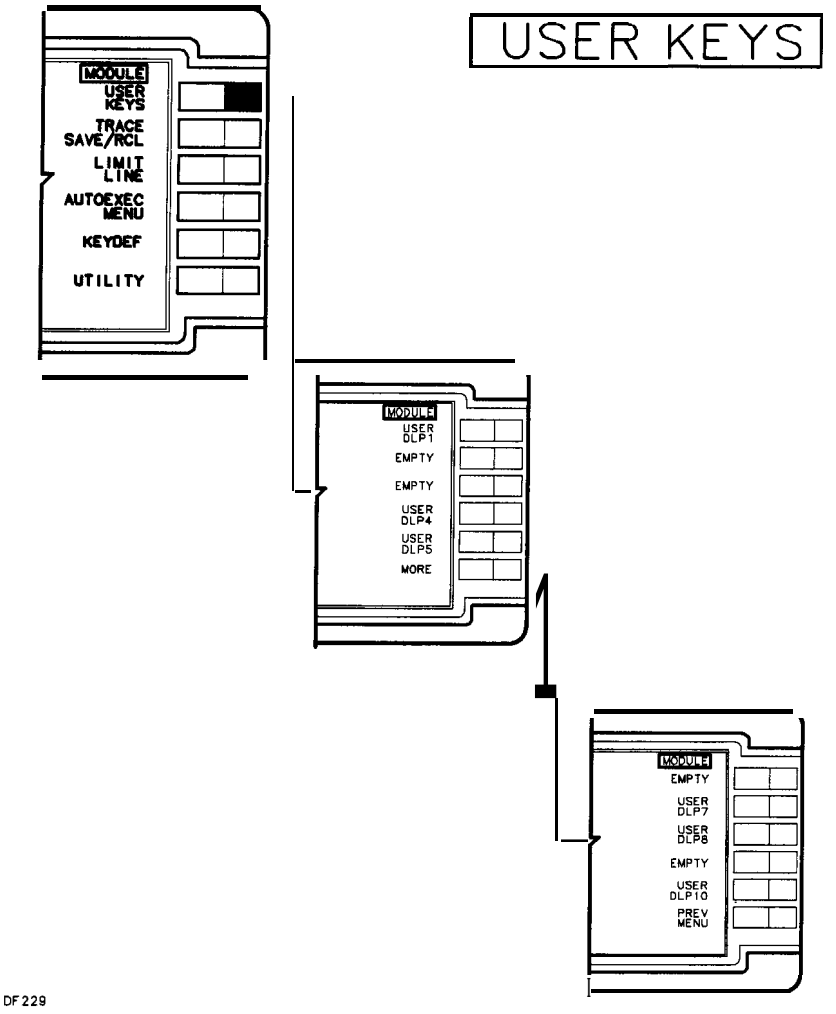


Figure 3- 1. User Keys

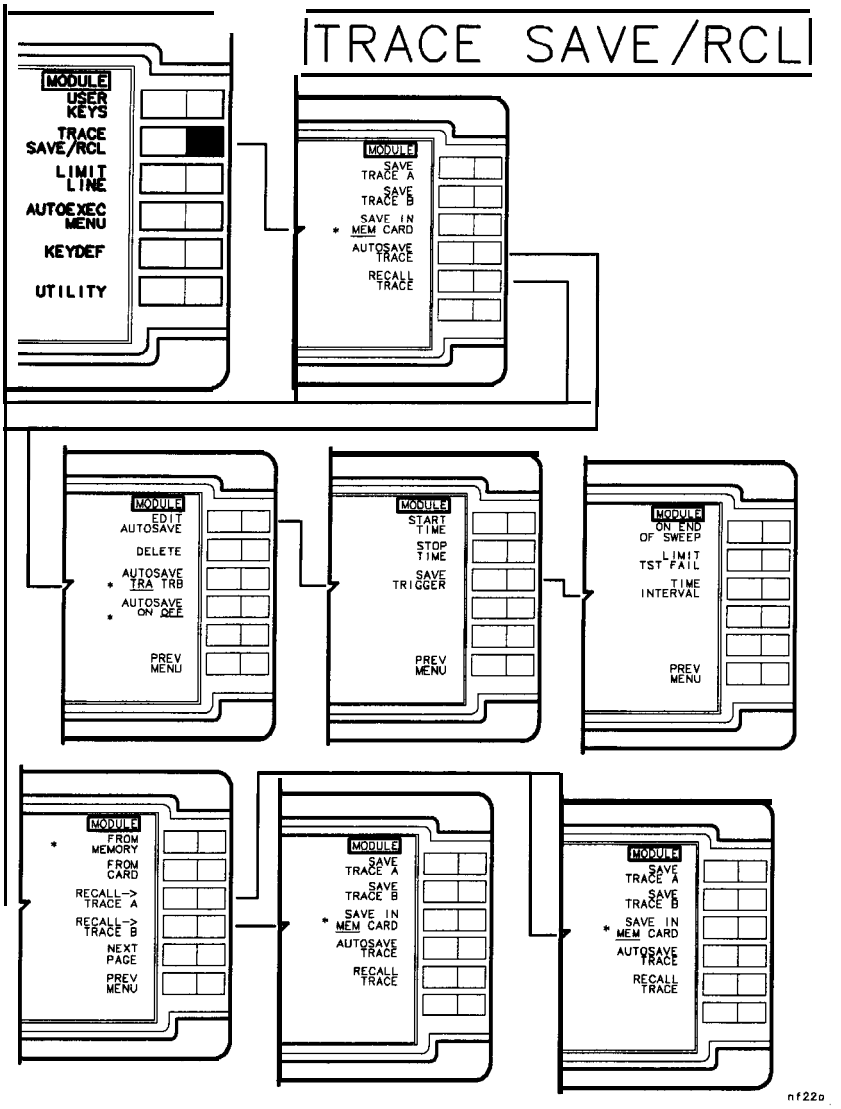


Figure 3-2. Trace Save/Rcl

*** default**

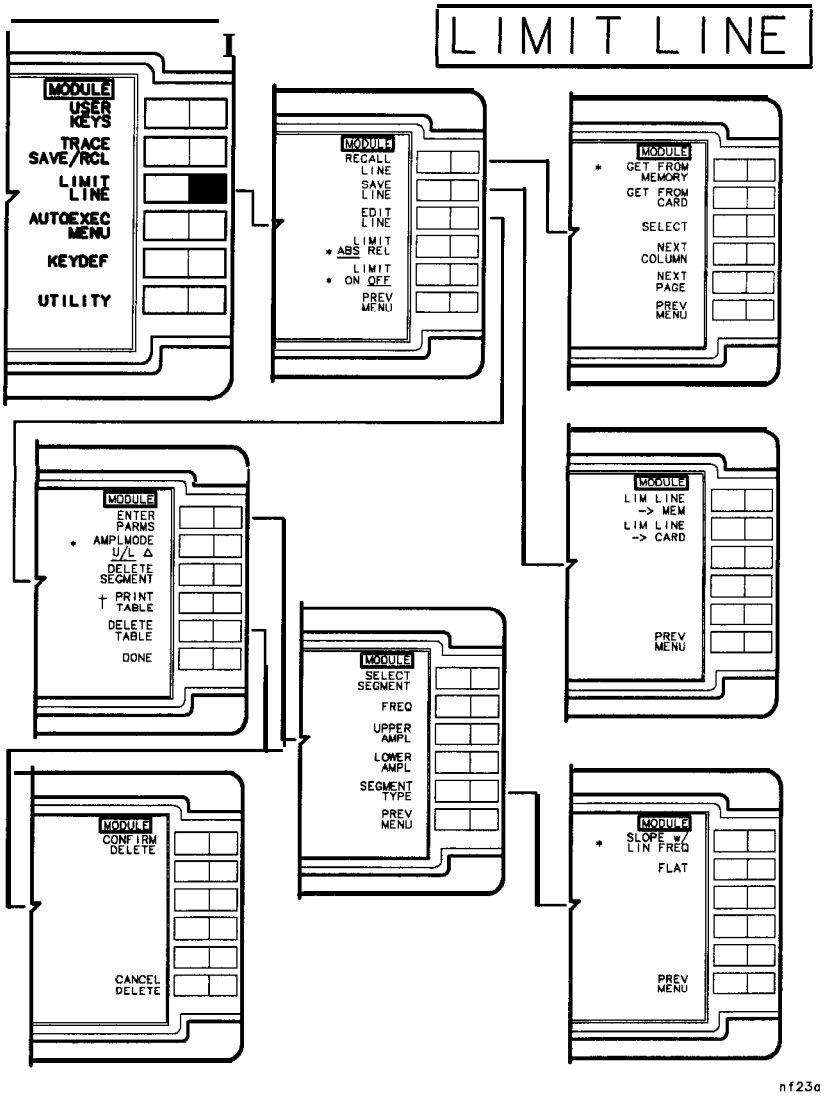


Figure 3-3. Limit Line

*** default**

† This softkey label appears only if the spectrum analyzer has printing capability.

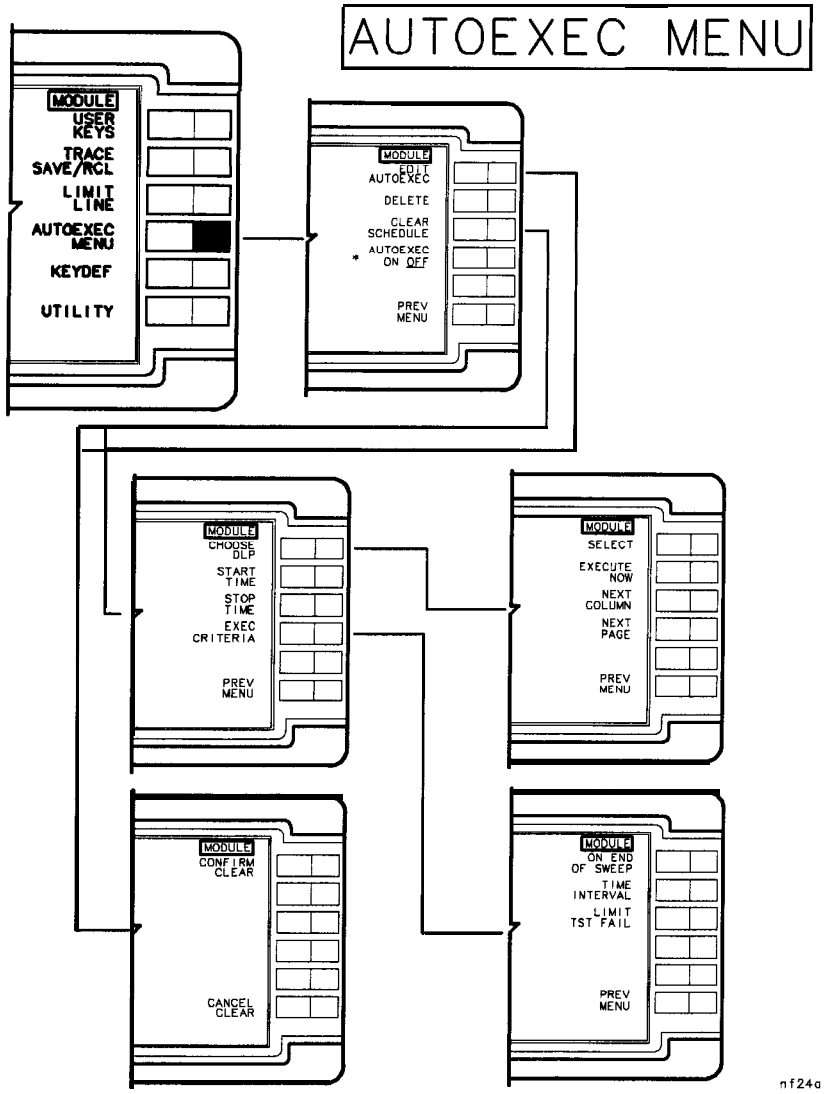


Figure 3-4. Autoexec Menu

- **default**

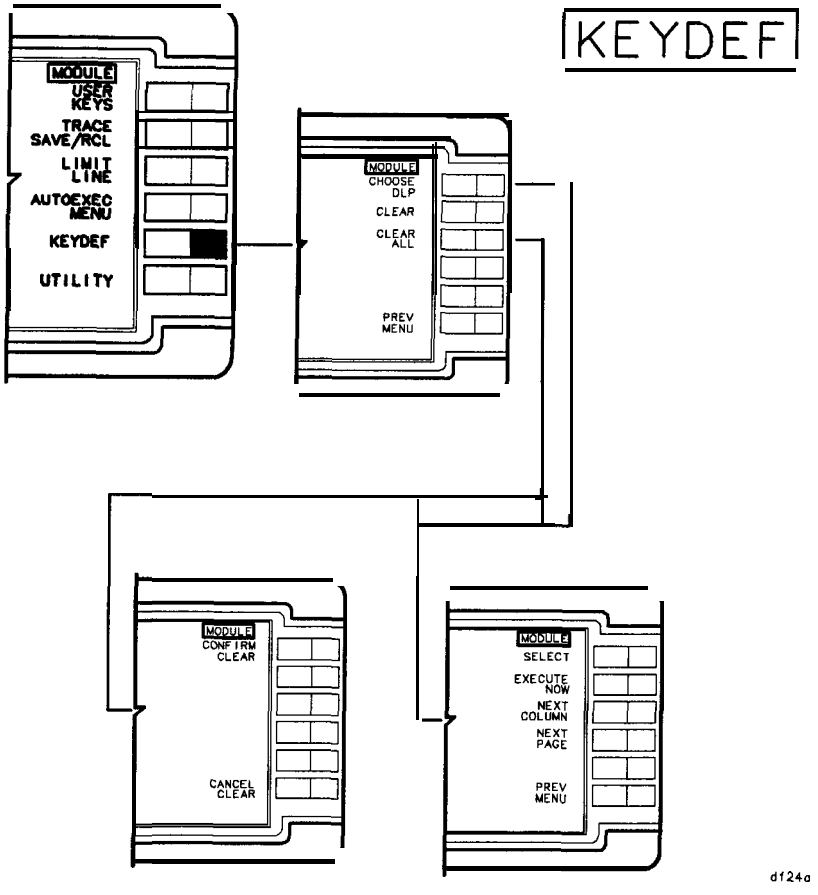


Figure 3-5. Keydef

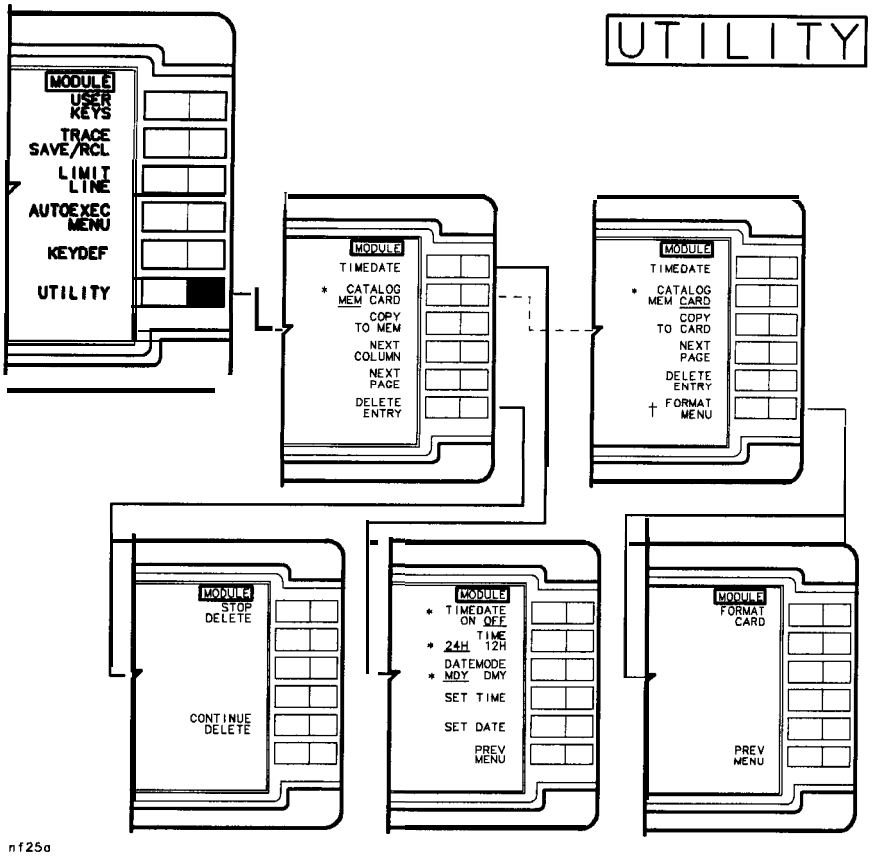


Figure 3-6. Utility

* Alternate functions appear when CARD is underlined in CATALOG MEM CARD .

† This softkey is absent for mass memory modules having firmware revision 910116 and earlier.

Note

FORMAT MENU does not appear (blank softkey) for firmware revisions 910116 and earlier, but the FORMAT MENU functionality is still available by pressing the blank softkey.

4

Programming

Introduction

This chapter contains programming information for the HP 85620A Mass Memory Module. The section that follows provides some fundamental information about creating your own DLPs (downloadable programs). Also included are descriptions of syntax diagram terms along with syntax diagrams and some program examples.

Getting Started with DLPs

This section is an introduction to the concept of DLPs. It includes front-panel operation and information on how to program and download programs into the mass memory module from a controller or from a memory card. You will find out how to correctly declare functions, variables, and traces, then allocate these variables in spectrum analyzer memory. After these are declared and allocated, the module allows you to execute DLPs without an external controller. Special features such as limit lines and automatic execution (autoexec), are also discussed. This section assumes that you are familiar with HP 9000 Series 200/300 Controllers.

What Is a DLP?

A DLP is a single command or a sequence of commands used to perform a customer-specified operation. The user can define DLPs made up of several functions, variables, and traces, download them into the module RAM memory as one DLP, or define each command as a DLP. In the HP 85620A, there are one hundred twenty-eight kilobytes of RAM available for user DLPs. This memory is called the user-defined memory. Almost any instruction that can be executed over HP-IB can be executed in a DLP. In addition, DLPs have the ability to control other instruments over HP-IB. It is possible to design application programs and store them in user-defined memory as DLPs. These programs can then be executed without an external controller.

DLPs remain in memory even when the spectrum analyzer power is turned off. They are stored in the battery-backed RAM of the mass memory module and can be used repeatedly, whenever needed.

DLP Examples

Several programming examples are included in this section to illustrate the operation of DLPs both remotely and via user-defined softkeys. Examples showing commands unique to DLPs are also given. Refer to the list of required equipment and the equipment setup information to set your system up and begin running the program examples.

Required Equipment

- HP 85620A Mass Memory Module
- HP 8560A/E, or HP 8561A/B/E, or HP 8562A/B/E, or HP 8563A/E Spectrum Analyzer
- HP Series 200/300 Controller
- 10833 A/B/C/D HP-IB Cable Assembly
- HP BASIC 2.0 (or greater)

Optional Equipment

- Any HP-IB Compatible Printer such as an HP 2225D ThinkJet

Equipment Setup

Connect the CAL OUTPUT to the RF INPUT of the spectrum analyzer. Set up the equipment as shown in Figure 4-1.

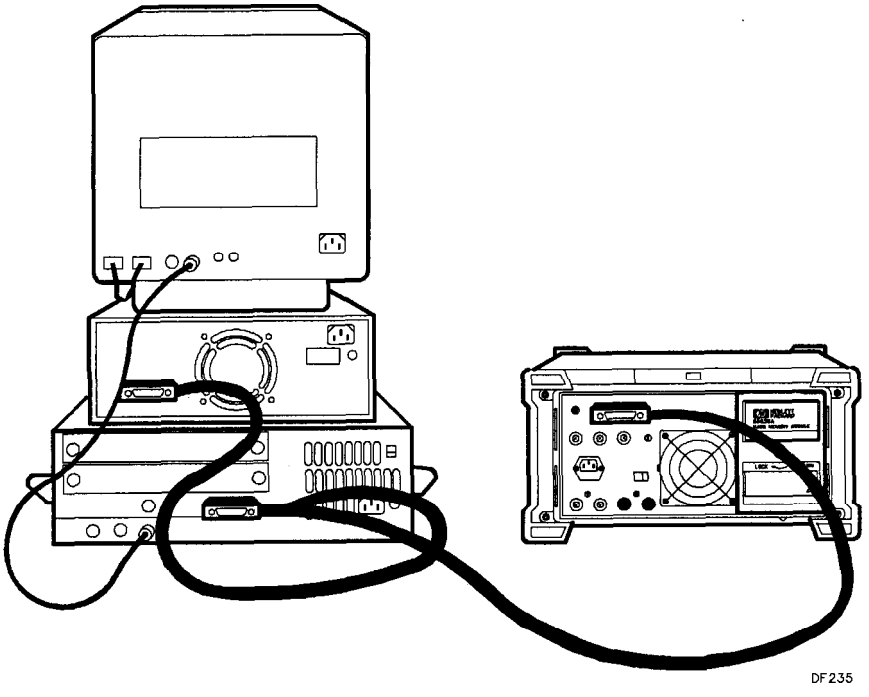


Figure 4-1. Equipment Setup

Programming Front-Panel Functions

To prepare the spectrum analyzer for programming, use an external controller to enter the following literal example of the diagrammed command. It will preset the spectrum analyzer, set center frequency to 300 MHz, and span to 10 MHz.

Example 4-1

```
10 OUTPUT 718;"IP;CF 300MHZ;SP 10MHZ;";
20 END
```

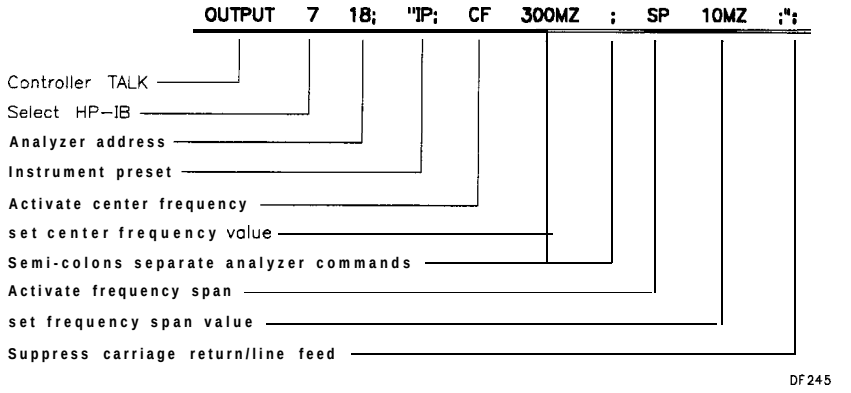


Figure 4-2. Preparing the Spectrum Analyzer for Programming

Executing the above program initiates the sequence of operations described above. If the CAL OUTPUT is connected to the RF INPUT, the 300 MHz calibrator signal should be displayed. The last function activated, SPAN, appears with its current value on the spectrum analyzer display.

It is important to note that the sequence of operations executed above may also be entered manually, from the front panel, to yield the same result. In fact, a manual sequence of keystrokes is usually developed first, then used as a basis for executing the same procedure under program control. This simple technique is recommended as a tool in developing software for automatic spectrum analyzers.

The semicolon (;) at the end of command lines serves to suppress the carriage-return/line-feed, and therefore conserves user memory.

Programming User-Defined Functions

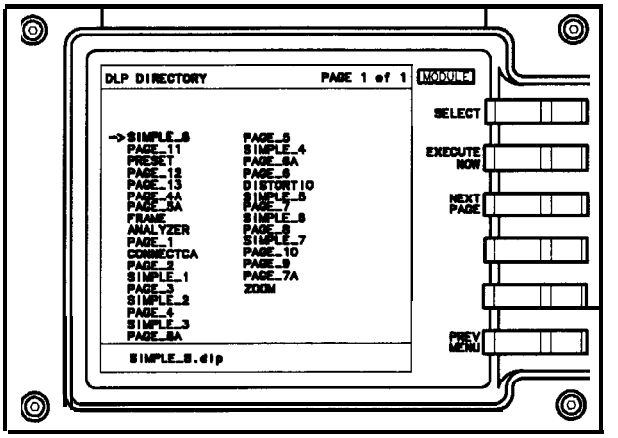
Example 4-2 demonstrates how to make a DLP from the commands used in Example 4-1.

Example 4-2

```
10 OUTPUT 718;"FUNCDEF ZOOM, @;IP;CF 300MHZ;SP 10MHZ;@;";
                                                    !Assign the
                                                    !label "ZOOM"
20                                                  !to the indicated
30                                                  !sequence of commands.
40 END
```

The FUNCDEF command specifies a user-defined function. The "at" sign (@) is used as a delimiter for the user-defined function "ZOOM". All characters between the "at" signs are part of the "ZOOM" routine.

Refer to the "Remote Programming" section in this chapter for further discussion of programming delimiters. Downloading the program in Example 4-2 from an external controller to the spectrum analyzer stores the routine in the mass memory module internal battery-backed RAM. The routine can now be executed without an external controller from the spectrum analyzer front panel. Press LCL, (MODULE), AUTOEXEC MENU, EDIT AUTOEXEC, and CHOOSE DLP . Locate the cursor at the DLP you want to execute, press EXECUTE NOW..
A typical listing of DLPs stored in a mass memory module is shown in Figure 4-3.



DF236

Figure 4-3. Typical DLP Listing

For frequently used DLPs, it may be more convenient to load the program onto one of the user softkeys in the User Keys menu. Any DLP can occupy one of these ten user-definable softkeys. The DLP, once assigned to a softkey, can be executed independently without a controller by pressing the appropriate softkey in the User Keys menu. To assign a DLP to a softkey, the KEYDEF command must be invoked. The following program stores the DLP named "ZOOM" under softkey number 1 in the User Keys menu. Notice that the percent sign is used to delimit the title "ZOOM".

Example 4-3

```
10 OUTPUT 718;"FUNCDEF ZOOM,@;IP;CF 300MHZ;SP 10MHZ;@;";
                                                    ! Assigns the label
20                                                  ! ZOOM to the indicated
30                                                  ! sequence of commands.
40 OUTPUT 718;"KEYDEF 1, ZOOM,%ZOOM%;";             ! Assigns the label "ZOOM"
50                                                  ! to user key 1.
60 END
```

To execute this DLP, press USER KEYS . "ZOOM" should be labeled on softkey number 1. Press the ZOOM softkey. Labels for user-defined softkeys can be from 1 to 16 characters long. You can manually assign DLPs to a User Keys softkey from the Keydef menu found in the main menu of the module. Refer to the Operation Chapter in this manual for details about the Keydef menu.

Note The user-defined softkeys do not need to be labeled with the same label used to define the DLPs they will activate.

Determining Available User Memory

Since user memory is limited, it may sometimes be valuable to determine the amount of memory a DLP requires. Doing this is a simple four-step process that requires the use of the MEM command.

1. Enter the command `OUTPUT 718; "DISPOSE ZOOM; ";"`, then run Example 4-4 before the DLP is downloaded to verify available memory in the mass memory module.

Example 4-4

```
10  OUTPUT 718;"MEM?;";          ! Determine available user-memory
20                               ! value and prepare to output value.
30  ENTER 718;M                  ! Store the available user-memory
40                               ! value in the variable "M".
50  PRINT "MEMORY = ";M;"BYTES"  ! Print the user-memory value.
60   END
```

2. Run Example 4-3 to download the entire DLP and allocate the required memory.
3. Run the program in step 1 again to determine the new value of available memory in the mass memory module.
4. Calculate the user memory required for the DLP by subtracting the value of memory found in step 1 from the value found in step 3.

Note The mass memory module has 128-kilobytes of memory. This corresponds to 131,072 bytes (1024 bytes/kilobyte x 128 kilobytes).

User-Defined Variable and Trace Declaration

To store a single value in the mass memory module RAM, a variable must be defined and set to an initial value. This allocates space in internal RAM for the variable name and value. The following example shows how to declare a variable and how the amplitude of a signal can be stored in a variable.

Example 4-5

```
IO OUTPUT 718;"VARDEF AMPLITUDE, 0;";   ! Define variable, "AMPLITUDE
20                                      ! and initialize its value to zero.
30 OUTPUT 718;"IP;SNGLS;";              ! Instrument preset, single sweep.
40 OUTPUT 718;"FA 275MHZ;FB 325MHZ;";   ! Set the start and stop frequencies
50                                      ! to 275 and 325 MHz respectively.
60 OUTPUT 718;"TS;MKPK HI;";            ! Put a marker on the largest
70                                      ! signal on the trace.
80 OUTPUT 718;"MOV AMPLITUDE,MKA;";     ! Move the marker amplitude
90                                      ! value into "AMPLITUDE".
100 END
```

The programming example above alters the variable “AMPLITUDE” that was defined using the VARDEF command. Other commands like MOV that can be used to alter variable values are the math commands ADD, DIV, and MPY. Refer to these commands in the “Syntax Diagrams, Descriptions, and Program Examples” section of this chapter.

lb store a trace in the module RAM, define a trace array within a DLP using the TRDEF command. TRDEF allocates a specified amount of memory to a specified trace name.

Example 4-6

```
IO OUTPUT 718;"TRDEF EXAMPLETRACE,601;";    ! Define a 601-point array
20                                          ! labeled "EXAMPLETRACE".
30 OUTPUT. 718;"MOV EXAMPLETRACE,0;";       ! Initialize trace values to zero.
40 END
```

The programming commands for a user-defined trace, function, or variable name may consist of 1 to 16 capital letters.

It is important to realize that VARDEF and TRDEF are global variables. This means that variables and traces retain their values until redefined, disposed of, or altered by MOV or math commands. Each time the variable or trace is altered, the new value writes over the old value in memory. Potential problems can be avoided by defining variables and traces at the beginning of a program. If variables and traces are defined at the beginning of a program, then the MEM? query returns the correct value for available memory after the DLP is downloaded by an external controller.

Displaying Variable and Trace Values

The value of a variable in user memory can be displayed on the spectrum analyzer screen using the DSPLY command. The DSPLY command requires that two numbers be specified after the variable name. The first number indicates the total field width, or the total amount of numbers to be displayed. The second number specifies the resolution, or the amount of numbers to **be** displayed after the decimal point. Those numbers should be separated by a comma.

The variable may also be displayed at a particular location **on** the spectrum analyzer screen by specifying the pen location. Refer to the "Graphics Operation Commands" in **Table 4-1** for command mnemonics that perform this operation. Then locate the actual command alphabetically listed in this chapter for a description.

User-defined traces that are stored in memory can be displayed by using the MOV command. The user-defined trace must first be moved into either trace A or **B,** then it can be displayed. The following example demonstrates how to move the trace EXAMPLETRACE (previously defined in Example 4-6) so it can be displayed in trace A.

```
OUTPUT 718;"MOV TRA, EXAMPLETRACE;";
```

Using EP to Modify User-Defined Variables (firmware revisions 910116 and later)

The secondary keyword EP can be used within a DLP to modify values of user-defined variables (e.g. variables defined using LCLVAR or VARDEF). This keyword can be used in a DLP to pause the program, allowing the user to input a value for the variable, and then continue. This is a simple alternative to using the ACTVFUNC command and can be very helpful in debugging a DLP.

When EP is used with a user-defined variable and the data entry keys are used, the terminators have the following effect on entered values:

GHz/ + dBm/dB ..... Multiplies entered value by $1x10^9$
MHz/-dBm/sec ..... Multiplies entered value by $1x10^6$
kHz/mV/ms ..... Multiplies entered value by $1x10^3$
Hz/uV/us/ENTER ..... Multiplies entered value by 1

These multipliers are convenient when entering frequency values, but care should be taken when entering amplitude values, especially in dB.

For proper operation, the display annotation should be turned on and at least one trace must be in either CLEAR/WRITE or MAX HOLD. When using EP, display a prompt in the first line of the active function block, as shown in the example below. A question mark will appear on the next line, and will be overwritten as data is entered. If a prompt is not displayed, the first line of the most current active function will appear with a question mark on the next line.

Program Example:

The following example could be used to setup for a total harmonic distortion measurement. The user will enter the fundamental frequency of the input signal into the variable E_NTRY. Line 70 prompts the user to enter the frequency. The HD command clears the active function block before writing the prompt text.

```
10    !
20    ASSIGN @Sa TO 718
30    !
40    OUTPUT @Sa;"FUNCDEF H_ARMDIST,@;";
50    OUTPUT @Sa;"LCLVAR E_NTRY,0;";
60    OUTPUT @Sa;"IP;SNGLS;TS;";
70    OUTPUT @Sa;"HD;PU;PA 100,575;TEXT/ENTER FUNDAMENTAL FREQUENCY/;";
80    OUTPUT @Sa;"E_NTRY EP;";
90    OUTPUT @Sa;"EM;";
100   OUTPUT @Sa;"DIV FA,E_NTRY,2;";
110   OUTPUT @Sa;"MPY FB,E_NTRY,3.5;";
120   OUTPUT @Sa;"TS;MKPK HI;MKD;MKPK NH;";
130   OUTPUT @Sa;"@;"
140   !
150   OUTPUT @Sa;"KEYDEF 1,H_ARMDIST,/      THD    SETUP/;"
160   !
170   ASSIGN @Sa TO *
180   END
```

Erasing User-Defined Memory

Use the DISPOSE command with a controller to remove previously stored contents (variables, traces, DLPs and limit lines) from the mass memory module RAM. You may remove any or all of the contents from memory. Refer to the DISPOSE command in this chapter for additional information. The following examples may be used to erase user-defined memory.

The following command line removes an individual variable called "ZOOM." Replace "ZOOM" with other variables, functions, and traces to remove them from memory.

```
OUTPUT 718;"DISPOSE ZOOM;";
```

Remove all contents from user-defined memory. This includes DLPs, traces, limit lines, and variables:

```
OUTPUT 718;"DISPOSE ALL;";
```

Any or all of user-defined memory contents can be removed using the softkeys of the module. Remove individual user-defined memory contents by pressing (MODULE), UTILITY. Press CATALOG MEM CARD until your memory location preference is underlined, then move the cursor to the entry you wish to delete. Press DELETE ENTRY, then CONTINUE DELETE.

Clear a user-defined softkey by pressing (MODULE), KEYDEF, move the cursor to the key label you wish to clear, then press CLEAR.

Storing DLPs on RAM Cards and in the Module

Downloading DLPs From Memory Cards to the Module

To download a DLP from a memory card, correctly insert the memory card into the module as described in Chapter 1, "Installation." Press (MODULE), UTILITY, then press CATALOG. MEM | CARD is underlined. Use the RPG knob or STEP keys to move the cursor to the DLP you want to copy. Press COPY TO MEMORY .

Storing DLPs on Memory Cards

To copy a DLP from the module RAM to a memory card, first install a RAM card into the module. Be sure the write-protect switch is not set to SAFE (write-protected). Refer to Chapter 1, "Installation." Press (MODULE), UTILITY, then press CATALOG MEM CARD until MEM is underlined. Use the RPG knob or STEP keys to move the cursor to the DLP you want to copy. Press COPY TO CARD .

Note

DLPs stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). DLPs stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

Programming Hints

Making a program easy to read also makes it easier to debug and document. Here are a few simple rules to follow which help make any program, including a DLP, more readable.

1. Write short program lines.
2. Use standard indent format for looping, branching, and subroutines.
3. Use descriptive variable names and labels.
4. Document program lines clearly.

In addition to the general readability rules above, here are some other procedures which apply specifically to DLPs to make them more readable and less prone to error.

1. Define all variables with VARDEF, traces with TRDEF, and arrays with ARRAYDEF at the beginning of the program *NOT* within a FUNCDEF. Use LCLVAR to define local variables within DLPs. For more information about LCLVAR, refer to its description in the Syntax Diagram, Descriptions, and Program Example section.
2. Use unique names (unique from command language) for all user-defined function, variable, trace, and array labels.
3. Use semicolons between commands. IEEE Standard 728 recommends this use of semicolons to avoid possible misinterpretation by the spectrum analyzer.

If rule number 2 is not followed, an error results and the definition process is aborted. Commands are reserved names and must not be used.

The program in Example 4-7 below demonstrates the concepts described above. It checks to see if there are any signals on the spectrum analyzer screen that are above -60 dBm. If there are, the spectrum analyzer zooms in on the signal to a 100 kHz span and saves that trace in the module battery-backed memory.

The "@"symbols, appearing in lines 60 and 170, delimit the function definition. All commands appearing between delimiters are assigned to the function label, CHECK.

Example 4-7

```
10 OUTPUT 718;"VARDEF POWER,0;";        ! Define a variable named POWER
20                                      ! and initialized it to zero.
30 OUTPUT 718;"TRDEF SAVE, 601;";       ! Define a 601-point trace
40                                      ! named SAVE.
50 !
60 OUTPUT 718;"FUNCDEF CHECK,@;";       ! Define a function named "CHECK".
70 OUTPUT 718;"IP;";                    ! Perform instrument preset.
80 OUTPUT 718;"SNGLS;CF 600MHZ;SP 1GZ;TS;";
                                        ! Set to single sweep, set the
90                                      ! center frequency to 600 MHz,
100                                     ! span to 1 GHz, take a sweep.
110  OUTPUT 718;"MKPK HI;TS";           ! Place the marker on the highest
120                                     ! peak, then take a sweep.
130  OUTPUT 718;"IF MA,GT,-60 THEN;";   ! If a peak is greater than -60 dBm,
140  OUTPUT 718;"    SP 1KZ;TS;TS;";    ! then set span to 100 kHz.
145  OUTPUT 718;"    MKRL;TS;";         ! Move marker to reference level
150  OUTPUT 718;"    MOV POWER, MKA;";  ! Move the marker amplitude
160                                     ! to the previously defined variable
                                        ! POWER.
170  OUTPUT 718;"    MOV SAVE, TRA;";   ! Move Trace A into previously defined
180                                     ! TRDEF named SAVE
190  OUTPUT 718;"ENDIF;";               ! End the IF statement.
200  OUTPUT 718;"@;";                   ! End the definition of CHECK.
210  END
```

Modularity

The preceding example, 4-7, is a DLP formatted in a modular style. This style offers four distinct advantages:

- easy to read
- easy to change
- easy to debug
- easy to document

Before beginning Example 4-8, manually set the spectrum analyzer to the correct span. To automate the operation completely, we can add command lines to set the span automatically. The following DLP steps through four predefined spans to find a signal higher than -60 dBm. If no signal is found in the first span, it steps to the next higher span. When a signal is found, the DLP zooms in on the signal, stores the signal, and records its amplitude. If a signal is found in any of the four spans, the DLP halts execution and displays the last signal found.

Example 4-8

```
10      ! File name: EXAMPLE
20      ! Date: 9/1/88 Author: Jane Doe
30      ! Description of the program:   This program checks for signals above
40      ! -50 dBm in the following frequency
50      ! spans: 10 - 12 MHz, 12 - 14 MHz,
60      ! 14 - 16 MHz, and 16 - 110 MHz. If a
70      ! signal is found, it "autozooms" to
80      ! 1 MHz span, records the signal
90      ! level, and displays the highest frequency
100     ! signal found in trace B.
110 OUTPUT 718;"VARDEF POWER,0;"          ! Define a variable named "POWER"
120                                       ! and initialize it to zero.
130 OUTPUT 718;"TRDEF SAVE, 601;"         ! Define a 601-point trace, "SAVE".
140                ! Subroutines:
150 OUTPUT 718;"FUNCDEF SPANONE,@;"       ! Define function SPANONE
170 OUTPUT 718;"FA 10MHZ;FB 12MHZ;"       ! Set the start and stop frequencies
180 OUTPUT 718:"@;";
190 !
200 OUTPUT 718;"FUNCDEF SPANTWO,@;"       ! Define function SPANTWO.
210 OUTPUT 718;"FA 12MHZ;FB 14MHZ;"
220 OUTPUT 718;"@;";
230 OUTPUT 718;"FUNCDEF SPANTHREE,@;"
240 OUTPUT 718;"FA 14MHZ;FB 16MHZ;"
250 OUTPUT 718;"@;";
260 OUTPUT 718;"FUNCDEF SPANFOUR,@;"
270 OUTPUT 718;"FA 16MHZ;FB 110MHZ;"
280 OUTPUT 718;"@;";
290 OUTPUT 718;"FUNCDEF CHECK,@;"         ! Define function named CHECK.-
300 OUTPUT 718;"TS;MKPK HI;"              ! Place a marker on the highest signal.
310 OUTPUT 718;"IF MA,GT,-50 THEN";       ! If there is a signal higher
320 OUTPUT 718;" MKTRACK ON;"             ! than -50 dBm, zoom to 1 MHz
330 OUTPUT 718;" SP 1MHZ;"                ! span, center it and bring it
340 OUTPUT 718;" MKTRACK OFF;TS;"         ! to the reference level.
350 OUTPUT 718;" MKPK HI;MKCF;TS;"        ! Store it in a 601-point
360 OUTPUT 718;" MKRL;TS;"                ! trace previously defined as
370 OUTPUT 718;" MOV POWER, MKA;"         ! having the label, "SAVE".
380 OUTPUT 718;" MOV SAVE, TRA;"          ! Save the control settings
390 OUTPUT 718;" SAVES 1;"                ! in register 1.
400 OUTPUT 718;"ENDIF;"                   ! End the IF statement.
410 OUTPUT 718;"@;"                       ! End the definition of "CHECK".
420                                       ! Main Program
430 OUTPUT 718;"FUNCDEF EXAMPLE,@;"       ! Label the main program EXAMPLE.
440 OUTPUT 718;"IP;SNGLS;MOV SAVE,0;"     ! Place the analyzer in single-sweep
445                                       ! and set all values in "SAME" to zero.
450 OUTPUT 718;" REPEAT";
460 OUTPUT 718;" SPANONE;CHECK;";
470 OUTPUT 718;" SPANTWO;CHECK;";         ! Check each span for a
480 OUTPUT 718;" SPANTHREE;CHECK;";       ! signal greater than -50 dBm.
490 OUTPUT 718;" SPANFOUR;CHECK;";        ! Repeat sequence until
500 OUTPUT 718;" UNTIL SAVE[0],NE,0;";    ! a non-zero value is found in
510 OUTPUT 718;" MOV TRB,SAVE;";          ! "SAVE". It then displays the located
520 OUTPUT 718;"RCLS l;BLANK TRA;VIEW TRB;";
                                          ! signal in trace B, and
```

```
530 OUTPUT 718;"@;";                    ! recalls the analyzer settings
540                                     ! that existed when the signal
550                                     ! was found. "EXAMPLE" is assigned
560 OUTPUT 718;"KEYDEF 2,EXAMPLE,%EXAMPLE%;";
                                        ! to User Keys menu softkey 2 so the
570 END'                                ! program may be executed from
580                                     ! the front panel.
```

Notice that four subroutines have been added (SPANONE, SPANTWO, and so on). Each subroutine sets the spectrum analyzer to a different frequency range. The lines from 150 through 410 now become a subprogram. Each of the five subroutines is called from the main program, Example. Line 560 enables access to the DLP stored in a USER KEYS softkey labeled EXAMPLE .

The DLP in Example 4-8 uses descriptive labels and flows in a logical fashion, making it readable. In addition, it is easy to modify. For example, if the application requires the stop frequency of the last span to extend to 4 GHz, simply change FB 110MHZ in SPANFOUR to FB 4GHZ.

Program Structure

It is important for the DLP to follow a logical, structured order. The program structure illustrated in Figure 4-4 is highly recommended for making all downloadable programs easy to read and easy to debug.

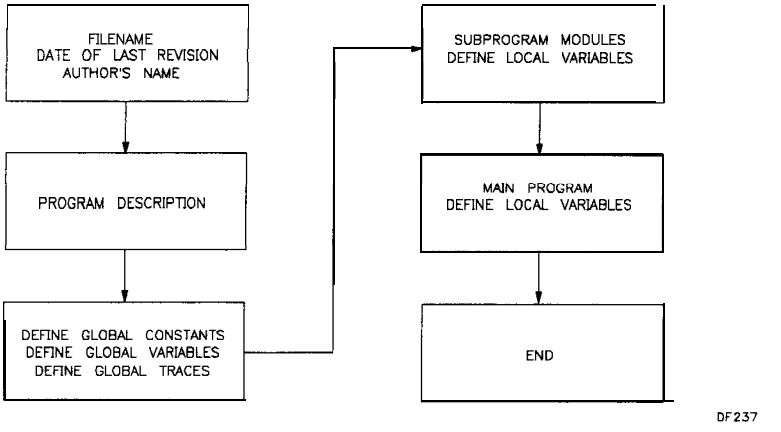


Figure 4-4. Program Structure Flowchart

Looping and Branching

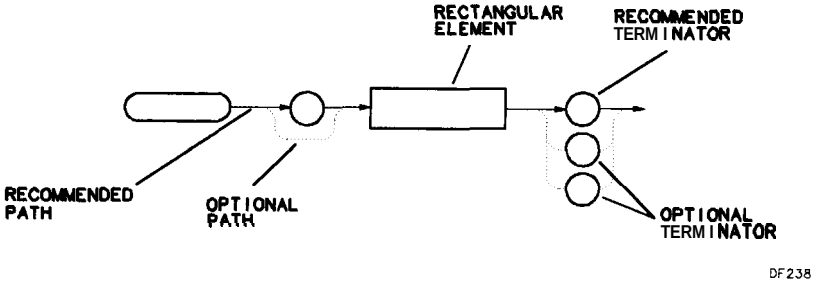
Looping and branching are the main types of program-flow control. The REPEAT/UNTIL command is used for program looping and the IF/THEN/ELSE/ENDIF statement is used for program branching.

Debugging

More often than not, new programs require debugging. In DLPs, bugs may appear in any of the following ways:

- As an error message displayed on the spectrum analyzer screen.
- The DLP does the unexpected. For example, it halts execution, or enters an infinite loop, or starts executing before its start-execution command occurs.
- As an unexpected or out-of-range result or value is obtained.

Command Syntax Diagrams



Syntax Format

Syntax Diagram Notation

circles or ovals enclose literals which must be entered exactly as shown (except for SP, ASCII code 32, which creates a space). Literals enclosed by ovals are printed in bold, capital letters in this manual. Literals enclosed by circles include the items listed below:

CR carriage return (ASCII code 13)
LF line-feed (ASCII code 10).
SP space (ASCII code 32), used to separate parameters.
, comma (ASCII code 44), used to separate parameters.
; semi-colon (ASCII code 59), used to separate and terminate commands. LF, CR, SP, and comma (,) are allowed, but not recommended.

solid lines represent the recommended command path. Each line can be followed in only one direction, as indicated by an arrow at the end of each line. Any combination of items generated by following the lines in the indicated direction is syntactically correct.

dotted lines represent optional paths. These paths are not recommended.

curved intersections clarify the flow of command path direction.

rectangles contain a parameter used in the command sequence. A description of each parameter is provided with its command description.

Syntax Diagram Parameters

Parameters or elements contained in rectangular boxes of syntax diagrams may be any of the following:

analyzer command
any spectrum analyzer command.

array element any point of a user-defined array that describes the array being accessed. When an array of a greater length is operated upon and stored in an array of

lesser length, the array is truncated to fit. When an array of a lesser length is operated upon and stored in a trace of greater length, the last array element is extended for operations with the greater length.

array range any segment or point of a user-defined array that specifies the array limits.

character sp ! " " # $ % & [\ ] ? () + , _ / 0 1 2 3 4 5 6 7 8 9 : ;
A B C D E F G H I J K L M N O P Q R S T U V W X Y
Z a b c d e f g h i j k l m n o p q r s t u v w x y z

compatible function
any spectrum-analyzer command in this chapter that performs an action **on** another function and contains predefined function in the syntax diagram. Refer to predefined function in this section. Some of the compatible functions are listed below:

AVG	EXP
DIV	IF/THEN/ELSE
DSPLY	KEYDEF
ENTER	

data byte 8-bit byte, containing numeric or character data.

identifier ASCII string composed of from 1 to 16 characters. Alpha character strings require an underscore to separate the alpha characters from subsequent numeric characters that are embedded into the identifier. As an example ZOOM_2 is an acceptable identifier, but ZOOM2 or ZOOM 2 is not.

delimiter matching characters marking the beginning and end of character strings, user-defined functions, or pre-defined functions. They include these characters:

! " $ % & ' / \ : @ ^

digit 0 1 2 3 4 5 6 7 8 9

DLP a user-defined function.

LF with EOI line feed with end-or-identify function. ASCII code 10 (LF) is sent via HP-IB, then the end-or-identify control line on HP-IB sets to indicate the transmission is complete.

measurement units
apply to TRA and TRB and range from 0 to 600 points.

number integer or real numerical data. Integers are numbers having no fractional part. *Integer range* is -32,768 through + 32,767.
Real numbers include integers and all other numbers. The range for *reals* is $-1.790E^{+308}$ through $-2.225E^{-308}$, 0, and $+2.225E^{-308}$ through $+1.798E^{+308}$.
The *byte mnge* is 0 through 255.

predefined function
math functions that return a value. The following list contains some predefined function commands. They are predefined functions when they do not end with a question mark (?). If they end with a question mark, they are queries.

MEAN	STDEV
PEAKS	SUM
PWRBW	**SUMSQR**
RMS	VARIANCE

predefined variable
functions that include variable data, usually numeric data. Some of these are included in the following list:

AT	**IDFREQ**	ML	STB
CF	LG	**RB**	TH
CNV	MKA	RBR	TRA
DL	MKN	RL	TRB
FA	MKPT	ROFFSET	VB
FB	MKPX	**SP**	VBR
FOFFSET	MKT	ss	VTL
HNLOCK	ML	ST	**LIMIFAIL***

* Firmware datecode 910116 and later.

trace element any point (element) of a user-defined trace element that identifies the trace being accessed. When a trace of a greater length is operated upon and stored in a trace of lesser length, the trace is truncated to fit. When a trace of a lesser length is operated upon and stored in a trace of greater length, the last trace element is extended for operations with the greater length.

trace range any segment or point of a user-defined trace that specifies trace limits. When a trace of a greater length is operated upon and stored in a trace of lesser length, the trace is truncated to fit. When a trace of a lesser length is operated upon and stored in a trace of greater length, the last trace element is extended for operations with the greater length.

units frequency, amplitude, time, and current units. These are listed below.

Frequency	Amplitude	Time	Current	Entry
HZ	DB	S	A	EP[1]
KHZ	DBM	SC	MA	
MHZ	DBMV	US	UA	
GHZ	DBUV	MS		
KZ	DM			
MZ	MV			
GZ	u v			
	MW			
	V			

1 For firmware datecode 910116 and later, the value of a user-defined variable may be modified using EP. Refer to "Using EP to Modify User-Defined Variables (firmware revision 910116 and later)" in this chapter.

user-deflned function
user-defined label from 1 to 16 characters long declared in FUNCDEF statement. Choice of characters are A to Z, 0 through 9, and underscore (_).

user-defined array
user-defined array label from 1 to 16 characters long declared in ARRAYDEF statement. Choice of characters are A to Z, 0 through 9, and underscore (_). The range is from 2 to 2047 elements.

user-defined trace
user-defined trace or array label from 1 to 16 characters long declared in TRDEF statement. Choice of characters are A to Z, 0 through 9, and underscore (_). The maximum number of elements possible is about 65,000. The actual number is dependent on available user memory. M format supported for user-defined traces only.

user-defined variable
user-defined variable label from 1 to 16 characters long declared in VARDEF or LCLVAR statement. Choice of characters are A to Z, 0 through 9, and underscore (_).

Textual Notation

Text used in syntax diagrams is defined below.

Bold Type	is used to represent literals which must be entered in the command exactly as shown.
CAPITAL LETTERS	are used to represent literals which must be entered in the command exactly as shown.
< >	enclose command parameters or elements of the language being defined. These elements are described in the above section titled "Parameters in Rectangular Boxes."
[ ]	indicate that whatever occurs within the brackets is an optional entry.
|	means "or." You may choose only one of the elements from a list. As an example, <a>|<b> means a or b, but not both.
( )	clarify which elements may be chosen.
_	(underscore) represents a space which must be placed where indicated.
::=	means "is defined as . . . " As an example, <a>::=<b><c> indicates that <a> can be replaced by the series of elements, <b><c> in any statement where <a> occurs.
{ }	enclose descriptive comment which refers to the preceding item in the command sequence.

Textual Notation Conventions

<A-block data field>	#A<high-byte><low-byte><data byte><data byte &END>
<A-block data format>	#A<high-byte><low-byte><data byte><data byte &END>
<analyzer command>	any spectrum analyzer command
<block data field>	<A-block data field> | <M-block data field> > (B, I, and P block-data fields are not supported)
<CR>	{ 13) (ASCII carriage return)
<destination>	<trace label | array label> |<variable identifier>|TRA|TRB
<EOI>	end or identify
<integer>	integer number
<key number>	integer 1—10 defined in KEYDEF statement
<length>	two 8-bit bytes specifying the length of the identifier
<LF>	{ 10) (ASCII line feed)
<numeric data field>	<real>
<numeric data format>	<real><CR><LF><EOI><trace label>| <variable identifier> [<numeric data field>|TRA|TRB)
<real>	positive or negative real number
<source 1 or 2>	<trace label | array label> |<variable identifier> [<numeric data field> |TRA|TRB | predefined variable
<string data field>	<string delimiter><ASCII character><string delimiter>
<string delimiter>	<!>|<">|<$>|<%>|<&>|<'>- |</>|<\>|<:>|<@>
<trace destination>	<trace label> |TRA|TRB
<trace label>	1 to 16 ASCII characters defined in TRDEF statement
<trace source>	<trace label> |TRA|TRB
<variable identifier>	1 to 16 ASCII characters defined in the VARDEF statement, LCLVAR, or ARRAYDEF.

Table 4-1. Functional Command Listing

Function	Mnemonic	Description
Auto-function command	AUTOEXEC	Automatic execution
	AUTOFUNC	Automatic function
	AUTOSAVE	Automatic trace save
	CLRSCHED	Clear autoexec/ autosave schedule
Active function command	ACTVFUNC	Active function
Clock command	SETDATE	Set date
	SETTIME	Set time
	TIMEDATE	Set time and date display on or off
Graphics operation command	CLRDSP	Clear display
	DATEMODE	Date format display
	DSPLY	Display
	EM	Erase user graphics memory
	OR	Set origin
	PA	Plot absolute
	PD	Pen down
	PR	Plot relative
	PU	Pen up
	TEXT	Screen text
HP-IB control command	CTRLHPIB	Control HP-IB
	ENTER	Enter from HP-IB
	OUTPUT	Output from HP-IB
	RELHPIB	Release HP-IB control
Limit-line command	EDITDONE	Limit-line edit done
	EDITLIML	Edit limit line
	LIMD	Limit-line segment delta
	LIMF	Limit-line segment freq
	LIMIFAIL	Limit-line test fail status
	LIMIPURGE	Purge limit line
	LIMIREL	Relative limit line
	LIMIRCL	Recall limit line
	LIMISAV	Save limit line
	LIMITEST	Limit-line test mode
	LIML	Lower amplitude limit
	LIMM	Middle amplitude limit
	LIMTFL	Flat limit-line segment
	LIMTSL	Sloped limit-line segment
	LIMU	Upper limit-line value
	SADD	Add limit-line segment
	SDEL	Delete limit-line segment
	SDON	Limit-line segment edit done
	SEDI	Edit limit-line segment
	SENTER	Enter limit-line segment parameters

Table 4-1. Functional Command Listing (continued)

Function	Mnemonic	Description
Memory Operation Command	CARDLOAD	Copy card data to module
	CARDSTORE	Copy module data to card
	CATALOG	Catalog module memory or card over HP-IB
	FORMAT	Format the memory card
	MSDEV	Mass storage device
Module-menu command	KEYCLR	Clear user softkey labels
	KEYDEF	Define user softkey label
	MENU	Show user softkey menu
	SHOWMENU	Show all user softkeys
	SKYDEF	Define user softkey
	SKYCLR	Clear user softkey
Predefine math operation	ABS	Absolute
	ADD	Addition
	AVG	Trace average
	DIV	Division
	EXP	Exponent
	INT	Integer
	LOG	Logarithm
	MIN	Minimum
	MOD	Modulo
	MOV	Move
	MPY	Multiply
	MXM	Maximum
	SQR	Square root
	SUB	Subtract
Trace Operation	MEAN	Trace mean
	MODRCLT	Recall trace from module or card
	MODSAVT	Save trace in module memory or card
	PDA	Probability distribution of amplitude
	PDF	Probability distribution of frequency
	PEAKS	Trace peaks
	RMS	Trace root-mean square
	SMOOTH	Smooth trace
	STDEV	Standard deviation of trace amplitude
	SUM	Sum of trace amplitude
	SUMSQR	Sum of squared trace amplitude
	VARIANCE	Variance
User definition command	ARRAYDEF	Array definition
	DISPOSE	Dispose
	FUNCDEF	Function definition
	LCLVAR	Local variable definition
	MEM	Memory available
	ONEOS	On end of sweep
	TRDEF	Trace definition
	VARDEF	Variable definition

Table 4-1. Functional Command Listing (continued)

Function	Mnemonic	Description
User program control flow	ABORT	Abort
	IF/THEN/ELSE/END IF	If/then/else/end if
	REPEAT/UNTIL	repeat/until
	RETURN	Return from function
Auxiliary interface	CNTLA	Aux control line A
	CNTLB	Aux control line B
	CNTLC	Aux control line C
	CNTLD	Aux control line D
	CNTLI	Aux control line I

Table 4-2. Alphabetical Command Listing

Mnemonic	Description	Function
	-A-	
ABORT	Abort	User program control flow
ABS	Absolute	Predefined math operation
ACTVFUNC	Active function	Active function command
ADD	Addition	Predefined math operation
ARRAYDEF	Array definition	User definition command
AUTOEXEC	Automatic execute	Auto-function command
AUTOFUNC	Automatic function	Auto-function command
AUTOSAVE	Automatic save trace	Auto-function command
AVG	Average trace	Predefined math operation
	-C-	
CARDLOAD	Copy card data to memory	Memory operation command
CARDSTORE	Copy memory data to card	Memory operation command
CATALOG	Catalog module memory or card over HP-IB	Memory operation command
CLRDSP	Clear display	Graphics control command
CLRSCHED	Clear autoexec/ autosave schedule	Auto-function command
CNTLA	Sets control line A	Aux interface command
CNTLB	Sets control line B	Aux interface command
CNTLC	Sets control line C	Aux interface command
CNTLD	Sets control line D	Aux interface command
CNTLI	Status of control line I	Aux interface command
CTRLHPIB	Control HP-IB	HP-IB control command
	-D-	
DATEMODE	Date mode	Clock control command
DISPOSE	Dispose	User definition command
DIV	Divide	Predefined math operation
DSPLY	Display	Graphics control command
	-E-	
EDITDONE	Edit done	Limit-line command
EDITLIML	Edit limit line	Limit-line command
EM	Erase user display memory	HP-IB control command
ENTER	Enter	HP-IB control command
EXP	Exponent	Predefined math operation

Table 4-2. Alphabetical Command Listing (continued)

Mnemonic	Description	Function
	-F-	
FORMAT	Format	Formats the memory card
FUNCDEF	Function definition	User definition command
	-I-	
IF/THEN/ELSE/END IF	If/then/else/end if	User program control flow
INT	Integer	Predefined math operation
	-K-	
KEYCLR	Clear a user key	Module menu command
KEYDEF	Define a user key	Module menu command
	-L-	
LCLVAR	Local variable	User definition command
LIMD	Limit-line delta	Limit-line command
LIMF	Limit-line frequency	Limit-line command
LIMIFAIL	Limit-line fail	Limit-line command
LIMIPURGE	Limit-line purge	Limit-line command
LIMIRCL	Limit-line recall	Limit-line command
LIMIREL	Relative limit line	Limit-line command
LIMISAV	Limit-line save	Limit-line command
LIMITEST	Limit-line test	Limit-line command
LIML	lower limit value	Limit-line command
LIMM	Middle limit value	Limit-line command
LIMTFL	Flat limit-line segment	Limit-line command
LIMTSL	Slope limit-line segment,	Limit-line command
LIMU	Upper limit value	Limit-line command
LOG	Logarithm	Predefined math operation
	-M-	
MEAN	Trace mean	Predefined math operation
MEM	Memory available	Memory operation command
MENU	Menu	Module menu command
MIN	Minimum	Predefined math operation
MOD	Modulo	Predefined math operation
MODRCLT	Recall module trace	Trace operation command
MODSAVT	Save module trace	Trace operation command
MOV	Move	Predefined math operation
MPY	Multiply	Predefined math operation
MSDEV	Mass storage device	Memory operation command
MXM	Maximum	predefined math operation

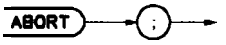
Table 4-2. Alphabetical Command Listing (continued)

Mnemonic	Description	Function
	-O-	
ONEOS	On end of sweep	User definition command
OR	Set Origin	Graphics control command
OUTPUT	Output to HP-IB	HP-IB control command
	-P-	
PA	Plot absolute	Graphics control command
PD	Pen Down	Graphics control command
PDA	Probability distribution of amplitude	Trace operation command
PDF	Probability distribution of frequency	Trace operation command
PEAKS	Trace peaks	Trace operation command
PR	Plot relative	Graphics control command
PU	Pen up	Graphics control command
	-R-	
RELHPIB	Release HP-IB	HP-IB control command
REPEAT/ UNTIL	Repeat sequence until	User program control Flow
RETURN	Return from function	User program control Flow
RMS	Trace root-mean-square root value	Trace operation command
	-S-	
SADD	Add line segment	Limit-line command
SDEL	Delete line segment	Limit-line command
SDON	Line segment done	Limit-line command
SEDI	Edit line segment	Limit-line command
SENTER	Enter line segment	Limit-line command
SETDATE	Set date	Clock control command
SE'ITIME	Set time	Clock control command
SHOWMENU	Show menu	Menu command
SKYCLR	Clear user softkey	Menu command
SKYDEF	Define user softkey	Menu command
SMOOTH	Smooth trace	Trace operation command
SQR	Square root	Predefined math operation
STDEV	Standard deviation of Trace amplitude	Trace operation command Memory operation command
SUB	Subtract	Predefined math operation
SUM	Sum of trace amplitude	Trace operation command
SUMSQR	Sum of squared trace amplitude	Trace operation command
	-T-	
TEXT	Text	Graphics control command
TIMEDATE	Time and date mode	Clock control command
TRDEF	Trace definition	User definition command
	-V-	
VARDEF	Variable definition	User definition command
VARIANCE	Variance	Trace operation command

ABORT

Abort Operation

Syntax



xf21c

Description

If a user defined function is executing, nested to any level, it is aborted. Control is then returned to the user-input level. If the nested program is initiated with a front-panel key, the control returns to the front-panel operation level. If the nested program is initiated with an HP-IB command, control is returned to the HP-IB level.

Related Commands: FUNCDEF, REPEAT/UNTIL, IF/THEN, AUTOFUNC

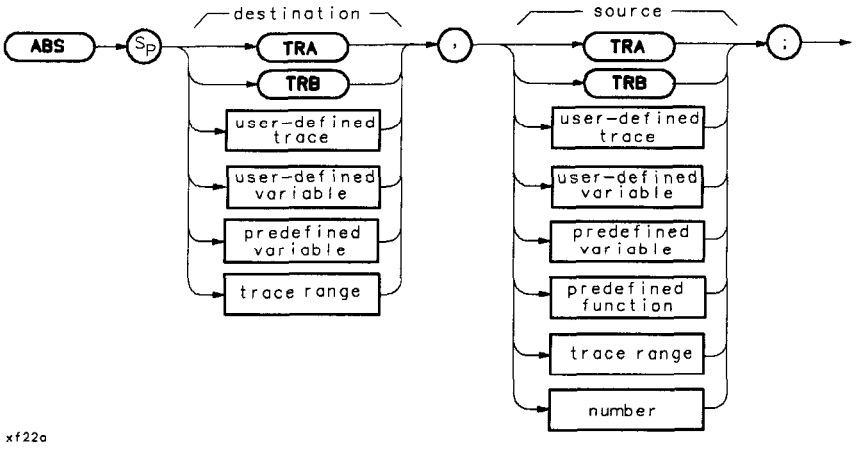
Program Example

```
10    ! The following example shows the use of the ABORT command.  The
20    ! instructions within the FUNCDEF '@' delimiters form a structure
30    ! called a DLP (downloadable program).
40    !
50    ASSIGN @Sa TO 718     ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"FUNCDEF TST,@;";     ! Logical start of the DLP.
80    OUTPUT @Sa;"VARDEF Y,500;";      ! Create variable and initialize to 500.
90    OUTPUT @Sa;"VARDEF X,500;";      ! Create variable and initialize to 500.
100   OUTPUT @Sa;"CLRDSP;";            ! Clear display.
110   OUTPUT @Sa;"REPEAT;";            ! Begin loop.
120   OUTPUT @Sa;" IF Y,LT,100; THEN;";
                                       ! Test condition.
130   OUTPUT @Sa;" PU;PA 100,X;";      ! Move pen.
140   OUTPUT @Sa;"  TEXT%DLP ABORTED%;";
                                       ! Print text.
150   OUTPUT @Sa;" ABORT;";
160   OUTPUT @Sa;" ELSE;";
170   OUTPUT @Sa;" PU;PA 100,X;";      ! Move pen.
180   OUTPUT @Sa;"DSPLY Y,5,2;";       ! Display 'Y'.
190   OUTPUT @Sa;" SUB X,X,40;";       ! Decrement pen pointer.
200   OUTPUT @Sa;" SUB Y,Y,100;";      ! Decrement variable.
210   OUTPUT @Sa;" ENDIF;";
220   OUTPUT @Sa;"UNTIL Y,EQ,-100;";   ! End loop (the abort will occur
230                                    ! before this condition will be
240                                    ! satisfied).
250   OUTPUT @Sa;"@;";                 ! Logical end of DLP.
260   !
270   OUTPUT @Sa;"TST;";               ! Execute DLP.
280   !
290   ASSIGN @Sa TO *                  ! Close I/O path.
300   END
```

ABS

Absolute Value

Syntax



Description The absolute value of the source is stored in the destination.

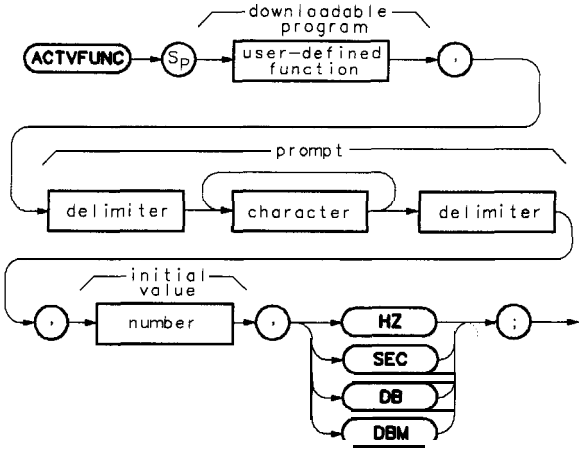
Program Example

```
10    ! The following example shows the use of the ABS command.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"IP;";                    ! Instrument preset.
81    OUTPUT @Sa;"CF 300MHZ;SP 1MHZ;";     ! Set center frequency and span.
90    OUTPUT @Sa;"VARDEF ABSLT_VAL,0;";    ! Create variable, initialize to 0.
91    OUTPUT @Sa;"TS;MKPK HI;";            ! Marker to signal peak.
100   OUTPUT @Sa;"ABS ABSLT_VAL,MKA;";     ! Put the absolute value of the
101                                        ! marker amplitude into ABSLT,VAL.
103   OUTPUT @Sa;"ABSLT_VAL?;";            ! Query ABSLT,VAL.
104   ENTER @Sa;Abs_val                    ! Get the value from the analyzer.
105   !
107   PRINT "The absolute value of the marker amplitude =";Abs_val
190   !
330   ASSIGN @Sa TO *  ! Close I/O path.
340   END
```

ACTVFUNC

Active Function

Syntax



xf23a

Description

This command makes a user-defined function operate like an active function. Active functions have the following characteristics:

- Their current value is displayed in the active-function block.
- Their values may be modified using front panel keys.
- Their values are expressed as variables for operations with other spectrum analyzer functions.

The ACTVFUNC command operates on any user-defined function, which must in turn operate on the predefined variable, ACTVAL. Use the following procedure to use the ACTVFUNC command:

1. Use FUNCDEF to define a user-defined function that operates on the predefined variable, ACTVAL.
2. Incorporate the ACTVFUNC command into the definition of a second user-defined function (also defined by FUNCDEF).
   a. Be sure to follow ACTVFUNC with the name of the user-defined function that operates on ACTVAL. Refer to the syntax diagram.
   b. Make ACTVFUNC the last command in the user-defined function definition.
3. Execute the user-defined function that executes ACTVFUNC.
4. Enter a number with the data keys, then press a hertz, seconds, or decibel terminate key.

When ACTVFUNC is executed, the spectrum analyzer displays the text specified by ACTVFUNC, then waits for data entry from the front panel data keys.

Note The command line causes the prompt-response input to be multiplied by the corresponding multiplier of the terminate key. As an example, if the initial value is 10 Hz and the GHz units key is used to terminate the prompt response, 10 GHz is displayed in the active-function block.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

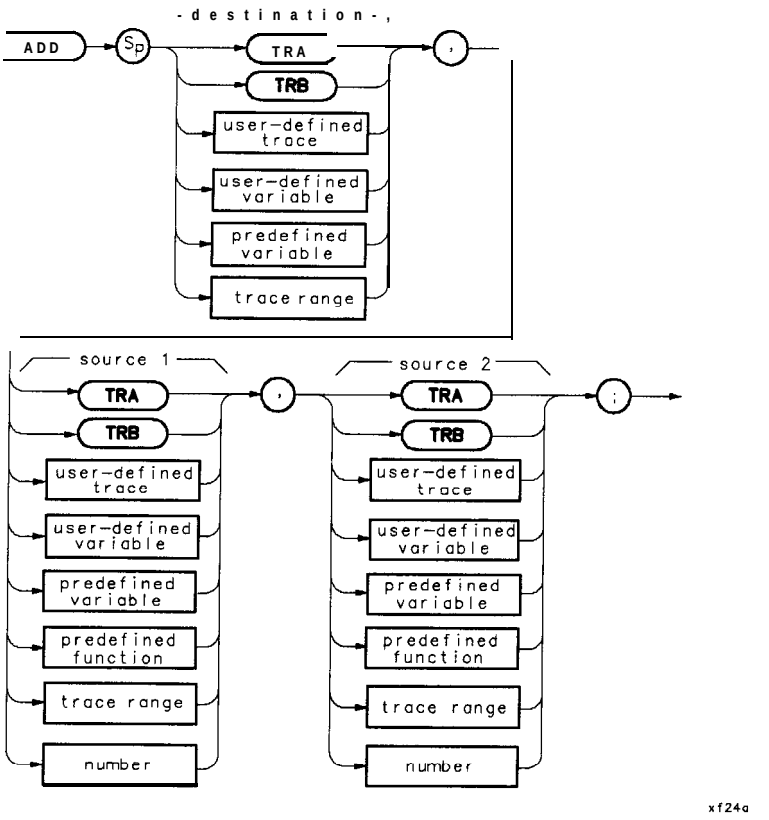
Program Example

```
10    ! The following example shows the use of the ACTVFUNC command. The
20    ! example uses an input signal of 300 MHz such as the CAL OUTPUT and
30    ! may be set (by the user input) to look at its harmonics.  An input
40    ! signal is not necessary to the function of this example, but acts as
50    ! a visual aid.
60    !
70    ASSIGN @Sa TO 718                          ! Assign I/O path to address 718.
80    !
90    OUTPUT @Sa;"FUNCDEF TST,@;";               ! Logical start of the DLP.
100   OUTPUT @Sa;"VARDEF FREQ,0;";               ! Create variable, initialize to 0.
110   OUTPUT @Sa;"SP 5MHZ;";                     ! Set span.
120   OUTPUT @Sa;"REPEAT;";                      ! Begin loop.
130   OUTPUT @Sa;"  ADD FREQ,FREQ,ACTVAL;";      ! Increment freq by number entered.
140   OUTPUT @Sa;"  MOV CF,FREQ;TS;";            ! Set new center freq; take sweep.
150   OUTPUT @Sa;"UNTIL FREQ,GT,2.9E9;";         ! Loop until frequency is 2.9 GHz.
160   OUTPUT @Sa;"@;";                           ! Logical end of DLP.
170   !
180   OUTPUT @Sa;"FUNCDEF SETUP,@;";             ! Logical start of the DLP.
190   OUTPUT @Sa;"IP;SNGLS;";                    ! Instrument preset; single sweep.
200   OUTPUT @Sa;"ACTVFUNC TST,%ENTER FREQ%,300E6,HZ;";
                                                 ! Set up the analyzer to
210                                              ! wait for front-panel input.
220   OUTPUT @Sa;"@;";                           ! Logical end of DLP.
230   !
240   OUTPUT @Sa;"KEYDEF 1,SETUP,%DEMO ACTVFUNC%;";
                                                 ! Create a softkey to
250                                              ! initiate the example.
260   PRINT "Press {LCL} [MODULE] {USER KEY), then {ACTVFUNC} torun the
example. "
270   PRINT
280   PRINT "Then enter a starting frequency such as 300 MHz. When the units"
290   PRINT "key has been pressed, the example will begin to increment the"
300   PRINT "Center Frequency from the entered frequency to 2.9 GHz in steps"
310   PRINT  “equal to the entered value.”
320   !
330   ASSIGN @Sa TO * ! Close I/O path.
340   END
```

ADD

Addition

Syntax



Description

The values of source 1 and 2 are added and the sum is sent to the destination.

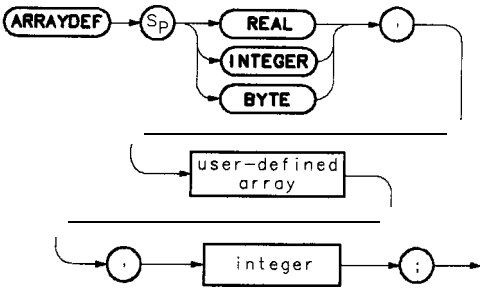
Program Example

```
10    ! The following example shows the use of the ADD command.  The example
20    ! uses an input signal of 300 MHz, such as the CAL OUTPUT signal, and
30    ! looks at its harmonics.  An input signal is not necessary to the
40    ! function of this example, but acts as a visual aid.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF ADDEX,@;";       ! Logical start of the DLP function.
90    OUTPUT @Sa;"VARDEF FREQ,300E6;";     ! Create variable and initialize it to
                                           ! 300 MHz.
100   OUTPUT @Sa;"IP;SP 1MHZ;";           ! Instrument preset; set span.
110   !
120   OUTPUT @Sa;"REPEAT;";                ! Begin loop.
130   OUTPUT @Sa;"  MOV CF,FREQ;";         ! Set center frequency.
140   OUTPUT @Sa;" TS;";                   ! Take a sweep to update display.
150   OUTPUT @Sa;" ADD FREQ,FREQ,300E6;";
                                           ! Increase FREQ by 300 MHz.
160   OUTPUT @Sa;"UNTIL FREQ,GT,3E9;";     ! End of loop.
170   OUTPUT @Sa;"@;";                     ! Logical end of DLP function.
180   !
190   OUTPUT @Sa;"ADDEX;";                 ! Execute function.
200   !
210   ASSIGN @Sa TO * ! Close I/O path.
220   END
```

ARRAYDEF

Array Definition

Syntax



xf25a

Description

The ARRAYDEF command allows you to create user-defined arrays of the type REAL, INTEGER, or BYTE. The number of elements in the array is limited only by the amount of free user memory in the module. In array operations, arrays of different types (such as REAL, INTEGER, or BYTE) cannot be operated on unless they are accessed element by element. For example a REAL array defined by the command in line 10 below, then executed with line 20, is an invalid combination.

```
10 OUTPUT 718;"ARRAYDEF REAL,TST,601;"
20 OUTPUT 718;"MOV TRA,TST;"
```

This is because TST is a REAL array and TRA is an integer array. A valid command combination to access an array element by element is as follows:

```
10 OUTPUT 718;"ARRAYDEF REAL,TST,601;"
20 OUTPUT 718; "MOVTRA[1],TST[1];"
```

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Query Response

For array data transfer to and from an external controller, only M format is supported. A, B, I, and P block-data field formats are not currently supported.

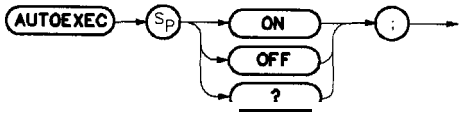
Program Example

```
10    ! The following example shows the use of the ARRAYDEF command. The
20    ! example uses an input signal of 300 MHz such as the CAL OUTPUT and
30    ! looks at its harmonics.
40    !
50    ASSIGN @Sa TO 718                        ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"ARRAYDEF REAL,FREQS,10;";    ! Create a lo-element REAL array.
80    OUTPUT @Sa;"ARRAYDEF REAL,AMPLS,10;";    ! Create another REAL array.
90    OUTPUT @Sa;"VARDEF X,l;VARDEF Y,600;";   ! Create, initialize two variables.
100   OUTPUT @Sa;"IP;FA 100MHZ;";              ! Preset; set start frequency.
110   OUTPUT @Sa;"FB 2900MHZ;TS;";             ! Set stop frequency; take sweep.
120   OUTPUT @Sa;"MKPK HI;";                   ! Marker to peak of highest signal.
130   !
140   OUTPUT @Sa;"REPEAT;";                    ! Begin loop.
150   OUTPUT @Sa;"  MOV FREQS[X],MKF;";       ! Put marker frequency into Xth
160   ! element of FREQS array.
170   OUTPUT @Sa;" MOV AMPLS[X],MKA;";         ! Put marker amplitude into Xth
180   ! element of AMPLS array.
190   OUTPUT @Sa;" MKPK NH;";                  ! Marker to next highest peak.
200   OUTPUT @Sa;"ADD X,X,1;";                 ! Increment array pointer.
210   OUTPUT @Sa;"UNTIL X,GT,10;";             ! Loop until array pointer > 10.
220   !
230   OUTPUT @Sa;"CLRDSP;";                    ! Clear analyzer display.
240   OUTPUT @Sa;"PA 110,650;";                ! Move pen to starting point.
250   OUTPUT @Sa;"TEXT %FREQUENCY(Hz)    AMPLITUDE(dBm)%;";
                                               ! Write titles.
260   OUTPUT @Sa;"MOV X,1;";                   ! Initialize array pointer.
270   OUTPUT @Sa;"PA 100,Y;";                  ! Pen to first column.
280   !
290   OUTPUT @Sa;"REPEAT;";                    ! Begin loop.
300   OUTPUT @Sa;" DSPLY FREQS[X],10,3;";      ! Display Xth frequency.
310   OUTPUT @Sa;" TEXT %      %;";           ! Space over to next column.
320   OUTPUT @Sa;" DSPLY AMPLS[X],10,3;";      ! Display Xth amplitude.
330   OUTPUT  @Sa;" SUB Y,Y,30;";              ! Decrement pen location.
340   OUTPUT @Sa;" PA 100,Y;";                 ! Move pen to new location
350   OUTPUT @Sa;" ADD X,X,1;";                ! Increment array pointer.
360   OUTPUT @Sa;"UNTIL X,GT,10;";             ! Loop until array pointer > 10.
370
380   ASSIGN @Sa TO * ! Close I/O path.
390   END
```

AUTOEXEC

Automatic Execution

Syntax



xf26a

Description

Turns off or on the automatic function as defined with the AUTOFUNC command.

Prerequisite Command: AUTOFUNC

Related Commands: AUTOSAVE, CLRSCHED

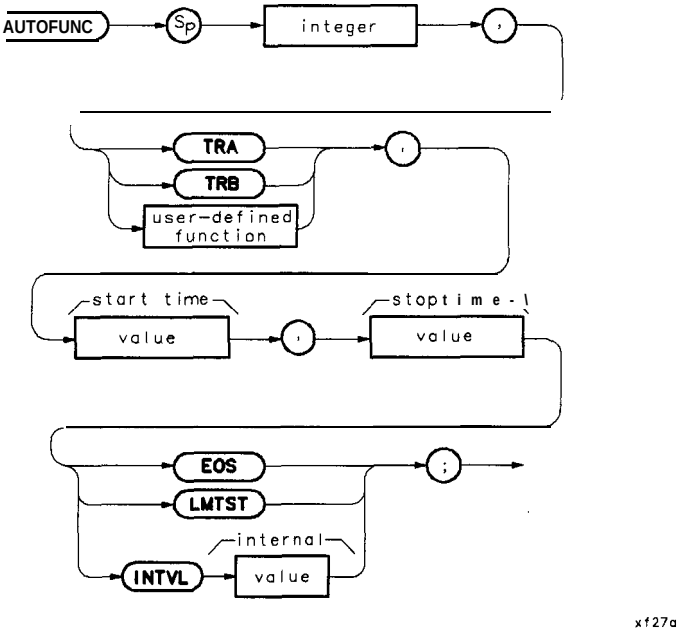
Program Example

```
10    ! The following example shows the use of the AUTOEXEC command.
20    !
30    ASSIGN @Sa TO 718            ! Assign I/O path to address 718.
40    !
50    Autoexec_status=999          ! Initialize status variable to
60                                 ! ELSE case value.
70    OUTPUT @Sa;"AUTOEXEC ON;"; ! Turn AUTOEXEC function on.
80    OUTPUT  @Sa;"AUTOEXEC?;";  ! Query its status.
90    ENTER @Sa;Autoexec_status  ! Get the status from the analyzer.
100   GOSUB Check-status
110   !
120   OUTPUT @Sa;"AUTOEXEC OFF;"; ! Turn AUTOEXEC function off.
130   OUTPUT  @Sa;"AUTOEXEC?;";  ! Query its status.
140   ENTER @Sa;Autoexec_status  ! Get the status from the analyzer.
150   GOSUB Check-status
160   STOP
170   !
180   Check-status:                ! Subroutine to display the status of
190                                ! the AUTOEXEC function.
200   SELECT  Autoexec,status
210   CASE 0
220      PRINT "The AUTOEXEC function is OFF."
230   CASE 1
240      PRINT "The AUTOEXEC function is ON."
250   CASE ELSE
260   ! This condition does not exist, however it is a good programming
270   ! practice to include an ELSE case for unexpected situations.
280      PRINT "The AUTOEXEC function returned an unknown status value."
290   END SELECT
300   RETURN                       ! From Check-status subroutine.
310   END
```

AUTOFUNC

Automatic Function

Syntax



Description

This command specifies the operation for automatic execution. Use the AUTOEXEC or AUTOSAVE function to turn execution on or off. When using LMTST as a trigger, the start and stop times must be valid dates (for example, 000000000000 or 999999999999 are not valid.) The specific operation may be one of the following:

- Store trace A data.
- Store trace B data.
- Execute a user-defined function.

when one of the following conditions occur:

- A specified time period elapses.
- The end of the sweep occurs.
- Current trace data exceeds limit-line values.

Parameters

1. There can be from one to seven processes scheduled.
2. TRA | TRB | DLP (TRA, TRB for autosaving traces; DLP:: = name of user-defined function.)
3. Start-time format: MMDDYYHHMMSS or DDMMYYHHMMSS (depending on datemode format)
4. Stop-time: MMDDYYHHMMSS or DDMMYYHHMMSS (depending on datemode format)
5. EOS | LMTST | INTVL selects criteria to perform autosave or to execute a DLP.
   a. EOS occurs at the end of a sweep.
   b. LMTST occurs at the end of a sweep after a limit test failure.
   c. **INTVL** occurs after the end of a sweep, when the first designated time interval is reached. The format for an interval entry is HHMMSS.
6. INTVL occurs at the interval time if INTVL is selected.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Prerequisite Commands: FUNCDEF, CONTS, TITLE, SLRW, and limit-line commands.

Related Commands: CLRDSP, TITLE, ABORT, RETURN, PAUSE, ERASE, DISPOSE.

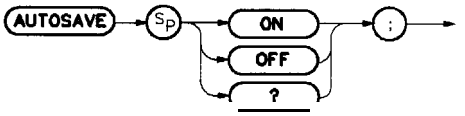
Program Example

```
10   ! The following example shows the use of the AUTOFUNC command.
20   !
30   ASSIGN @Sa TO 718      ! Assign I/O path to address 718.
40   !
50   OUTPUT @Sa;"IP;";      ! Instrument preset.
60   ! Create three items for the AUTOEXEC Schedule.
70   OUTPUT @Sa;"AUTOFUNC 1,BOX,010189000000,010589000000 EOS;";
80   OUTPUT @Sa;"AUTOFUNC 2,CHK_SIG,123188235500,123188235900 INTVL 000030;";
90   OUTPUT @Sa;"AUTOFUNC 3 TRA,122488090000,122488125900 LMTST;";
100  PRINT "Press {LCL} [MODULE] AUTOEXEC MENU to see the new schedule."
110  DISP "Press [CONTINUE] on the computer when ready"
120  PAUSE
130  !
140  ! Remove one item from the schedule.
150  OUTPUT @Sa;"IP;CLRSCHED 2;";
160  PRINT "Press {LCL} [MODULE] {AUTOEXEC MENU) to see the updated schedule."
170  DISP "Press [CONTINUE] on the computer when ready"
180  PAUSE
190  !
200  ! Clear the entire schedule.
210  OUTPUT @Sa;"IP;CLRSCHED ALL;";
220  PRINT "Press {LCL} [MODULE] (AUTOEXEC MENU) to see the cleared schedule."
230  DISP ""
240  !
250  ASSIGN @Sa TO *
260  END
```

AUTOSAVE

Automatically Save Traces

Syntax



xf28a

Description

When set to ON, this command activates the automatic saving of traces. The data to be automatically saved must be identified in the AUTOFUNC command.

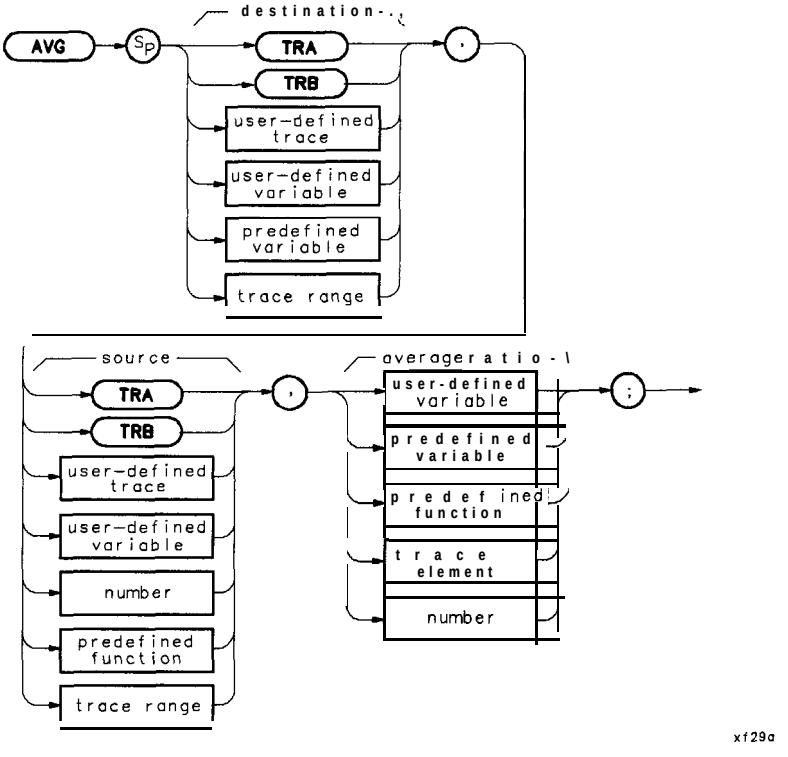
Prerequisite Commands: AUTOFUNC and TITLE.

Restrictions: A maximum of one trace per second and subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

AVG

Average

Syntax



Description

The data in the source and destination are averaged, then stored in the destination. The following averaging algorithm is used:

$$DEST_{new} = ((RATIO - 1) \times DEST_{old} + SOURCE)/RATIO$$

Parameter Range

Average Ratio:

Minimum: -32,767
0 is not allowed
Maximum: + 32,767

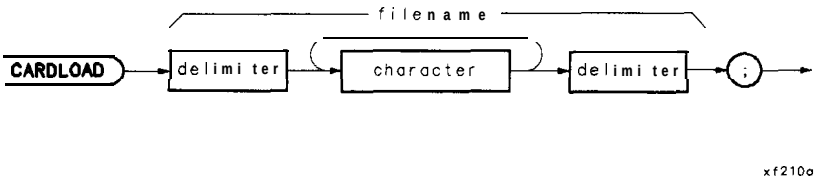
Program Example

```
10    ! The following example shows the use of the AVG command.
20   !
30    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
40   !
50    OUTPUT @Sa;"IP;";                    ! Instrument preset.
60    OUTPUT @Sa;"SNGLS;CLRW TRA;TS;";     ! \ Set up the analyzer.
70    OUTPUT @Sa;"FA 300MHZ;FB 2GHZ;TS;"; ! /
80    OUTPUT @Sa;"VAVG 10;TS;";
90    OUTPUT @Sa;"VIEW TRA;VIEW TRB;";     !
100   OUTPUT @Sa;"AVG TRB,TRA,2;";         ! Average trace A and trace B,
110                                        ! place result in trace B.
120   ASSIGN @Sa TO * ! Close I/O path.
130   END
```

CARDLOAD

Copy Data From Memory Card to Module Memory

Syntax



Description

Copy the specified data from the memory card to the module battery-backed memory. The filename label (identifier) should follow this format: 1 to 9 ASCII characters followed by a period, then followed by one of these three-letter suffixes: DLP or LMT. Valid ASCII characters that may be selected are: A through Z, 0 through 9, and _ (underscore).

A limit line may be created with the extension .lim appended to the filename. The extension LMT must be used when using the CARDLOAD and CARDSTORE commands with mass memory module firmware revisions before 950829. For later firmware, either extension is allowed.

The following statement copies the DLP "ABCDEFGHI" from the memory card to the module:

CARDLOAD %ABCDEFGHI.DLP%;

Program Example

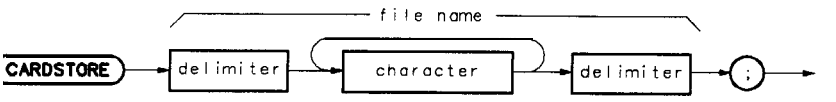
Note DLPs, traces, and limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example 890524). DLPs, traces, and limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

```
10    ! The following example shows the use of the CARDLOAD command. The
20    ! example creates a DLP (downloadable program) and stores it in memory.
30    ! It is then copied to the memory card, if available.
40    !
50    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"FUNCDEF BOX,@;";         ! Logical start of function 'BOX'.
80    OUTPUT @Sa;" IP;";                   ! Instrument preset.
90    OUTPUT @Sa;" CLRDSP;";               ! Clear the analyzer screen.
100   OUTPUT @Sa;"  PU;PA 300,300;";       ! Move pen to starting point.
110   OUTPUT @Sa;"  PD;PR  240,0;";        ! \
120   OUTPUT @Sa;" PR 0,240;";             !   \ Draw
130   OUTPUT @Sa;" PR -240,0;";            !   / rectangle.
140   OUTPUT @Sa;" PR 0,-240;";            ! /
150   OUTPUT @Sa;"@;";                     ! Logical end of function.
160   !
170   OUTPUT @Sa;"CARDSTORE %BOX.DLP%;";   ! Copy DLP to memory card.
180   !
190   ! The DLP now appears on the catalog of the memory card available in
200   ! the module utility menu.
210   !
220   OUTPUT @Sa;"DISPOSE BOX;";           ! Remove the DLP 'BOX' from
230                                        ! the module memory.  It is
240                                        ! still on the card!!
250   !
260   OUTPUT @Sa;"CARDLOAD %BOX.DLP%;";    ! Copy DLP from card to module
270                                        ! memory.  Now it's in both places.
280   !
290   ASSIGN @Sa TO *  ! Close I/O path.
300   END
```

CARDSTORE

Copy Data to a Memory Card

Syntax



xf211a

Description

Copy the specified data from the module memory to a RAM card. The filename should follow this format: 1 to 9 ASCII characters followed by a period, then followed by one of these three-letter suffixes: DLP or LMT. Valid ASCII characters that may be selected are: A through Z (upper-case only), 0 through 9, and _ (underscore). RAM cards use the Logical Interchange Format (LIF) and therefore accept only 9 of the 16 characters used to title data.

Note

The first 9 characters must be unique to avoid writing over an existing file. If a file name is longer than 9 characters or if lower-case letters are used, the file name will be converted, if possible, to an LIF compatible file name using only the first 9 characters.

A limit line may be created with the extension .lim appended to the filename. The extension .LMT must be used when using the CARDLOAD and CARDSTORE commands with mass memory module firmware revisions before 950829. For later firmware, either extension is allowed.

Note

DLPs, traces, and limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example 890524). DLPs, traces, and limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

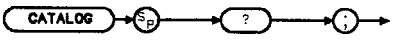
Program Example

```
10    ! The following example shows the use of the CARDSTORE command. The
20    ! example creates a DLP (downloadable program) and stores it in memory.
30    ! It is then copied to the memory card, if available.
40    !
50    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"FUNCDEF BOX,@;";         ! Logical start of function 'BOX'.
80    OUTPUT @Sa;" IP;";                   ! Instrument preset.
90    OUTPUT @Sa;" CLRDSP;";               ! Clear the analyzer screen.
100   OUTPUT @Sa;" PU;PA 300,300;";        ! Move pen to starting point.
110   OUTPUT @Sa;" PD;PR 240,0;";         ! \
120   OUTPUT @Sa;" PR 0,240;";             !   \ Draw
130   OUTPUT @Sa;" PR -240,0;";            !   / rectangle.
140   OUTPUT @Sa;" PR 0,-240;";            ! /
150   OUTPUT @Sa;"@;";                     ! Logical end of function.
160   !
170   OUTPUT @Sa;"CARDSTORE %BOX.DLP%;";   ! Copy DLP to memory card.
180   ASSIGN @Sa TO *                      ! Close I/O path.
190   END
```

CATALOG

Directory Listing over HPIB

Syntax



XCAT

Description

The CATALOG command returns a directory listing of the current mass storage device over the HPIB interface. The mass storage device should be specified using MSDEV prior to executing the CATALOG command.

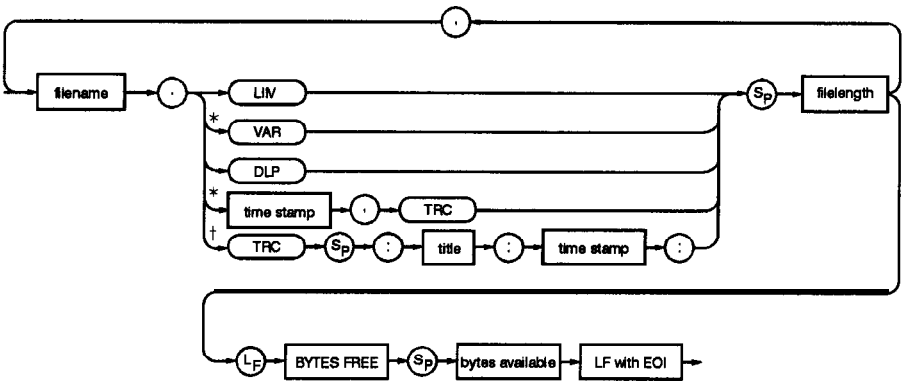
Related command: MSDEV

The listing is in the form of one string terminated by a linefeed with EOI. The string is divided into two substrings by a linefeed character. The first substring contains the actual listing and the second substring contains the amount of free memory in bytes. Refer to the Query Response figure and Pile Information Parameters table for more information.

Note

The CATALOG command is only available in firmware revision datecodes of 910116 and later.

Query Response



nf21a

Where:

filename up to 16 characters (up to 9 if MSDEV is CARD)
filelength up to 6 characters
timestamp 12 characters
title up to 32 characters

* These paths only available when MSDEV is MEM.

† This path only available when MSDEV is CARD.

File Information Parameters

File Information	Description
filename.LIM	This file contains a limit line
filename.VAR	This file is a variable defined using the **VARDEF,** or **TRDEF,** or **ARRAYDEF** command. It is only available when MSDEV is set to MEM.
f ilename.DLP	If MSDEV is set to MEM this is the downloadable program defined using the FUNCDEF command.
filename.timestamp.TRC	This file is a trace. It can be recalled by way of the front panel or by using filename.timestamp as an argument to **MODRCLT** when MSDEV is set to MEM
filename.TRC :title:timestamp:	This trace file is stored in the memory card. When the file is copied to the module memory, it will be stored under filename title with the corresponding t imest amp.

Program Example 1 The following example simply queries the module memory for its catalog and prints the string returned from the module. Example 2 shows how to query the catalog and parse the output string.

```
10    ASSIGN @Sa TO 718
20    DIM Cat$[10000]           ! Dimension string arbitrarily large.
30    DIM Bytes_avail$[20]      ! Must accommodate "BYTES FREE XXXXXX<lf>".
40    OUTPUT @Sa;"MSDEV MEM;"   ! Specify MSDEV to be cataloged.
60    OUTPUT @Sa;"CATALOG?;"    ! Query module for directory listing.
70    ENTER @Sa USING "#,K";Cat$,Bytes_avail$
                                ! Data up to the first <lf>
80                              ! will go into Cat$; data up
90                              ! to <lf-EOI> will go into
100                             ! Bytes_avail$.
110   PRINT Cat$
120   PRINT Bytes_avail$
130   ASSIGN @Sa TO *
140   END
```

The following is a sample output of the mass memory module memory after the DEMO DLPs have been loaded:

```
ANALYZER.DLP 966,CONNECTCAL.DLP 157,DEMOS.DLP 34,DISTORTION_1.DLP 691,DISTORTION
_2.DLP 78,DISTORTION_3.DLP 1458,FRAME.DLP 42,PAGE_1.DLP 804,PAGE_10.DLP 961,PAGE
_11.DLP 891,PAGE_12.DLP 848,PAGE_13.DLP 958,PAGE_13A.DLP 86,PAGE_2.DLP 945,PAGE_
3.DLP 882,PAGE_4.DLP 1012,PAGE_4A.DLP 884,PAGE_5.DLP 999,PAGE_5A.DLP 802,PAGE_6 .
DLP 828,PAGE_6A.DLP 697,PAGE_7.DLP 563,PAGE_7A.DLP 561,PAGE_8.DLP 856,PAGE_8A.DLP
857,PAGE_9.DLP 1007,PRESET.DLP 21,SIGMON_1.DLP 1056,SIGMON_2.DLP 73,SIGMON_3. DLP
 1145,SIMPLE_1.DLP 284,SIMPLE_2.DLP 285,SIMPLE_3.DLP 279,SIMPLE_4.DLP 287,SIMPLE_
5.DLP 244,SIMPLE_6.DLP 589,SIMPLE_7.DLP 699,SIMPLE_8.DLP 1134
BYTES FREE 103886
```

Program Example 2

The following example parses the output of the CATALOG command. The program displays softkeys enabling the user to catalog the entire mass storage device or only certain file types, such as DLPs, limit lines, or traces. Variables can be cataloged only if the mass storage device is MEM; variables cannot be stored to the memory card.

This example is written for HP BASIC 2.1 or greater and runs on an HP Series 200/300 Controller.

```
10   !The following example shows the use of the CATALOG command. The example
20   !catalogs the current mass storage device (CARD or MEM) and parses the
30   !returned string into a holding array.  Softkeys are then enabled to
40   !allow the user to select which part of the catalog to display.
50   !
60    INTEGER Last_match,Entry_name,Entry_length,Entry_type,Entry
70    INTEGER Space_loc,Dot_loc,Two_dots
80    DIM String_parsed$[75],String$[75],Rev_str$[75],Bytes_avail$[20]
90    DIM Mass_stg_dev$[1],Temp$[75]
100   DIM Ent$(1:3,1:500)[75],Cat$[5000]
110   !
120   ASSIGN @Sa TO 718                        ! Spectrum analyzer HP-IB address
130   DISP "Loading user defined memory."
140   OUTPUT @Sa;"MSDEV?;"
150   ENTER @Sa;Mass_stg_dev$
160   IF Mass_stg_dev$="M" THEN PRINT "Mass Storage Device is MEMORY"
170   IF Mass_stg_dev$="C" THEN PRINT "Mass Storage Device is CARD"
180   !
190   OUTPUT @Sa;"CATALOG?;"
200   ENTER @Sa USING "#,K";Cat$,Bytes_avail$
210   PRINT Bytes_avail$;" (of available user memory)"
220   !
230   Entry=0
240   Entry_name=FNWhich_pos("NAME")
250   Entry_length=FNWhich_pos("LENGTH")
260   Entry_type=FNWhich_pos("TYPE")
270   REPEAT
280     Entry=Entry+1
290     CALL Universal_parse(",",Cat$,String_parsed$,Last_match)
300     IF LEN(String_parsed$)=0 THEN No-entries
310     Dot_loc=POS(String_parsed$,".")
320     Two_dots=POS(String_parsed$[Dot_loc+1],".")
330     IF Two-dots THEN                     ! (it must be a trace in MEM)
```

```
340       Dot_loc=Two_dots+Dot_loc
350     END IF
360     Space_loc=POS(String_parsed$," ")
370     WHILE Space_loc<Dot_loc       ! Ignore spaces which are
380       Temp$=String_parsed$[Space_loc+1] ! part of LIMIT LINE title.
390       Space_loc=Space_loc+POS(Temp$," ")
400     END WHILE
410     !
420     String$=String_parsed$[1,Dot_loc-1]
430     WHILE NUM(String$[1,1])<32         ! Strip any special characters from
440       String$=String$[2]                ! system-generated dlp names.
450     END WHILE
460     Ent$(Entry_name,Entry)=String$
470     !
480     SELECT  Mass-stg-dev$               !Allow for differences in string
490     CASE "M"                            !of the Memory Card and Module Memory
500       Ent$(Entry_length,Entry)=String_parsed$[Space_loc]
510     CASE "C"
520       Rev_str$=REV$(String_parsed$)
530       Ent$(Entry_length,Entry)=TRIM$(REV$(Rev_str$[1,POS(Rev_str$," ")]))
540     END SELECT
550     !
560     Ent$(Entry_type,Entry)=TRIM$(String_parsed$[Dot_loc+1;4])
570   UNTIL  Last-match
580     !
590   LOOP                                  ! Display softkeys until Exit key
                                            ! is pressed.
600     ON KEY 1 LABEL "DLP" GOSUB List-dlps
610     ON KEY 2 LABEL "All" GOSUB List-all
620     ON KEY 4 LABEL "Exit" RECOVER Exit-cat
630     ON KEY 3 LABEL "Lim Line" GOSUB List-limit
640     IF Mass_stg_dev$="M" THEN ON KEY 6 LABEL "Variable" GOSUB List,vars
650     !Variable key is only displayed for a catalog of MEM. Variables
660     !cannot be stored on the card.
670     ON KEY 8 LABEL "Trace" GOSUB List-traces
680     DISP "Select list mode."
690   END LOOP
700 No_entries:PRINT "No Catalog Entries ! !"
710 Exit,cat:ASSIGN @Sa TO *
720   DISP "PROGRAM ENDED"
730  STOP
740  !-------------------------------------------------------------------!
750 List_dlps:Display_cat("DLP",Ent$(*),Entry)
760  RETURN
770 List_all:Display_cat("ALL",Ent$(*),Entry)
780  RETURN
790 List_vars:Display_cat("VAR",Ent$(*),Entry)
800  RETURN
810 List_traces:Display_cat("TRC",Ent$(*),Entry)
820  RETURN
830 List_limit:Display_cat("LIM",Ent$(*),Entry)
840  RETURN
850  END
860
!-------------------------------------------------------------------
```

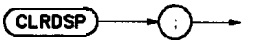
```
870   SUBUniversal_parse(Delimiter$,In_n_out$,String_parsed$,INTEGERLast-match)
880  !A generic parsing routine.
890 Universal-parse:  !
900     INTEGERDelim_loc,Len_delim
910     Len_delim=LEN(Delimiter$)
920     Delim_loc=POS(In_n_out$,Delimiter$)
930     IF Delim_loc=0 THEN
940       String-parsed$=In,n,out$
950       Last_match=1
960     ELSE
970       String_parsed$=TRIM$(In_n_out$[1,Delim_loc-1])
980       In_n_out$=TRIM$(In_n_out$[Delim_loc+Len_delim])
990       Last_match=0
1000    END IF
1010 SUBEND                                    ! <Universal-parse>
1020 !-------------------------------------------------------------------
1030 SUB Display_cat(Class$,Ent$(*),INTEGER Num,entries)
1040 !Displays the previously parsed catalog retrieved from the 85620A+.
1050 Display-cat:!
1060    INTEGEREntry_name,Entry_length,Entry_type,Entry
1070    REAL Total_length,Total_entries
1080    !
1090    Entry_name=FNWhich_pos("NAME")
1100    Entry_length=FNWhich_pos("LENGTH")
1110    Entry_type=FNWhich_pos("TYPE")
1120    Total_length=0
1130    Total_entries=0
1140    !
1150 Im:IMAGE 12A,2X,20A,2X,8D
1160 Im2:IMAGE 12A,2X,20A,2X,15A
1170    DISP
1180    OUTPUTKBD;CHR$(255)&"K";              ! Clear screen
1190    PRINT USING Im2;"   Type    ","        Name        ","   Byte total"
1200    PRINT USING Im2;"-----------","--------------------","--------------"
1210    !
1220    FOR Entry=1 TO Num,entries
1230      IF Class$=Ent$(Entry_type,Entry) OR Class$="ALL" THEN
1240        SELECTEnt$(Entry_type,Entry)
1250        CASE "DLP"
1260          String$="DLP (Func) "
1270        CASE "VAR"
1280          String$="Variable "
1290        CASE "TRC"
1300          String$="Trace "
1310        CASE "LIM"
1320          String$="Limit Line "
1330        END SELECT
1340        PRINT USING Im;String$,Ent$(Entry_name,Entry),
                  VAL(Ent$(Entry_length,Entry))
1350        GOSUB Totals
1360      END IF
1370    NEXT Entry
1380    PRINT
1390    PRINT "TOTALS. ";VAL$(Total_length);"bytes."
1400    PRINT "        ";VAL$(Total_entries);"entries."
```

```
1410    SUBEXIT
1420    !
1430 Totals: !
1440    Total_entries=Total_entries+1
1450    Total_length=Total_length+VAL(Ent$(Entry_length,Entry))
1460    RETURN
1470    !
1480  SUBEND
1490   !-----------------------------------------------------------------!
1500  DEF FNWhich_pos(Class$)
1510 !Determines where information is placed in the array. Allows
1520 !for re-arranging of the array.
1530 Which,pos: !
1540    SELECT Class$
1550    CASE "NAME"
1560      RETURN 1
1570    CASE "LENGTH"
1580      RETURN 2
1590    CASE "TYPE"
1600      RETURN 3
1610    CASE ELSE
1620      RETURN 0
1630    END SELECT
1640  FNEND
```

CLRDSP

Clear Display

Syntax



xf212a

Description This command erases spectrum-analyzer display annotation.
Related Commands: DSPLY, OR, TEXT, PA, PR, PD, and PU

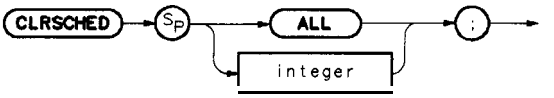
Program Example

```
10    ! The following example shows the use of the CLRDSP command.
20    !
30    ASSIGN @Sa TO 718                        ! Assign I/O path to address 718.
40    !
50    OUTPUT@Sa;"CLRDSP;";                     ! Clears the analyzer display.
60    !
70    OUTPUT @Sa;"VARDEF LOG_TEN,0;";          ! \ Initialize variables.
80    OUTPUT @Sa;"VARDEF YVAL,700;";           ! /
90    !
100   FOR I=100 TO 1000 STEP 100               ! Begin loop.
110      OUTPUT @Sa;"LOG LOG_TEN,"&VAL$(I)&",1;";
                                               !Take the LOG and
120    ! multiply by scaling factor of 1.
130      OUTPUT @Sa;"PU;PA 20,YVAL;";          ! Position "pen" for text.
140      OUTPUT @Sa;"TEXT %The LOG of %;";     ! Write text.
150      OUTPUT @Sa;"DSPLY "&VAL$(I)&",6,3;";
                                               ! Write a value.
160      OUTPUT @Sa;"TEXT % = %;";             ! Write text.
170      OUTPUT @Sa;"DSPLY LOG_TEN,5,3;";      ! Write a value.
180      OUTPUT @Sa;"SUB YVAL,YVAL,50;";       ! Calculate new "pen" position.
190   NEXT I                                   ! End loop.
200   !
210   ASSIGN @Sa TO *                          ! Close I/O path.
220   END
```

CLRSCHED

Clear Autosave/Autoexec Schedule Buffer

Syntax



xf213a

Description

Clears the Autosave/Autoexec Schedule of all or individually specified contents. Clear all schedule contents with the ALL command or selectively by specifying which number (from one to seven) to clear.

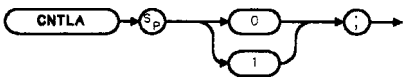
Program Example

```
10    ! The following example shows the use of the CLRSCHED command.
20    !
30    ASSIGN @Sa TO 718     ! Assign I/O path to address 718.
40    !
50    OUTPUT @Sa;"IP;";     ! Instrument preset.
60    ! Create three items for the AUTOEXEC Schedule.
70    OUTPUT @Sa;"AUTOFUNC 1,BOX,010189000000,010589000000 EOS;";
80    OUTPUT @Sa;"AUTOFUNC 2,CHK_SIG,123188235500,123188235900 INTVL 000030;";
90    OUTPUT @Sa;"AUTOFUNC 3 TRA,122488090000,122488125900 LMTST;";
100   PRINT "Press {LCL} [MODULE] (AUTOEXEC MENU) to see the new schedule."
110   DISP "Press [CONTINUE] on the computer when ready"
120   PAUSE
130   !
140                         ! Remove one item from the schedule.
150   OUTPUT @Sa;"IP;CLRSCHED 2;";
160   PRINT "Press {LCL} [MODULE] (AUTOEXEC MENU) to see the updated schedule."
170   DISP "Press [CONTINUE] on the computer when ready"
180   PAUSE
190   !
200                         ! Clear the entire schedule.
210   OUTPUT @Sa;"IP;CLRSCHED ALL;";
220   PRINT "Press {LCL} [MODULE] (AUTOEXEC MENU) to see the cleared schedule."
230   DISP ""
240   !
250   ASSIGN @Sa TO *
260   END
```

CNTLA

Auxiliary Control Line A

Syntax



Description

The CNTLA command* sets control line A of the auxiliary interface high or low.

Related commands: CNTLB* , CNTLC*, CNTLD* , CNTLI*, and OUTPUT*

Refer to "Specifications and Characteristics" in Chapter 1, Installation, for a detailed description of the auxiliary interface.

Preset State

On

Program Example

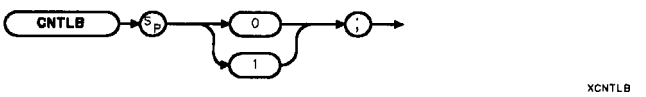
```
10    !The following example shows a use of the CNTLA command.
20    !
30    ASSIGN @Sa TO 718                    !Assign I/O path to address 718.
40    !
50    OUTPUT @Sa;"VARDEF S_CNTLA,0;"       !CNTLA STATE
60    OUTPUT @Sa;"FUNCDEF AUX_CLR_A,@;";
70    OUTPUT @Sa;" CNTLA 0;";              !SET LINE A TO 0
80    OUTPUT @Sa;"  MOV S_CNTLA,0;";       !UPDATE CNTLA IMAGE
90    OUTPUT @Sa;"@;"
100   OUTPUT @Sa;"FUNCDEF AUX_SET_A,@;";
110   OUTPUT @Sa;" CNTLA 1;";              !SET LINE A TO 1
120   OUTPUT @Sa;"  MOVE S_CNTLA,1;";      !UPDATE CNTLA IMAGE
130   OUTPUT @Sa;"@;"
140   OUTPUT @Sa;"AUX_CLR_A;"              !CLEAR LINE A
150   OUTPUT @Sa;"S_CNTLA?;"               !GET LINE A STATUS
160   ENTER @Sa;A$
170   END
```

* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

CNTLB

Auxiliary Control Line B

Syntax



Description

The CNTLB command* sets control line B of the auxiliary interface high or low.

Related commands: CNTLA* , CNTLC*, CNTLD* , CNTLI*, and OUTPUT*

Refer to "Specifications and Characteristics" in Chapter 1, Installation, for a detailed description of the auxiliary interface.

Preset State On

Program Example

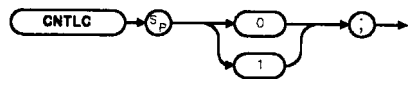
```
10    !The following example shows a use of the CNTLB command.
20    !
30    ASSIGN @Sa TO 718                    !Assign I/O path to address 718.
40    !
50    OUTPUT @Sa;"VARDEF S_CNTLB,0;"       !CNTLB STATE
60    OUTPUT @Sa;"FUNCDEF AUX_CLR_B,@;";
70    OUTPUT @Sa;" CNTLB 0;";              !SET LINE B TO 0
80    OUTPUT @Sa;" MOV S_CNTLB,0;";        !UPDATE CNTLB IMAGE
90    OUTPUT @Sa;"@;"
100   OUTPUT @Sa;"FUNCDEF AUX_SET_B,@;";
110   OUTPUT @Sa;" CNTLB 1;";              !SET LINE B TO 1
120   OUTPUT @Sa;" MOVE S_CNTLB,1;";       !UPDATE CNTLB IMAGE
130   OUTPUT @Sa;"@;"
140   OUTPUT@Sa;"AUX_SET_B;"               !SET LINE B
150   OUTPUT@Sa;"S_CNTLB?;"                !GET LINE B STATUS
160   ENTER @Sa;A$
170   END
```

* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

CNTLC

Auxiliary Control Line C

Syntax



Description

The CNTLC command* sets control line C of the auxiliary interface high or low.

Related commands: CNTLA*, CNTLB*, CNTLD*, CNTLI*, and OUTPUT*

Refer to "Specifications and Characteristics" in Chapter 1, Installation, for a detailed description of the auxiliary interface.

Preset State

On

Program Example

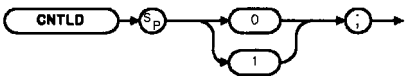
```
10    !The following example shows a use of the CNTLC command.
20    !
30    ASSIGN @Sa TO 718                    !Assign I/O path to address 718.
40    !
50    OUTPUT @Sa;"VARDEF S_CNTLC,0;"       !CNTLC STATE
60    OUTPUT @Sa;"FUNCDEF AUX_CLR_C,@;";
70    OUTPUT @Sa;" CNTLC 0;";              !SET LINE C TO 0
80    OUTPUT @Sa;"  MOV S_CNTLC,0;";       !UPDATE CNTLC IMAGE
90    OUTPUT @Sa;"@;"
100   OUTPUT @Sa;"FUNCDEF AUX_SET_C,@;";
110   OUTPUT @Sa;" CNTLC 1;";              !SET LINE C TO 1
120   OUTPUT @Sa;" MOVE S_CNTLC,1;";       !UPDATE CNTLC IMAGE
130   OUTPUT @Sa;"@;"
140   OUTPUT@Sa;"AUX_SET_C;"               !SET LINE C
150   OUTPUT@Sa;"S_CNTLC?;"                !GET LINE C STATUS
160   ENTER @Sa;A$
170   END
```

* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

CNTLD

Auxiliary Control Line D

Syntax



Description

The CNTLD command* sets control line D of the auxiliary interface high or low.

Related commands: CNTLA* , **CNTLB***, CNTLC* , CNTLI*, and OUTPUT*

Refer to "Specifications and Characteristics" in Chapter 1, Installation, for a detailed description of the auxiliary interface.

Preset State On

Program Example

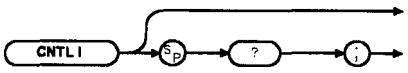
```
10    !The following example shows a use of the CNTLD command.
20    !
30    ASSIGN @Sa TO 718                    !Assign I/O path to address 718.
40    !
50    OUTPUT @Sa;"VARDEF S_CNTLD,0;"       !CNTLD STATE
60    OUTPUT @Sa;"FUNCDEF AUX_CLR_D,@;";
70    OUTPUT @Sa;" CNTLD 0;";              !SET LINE D TO 0
80    OUTPUT @Sa;"  MOV S_CNTLD,0;";       !UPDATE CNTLD IMAGE
90    OUTPUT @Sa;"@;"
100   OUTPUT @Sa;"FUNCDEF AUX_SET_D,@;";
110   OUTPUT @Sa;" CNTLD 1;";              !SET LINE D TO 1
120   OUTPUT @Sa;"  MOVE S_CNTLD,1;";      !UPDATE CNTLD IMAGE
130   OUTPUT @Sa;"@;"
140   OUTPUT@Sa;"AUX_SET_D;"               !SET LINE D
150   OUTPUT@Sa;"S_CNTLD?;"                !GET LINE D STATUS
160   ENTER @Sa;A$
170   END
```

* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

CNTLI

Auxiliary Control Line Input

Syntax



XCNTL I

Description

The CNTLI command* is a predefined variable used to read the control line I status of the auxiliary interface.

Related commands: CNTLA*, CNTLB*, CNTLC*, CNTLD*, OUTPUT*

Refer to "Specifications and Characteristics" in Chapter 1, Installation, for a detailed description of the auxiliary interface.

Program Example

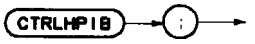
```
10    !The following example shows a use of the CNTLI command.
20    ASSIGN @Sa TO 718                    !Assign I/O path to address 718.
30    OUTPUT @Sa;FUNCDEF AUX_GET_CTRLI,0;";
40    OUTPUT @Sa;" LCLVAR I_VAL,0;";       !CONTROL VALUE TEMP
50    OUTPUT @Sa;"  MOV I_VAL,CNTLI;";     !GET CONTROL I VALUE
60    OUTPUT @Sa;"  EM; PU;PA 110,576;";   !DISPLAY VALUE ON SCREEN
70    OUTPUT @Sa;" TEXT 'CNTLI:';";
80    OUTPUT @Sa;"  DISPLYI_VAL,2,0;";
90    OUTPUT @Sa;"@;"
100   OUTPUT@Sa;"AUX_GET_CTRLI;"
110   END
```

* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

CTRLHPIB

Control HP-IB

Syntax



xf214a

Description

This command takes control of the HP-IB. If a controller is active and detected on the bus, then the command is not executed and an error results. If none is detected, the spectrum analyzer assumes control by asserting the remote-enable (REN) line. This command should precede the related commands RELHPIB, ENTER, and OUTPUT.

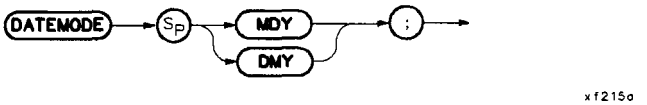
Program Example

```
10    ! The following example shows how to use the CTRLHPIB command to have
20    ! the analyzer send data to another HP-IB device. The instructions
30    ! within the FUNCDEF '@' delimiters form a structure called a
40    ! DLP (downloadable program).
50    !
60    ! NOTE: A printer (HP-IB address 01) needs to be connected.
70    !
80    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
90    !
100   OUTPUT @Sa;"FUNCDEF E_XMPLE,@;";     ! Logical start of the DLP.
110   OUTPUT @Sa;" CTRLHPIB;";             ! Tells analyzer to take control
120                                        ! of the bus.
130   OUTPUT @Sa;" MKN;";                  ! Turn on a marker.
140   OUTPUT @Sa;" OUTPUT l,KC,'THIS IS AN EXAMPLE OF THE ANALYZER
SENDING'," ,"
150   OUTPUT @Sa;" OUTPUT l,KC,'DATA TO ANOTHER HPIB DEVICE';";
160   OUTPUT @Sa;" OUTPUT 1,KC,";";
170   OUTPUT @Sa;" OUTPUT l,K,'MARKER FREQUENCY = ';";
180   OUTPUT @Sa;"  OUTPUT 1,K,MKF;";
190   OUTPUT @Sa;" OUTPUT 1,KC,' Hz';";
200   OUTPUT @Sa;" OUTPUT 1,KC,";";
210   OUTPUT @Sa;" RELHPIB;";              ! Release HP-IB control.
220   OUTPUT @Sa;"@;"                      ! Logical end of the DLP.
230   !
240   OUTPUT @Sa;"E_XMPLE;"                ! Have the analyzer execute the
250                                        ! DLP E,XMPLE.
260   SEND 7;UNL TALK 18 LISTEN 1 DATA     ! Send to HP-IB select code 7 the
270                                        ! commands necessary-to allow
280                                        ! the analyzer (address 18) to
290                                        ! talk to the printer (address 1)
300                                        ! while this controller is still
310                                        ! connected.
320   LOCAL 7                              ! Local HP-IB select code 7.
330   WAIT 2                               ! Wait for printer to finish.
340   REMOTE 7                             ! Toggle the HP-IB REN line.
350   LOCAL @Sa                            ! Local the SA.
360   !
370   ASSIGN @Sa TO *                      ! Close I/O path.
380   END
```

DATEMODE

Date Mode

Syntax



xf215a

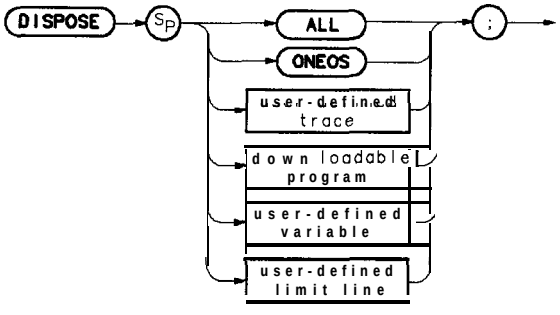
Description

Used to set European (DDMMYY) or United States (MMDDYY) date format. This command cannot be queried.

DISPOSE

Dispose

Syntax



xf216a

Description

Dispose allows the user to free module RAM previously allocated for user-defined functions. These functions include traces, user-defined variables, DLPs, and limit-lines. The DISPOSE command will search for the first occurrence of the indicated Ele name and delete it. The command has a file search hierarchy; it searches for different types of files in the order shown in Table 4-3. This table also shows examples of using the `DISPOSE` command for each file type.

Table 4-3.
Dispose Command File Search Hierarchy and Programming Examples

File Hierarchy	File Type	Programming Example
1.	Trace	DISPOSE TRACE.961225101522.TRC
2.	User-Defined Variable	DISPOSE D_DATA.VAR
3.	DLP (Down-Loadable Program)	DISPOSE F_PRCTAM.DLP
4.	Limit Line	DISPOSE B_CDMA.LIM

File extensions such as .TRC, .VAR, and .DLP shown in the programming examples in Table 4-3 are not required, as long as the file name is unique. However, using extensions help reduce the possibility that an incorrect file type is deleted. The DISPOSE command chooses the first filename match in its hierarchy and ignores the extension if the extension is omitted in the DISPOSE command.

A timedate stamp is included as part of the filename for a trace. If there are multiple traces with the same filename, the timedate stamp can be used to identify each trace individually. When the DISPOSE command is used to dispose of a trace, the timedate stamp must be included with the trace filename or it will dispose of the first trace that it finds with that filename. The CATALOG command can be used to obtain timedate stamps for traces.

The dispose command file search was limited to DLP files in earlier revisions of firmware.

The DISPOSE ALL command deletes all existing files and makes available the maximum amount of memory.

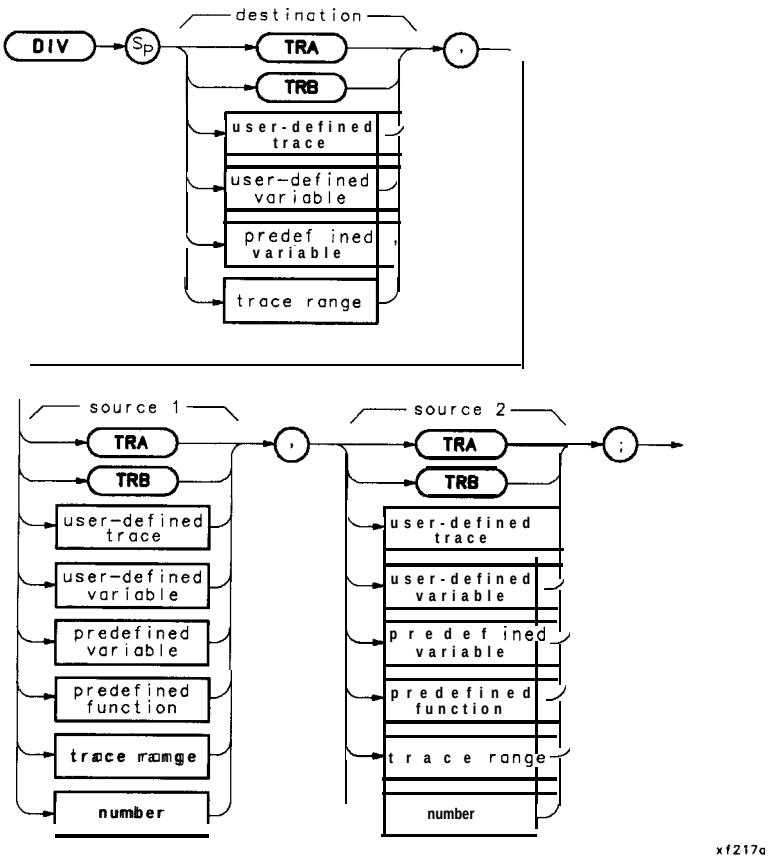
Program Example

```
10   ! The following example shows the use of the DISPOSE command. First it
20   ! clears memory. Then it creates a DLP and a variable. Finally, it deletes
30   ! the variable. Since this example disposes EVERYTHING currently downloaded
40   ! into the memory module, it should be used with caution.
50   !
60   ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70   !
80   OUTPUT @Sa;"IP;DISPOSE ALL;";
90   PRINT "DISPOSE ALL executed. Press {LCL} [MODULE] (UTILITY) to"
100   PRINT "observe that there are no applicable entries."
110  DISP "Press [CONTINUE] on computer when ready"
120  PAUSE
130  !
140  OUTPUT @Sa;"FUNCDEF TST,@;";         ! Create a DLP function.
150  OUTPUT @Sa;"VARDEF NUMBER,999;";     ! Create, initialize a real variable.
160  OUTPUT @Sa;"ADD NUMBER,NUMBER,1;";
170  OUTPUT @Sa;"@;";
180  !
190  OUTPUT @Sa;"IP;TST;";                ! Execute the DLP creating.
200  PRINT "Press {LCL} [MODULE] (UTILITY) to observe that there are"
210  PRINT "now two entries."
220  DISP "Press [CONTINUE] on computer when ready"
230  PAUSE
240  !
250  OUTPUT @Sa;"IP;DISPOSE NUMBER;";
260  PRINT "Press {LCL} [MODULE] (UTILITY) to observe that there is"
270  PRINT "now ONE entry.  The variable NUMBER has been disposed."
280  !
290  ASSIGN @Sa TO *                      ! Close I/O path.
300  END
```

DIV

Divide

Syntax



Description

Divides source 1 by source 2, then stores the results in the destination. A divide-by-zero attempt generates an error, attaches the sign of the value contained in source 1 to the maximum value, and sends it to the destination.

Program Example

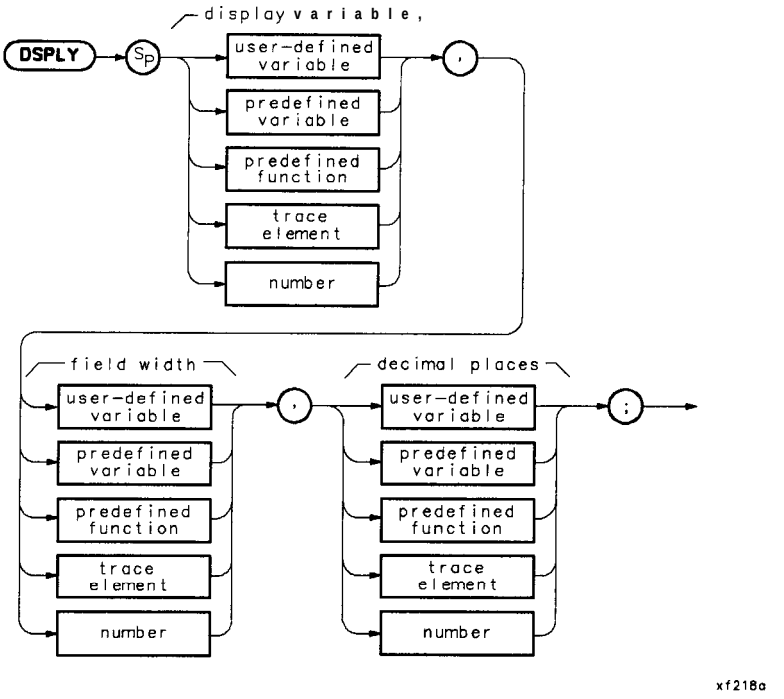
```
10    ! The following example shows the use of the DIV command.  The example
20    ! uses an input signal of 300MHz, such as the CAL OUTPUT.
30    ! An input signal is not necessary to the function of
40    ! this example, but acts as a visual aid.
50    !
60    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF DIVEX,@;";  ! Logical start of the DLP function.
100   OUTPUT @Sa;"TRDEF ARY,300;";    ! Create 300 element trace.
110   OUTPUT @Sa;"IP; CF 300MHZ;SP 1MHZ;";
                                       ! Instrument preset; set center
120                                    ! frequency and span.
130   OUTPUT @Sa;"CLRW TRA; TS;";      ! Clear trace A and take a sweep.
140   OUTPUT @Sa;"VIEW TRA;";          ! View trace A.
150   OUTPUT @Sa;"MOVARY,TRA;";        ! Move first 300 points of trace A
160                                    ! into user-defined trace.
170   OUTPUT @Sa;"DIV TRA,ARY,2;";     ! Divide user-defined trace by 2 and
180                                    ! place result in trace A.
190   OUTPUT @Sa;"VIEW TRA;";          ! View result.
200   OUTPUT @Sa;"@;";                 ! Logical end of DLP function.
210   !
220   OUTPUT @Sa;"DIVEX;";             ! Execute function.
230   !
240   ASSIGN @Sa TO *                  ! Close I/O path.
250   END
```

Note Since in this example the 300-point user-defined trace called ARY is smaller than the 600-point trace A, the last value in the user-defined trace is used as an operand on the remaining elements of trace A.

DSPLY

Display Variable

Syntax



Description

Displays the value of the variable at the current position of the graphics pen. Refer to the OR, PA, PR, PU, or PD commands. The variable is displayed according to the field-width specifier and the decimal places assigned to the current position. Field width is made up of all digits, including the sign and decimal point. If the variable value is too large to fit into the field-width and decimal-places specification, exponential notation is used.

Note

For the OR command to function properly in conjunction with the DSPLY command, you must use PU or PA after OR to position the graphics pen correctly.

Prerequisite Command: LCLVAR or VARDEF when using a user-defined variable, user-defined trace or user-defined array.

Related Commands: CLRDSP, PA, and PR

Field Width: 1 to 16

Decimal-Place Range: Minimum = 0. Maximum = if Field Width is >3, then maximum is Field Width -3, otherwise it is 0.

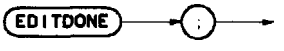
Program Example

```
10   ! The following example shows the use of the DSPLY command. The example
20   ! uses values from HPBASIC and concatenates them into the statements as
30   ! they are sent to the spectrum analyzer.
40   !
50   ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60   !
70   OUTPUT @Sa;"IP;CLRDSP;";             ! Clears the analyzer display.
80   !
90   OUTPUT @Sa;"VARDEF LOG_TEN,0;";      ! \ Initialize variables.
100  OUTPUT @Sa;"VARDEF YVAL,700";        ! /
110  !
120  FOR I=100 TO 1000 STEP 100           ! Begin loop.
130     OUTPUT @Sa;"LOG LOG_TEN,"&VAL$(I)&",1;";
                                          ! Take the LOG and multiply
140                                       ! by scaling factor of 1.
150     OUTPUT @Sa;"PU;PA 20,YVAL;";      ! Position "pen" for text.
160     OUTPUT @Sa;"TEXT %The LOG of %;"; ! Write text.
170     OUTPUT @Sa;"DSPLY "&VAL$(I)&",6,3;";
                                          ! Write a value.
180     OUTPUT @Sa;"TEXT % = %;";         ! Write text.
190     OUTPUT @Sa;"DSPLY LOG_TEN,5,3;"; ! Write a value.
200     OUTPUT @Sa;"SUB YVAL,YVAL,50;";   ! Calculate new "pen" position.
210  NEXT I                               ! End loop.
220  !
230  ASSIGN @Sa TO *                      ! Close I/O path.
240  END
```

EDITDONE

Limit-Line Edit Done

Syntax



xf219a

Description

This command is used at the completion of limit-line editing with the EDITLIML command.

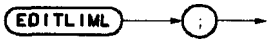
Program Example

```
130   ! This program demonstrates the use of the EDITDONE command
140   ! to generate a limit line:
150   !
160   OUTPUT718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT718;"EDITLIML;";         ! Begin editing limit line.
180   OUTPUT 718;"LIMIREL OFF;";     ! Make sure it is an absolute limit line.
190   OUTPUT 718;"SADD;";            ! Add segment to limit line.
200   OUTPUT 718;"SEDI 1;";          ! Edit the first limit line.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set the frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";            ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";     ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";     ! Set the frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML -80DBM;";
                                     ! Set amplitude data for segment.
290   OUTPUT718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";            ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU -5DBM;LIML -25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT718;"EDITDONE;";         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                     ! Set up analyzer to display
505                                  ! the limit line.
510   END
```

EDITLIML

Edit Limit Line

Syntax



xf220a

Description

This command turns off the currently active limit line, then places you in limit-line edit mode. Use this command with the commands SEDI and SADD to call up a limit-line segment for editing. The editing of each segment is terminated with SDON. EDITLIML is terminated with the EDITDONE command.

Related commands are SENTER and SEDI.

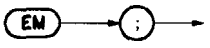
Program Example

```
130   ! This program demonstrates the use of the EDITLIML command
140   ! to generate a limit line:
150   !
160   OUTPUT718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT718;"EDITLIML;";         ! Begin editing limit line.
180   OUTPUT 718;"LIMIREL OFF;";     ! Make sure it is an absolute limit line.
190   OUTPUT 718;"SADD;";            ! Add segment to limit line.
200   OUTPUT 718;"SEDI I;";          ! Edit the first limit line.
210   OUTPUT 718;"LIMF 250MHZ;";    ! Set the frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";    ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";    ! Enter the lower amplitude.
240   OUTPUT718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";            ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";     ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";     ! Set the frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML-80DBM;";
                                     ! Set amplitude data for segment.
290   OUTPUT718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";            ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU -5DBM;LIML -25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT718;"EDITDONE;";        ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                     ! Set up analyzer to display
505                                  ! the limit line.
510   END   !
```

E M

Erase User Display Memory

Syntax



xf221a

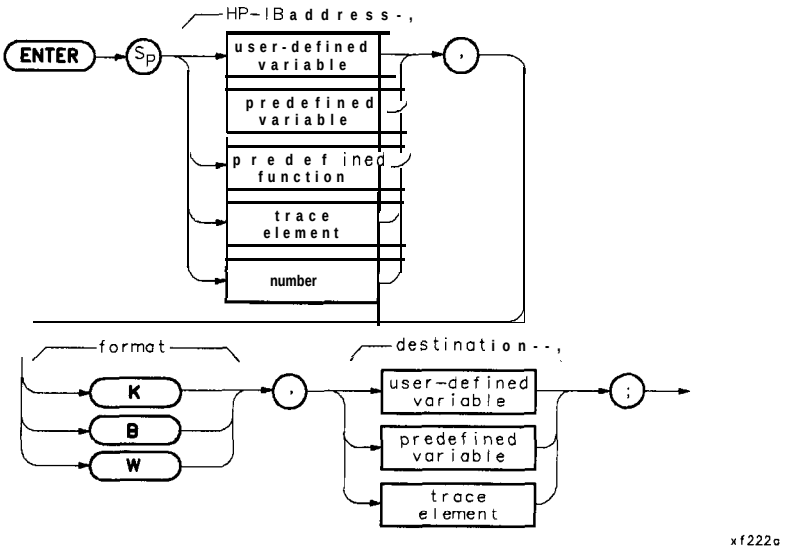
Description

This command can be used to clear the display of user-generated graphics. EM does not erase spectrum analyzer display annotation. Refer to the CLRDSP command as well.

ENTER

Enter from HP-IB

Syntax



Description

This command allows a DLP, or user-defined function, to enter data over HP-IB. If the spectrum analyzer is not the controller, the command aborts. The controller that is active and detected on the bus has control. Use the CTRLHPIB command to gain control of the HP-IB, then RELHPIB after the ENTER command to relinquish HP-IB control. The data entered is formatted as specified by the format field of the syntax diagram. This format may be one of the following:

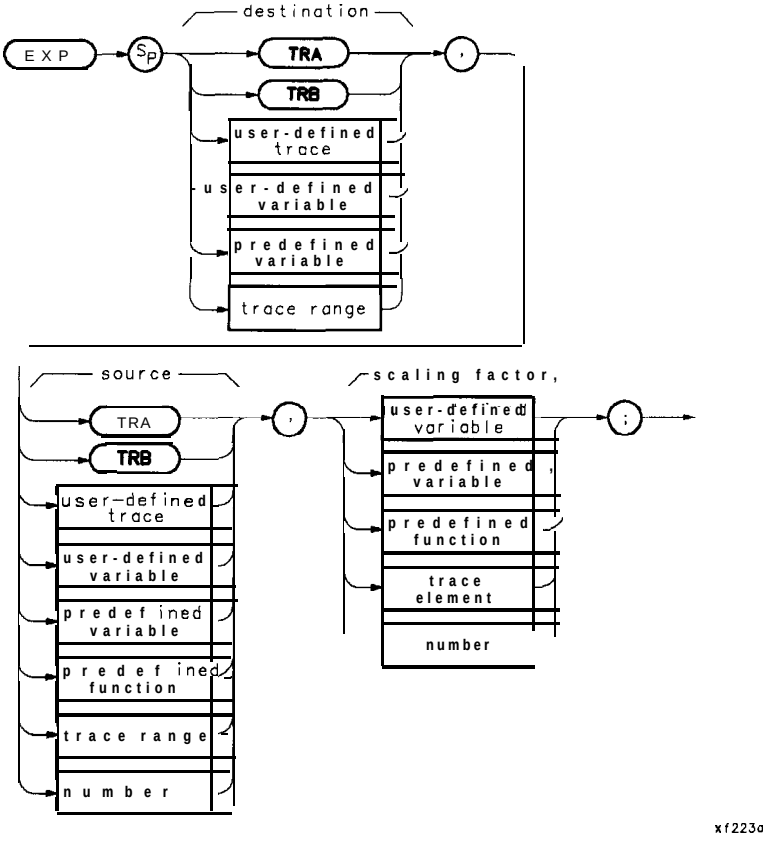
- K, a free field (ASCII real-number format)
- B, one binary byte
- W, one binary word (two bytes)

Prerequisite Commands: VARDEF and LCLVAR when using user-defined variable, user-defined trace, or user-defined array.

EXP

Exponent

Syntax



Description

The source is divided by the scaling factor and the result is raised to a power of 10, then stored in the destination.

Parameters

<scaling factor>:: = <variable identifier> | <numeric data field>
<destination> = 10 <source>/<scaling factor>

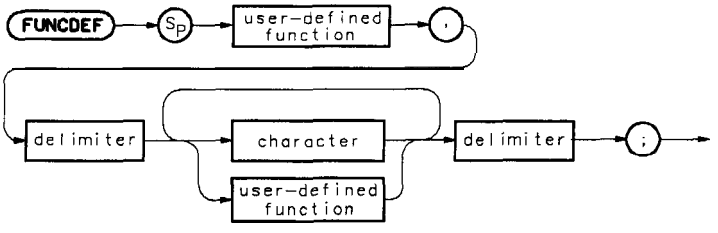
Program Example

```
10    ! The following example shows the use of the EXP command.  This example
20    ! calculates the power in milliwatts of the largest signal on the analyzer
30    ! CRT.  Initial settings are sent outside the function to set up the
40    ! CAL OUTPUT signal on the CRT.  These settings act as a visual aid.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"IP; CF 300MHZ; SP 100MHZ;";
                                           ! CAL OUTPUT signal to center-screen.
90    !
100   OUTPUT @Sa;"FUNCDEFDBM_TO_MW,@;";   ! Logical start of DLP.
110   OUTPUT @Sa;"  LCLVAR PWR_MW,0;";
                                           ! Define local variable and
                                              initialize to 0.
120   OUTPUT @Sa;" TS;MKPK HI;";           ! Take sweep; marker to peak;
130   OUTPUT @Sa;"  EXP PWR_MW,MKA,10;";   ! pwr,mw = 10^(mka/10).
150   OUTPUT @Sa;" PU;PA 100,650;PD;";     ! Move to starting position.
160   OUTPUT @Sa;" TEXT %POWER (mW)=%;"; ! Write text.
170   OUTPUT @Sa;" DSPLY PWR_MW,5,3;";     ! Write results.
180   OUTPUT @Sa;"@;";                     ! Logical end of DLP.
190   !
200   OUTPUT @Sa;"DBM_TO_MW;";             ! Execute DLP.
210   !
220   ASSIGN @Sa TO *                      ! Close I/O path.
230   END
```

FUNCDEF

Function Definition

Syntax



xf224a

Description

This command allows you to define a program which is identified as a user-defined function or a DLP. If the user-defined function label is the same as a command mnemonic, an error results and the command is ignored.

This command requires user memory in the module to execute. Memory is allocated by executing this function and becomes free user memory with the DISPOSE command.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Related Commands: ABORT, RETURN, ERASE, and DISPOSE

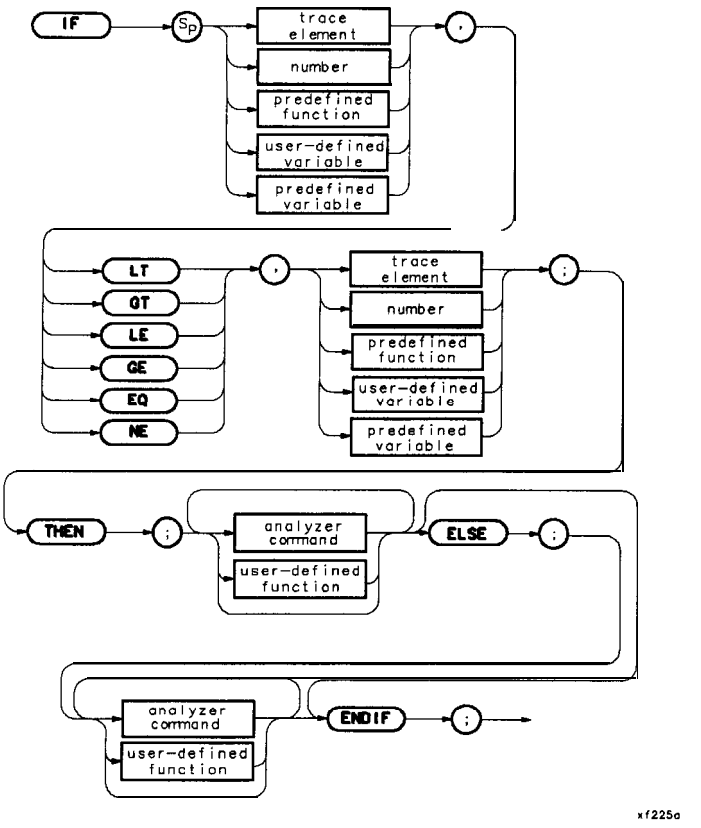
Program Example

```
10   ! The following example shows the use of the FUNCDEF command.  The example
20   ! uses an input signal of 300 MHz, such as the CAL OUTPUT, and looks at
30   ! its harmonics.  An input signal is not necessary to the function of
40   ! this example, but acts as a visual aid.
50  !
60   ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70  !
80   OUTPUT @Sa;"FUNCDEF INCRFREQ,@;";    ! Logical start of the DLP function.
90   OUTPUT @Sa;"VARDEF FREQ,300E6;";     ! Create variable and initialize
                                          ! to 300 MHz.
100 OUTPUT @Sa;"IP;SP 1MHZ;";           ! Instrument preset.
110  !
120  OUTPUT @Sa;"REPEAT;";                ! Begin loop.
130  OUTPUT @Sa;" MOV CF,FREQ;";          ! Set center frequency.
140  OUTPUT @Sa;"TS;";                    ! Take a sweep to update display.
150  OUTPUT @Sa;"  ADD FREQ,FREQ,300E6;";
                                          ! Increase FREQ by 300 MHz.
160  OUTPUT @Sa;"UNTIL FREQ,GT,3E9;";     ! End of loop.
170  OUTPUT @Sa;"@;";                     ! Logical end of DLP function.
180  !
190  !
200  OUTPUT @Sa;" INCRFREQ;";             ! Execute function.
210  !
220  ASSIGN @Sa TO *                      ! Close I/O path.
230  END
```

IF/THEN/ELSE/ENDIF

If/Then/Else/Endif

Syntax



Description

The IF/THEN/ELSE/ENDIF statement combination allows the comparison of two operands to a condition. If the condition is true, the command list following THEN is executed. If false, commands following either the next ELSE or ENDIF statements are executed. Valid conditions are less than (LT), greater than (GT), less than or equal to (LE), greater than or equal to (GE), equal (EQ), and not equal (NE).

TEEN The THEN command is treated as a no-operation function, but is required for user program flow purposes.

ELSE The ELSE command delimits the alternate condition of an IF command.

ENDIF The ENDIF command delimits the end of a conditional command sequence.

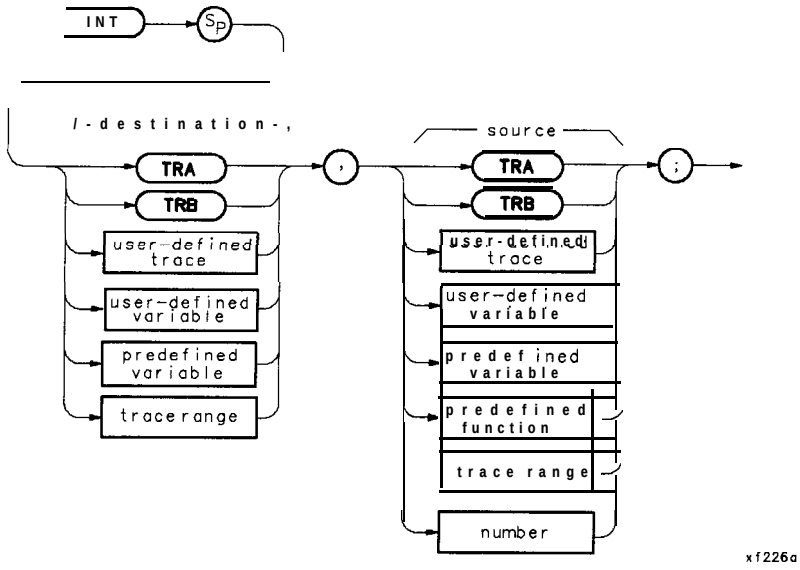
Program Example

```
10   !The following example shows the use of the IF/THEN/ELSE/ENDIF command.
20   !The instructions within the FUNCDEF '@' delimiters form a structure
30   !called a DLP (downloadable program).
40  !
50   ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
60  !
70   OUTPUT @Sa;"FUNCDEF TST,@;";     ! Logical start of the DLP.
80   OUTPUT @Sa;"VARDEF Y,500;";      ! Create variable and initialize to 500.
90   OUTPUT @Sa;"VARDEF X,500;";      ! Create variable and initialize to 500.
100 OUTPUT @Sa;"CLRDSP;";             ! Clear display.
110 OUTPUT @Sa;"REPEAT;";             ! Begin loop.
120 OUTPUT @Sa;" IF Y,LT,lOO; THEN;";
                                      ! Test condition.
130 OUTPUT @Sa;" PU;PA 100,X;";       ! Move pen.
140 OUTPUT @Sa;"  TEXT%DLP ABORTED%;";
                                      ! Print text.
150 OUTPUT @Sa;" ABORT;";
160 OUTPUT @Sa;" ELSE;";
170 OUTPUT @Sa;"PU;PA 100,X;";        ! Move pen.
180 OUTPUT @Sa;" DSPLY Y,5,2;";       ! Display 'Y'.
190 OUTPUT @Sa;" SUB X,X,40;";        ! Decrement pen pointer.
200 OUTPUT @Sa;" SUB Y,Y,100;";       ! Decrement variable.
210 OUTPUT @Sa;"ENDIF;";
220 OUTPUT @Sa;"UNTIL Y,EQ,-100;";    ! End loop (The abort will occur
230                                   ! before this condition will be
240                                   ! satisfied.
250 OUTPUT @Sa;"@;"                   ! Logical end of DLP.
260 !
270 OUTPUT @Sa;"TST;"                 ! Execute DLP.
280 !
290 ASSIGN @Sa TO *                   ! Close I/O path.
300 END
```

INT

Integer

Syntax



Description

Stores in the destination the greatest integer number which is less than or equal to the real number in the source. Since traces and trace ranges consist of integers only, using them as source data in the INT command yields the same result as using them as source data with the MOV command.

Program Example

```
10    ! The following example shows the use of the INT command. The real
20    ! value is truncated by the INT command.
30    !
40    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50    !
60    OUTPUT @Sa;"VARDEF REAL_NUM,3.14;";
                                       ! Create and initialize a real variable.
70    OUTPUT @Sa;"VARDEF INT_NUM,0;";
                                       ! Create and initialize a real variable.
80    OUTPUT @Sa;"INT INT_NUM,REAL_NUM;";
                                       ! Put the integer portion of the
90                                     ! real number into INT,NUM.
100   OUTPUT@Sa;"REAL_NUM?;";          ! Query REAL_NUM.
110   ENTER@Sa;Real_num                ! Get contents of variable.
120   OUTPUT@Sa;"INT_NUM?;";           ! Query INT_NUM.
130   ENTER@Sa;Int_num                 ! Get contents of variable.
140   !
150   PRINT "REAL=";Real_num,"INTEGER=";Int_num
                                       ! Print contents of variables
160                                    ! to computer CRT.
170   !
180   ASSIGN @Sa TO *                  ! Close I/O path.
190   END
```

KEYCLR

Clear User Defined Keys

Syntax

xf227a

Description

Use this command to clear all the softkeys in the module User Keys menu.

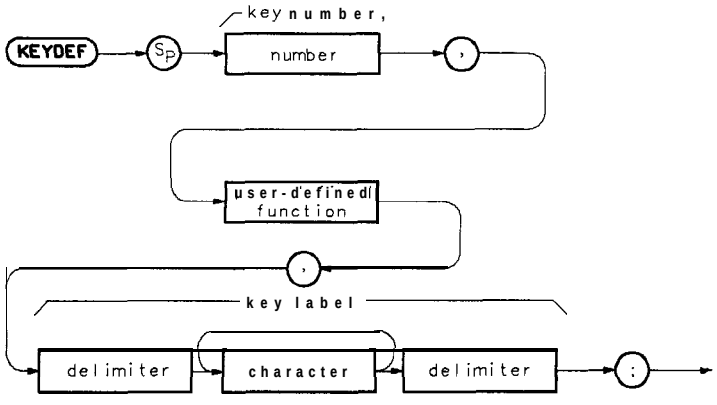
Program Example

```
10   ! The following example shows the use of the KEYCLR command.
20   !
30   ASSIGN @Sa TO 718          ! Assign I/O path to address 718.
40   !
50   OUTPUT @Sa;"KEYCLR;";      ! Clear all user-defined keys.
60   ASSIGN @Sa TO *            ! Close I/O path.
70   END
```

KEYDEF

User Defined Key Definition

Syntax



xf228a

Description

KEYDEF assigns a DLP (function label) to a USER KEY (key number) and labels the key with the function label. Pressing the softkey executes the function or DLP. There are 10 softkeys available to label. Softkey labels may be up to two lines long containing eight characters in each line.

Parameters

Minimum: 1
Maximum: 10

Query Response

The query returns the function or softkey name.

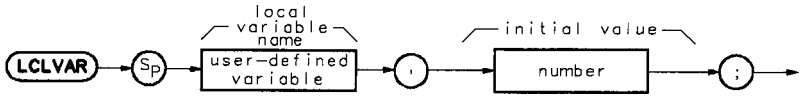
Program Example

```
10    ! The following example shows the use of the KEYDEF command.
20    !
30    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
40    OUTPUT @Sa;"KEYDEF 2,BOX,%DRAW BOX%;";
                                       ! Define softkey 2 to execute the
50                                     ! DLP BOX when key is pressed.
60                                     ! Give the key a label 'DRAW BOX'.
70    !
80    OUTPUT @Sa;"FUNCDEF BOX,@;";     ! Logical start of function.
90    OUTPUT @Sa;" IP;";               ! Instrument preset.
100   OUTPUT @Sa;" CLRDSP;";           ! Clear the analyzer screen.
110   !
120   OUTPUT @Sa;" PU;PA 300,300;";
                                       ! Move pen to starting point.
130   OUTPUT @Sa;" PD;PR 240,0;"; ! \
140   OUTPUT @Sa;" PR 0,240;";         ! \ Draw
150   OUTPUT @Sa;" PR -240,0;";        ! / Rectangle
160   OUTPUT @Sa;" PR 0,-240;";        ! /
170   OUTPUT @Sa;"@;";                 ! Logical end of function.
180   !
190   ASSIGN @Sa TO *                  ! Close I/O path.
200   END
```

LCLVAR

Local Variable

Syntax



xf229a

Description

A local variable is a variable that is defined within a FUNCDEF. It is recognized only when the FUNCDEF which defined it is running. Local variables have no meaning in a program outside the FUNCDEF that defined it, but are recognized by any FUNCDEF that is called up by the defining FUNCDEF.

Note

In Mass Memory Modules with firmware datecode 910116 and later, the value of a user-defined variable can be modified using the secondary keyword EP. Refer to "Using EP to Modify User-Defined Variables (firmware revision 910116 and later)" in this chapter.

Memory is allocated for the local-variable operation only as long as its defining FUNCDEF is running. Memory used by the local variable is freed at the completion of the defining FUNCDEF.

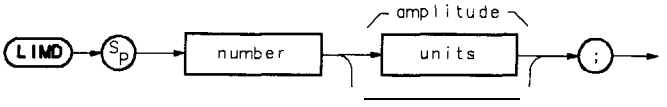
Program Example

```
10    ! The following example shows the use of the LCLVAR command.  This example
20    ! calculates the power in milliwatts of the largest signal on the analyzer
30    ! CRT. Initial settings are sent outside the function to set up the
40    ! CAL OUTPUT signal on the CRT.  These settings act as a visual aid.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"IP; CF 300MHZ; SP 100MHZ;";
                                           ! CAL OUTPUT signal to center screen.
90    !
100   OUTPUT@Sa;"FUNCDEFDBM_TO_MW,@;";   ! Logical start of DLP.
110   OUTPUT @Sa;" LCLVAR PWR_MW,0;";
                                           ! Define local variable and
                                              initialize to 0.
120   OUTPUT @Sa;" TS;MKPK HI;";           ! Take sweep; marker to peak;
130   OUTPUT @Sa;"  EXP PWR_MW,MKA,10;";   ! pwr_mw = 10^(mka/10)
150   OUTPUT @Sa;"  PU;PA 100,650;PD;";    ! Move to starting position.
160   OUTPUT @Sa;" TEXT %POWER (mW)=%;"; ! Write text.
170   OUTPUT @Sa;"  DSPLY PWR_MW,5,3;";    ! Write results.
180   OUTPUT@Sa;"@;";                      ! Logical end of DLP.
190   !
200   OUTPUT@Sa;"DBM_TO_MW;";              ! Execute DLP.
210   !
220   ASSIGN @Sa TO *                      ! Close I/O path.
230   END
```

LIMD

Limit-Line Delta

Syntax



xf230a

Description

Use this command to enter the delta value for the amplitude of a limit-line segment. Related commands are EDITLIML and SEDI. This command is used along with LIMM to define the deviation, both positive and negative, from a middle value.

Parameter

Number Range: -175 dB to 50 dB

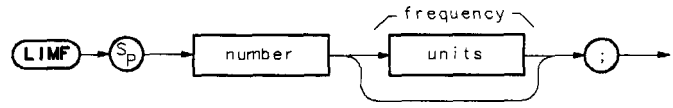
Program Example

```
120   ! This program demonstrates the use of the LIMD command
130   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";      ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";    ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMM -15DBM;LIMD 10DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                      ! Set up analyzer to display the
505                                   ! limit line.
510   END
```

LIMF

Limit-Line Frequency

Syntax



xf231a

Description

Use this command to enter a frequency value for a limit-line segment. This command is used along with the SEDI command while editing a table of limit-line segments.

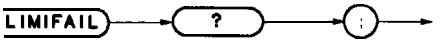
Program Example

```
120   ! This program demonstrates the use of the LIMF command
130   ! to generate a limit line:
150   !
160   OUTPUT718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";     ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";            ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";          ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";    ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";    ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";    ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";          ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";            ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";     ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";     ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML-80DBM;";
                                     ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";          ! Set segment type to slope.
300   OUTPUT 718;"SDON;";            ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU -5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT718;"EDITDONE;";         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                     ! Set up analyzer to display the
505                                  ! limit line.
510   END
```

LIMIFAIL

Limit-Fail Query

Syntax



xf232a

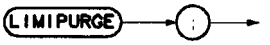
Description

This command is a query which returns a zero when a limit-line test passes. If an active trace fails the lower-amplitude parameter, the query response is 1; an upper-amplitude failure query response is 2. If an active trace fails both upper- and lower-limits, the query response is 3.

LIMIPURGE

Purge Limit Line

Syntax



xf233a

Description

Deletes the current limit line, but does not remove any limit-line tables saved in the module RAM. Use the DISPOSE command to remove limit-line tables from module memory.

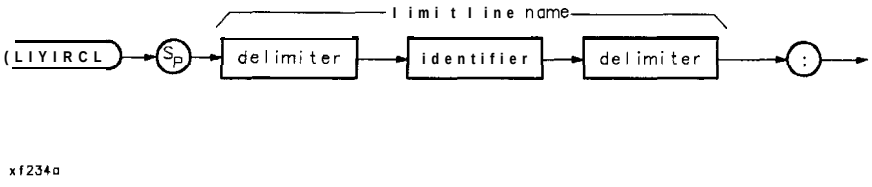
Program Example

```
130   ! This program demonstrates the use of the LIMIPURGE command
140   ! to generate a limit line:
150   !
160   OUTPUT718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";     ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";            ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";          ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT718;"LIMTFL;";           !! Set type of segment to flat.
250   OUTPUT 718;"SDON;";            !! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";     !! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";     ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML-80DBM;";
                                     ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";          ! Set segment type to slope.
300   OUTPUT 718;"SDON;";            ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"LIMTFL;"
340   OUTPUT 718;"SADD;SEDI 4;"; 1
350   OUTPUT 718;"LIMF 300MHZ;LIMU -5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT718;"EDITDONE;",         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                     ! Set up analyzer to display the
505                                  ! limit line.
510   END
```

LIMIRCL

Recall Limit Line

Syntax



xf234a

Description

Note

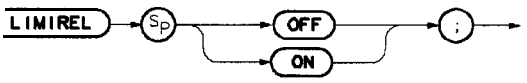
Limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). Limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

Recalls a limit-line set from the limit-line table in the module user memory. The table is stored in user memory with the LIMISAVE command. The command displays a limit line which is recalled by the name assigned to it. A limit line may be saved and given a name using the remote command LIMISAV, or entered from the front panel with the screen-title function. 'lb recall a limit line from a memory card, use the command CARDLOAD first to copy the limit line to the module memory. Use the LIMITEST ON command to display the line.

LIMIREL

Relative Limit line

Syntax



xf235a

Description

When set to ON, this command used with the EDITLIML command creates a relative limit line. The default setting is OFF, which makes the limit line amplitude and frequency parameters absolute.

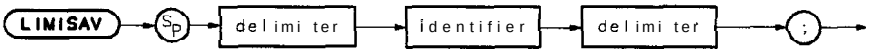
Program Example

```
130   ! This program demonstrates the use of the LIMIREL command
140   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL ON;";       ! Make sure it's a relative limit line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";    ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU -5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                      ! Set up analyzer to display the
505                                   ! limit line.
510   END
```

LIMISAV

Limit-Line Save

Syntax



xf236a

Description

Note

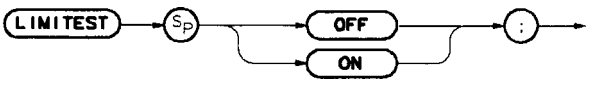
Limit lines stored on memory cards using a mass-memory module with firmware datecode 910116 or later cannot be read into a module with an earlier firmware datecode (for example, 890524). Limit lines stored on cards using modules with firmware datecode 890524 or earlier can be read into a module with firmware datecode 910116 or later.

This command saves the active limit line to module memory under the name assigned to it. Any previously existing limit line having the same name is overwritten with the new limit-line table data. Refer also to the LIMIRCL command. To save a limit line to the memory card, execute CARDSTORE after the LIMISAV command.

LIMITEST

Limit-Line Test

Syntax



xf237a

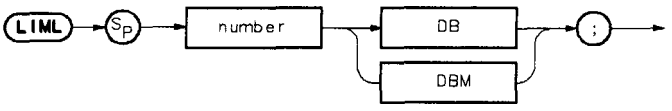
Description

This command activates the limit-line test function, which compares the trace data in the current sweep with the limits set up in the limit table of the active limit line. The results of the current active trace compared with the active limit line can be read using the LIMIFAIL command. When this command is set to ON, the active limit-line test limits are displayed on-screen along with a `LIMIT FAILED` message if the trace data fails.

LIML

Lower Limit-Line Value

Syntax



xf238a

Description

This command is used within the SEDI command to assign the lower-limit amplitude value to a limit-line segment. This command used with the LIMU command creates upper and lower limit-line amplitude parameters.

Parameter

Number range: -175 dB to 50 dB

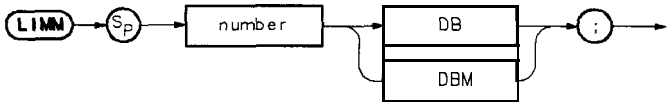
Program Example

```
130   ! This program demonstrates the use of the LIML command
140   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";      ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";    ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";    ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML -80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU -5DBM;LIML -25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                      ! Set up analyzer to display the
505                                   ! limit line.
510   END
```

LIMM

Middle Limit-Line Value

Syntax



xf239a

Description

This command is used within the SEDI command to assign a middle amplitude value to a limit line. This command used with the LIMD command create middle and delta limit-line amplitude parameters.

Parameter

Number range: -175 dB to 50 dB

Program Example

```
120   ! This program demonstrates the use of the LIMM command
130   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";      ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";    ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU -35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU -5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMM -15DBM;LIMD 10DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML -80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU -35DBM;LIML -80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
500   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
                                      ! Set up analyzer to display the
505                                   ! limit line.
510   END
```

LIMTFL

Flat Limit-Line Segment

Syntax

xf240a

Description

This command is used within the SEDI command to make the selected limit-line segment flat.

Program Example

```
130   ! This program demonstrates the use of the LIMTFL command
140   ! to generate a limit line:
150   !
160   OUTPUT718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";     ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";            ! Add segment to the limit line.
200   OUTPUT 718:"SEDI 1;";          ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";            ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";     ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";     ! Set frequency of segment 2.
280   OUTPUT718;"LIMU-35DBM;LIML-80DBM;";
                                     ! Set amplitude data for segment.
290   OUTPUT718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";            ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU-5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT718;"EDITDONE;";         ! End of limit-line definition.
491
492                                  ! Set up analyzer to display the
493                                  ! limit line.
494   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
500   END
```

LIMTSL

Sloped Limit-Line Segment

Syntax

xf241a

Description This command is used within the SEDI command to create a limit line with a sloped line segment.

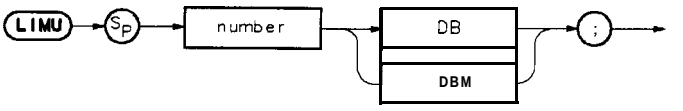
Program Example

```
130   ! This program demonstrates the use of the LIMTSL command
140   ! to generate a limit line:
150   !
160   OUTPUT718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";     ! Make sure it's an absolute limit line.
190   OUTPUT718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";          ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";     ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";     ! Set frequency of segment 2.
280   OUTPUT718;"LIMU-35DBM;LIML-80DBM;";
                                     ! Set amplitude data for segment.
290   OUTPUT718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718; "SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU-5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT718;"SDON;";
490   OUTPUT718;"EDITDONE;";         ! End of limit-line definition.
491   !
492                                  ! Set up analyzer to display the
493                                  ! limit line.
494   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
500   END
```

LIMU

Upper Limit-Line Value

Syntax



xf242a

Description

This command is used within the SEDI command to assign the upper-amplitude value to a limit-line segment. This command combined with the LIML command may be used to create upper and lower limit-line amplitude parameters.

Parameters

Number Range: -175 dB to 50 dB

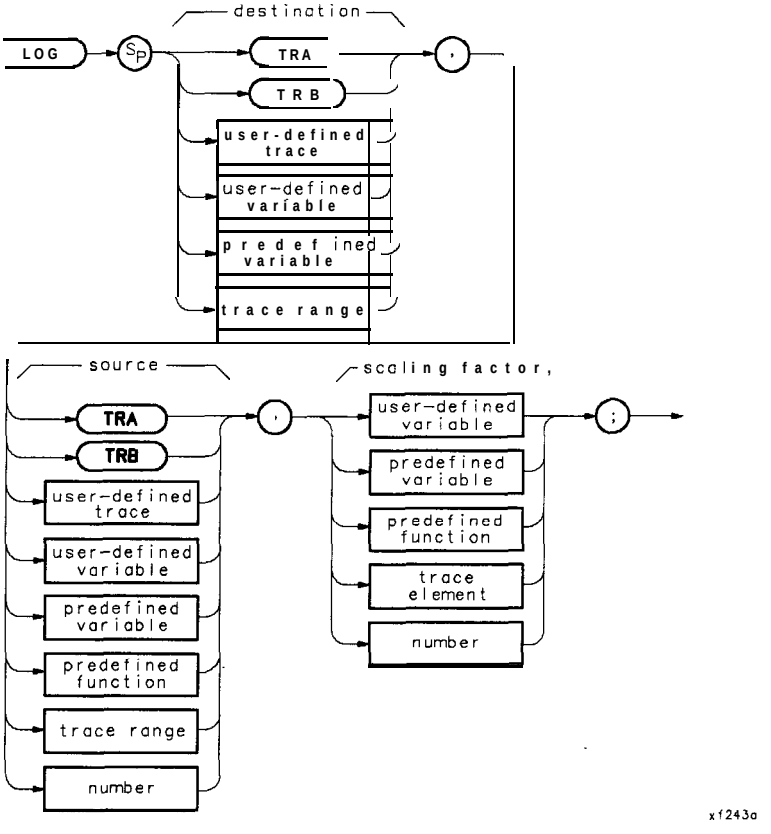
Program Example

```
130   ! This program demonstrates the use of the LIMU command
140   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";      ! Make sure it's an absolute limit line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add, then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU-35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU-5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
491   !
492                                   ! Set up analyzer to display the
493                                   ! limit line.
494   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
500   END
```

LOG

Logarithm

Syntax



Description

The logarithm (base 10) of the source is taken, the result is multiplied by a specified scaling factor, then sent to the destination.

Program Examples

Example #1

```
10    ! The following example shows the use of the LOG command.  The example
20    ! uses values from HP BASIC and concatenates them into the statements as
30    ! they are sent to the spectrum analyzer.
40    !
50    ASSIGN @Sa TO 718                  ! Assign I/O path to address 718.
60    !
70    OUTPUT@Sa;"CLRDSP;";               ! Clears the analyzer display.
80    !
90    OUTPUT @Sa;"VARDEF LOG_TEN,0;";    ! \ Initialize variables.
100   OUTPUT @Sa;"VARDEF YVAL,700;";     ! /
110   !
120   FOR I=100 TO 1000 STEP 100         ! Begin loop.
130      OUTPUT @Sa;"LOG LOG_TEN,"&VAL$(I)&",1;";
                                         ! Take the LOG and multiply
140                                      ! by scaling factor of 1.
150     OUTPUT @Sa;"PU;PA 20,YVAL;";     ! Position "pen" for text.
160     OUTPUT @Sa;"TEXT %The LOG of %;";
                                         ! Write text.
170     OUTPUT @Sa;"DSPLY "&VAL$(I)&",6,3;";
                                         ! Write a value.
180     OUTPUT @Sa;"TEXT % = %;";        ! Write text.
190     OUTPUT @Sa;"DSPLY LOG_TEN,5,3;";
                                         ! Write a value.
200     OUTPUT @Sa;"SUB YVAL,YVAL,50;";  ! Calculate new "pen" position.
210   NEXT I                             ! End loop.
220   !
230   ASSIGN @Sa TO *                    ! Close I/O path.
240   END
```

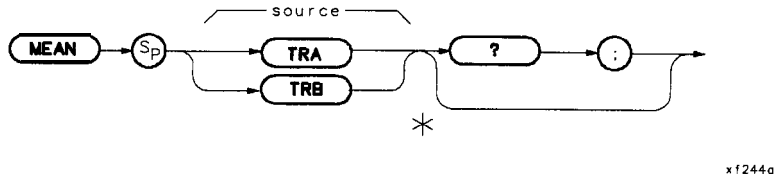
Example #2

```
10    !The following example shows another use of the LOG command. This example
20    !performs the same function as the previous example, but is fully
30    !downloadable. Note that only minor changes need to be made to convert
40    !a program from computer-dependent to computer-independent! This method
50    !is also visibly much faster for the spectrum analyzer to execute.
60    !
70    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
80    !
90    OUTPUT @Sa;"FUNCDEF LOG_EX,@;"
                                           ! Logical start of DLP.
100   OUTPUT@Sa;"CLRDSP;";                 ! Clears the analyzer display.
110   !
120   OUTPUT @Sa;"VARDEF LOG_TEN,0;";      ! \ Initialize variables.
130   OUTPUT @Sa;"VARDEF YVAL,700;";       ! /
140   OUTPUT @Sa;"VARDEF LP_CTR,100;";     ! Initialize loop counter.
150   !
160   OUTPUT@Sa;"REPEAT;";                 ! Begin loop.
170      OUTPUT @Sa;"LOG LOG_TEN,LP_CTR,1;";
                                           ! Take the LOG and multiply
175                                        ! by scaling factor of 1.
190      OUTPUT @Sa;"PU;PA 20,YVAL;";      ! Position "pen" for text.
200      OUTPUT @Sa;"TEXT %The LOG of %;"; ! Write text.
210      OUTPUT @Sa;"DSPLY LP_CTR,6,3;";   ! Write a value.
220      OUTPUT @Sa;"TEXT % = %;";         ! Write text.
230      OUTPUT @Sa;"DSPLY LOG_TEN,5,3;";  ! Write a value.
240      OUTPUT @Sa;"SUB YVAL,YVAL,50;";   ! Calculate new "pen" position.
250      OUTPUT @Sa;"ADD LP_CTR,LP_CTR,100;";
                                           ! Increment loop counter.
260   OUTPUT @Sa;"UNTIL LP_CTR,GT,1000;";  ! End loop.
270   OUTPUT @Sa;"@;"
280   !
290   OUTPUT@Sa;"LOG_EX;";                 ! Execute the DLP.
300   ASSIGN @Sa TO *                      ! Close I/O path.
310   END
```

MEAN

Trace Mean

Syntax



Note This bypass command path is only legal if you use MEAN as a predefined function. It must reside within a compatible-function operation.

Description

Returns the mean value of a trace in measurement units. This single value must be used as the <source> of another function. In the first example below, MEAN TRA is the source for the MOV command.

Program Examples

Example #1

```
10    ! The following example shows how to use the trace MEAN function
20    ! to return the mean value to the controller using an internal-variable.
30    !
40    INTEGER Mean-value                    ! Define an INTEGER variable.
50    ASSIGN @Sa TO 718                     ! Assign I/O path to address 718.
60    OUTPUT @Sa;"VARDEF M_VALUE,0;";       ! Define an analyzer variable.
70    OUTPUT @Sa;"MOV M_VALUE,MEAN TRA;"; ! Determine the mean of trace A.
80    OUTPUT@Sa;"M_VALUE?;"                 ! Return contents of variable.
90    ENTER@Sa;Mean_value                   ! Read value from analyzer.
100   PRINT "MEAN of trace A in measurement units = ";Mean_value
110   ASSIGN @Sa TO *                       ! Close I/O path.
120   END
```

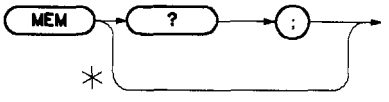
Example #2

```
10    ! The following example shows how to use the trace MEAN function to return
20    ! the mean value of the specified trace to the controller.
30    !
40    INTEGER Mean-value          ! Define an INTEGER variable.
50    ASSIGN @Sa TO 718           ! Assign I/O path to address 718.
60    OUTPUT @Sa;"MEAN TRA,?;";   ! Determine the mean of trace A.
70    ENTER@Sa;Mean_value         ! Read value from analyzer.
80    PRINT "MEAN of trace A in measurement units = ";Mean_value
90    ASSIGN @Sa TO *             ! Close I/O path.
100   !
110   END
```

MEM

Memory Available

Syntax



xf245a

Note This bypass command path is only legal if you use MEM as a predefined function. It must reside within a compatible-function operation.

Description

Use this command to query the amount of unused user memory. This command cannot be used within a DLP (or a FUNCDEF). The quantity is dependent on the following conditions:

- number and length of DLPs stored
- number of traces stored
- number of limit lines stored
- number and length of variables stored

The following commands use available memory to store data:

- LIMISAV (save a limit line)
- ARRAYDEF (define an array)

a TRDEF (define a trace)

- VARDEF (define a variable)
- FUNCDEF (define a function)
- ONEOS (on-end-of-sweep)
- REPEAT/UNTIL (looping construct sent as remote HP-IB command)
- IF/THEN/ELSE/ENDIF (conditional construct sent as remote HP-IB command)
- MODSAVT (save trace data in module memory)

Related Commands: DISPOSE, FUNCDEF, VARDEF, LCLVAR, ARRAYDEF, TRDEF, REPEAT/UNTIL, IF/THEN, and ONEOS

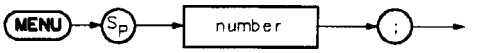
Program Example

```
10    ! The following example shows the use of the MEM command.
20    !
30    ASSIGN @Sa TO 718              ! Assign I/O path to address 718.
40    !
50    OUTPUT @Sa;"IP;";              ! Instrument preset.
60    !
70    OUTPUT @Sa;"MEM?;";            ! Query available memory.
80    ENTER @Sa;A_mem                ! Enter value.
90    PRINT "AVAILABLE ANALYZER MEMORY = ";A_mem;" BYTES"
100   !
110   ASSIGN @Sa TO *                ! Close I/O path.
120   END
```

MENU

Show the User Key Menu

Syntax



xf246a

Description

This command can be used in a DLP only to display the module User Keys menu you specify. Specify zero to display the User Keys menu with all labels removed, 1 to display the first level of user keys (1 through 5), and 2 to display the second level of user keys (6 through 10). This command is used only within a DLP and has no meaning if the spectrum analyzer is in remote mode. It must be used in a user-defined function, or DLP. If used from an external controller, an error results.

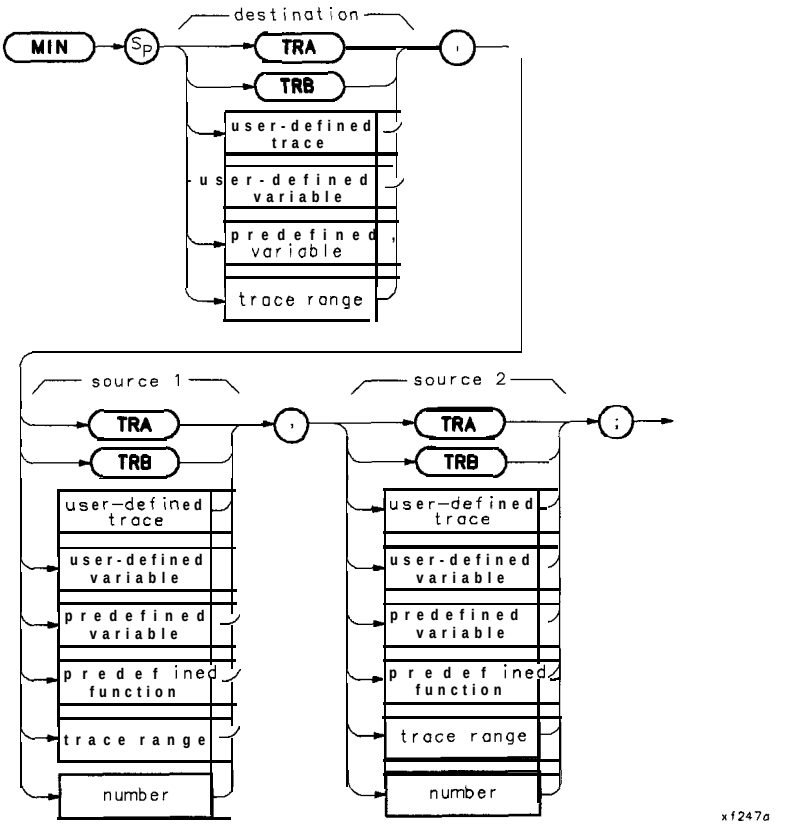
Program Example

```
10    ! The following example shows the use of the MENU command.  The
20    ! example is a function that loads two user softkeys. By executing
30    ! this function (from the front panel), softkeys will be displayed
40    ! which can then be used to execute other previously loaded DLPs.
50    !
60    ASSIGN @Sa TO 718                          ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF DISP_KEYS,@;";         ! Logical start of DLP.
90    OUTPUT @Sa;"KEYDEF 1,BOX,%DRAW BOX%;";     ! Create a labeled softkey.
100   OUTPUT @Sa;"KEYDEF 2,DBM_TO_MW,%dBm TO mW%;";
                                                 !Create another softkey.
110   OUTPUT @Sa;"MENU 1;";                      ! Display softkey menu 1.
120   OUTPUT @Sa;"@;";                           ! Logical end of DLP.
130   !
140   ASSIGN @Sa TO *                            ! Close I/O path.
150   END
```

MIN

Minimum

Syntax



Description

Compares source 2 with source 1, point by point, and sends the lesser value of each comparison to the destination.

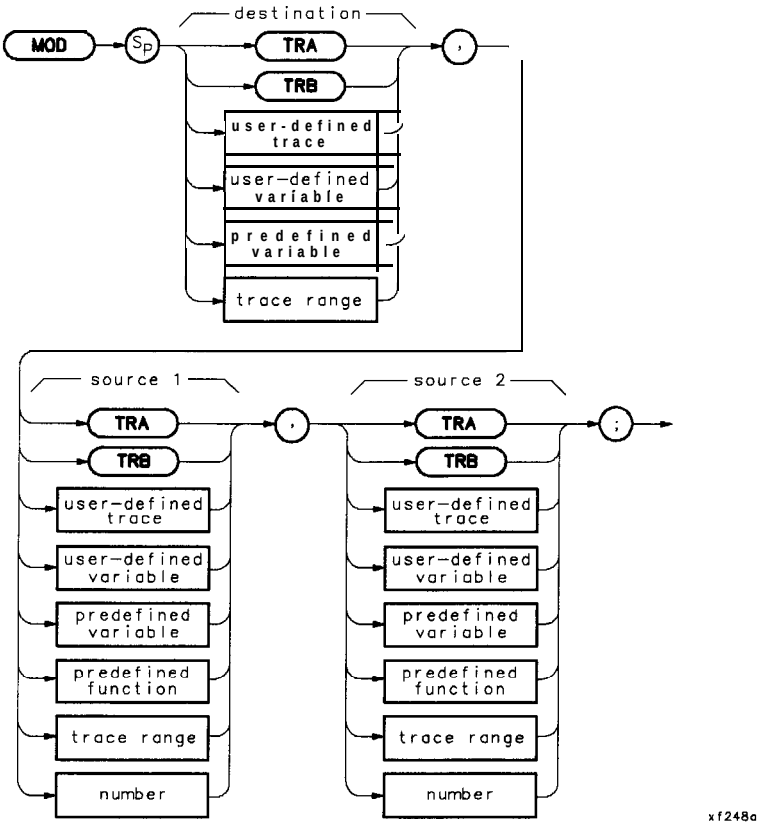
Program Example

```
10    ! The following example shows a use of the MIN command.  The example
20    ! requires an input signal of 300 MHz, such as the CAL OUTPUT.
30    !
40    ASSIGN @Sa TO 718              ! Assign I/D path to address 718.
50    !
60    OUTPUT @Sa;"IP;";              ! Instrument preset.
70    OUTPUT @Sa;"CF 300MHZ; SP 200KHZ;";
                                     ! Set center frequency and span.
80    OUTPUT @Sa;"CLRW TRA;";        ! Clear-write trace A.
90    OUTPUT @Sa;"CLRW TRB;";        ! Clear-write trace B.
100   OUTPUT @Sa;"TS;";              ! Update the display.
110   OUTPUT @Sa;"VIEW TRA;";        ! View trace A.
120   !
130   FOR Counter=1 TO 10
140      OUTPUT @Sa;"APB;";          ! A + B --> A
150   NEXT Counter
160   OUTPUT @Sa;"AMB ON;";          ! A - B --> A
170   !
180   OUTPUT @Sa;"MIN TRA,TRA,TRB;"; ! Compare trace A and trace B.
190                                  ! Put the minimum point in trace A.
200   OUTPUT @Sa;"BLANK TRB;";       ! Blank trace B to view the results
210   !
220   ASSIGN @Sa TO *                ! Close I/O path.
230   END
```

MOD

Module

Syntax



Description

Divides source 1 by source 2 and sends the remainder to the destination. If source 2 is zero, an error occurs, and source 1 becomes the result.

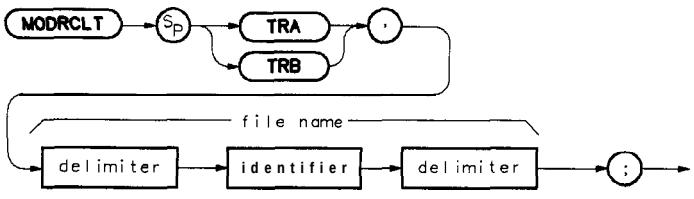
Program Example

```
10    ! The following example shows the use of the MOD command.  The
20    ! instructions within the FUNCDEF '@' delimiters form a structure
30    ! called a DLP (downloadable program).
40    !
50    ASSIGN @Sa TO 718                  ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"IP;";                  ! Instrument preset.
80    OUTPUT @Sa;"FUNCDEF M_OD_EX,@;";   ! Logical start of the DLP.
90    OUTPUT @Sa;"VARDEF DIVIDEND,10;"; ! Create variable and initialize to IO.
100   OUTPUT @Sa;"VARDEF DIVISOR,6;";    ! Create variable and initialize to 6.
110   OUTPUT @Sa;"VARDEF RESULT,0;";     ! Create variable.
120   !
130   OUTPUT @Sa;"MOD RESULT,DIVIDEND,DIVISOR;";
                                         ! Perform calculation.
140   OUTPUT @Sa;"CLRDSP;";              ! Clear display.
150   OUTPUT @Sa;"PU;PA 10,400;";        ! Move pen to starting position.
160   OUTPUT @Sa;"DSPLY DIVIDEND,4,2;TEXT % MOD %;";  ! \ Display calculation
170   OUTPUT @Sa;"DSPLY DIVISOR,2,1;";                !   and results.
180   OUTPUT @Sa;"TEXT % =%;DSPLY RESULT,2,0;";       ! /
190   OUTPUT @Sa;"@;";                   ! Logical end of the DLP.
200   !
210   OUTPUT @Sa;"M_OD_EX;";             ! Have the analyzer execute the
220    ! DLP M_OD_EX.
230   !
240   ASSIGN @Sa TO *                    ! Close I/O path.
250   END
```

MODRCLT

Recall Trace from Module Memory

Syntax



xf249a

Description

Recall a specified trace from the source specified by the MSDEV command, to the TRA or TRB of the instrument. This command specifies that the recall occur from a memory module or memory card as specified by the MSDEV command.

Note

For firmware datecode 890524 and earlier:

If more than one trace is labeled with the same name, MODRCLT cannot distinguish between them.

Note

Traces stored on memory cards using a mass-memory module with firmware **datecode** 910116 or later cannot be read into a module with an earlier firmware **datecode** (for example, 890524). Traces stored on cards using modules with firmware **datecode** 890524 or earlier can be read into a module with firmware **datecode** 910116 or later.

Prerequisite Command: MSDEV

Related Commands: MODSAVET and DISPOSE

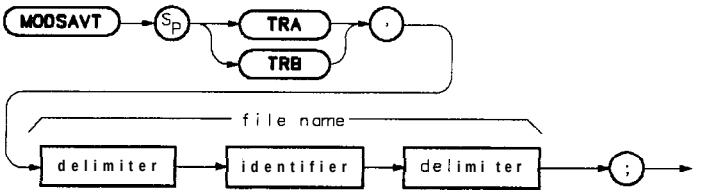
Program Example

```
10    ! The following example shows the use of the MODRCLT command.  The
20    ! instructions within the FUNCDEF '@' delimiters form a structure
30    ! called a DLP (downloadable program).
40    !
50    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"FUNCDEF GET_TRC,@;";     ! Logical start of the DLP.
80    OUTPUT @Sa;"IP;SNGLS;TS;VIEW TRA;"; ! Set up the analyzer.
90    OUTPUT @Sa;"MSDEV MEM;";             ! Tell the analyzer where the
100                                        ! trace is stored.
110   OUTPUT @Sa;"MODRCLT TRA,%CAL_OUT%;";! Recall the trace from memory.
120   OUTPUT @Sa;"@;";                     ! Logical end of the DLP.
130   OUTPUT @Sa;"GET_TRC;";               ! Execute the DLP.
140   !
150   ASSIGN @Sa TO *                      ! Close I/O path.
160   END
```

MODSAVT

Save Trace in Module Memory

Syntax



xf250a

Description

This command saves a trace in module memory by its created name or by the default name, *trace*. The spectrum analyzer state and the time and date the trace was saved is also stored. The trace is stored in the destination specified with the MSDEV command.

Note

For firmware datecode 890524 and earlier: It is recommended that unique names be assigned to each trace, since the **MODRCLT** command does not distinguish traces by the time and date stamp. In addition, when traces are saved on the card the title is modified. If no name is given, the title becomes TR plus the last five digits of the time and date stamp. If a name is given, the title becomes the first four characters of the name plus the last five digits of the time and date stamp.

Note

Traces stored on memory cards using a mass-memory module with firmware **datecode** 910116 or later cannot be read into a module with an earlier **firmware datecode** (for example, 890524). Traces stored on cards using modules with firmware **datecode** 890524 or earlier can be read into a module with firmware **datecode** 910116 or later.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Prerequisite Command: MSDEV

Related Commands: MODRCLT and DISPOSE

Program Example

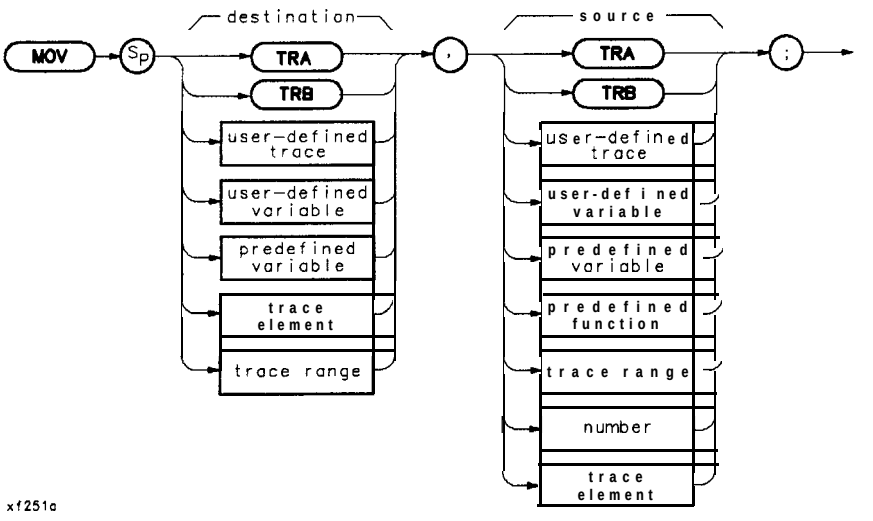
```
10    ! The following example shows the use of the MODSAVT command. The
20    ! instructions within the FUNCDEF '@' delimiters form a structure
30    ! called a DLP (downloadable program).
40  !
50    ASSIGN @Sa TO 718                          ! Assign I/O path to address 718.
60  !
70    OUTPUT @Sa;"FUNCDEF SAVE_TRC,@;";          ! Logical start of the DLP.
80    OUTPUT @Sa;"IP;CF 300MHZ;SP 1MHZ;TS;";   ! Set up the analyzer.
```

```
90    OUTPUT @Sa;"MSDEV MEM;";                  ! Tell the analyzer where the
100                                             ! trace is to be stored.
110   OUTPUT @Sa;"MODSAVT TRA,%CAL_OUT%;";      ! Store the trace.
120   OUTPUT @Sa;"@;";                          ! Logical end of the DLP.
130   OUTPUT @Sa;"SAVE_TRC;";                   ! Execute the DLP.
140 !
150   ASSIGN @Sa TO *                           ! Close I/O path.
160   END
```

MOV

Move

Syntax



Description Store the source contents in the destination.

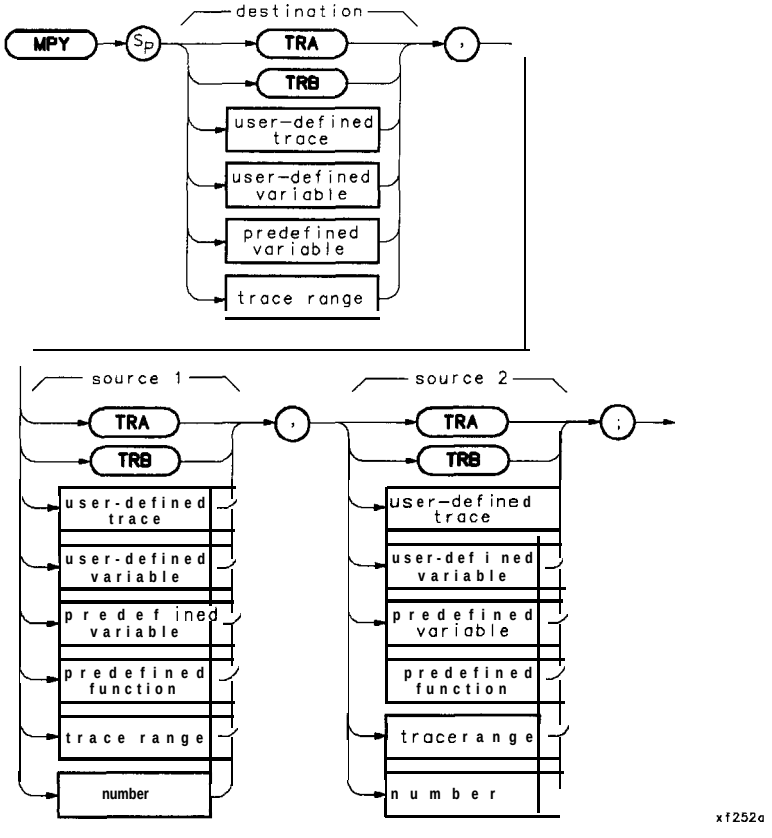
Program Example

```
10    ! The following example shows the use of the MOV command.  The example
20    ! uses an input signal of 300 MHz,such as the CAL OUTPUT, and looks at
30    ! its harmonics.  An input signal is not necessary to the function of
40    ! this example, but acts as a visual aid.
50    !
60    ASSIGN @Sa TO 718                      ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF INCRFREQ,@;";      ! Logical start of the DLP function.
90    OUTPUT @Sa;"VARDEF FREQ,300E6;";       ! Create variable and initialize to
                                               300 MHz.
100   OUTPUT @Sa;"IP;SP 1MHZ;";              ! Instrument preset; set span;
110   !
120   OUTPUT @Sa;"REPEAT;";                  ! Begin loop.
130   OUTPUT @Sa;" MOV CF,FREQ;";            ! Set center frequency.
140   OUTPUT @Sa;" TS;";                     ! Take a sweep to update display.
150   OUTPUT @Sa;"  ADD FREQ,FREQ,300E6;";   ! Increase FREQ by 300 MHz.
160   OUTPUT @Sa;"UNTIL FREQ,GT,3E9;";       ! End of loop.
170   OUTPUT @Sa;"@;";                       ! Logical end of DLP function.
180   !
190   OUTPUT @Sa;" INCRFREQ;";               ! Execute function.
200   ! 210   ASSIGN @Sa TO *                ! Close I/O path.
220   END
```

MPY

Multiply

Syntax



Description

Multiplies source 1 by source 2, point by point, and sends the result to the destination. In case of destination overflow, an error is reported and the result is limited to its maximum legal value with a proper sign.

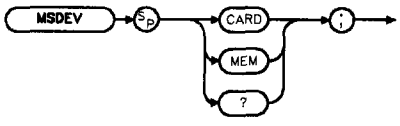
Program Example

```
10    ! The following example shows the use of the MPY command.  The example
20    ! uses an input signal of 300MHz, such as the CAL OUTPUT) and looks at
30    ! its harmonics.  An input signal is not necessary to the function of
40    ! this example, but acts as a visual aid.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF MPYEX,@;";       ! Logical start of the DLP function.
90    OUTPUT @Sa;"VARDEF FUNDMNTL,300E6;";
                                           ! Create variable and initialize to
                                           ! 300 MHz.
100   OUTPUT @SA;"VARDEF HARMNC,0;";       ! Create variable and initialize to 0.
105   OUTPUT @Sa;"MOV HARMNC,FUNDMNTL;";   ! Let HARMNC equal
                                           ! FUNDMNTL.
110   OUTPUT @Sa;"VARDEF HARMNUM,0;";      ! Initialize HARMNUM to 0.
120   OUTPUT @Sa;"IP;SP 1MHZ;";            ! Instrument preset; set span.
130   !
140   OUTPUT @Sa;"REPEAT;";                ! Begin loop.
150   OUTPUT @Sa;" ADD HARMNUM,HARMNUM,1;";
                                           ! Increment to next harmonic.
160   OUTPUT @Sa;"  MPY HARMNC,FUNDMNTL,HARMNUM;";
                                           ! Harm freq=fund * harm num.
170   OUTPUT @Sa;"  MOV CF,HARMNC;";       ! Set center frequency.
180   OUTPUT  @Sa;"TS;";                   ! Take a sweep to update display.
190   OUTPUT @Sa;"UNTIL HARMNC,GE,3E9;";   ! End of loop.
200   OUTPUT  @Sa;"@;";                    ! Logical end of DLP function.
210   !
220   OUTPUT @Sa;"MPYEX;";                 ! Execute function.
230   !
240   ASSIGN @Sa TO *                      ! Close I/O path.
250   END
```

MSDEV

Mass Storage Device

Syntax

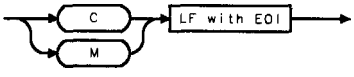


xf253a

Description

Establishes the data storage and access device as either the module memory or the memory card.

Query Response



QMSDEV

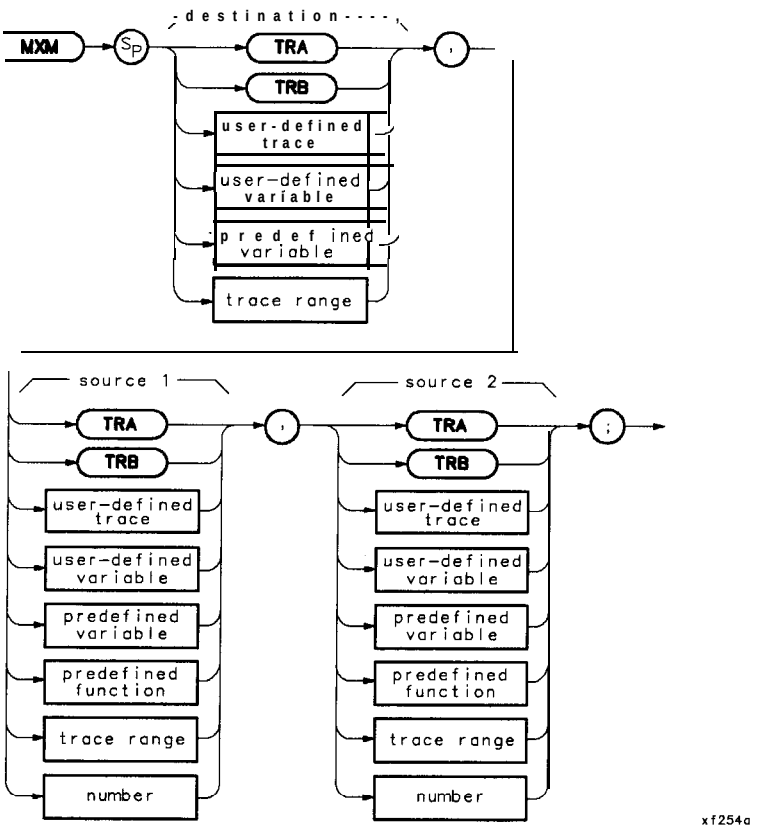
Program Example

```
10    ! The following example shows the use of the MSDEV command. The
20    ! instructions within the FUNCDEF '@' delimiters form a structure
30    ! called a DLP (downloadable program).
40    !
50    ASSIGN @Sa TO 718                        ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"FUNCDEF SAVE_TRC,@;";        ! Logical start of the DLP.
80    OUTPUT @Sa;"IP;CF300MHZ;SP 1MHZ;TS;";! Set up the analyzer.
90    OUTPUT @Sa;"MSDEV CARD;";                ! Tell the analyzer where the
100   !
110   OUTPUT @Sa;"MODSAVT TRA,%CAL_OUT%;";     ! Store the trace on the card.
120   OUTPUT @Sa;"@;";                         ! Logical end of the DLP.
130   OUTPUT @Sa;"SAVE_TRC;";                  ! Execute the DLP.
140   !
150   ASSIGN @Sa TO*                           !Close I/O path.
160   END
```

MXM

Maximum

Syntax



Description

Compares source 2 with source 1, point by point, and sends the greater value of each comparison to the destination.

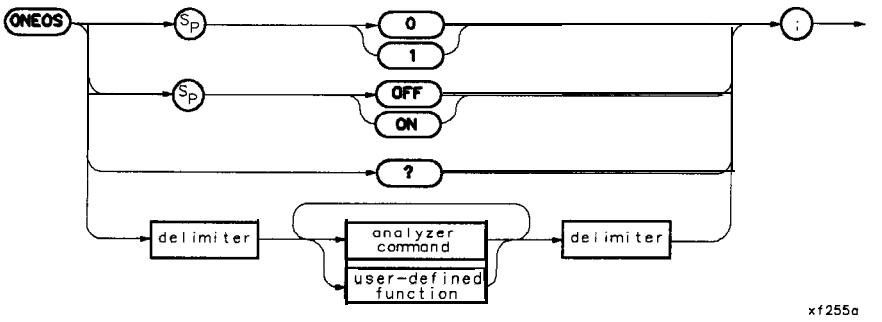
Program Example

```
10    ! The following example shows a use of the MXM command.  The example
20    ! requires an input signal of 300 MHz, such as the CAL OUTPUT signal.
30    !
40    ASSIGN @Sa TO 718              ! Assign I/O path to address 718.
50    !
60    OUTPUT @Sa;"IP;";              ! Instrument preset.
70    OUTPUT @Sa;"CF 300MHZ; SP 200KHZ;";
                                     ! Set center frequency and span.
80    OUTPUT @Sa;"CLRW TRA;";        ! Clear-write trace A.
90    OUTPUT @Sa;"CLRW TRB;";        ! Clear-write trace B.
100   OUTPUT @Sa;"TS;";              ! Update the display.
110   OUTPUT @Sa;"VIEW TRA;";        ! View trace A.
120   !
130   FOR Counter=1 TO 10
140      OUTPUT @Sa;"APB;";          ! A + B --> A
150   NEXT Counter
160   OUTPUT @Sa;"AMB ON;";          ! A - B --> A
170   !
180   OUTPUT @Sa;"MXM TRA,TRA,TRB;"; ! Compare trace A and trace B.
190                                  ! Put the maximum point in trace A.
200   OUTPUT @Sa;"BLANK TRB;";       ! Blank trace B to view the results.
210   ASSIGN @Sa TO *                ! Close I/O path.
220   END
```

ONEOS

On End of Sweep

Syntax



Description

ONEOS is a predefined function name. The contents of ONEOS are executed at the end of a sweep, after completing trace processing and all other end-of-sweep functions.

User memory is required to execute the ONEOS command. The ONEOS command allocates memory which can be freed with the DISPOSE command.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

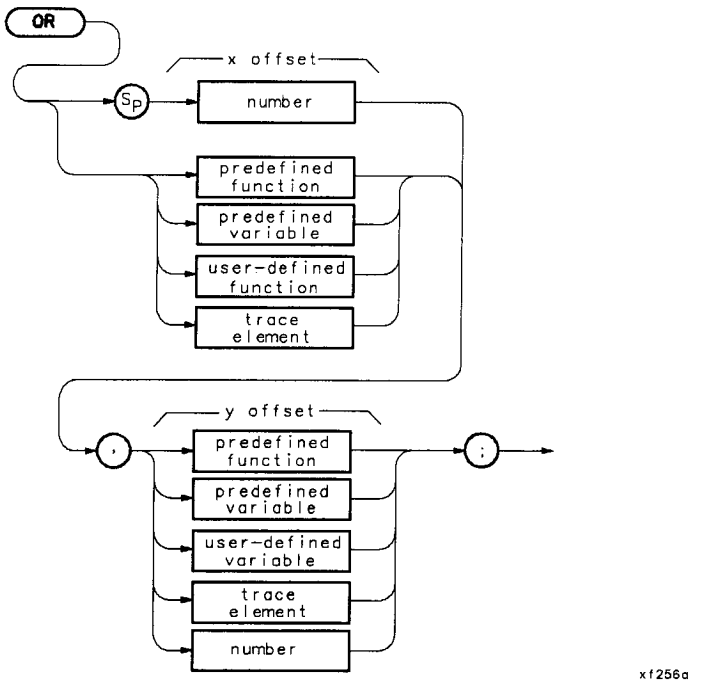
Program Example

```
10    ! The following example shows the use of the ONEOS command. The
20    !  example uses an input signal of 300 MHz such as the CAL OUTPUT.
30    !
40    ASSIGN @Sa TO 718              ! Assign I/O path to address 718.
50    !
60    OUTPUT @Sa;"IP;ST 1SC;TS;";    ! Instrument preset; set sweep
70                                   ! time; take a sweep.
80    OUTPUT @Sa;"ONEOS $CF 300MHZ;SP 1MHZ;$;";
                                     ! At the end of the following
90                                   ! sweep, set frequency and span.
100   OUTPUT @Sa;"TS;ONEOS OFF;";    ! Take sweep; turn ONEOS off.
110   !
120   ! Note: If the ONEOS OFF command is not given, the analyzer will
130   ! continue to set the frequency and span at the end of each sweep.
140   !
150   ASSIGN @Sa TO *                ! Close I/O path.
160   END
```

OR

Set Origin of Graphics Pen

Syntax



Description

Use this command to set the origin of the graphics pen as determined by the values of the x- and y-coordinate offsets.

Note

For the OR command to function properly in conjunction with the DSPLY command, you must use PU or PA after OR to position the graphics pen correctly.

Prerequisite Command: VARDEF

Related Commands: PA and PR

Preset State: OR 0,0

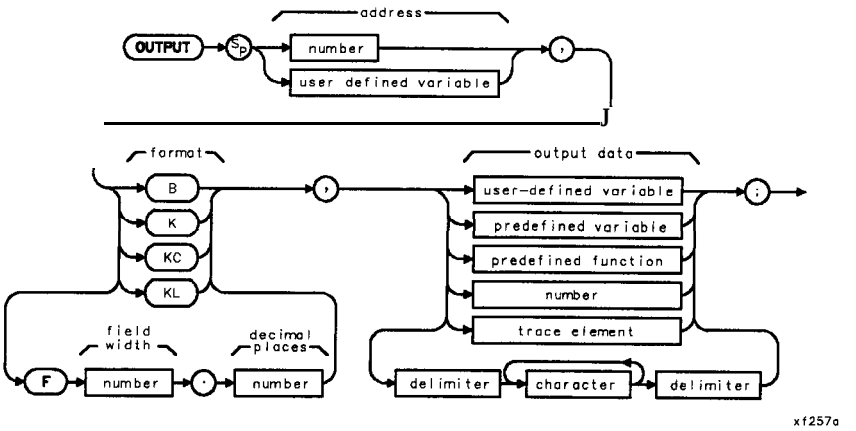
Program Example

```
10    ! The following example shows the use of the OR command.  The example
20    ! creates and displays two boxes.  The function 'BOX' always draws the
30    ! same box but it appears in a different area of the screen according
40    ! to the position of the ORigin.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    OUTPUT @Sa;"FUNCDEF DRAW_BOXES,$;";  ! Logical start of function.
80    OUTPUT @Sa;" IP;";                   ! Instrument preset.
90    OUTPUT @Sa;" CLRDSP;";               ! Clear the analyzer screen.
100   OUTPUT @Sa;" OR 0,0;";               ! Set origin to lower left corner
110                                        ! of graticule.
120   OUTPUT @Sa;" BOX;";                  ! Draw box.
130   OUTPUT @Sa;" OR 200,200;";           ! Move origin to a different spot.
140   OUTPUT @Sa;" BOX;";                  ! Draw the same box.
150                                        ! Note that it appears in a
160                                        ! different place on the analyzer.
170   OUTPUT @Sa;"$;";                     ! Logical end of function.
180   !
190   !
200   OUTPUT @Sa;"FUNCDEF BOX,@;";         ! Logical start of function 'BOX'.
210   OUTPUT @Sa;" PU;PA 200,200;";        ! Move pen to starting point.
220   OUTPUT @Sa;" PD;PR 240,0;";          ! \
230   OUTPUT @Sa;" PR 0,240;";             ! \ Draw
240   OUTPUT @Sa;" PR -240,0;";            ! / rectangle.
250   OUTPUT @Sa;" PR 0,-240;";            ! /
260   OUTPUT @Sa;"@;";                     ! Logical end of function.
270   !
280   OUTPUT @Sa;"DRAW-BOXES;";            ! Execute DLP.
290   ASSIGN @Sa TO *                      ! Close I/O path.
300   END
```

OUTPUT

Output to HP-IB

Syntax



Description

This command sends output data in the format appropriate to the addressed device. The data may be from a function definition or a DLP. The command assumes the CTRLHPIB command has been executed to place the spectrum analyzer in controller mode. If a controller is detected on HP-IB, the command is aborted. The output format is determined by the format field specifications.

Related commands: RELHPIB, ENTER, and CTRLHPIB

Parameters

Address — Integers 0 to 30 are for the HPIB interface, excluding the HP-IB address of the spectrum analyzer.

Integers 98 and 99 are for the Auxiliary interface. *

98 outputs with the least-significant bit (LSB) of the serial data byte first.

99 outputs with the most-significant bit (MSB) of the serial data byte first.

Format

B Output a single 8-bit byte to the specified interface.

F Output a number in ASCII format, using the specified field width and precision, with LF and END terminators.

K Output in ASCII format, without a terminator, to a free field.

KC Output in ASCII format, with CR and LF terminators, to a free field.

KL Output in ASCII format, with LF and END terminators, to a free field.

Related Commands: CTRLHPIB, RELHPIB, and ENTER

---

* These auxiliary interface connector commands can only be accessed remotely using DLPs, and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

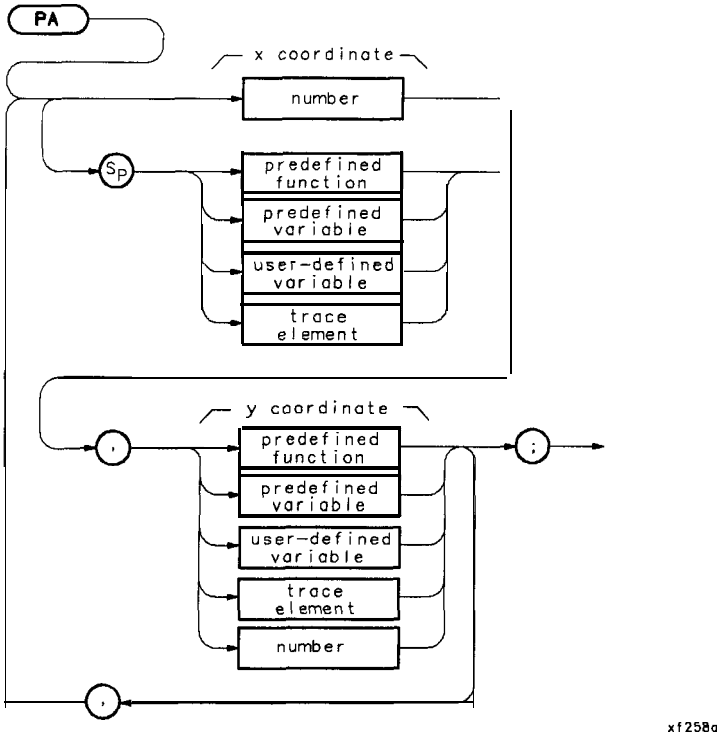
Program Example

```
10    ! The following example shows how to use the OUTPUT command to have
20    ! the analyzer send data to another HP-IB device.  The instructions
30    ! within the FUNCDEF '@' delimiters form a structure called a
40    ! DLP (downloadable program).
50   !
60    ! NOTE: A printer (HP-IB address 01) needs to be connected.
70    !
80    ASSIGN @Sa TO 718                        ! Assign I/O path to address 718.
90    !
100   OUTPUT @Sa;"FUNCDEF E_XMPLE,@;";         ! Logical start of the DLP.
110   OUTPUT @Sa;" CTRLHPIB;";                 ! Tells analyzer to take control
120                                            ! of the bus.
130   OUTPUT @Sa;"  MKN;";                     ! Turn on a marker.
140   OUTPUT @Sa;" OUTPUT 1,KC,'THIS IS AN EXAMPLE OF THE ANALYZER
SENDING';";
150   OUTPUT @Sa;" OUTPUT 1,KC,'DATA TO ANOTHER HPIB DEVICE';";
160   OUTPUT @Sa;" OUTPUT 1,KC,";";
170   OUTPUT @Sa;"OUTPUT 1,K,'MARKER FREQUENCY = ';";
180   OUTPUT @Sa;" OUTPUT 1,K,MKF;";
190   OUTPUT @Sa;" OUTPUT 1,KC,' Hz';";
200   OUTPUT @Sa;" OUTPUT 1,KC,";";
210   OUTPUT @Sa;" RELHPIB;";                  ! Release HP-IB control.
220   OUTPUT @Sa;"@;";                         ! Logical end of the DLP.
230   !
240   OUTPUT @Sa;"E_XMPLE;";                   ! Have the analyzer execute the
250                                            ! DLP E,XMPLE.
260   SEND 7;UNL TALK 18 LISTEN 1 DATA         ! Send to HP-IB select code 7 the
270                                            ! commands necessary to allow
280                                            ! the analyzer (address 18) to
290                                            ! talk to the printer (address 1)
300                                            ! while this controller is still
310                                            ! connected.
320   LOCAL 7                                  ! Local HP-IB select code 7.
330   WAIT 2                                   ! Wait for printer to finish.
340   REMOTE 7                                 ! Toggle the HP-IB REN line.
350   LOCAL @Sa                                ! Local the SA.
360   !
370   ASSIGN @Sa TO *                          ! Close I/O path.
380   END
```

P A

Plot Absolute

Syntax



Description

This command moves the pen from its current position to the position specified by the coordinates with respect to the origin (refer to the OR command). A line is drawn if the pen is down. Refer to PD (pen down) or PU (pen up) commands. The x and *y* coordinates are in measurement units.

Note

With the origin at (O,O), the lower left-hand corner of the spectrum analyzer graticule is at (100,100) and the upper right-hand comer is at (700,700).

Parameters

The following parameters apply with OR set to 0,0.

X Maximum = 710 Y Maximum = 710 X Minimum = 90 Y Minimum = 25

Related Commands: OR, PU, PD, and DSPLY

Program Example

```
10    ! The following example shows the use of the PA, PR, PU, and PD commands.
20    ! The figures drawn are an ellipse within a rectangle.
30    !
40    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50    OUTPUT @Sa;"IP;";                ! Instrument preset.
60    OUTPUT @Sa;"CLRDSP;";            ! Clear the analyzer screen.
70    !
80                                     ! Draw a rectangle with fixed points.
90    OUTPUT @Sa;"PU;PA 300,300;";     ! Move pen to starting point.
100   OUTPUT @Sa;"PD;PR 240,0;";       ! \
110   OUTPUT @Sa;"PR 0,240;";          ! \ Draw
120   OUTPUT @Sa;"PR -240,0;";         ! / rectangle.
130   OUTPUT @Sa;"PR 0,-240;";         ! /
140   !
150                                    ! Draw an ellipse with calculated points.
160   OUTPUT @Sa;"PU;PA 415,305; PD;";
                                       ! Move pen to starting point.
170   FOR I=0 TO 2*PI STEP PI/40
180      X=PROUND(10*COS(I),-3)        ! \ Calculate x and y
190      Y=PROUND(10*SIN(I),-3)        ! / coordinates.
200      !
210      OUTPUT @Sa;"PR "&VAL$(X)&","&VAL$(Y)&";";
                                       ! Create plot statement using
220                                    ! calculated coordinates.
230   NEXT I
240   !
250   ASSIGN @Sa TO *                  ! Close I/O path.
260   END
```

PD

Pen Down

Syntax

xf259a

Description

This command causes the pen to draw a line when the PA or PR commands are activated.

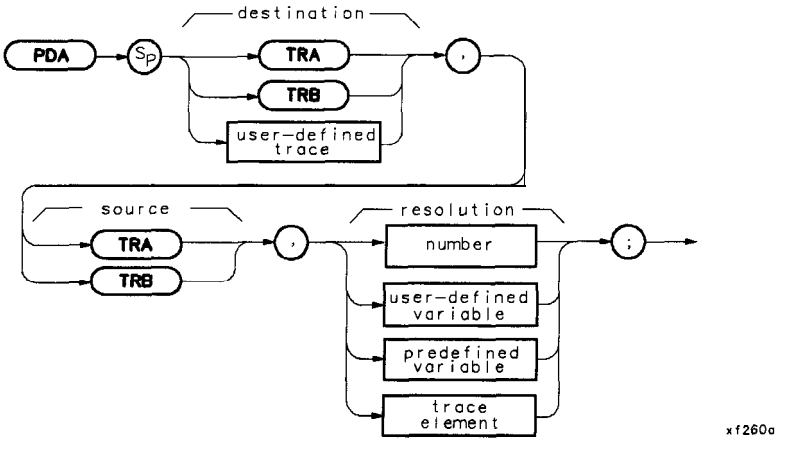
Program Example

```
10    ! The following example shows the use of the PA, PR, PU, and PD commands.
20    ! The figures drawn are an ellipse within a rectangle.
30    !
40    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50    OUTPUT @Sa;"IP;";                ! Instrument preset.
60    OUTPUT @Sa;"CLRDSP;";            ! Clear the analyzer screen.
70    !
80                                     ! Draw a rectangle with fixed points.
90    OUTPUT @Sa;"PU;PA 300,300;";     ! Move pen to starting point.
100   OUTPUT @Sa;"PD;PR 240,0;";       ! \
110   OUTPUT @Sa;"PR 0,240;";          ! \ Draw
120   OUTPUT @Sa;"PR -240,0;";         ! / rectangle.
130   OUTPUT @Sa;"PR 0,-240;";         ! /
140   !
150                                    ! Draw an ellipse with calculated points.
160   OUTPUT @Sa;"PU;PA 415,305; PD;";
                                       ! Move pen to starting point.
170   FOR I=0 TO 2*PI STEP PI/40
180      X=PROUND(10*COS(I),-3)        ! \ Calculate x and y
190      Y=PROUND(10*SIN(I),-3)        ! / coordinates.
200      !
210      OUTPUT @Sa;"PR "&VAL$(X)&","&VAL$(Y)&";";
                                       ! Create plot statement using
220                                    ! calculated coordinates.
230   NEXT I
240   !
250   ASSIGN @Sa TO *                  ! Close I/O path.
260   END
```

PDA

Probability Distribution of Amplitude

Syntax



Description

Replace the destination trace with the amplitude distribution function of the source trace. The source trace data is taken point by point. The value for bottom-screen is subtracted from **the** value of each data point, then the difference is divided by the resolution value (which is rounded to an integer). If the result falls within the bucket range of the destination trace (0 to 600), the corresponding destination trace element is increased by one. The function is complete after all source points are dealt with.

Resolution Range: Limited by source amplitude.

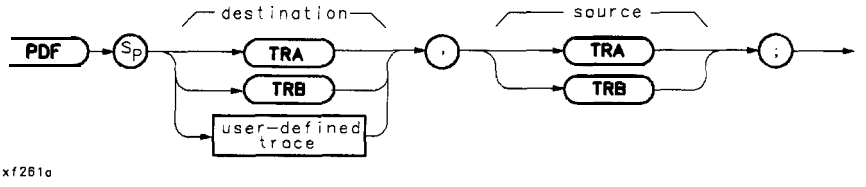
Program Example

```
10    ! The following example shows how to use the PDA command to determine
20    ! the probability distribution of the amplitude values in trace A.
30    ! The results are placed in trace B and expanded by a factor of 20
40    ! to make the results more visible.
50    !
60    ASSIGN @Sa TO 718              ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF TST,@;";   ! Logical start of DLP.
90    OUTPUT @Sa;"IP;SNGLS;";        ! Instrument preset the analyzer.
100   OUTPUT @Sa;"VB10KZ;HD;TS;";    ! Set video BW at IO kHz.
110   OUTPUT @Sa;"MOV TRB,0;";       ! Put all zeros into trace B.
120   OUTPUT @Sa;"PDA TRB,TRA,.8;";  ! Determine the distribution
130                                  ! of trace A and put results
140                                  ! into trace B.
150   OUTPUT @Sa;"MPY TRB,TRB,20;";  ! Multiply values in trace B
160                                  ! by 20.
170   OUTPUT @Sa;"VIEW TRB;";        ! View trace B.
180   OUTPUT @Sa;"@;";               ! Logical end of DLP.
190   !
200   OUTPUT @Sa;"TST;";             ! Execute the DLP.
210   !
220   LOCAL @Sa                      ! Local analyzer for manual use.
230   ASSIGN @Sa TO *                ! Close I/O path.
240   END
```

PDF

Probability Distribution of Frequency

Syntax



Description

Replace the destination trace with the frequency distribution function of the source trace. Source trace elements falling above the TH command threshold level increase the corresponding destination trace elements amplitude by one display unit. The default threshold value is nine major divisions below the reference level.

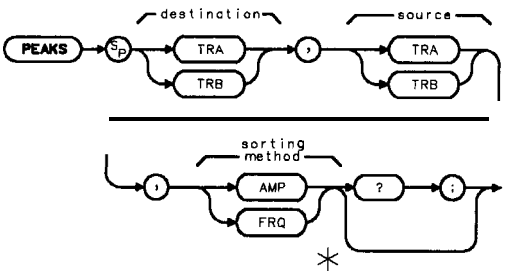
Program Example

```
10 OUTPUT 718;"TRDEF S_AMPLE,50;";
20 OUTPUT 718;"PDF S_AMPLE,TRA;";
30 END
```

PEAKS

Trace Peaks

Syntax



xf262o

Note

This bypass command path is only legal if you use PEAKS as a predefined function. It must reside within a compatible-function operation.

Description

The PEAKS command sorts signal peaks by frequency or amplitude, stores in the destination trace the horizontal position of each peak in position units, then computes the number of peaks found. The value set by MKPT is the minimum amplitude level from which a peak on a trace can be detected. When sorting by frequency, PEAKS first computes the horizontal position of all peaks in the sort trace. These positions are consecutively loaded into the destination trace, the lowest horizontal position value occupying the first element. Thus, the destination trace amplitude values from left to right correspond to signal frequencies from low to high.

When sorting by amplitude, PEAKS first computes the amplitude of all peaks in the source trace in measurement units, and sorts these values from high to low. The horizontal positions of **the** peaks are then loaded into the destination trace, with the highest value occupying the first element. Thus, the destination trace amplitude values from left to right correspond to the horizontal positions of the source trace amplitudes sorted from high to low.

PEAKS must be used as either a query or as a source in another command function. Form a query by ending the PEAKS statement with a question mark **(?).** When used as a query, PEAKS returns the number of peaks found.

Use PEAKS as a source by incorporating the PEAKS statement into any command having “predefined function” in its syntax diagram. When PEAKS is used as a source, the number of peaks found is used for operation by the command that contains PEAKS.

Query Response The PEAKS command outputs the number of signal peaks found.

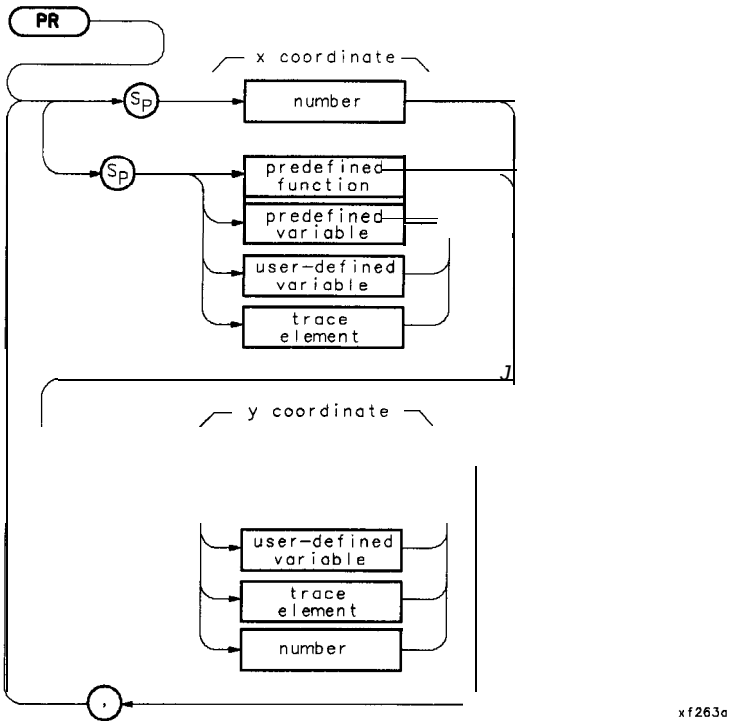
Program Example

```
10    ! The following example shows the use of the PEAKS command. The example
20    ! uses an input signal of 300 MHz such as the CAL OUTPUT and looks at its
30    ! harmonics.
40    !
50    ASSIGN @Sa TO 718                        ! Assign I/O/ path to address 718.
60
70    OUTPUT @Sa;"FUNCDEF NUM_PKS,@;";         ! Logical start of DLP.
80    OUTPUT @Sa;"VARDEF NUM_PEAKS,0;";        ! Create and initialize variable.
90    OUTPUT @Sa;"FA 250MHZ;FB 2900MHZ;";      ! Set start and stop frequencies.
100   OUTPUT @Sa;"MKPT -60DB;MKPX 3DB;TS;";  ! Set the threshold and marker-
110                                            ! peak excursion. Take a sweep.
120   OUTPUT @Sa;"MOV NUM_PEAKS,PEAKS TRB,TRA,AMP;";
                                               ! Sort signals by amplitude
130                                            ! and place results in trace B.
140                                            ! Trace B now contains position
150                                            ! information.
160   OUTPUT @Sa;"@;";                         ! Logical end of DLP.
170   !
180   OUTPUT @Sa;"NUM_PKS;";                   ! Execute DLP.
190   !
200   OUTPUT @Sa;"NUM_PEAKS?;";                ! How many peaks?
210   ENTER @Sa;Number_of_peaks                ! Get returned value.
220   PRINT "The number of signals above -60 dBm is ",Number_of_peaks
230   !
240   ASSIGN @Sa TO *                          ! Close I/O path.
250   END
```

PR

Plot Relative

Syntax



Description

This command moves the pen from its current location to a position determined by adding the new x and *y* coordinates to the current *x, y* position.

Prerequisite Commands: VARDEF when using user-defined variable

Related Commands: OR PU, and PD

Program Example

```
10    ! The following example shows the use of the PA, PR, PU, and PD commands.
20    ! The figures drawn are an ellipse within a rectangle.
30   !
40    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50    OUTPUT @Sa;"IP;";                ! Instrument preset.
60    OUTPUT @Sa;"CLRDSP;";            ! Clear the analyzer screen.
70   !
80                                     ! Draw a rectangle with fixed points.
90    OUTPUT @Sa;"PU;PA 300,300;";     ! Move pen to starting point.
100   OUTPUT @Sa;"PD;PR 240,0;";       ! \
110   OUTPUT @Sa;"PR 0,240;";          ! \ Draw
120   OUTPUT @Sa;"PR -240,0;";         ! / rectangle.
130   OUTPUT @Sa;"PR 0,-240;";         ! /
140  !
150                                    ! Draw an ellipse with calculated points.
160   OUTPUT @Sa;"PU;PA 415,305; PD;";
                                       ! Move pen to starting point.
170   FOR I=0 TO 2*PI STEP PI/40
180      X=PROUND(10*COS(I),-3)        ! \ Calculate x and y
190      Y=PROUND(10*SIN(I),-3)        ! / coordinates.
200  !
210      OUTPUT @Sa;"PR "&VAL$(X)&","&VAL$(Y)&";";
                                       ! Create plot statement using
220                                    ! calculated coordinates.
230   NEXT I
240  !
250   ASSIGN @Sa TO *                  ! Close I/O path.
260   END
```

PU

Pen Up

Syntax

xf264a

Description

This command causes the pen to stop drawing at the location specified in the last plot statement.

Related Commands: PA, PR, and DSPLY

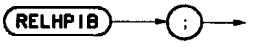
Program Example

```
10    ! The following example shows the use of the PA, PR, PU, and PD commands.
20    ! The figures drawn are an ellipse within a rectangle.
30    !
40    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50    OUTPUT @Sa;"IP;";                ! Instrument preset.
60    OUTPUT @Sa;"CLRDSP;";            ! Clear the analyzer screen.
70    !
80                                     ! Draw a rectangle with fixed points.
90    OUTPUT @Sa;"PU;PA 300,300;";     ! Move pen to starting point.
100   OUTPUT  @Sa;"PD;PR  240,0;"; !  \
110   OUTPUT @Sa;"PR 0,240;";          ! \ Draw
120   OUTPUT @Sa;"PR -240,0;";         ! / rectangle.
130   OUTPUT @Sa;"PR 0,-240;";         ! /
140   !
150                                    ! Draw an ellipse with calculated points.
160   OUTPUT @Sa;"PU;PA 415,305; PD;";
                                       ! Move pen to starting point.
170   FOR I=0 TO 2*PI STEP PI/40
180      X=PROUND(10*COS(I),-3)        ! \ Calculate x and y
190      Y=PROUND(10*SIN(I),-3)        ! / coordinates.
200      !
210      OUTPUT @Sa;"PR "&VAL$(X)&","&VAL$(Y)&";";
                                       ! Create plot statement using
220                                    ! calculated coordinates.
230   NEXT I
240   !
250   ASSIGN @Sa TO *                  ! Close I/O path.
260   END
```

RELHPIB

Release HP-IB

Syntax



xf265a

Description

This command releases HP-IB control **taken** by the CTRLHPIB command. Refer also to the commands ENTER, OUTPUT, and CTRLHPIB.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Prerequisite Commands: FUNCDEF when using user-defined function. VARDEF or LCLVAR when using user-defined variable, user-defined array, or user-defined trace.

Related Commands: ABORT and RETURN

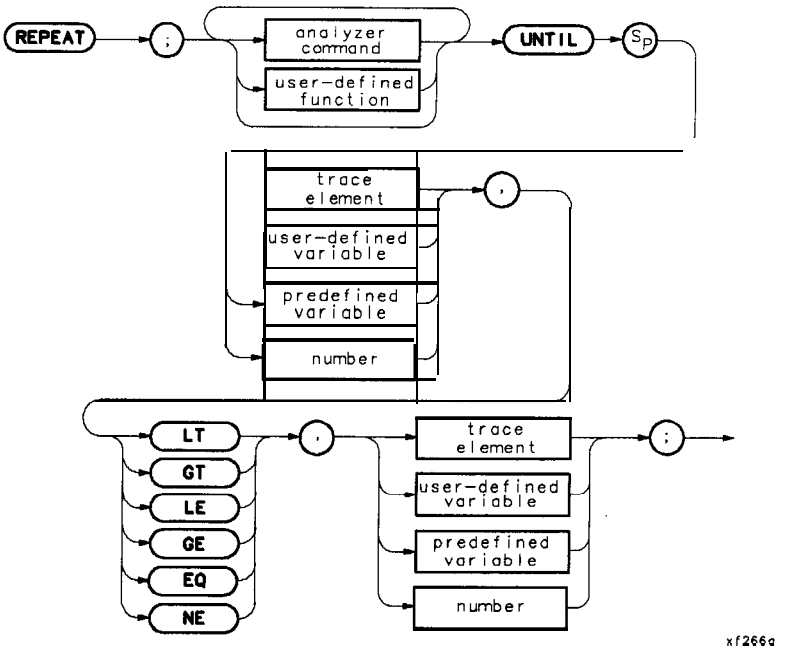
Program Example

```
10    ! The following example shows how to use the RELHPIB command to have
20    ! the analyzer send data to another HP-IB device. The instructions
30    ! within the FUNCDEF '@' delimiters form a structure called a
40    ! DLP (downloadable program).
50    !
60    ! NOTE: A printer (HP-IB address 01) needs to be connected.
70    !
80    ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
90    !
100   OUTPUT @Sa;"FUNCDEF E_XMPLE,@;";
                                       ! Logical start of the DLP.
110   OUTPUT @Sa;" CTRLHPIB;";         ! Tells analyzer to take control
120                                    ! of the bus.
130   OUTPUT @Sa;" MKN;";              ! Turn on a marker.
140   OUTPUT @Sa;" OUTPUT 1,KC,'THIS IS AN EXAMPLE OF THE ANALYZER
SENDING',",
150   OUTPUT @Sa;"  OUTPUT  l,KC,'DATA TO ANOTHER HPIB DEVICE';";
160   OUTPUT @Sa;" OUTPUT 1,KC,";";
170   OUTPUT @Sa;"  OUTPUT 1,K,'MARKER FREQUENCY = ';";
180   OUTPUT @Sa;" OUTPUT 1,K,MKF;";
190   OUTPUT @Sa;" OUTPUT 1,KC,' Hz';";
200   OUTPUT @Sa;" OUTPUT 1,KC,";";
210   OUTPUT @Sa;" RELHPIB;";          ! Release HP-IB control.
220   OUTPUT @Sa;"@;";                 ! Logical end of the DLP
230   !
240   OUTPUT@Sa;"E_XMPLE;";            ! Have the analyzer execute the
250                                    ! DLP E,XMPLE.
260   SEND 7;UNL TALK 18 LISTEN 1 DATA
                                       ! Send to HP-IB select code 7 the
270                                    ! commands necessary to allow
280                                    ! the analyzer (address 18) to
290                                    ! talk to the printer (address 1)
300                                    ! while this controller is still
310                                    ! connected.
320   LOCAL 7                          ! Local HP-IB select code 7.
330   WAIT 2                           ! Wait for printer to finish.
340   REMOTE 7                         ! Toggle the HP-IB REN line.
350   LOCAL @Sa                        ! Local the SA.
360   !
370   ASSIGN @Sa TO *                  ! Close I/O path.
380   END
```

REPEAT/UNTIL

Repeat/Until

Syntax



Description

Repeat

The REPEAT command determines the starting point of the looping process. UNTIL determines the end of the REPEAT/UNTIL command loop based on the comparison of two variables. Valid conditions are less than (LT), greater than (GT), less than or equal to (LE), greater than or equal to (GE), equal (EQ), and not equal (NE). The commands within the repeat/until loop are executed until the comparison result is true.

This command requires user memory while executing as a remote command. When the command is complete, memory is returned as available user memory.

Program Example #1

```
10    ! The following example shows the use of the REPEAT/UNTIL commands
20    ! in a FOR/NEXT loop context.  A previously downloaded function may
30    ! be executed repeatedly from within an immediate execute download.
40    ! This is one way of nesting REPEATs.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"IP;";                    ! Instrument preset.
90    OUTPUT @Sa;"VARDEF OUTER_LP,0;";     ! Create variable and initialize to 0.
100   OUTPUT @Sa;"VARDEF TOTAL,0;";        ! Create variable and initialize to 0.
110   !
120   OUTPUT @Sa;"FUNCDEF CNT_LP,0;";      ! Logical start of the DLP function.
130   OUTPUT @Sa;"  VARDEF INNER_LP,0;";   ! Create and initialize inner loop counter.
140   OUTPUT @Sa;" REPEAT;";               ! Begin inner loop.
150   OUTPUT @Sa;"    ADD TOTAL,TOTAL,1;";! Increment running total.
160   OUTPUT @Sa;"    ADD INNER_LP,INNER_LP,1;";
                                           ! Increment inner loop counter.
170   OUTPUT @Sa;"  UNTIL INNER_LP,EQ,3;";! End of inner loop.
180   OUTPUT @Sa;"@;";
190   !
200   OUTPUT @Sa;"REPEAT;";                ! Begin outer loop.
210   OUTPUT @Sa;" CNT_LP;";               ! Execute function.
220   OUTPUT @Sa;"  ADD OUTER_LP,OUTER_LP,1;";
                                           ! Increment outer loop counter.
230   OUTPUT @Sa;"UNTIL OUTER_LP,EQ,4;";   ! End of outer loop.
240   !
250   OUTPUT @Sa;"CLRDSP;";
260   OUTPUT @Sa;"PU;PA 10,500;TEXT %INNER LOOP COUNTER = %;";
270   OUTPUT @Sa;"DSPLY INNER_LP,5,2;";
280   OUTPUT @Sa;"PU;PA 10,400;TEXT %OUTER LOOP COUNTER = %;";
290   OUTPUT @Sa;"DSPLY OUTER_LP,5,2;";
300   OUTPUT @Sa;"PU;PA 10,300;TEXT %TOTAL ITERATIONS = %;";
310   OUTPUT @Sa;"DSPLY TOTAL,6,2;";
320   !
330   ASSIGN @Sa TO *                      ! Close I/O path.
340   END
```

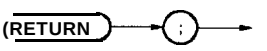
Program Example #2

```
10    ! The following example shows the use of the REPEAT/UNTIL commands
20    ! in a FOR/NEXT loop context.  This is an immediate-execute DLP
30    ! (downloadable program).  This is another way of nesting REPEATs.
40    !
50    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"IP;",                    ! Instrument preset.
80    OUTPUT @Sa;"VARDEF OUTER_LP,0;";     ! Create variable and initialize to 0.
90    OUTPUT @Sa;"VARDEF TOTAL,0;";        ! Create variable and initialize to 0.
100   !
110   OUTPUT @Sa;"REPEAT;";                ! Begin outer loop.
120   OUTPUT @Sa;"  VARDEF INNER_LP,0;";  ! Create and initialize inner loop counter.
130   OUTPUT @Sa;" REPEAT;";               ! Begin inner loop.
140   OUTPUT @Sa;"    ADD TOTAL,TOTAL,1;";! Increment running total
150   OUTPUT @Sa;"    ADD INNER_LP,INNER_LP,1;";
                                           ! Increment inner loop counter.
160   OUTPUT @Sa;"  UNTIL INNER_LP,EQ,3;";! End of inner loop.
170   OUTPUT @Sa;"  ADD OUTER_LP,OUTER_LP,1;";
                                           ! Increment outer loop counter.
180   OUTPUT @Sa;"UNTIL OUTER_LP,EQ,4;";   ! End of outer loop.
190   !
200   OUTPUT @Sa;"CLRDSP;";
210   OUTPUT @Sa;"PU;PA 10,500;TEXT %INNER LOOP COUNTER=%;";
220   OUTPUT @Sa;"DSPLY INNER_LP,5,2;";
230   OUTPUT @Sa;"PU;PA 10,400;TEXT %OUTER LOOP COUNTER=%;";
240   OUTPUT @Sa;"DSPLY OUTER_LP,5,2;";
250   OUTPUT @Sa;"PU;PA 10,300;TEXT %TOTAL ITERATIONS=%;";
260   OUTPUT @Sa;"DSPLY TOTAL,5,2;";
270   !
280   ASSIGN @Sa TO *                      ! Close I/O path.
290   END
```

RETURN

Return from Function

Syntax



xf267a

Description

Use this command to return from a user-defined function before its completion. The program returns to the point from which the function was called.

Related Commands: IF/THEN and FUNCDEF

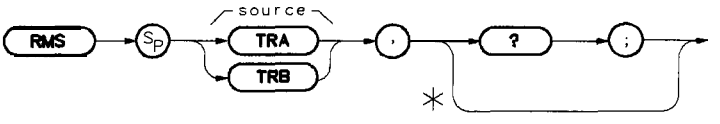
Program Example

```
10   ! Program to test the RETURN command for use in DLPs. Two FUNCDEFs
20   ! are defined, C-ALLER and C-ALLEE. C,ALLER sets the spectrum analyzer
30   ! up in single sweep mode with a 1 second sweeptime, so instrument
40   ! state changes can be easily observed. C-ALLER first sets the CF to
50   ! 1 GHz and then calls C,ALLEE. C-ALLEE tests the CF value, and if it
60   ! is less than 1.5 GHz, it changes the span to 300 MHz and takes
70   ! another sweep. C-ALLEE then changes the span to 100 MHz, takes
80   ! another sweep, and returns to C,ALLER.
90   !
100  ! C-ALLER then changes the CF to 2 GHz, takes a sweep, and again calls
110  ! C,ALLEE. Since the CF is now greater than 1.5 GHz, C-ALLEE returns
120  ! immediately to C,ALLER changes the span to 200 MHz and takes a sweep.
130  !-----------------------------------------------------------------
140  !
150  ASSIGN @Sa TO 718
160  !
170  OUTPUT @Sa;"FUNCDEF C_ALLER,0;";
180  OUTPUT @Sa;"IP;SNGLS;ST 1SC;";
190  OUTPUT @Sa;"CF 1GZ;TS;SP 500MZ;TS;";
200  OUTPUT @Sa;"C_ALLEE;";
210  OUTPUT @Sa;"CF 2 GZ;TS;";
220  OUTPUT @Sa;"C_ALLEE;";
230  OUTPUT @Sa;"SP 200MZ;TS;";
240  OUTPUT @Sa;"@;";
250  !
260  OUTPUT @Sa;"FUNCDEF C_ALLEE,@;";
270  OUTPUT @Sa;"IF CF,LT,1.5E+9;THEN;";
280  OUTPUT @Sa;"SP 300MZ;TS;";
290  OUTPUT @Sa;"ELSE;";
300  OUTPUT @Sa;"RETURN;";
310  OUTPUT @Sa;"SP 1GZ;TS;";
320  OUTPUT @Sa;"ENDIF;";
330  OUTPUT @Sa;"SP 100MZ;TS;";
340  OUTPUT @Sa;"@;";
350  !
360  ASSIGN @Sa TO *
370  END
```

RMS

Trace Root Mean Square Value

Syntax



xf268a

Note This bypass command path is only legal if you use RMS as a predefined function. It must reside within a compatible-function operation.

Description

The root mean square (rms) value of a trace is determined and returned in measurement units.

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

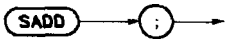
Program Example

```
10   ! The following example shows the use of the RMS command.
20   !
30   ASSIGN @Sa TO 718                ! Assign an I/O path.
40   !
50   OUTPUT @Sa;"IP;";                ! Instrument preset.
60   OUTPUT @Sa;"SNGLS;";             ! Single sweep mode.
70   OUTPUT @Sa;"TS;RMS TRA,?;";      ! Take sweep; find RMS value.
80   ENTER @Sa;Rms_value              ! Get RMS value from analyzer.
90   !
100  Rms_value=PROUND(Rms_value,-2)   ! Round the value to two decimal
110                                   ! places.
120  PRINT "The RMS value of the trace is ";Rms_value;" measurement units"
130  !
140  ASSIGN @Sa TO *                  ! Close I/O path.
150  END
```

SADD

Add a Limit-Line Segment

Syntax



xf269a

Description

This command is used to add a limit-line segment to the current limit line,

Related commands include: LIMU, LIML, LIMM, LIMD, LIMIFL, LIMISL, LIMISP, SDEL, SEDI

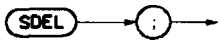
Program Example

```
130   ! This program demonstrates the use of the SADD command
140   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";      ! Make sure it's an absolute line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU-35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU-5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718;"SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
491   !
492   ! Set up spectrum analyzer to display the limit line.
493   !
494   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
500   END
```

SDEL

Delete Limit-Line Segment

Syntax



xf270a

Description

This command deletes the limit-line segment specified with the SEDI command.

SDON

Limit-Line Segment Done

Syntax

xf271a

Description This command is used to terminate the SEDI command.

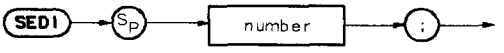
Program Example

```
130   ! This program demonstrates the use of the SDON command
140   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIRELOFF;";       ! Make sure it's an absolute line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT718;"LIMTFL;";            ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT718;"LIMU-35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT718;"LIMTSL;";            ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718;"SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU-5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718; "SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718;"SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT718;"EDITDONE;";          ! End of limit-line definition.
491   !
492                                   ! Set up to display the limit line.
493   !
494   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
500   END
```

SEDI

Edit Limit-Line Segment

Syntax



xf272a

Description

Activates the limit-line segment you identify by its segment number in the limit-line table.

Related commands: LIMU, LIML, LIMM, LIMD, SDEL, LIMTFL, and LIMTSL to modify the limit-line parameters.

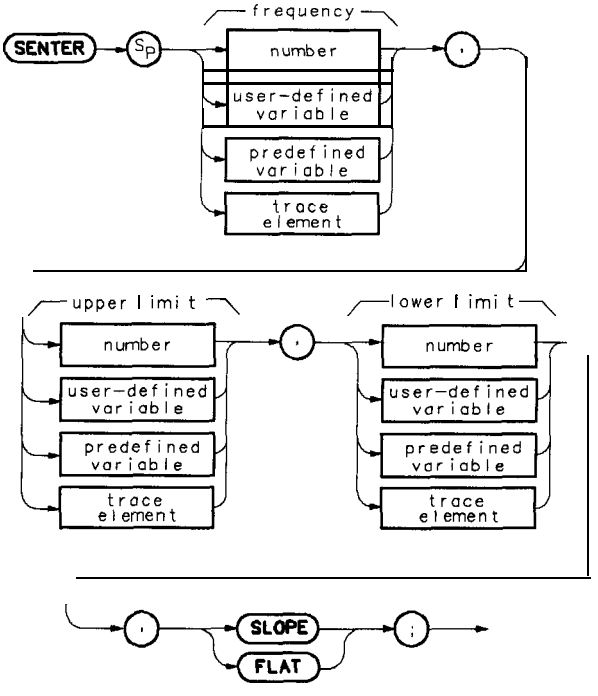
Program Example

```
130   ! This program demonstrates the use of the SEDI command
140   ! to generate a limit line:
150   !
160   OUTPUT 718;"LIMIPURGE;";        ! Purge current limit line.
170   OUTPUT 718;"EDITLIML;";         ! Begin edit of limit line.
180   OUTPUT 718;"LIMIREL OFF;";      ! Make sure it's an absolute line.
190   OUTPUT 718;"SADD;";             ! Add segment to the limit line.
200   OUTPUT 718;"SEDI 1;";           ! Edit the first segment.
210   OUTPUT 718;"LIMF 250MHZ;";     ! Set frequency of the segment.
220   OUTPUT 718;"LIMU -35DBM;";     ! Provide the upper amplitude.
230   OUTPUT 718;"LIML -80DBM;";     ! Enter the lower amplitude.
240   OUTPUT 718;"LIMTFL;";           ! Set type of segment to flat.
250   OUTPUT 718;"SDON;";             ! Enter parameters into table.
260   OUTPUT 718;"SADD;SEDI 2;";      ! Add then edit second segment.
270   OUTPUT 718;"LIMF 290MHZ;";      ! Set frequency of segment 2.
280   OUTPUT 718;"LIMU-35DBM;LIML-80DBM;";
                                      ! Set amplitude data for segment.
290   OUTPUT 718;"LIMTSL;";           ! Set segment type to slope.
300   OUTPUT 718;"SDON;";             ! Enter parameters into table.
310   OUTPUT 718;"SADD;SEDI 3;";
320   OUTPUT 718;"LIMF 296.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
330   OUTPUT 718;"SDON;";
340   OUTPUT 718; "SADD;SEDI 4;";
350   OUTPUT 718;"LIMF 300MHZ;LIMU-5DBM;LIML-25DBM;LIMTSL;";
360   OUTPUT 718;"SDON;";
370   OUTPUT 718; "SADD;SEDI 5;";
380   OUTPUT 718;"LIMF 303.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
390   OUTPUT 718;"SDON;";
400   OUTPUT 718;"SADD;SEDI 6;";
410   OUTPUT 718;"LIMF 304.5MHZ;LIMU-5DBM;LIML-80DBM;LIMTSL;";
420   OUTPUT 718;"SDON;";
430   OUTPUT 718; "SADD;SEDI 7;";
440   OUTPUT 718;"LIMF 310MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
450   OUTPUT 718;"SDON;";
460   OUTPUT 718;"SADD;SEDI 8;";
470   OUTPUT 718;"LIMF 350MHZ;LIMU-35DBM;LIML-80DBM;LIMTFL;";
480   OUTPUT 718;"SDON;";
490   OUTPUT 718;"EDITDONE;";         ! End of limit-line definition.
491   !
492                                   ! Set up to display the limit line.
493   !
494   OUTPUT 718;"CF 300MHZ;SP 50MHZ;RB 2MHZ;VB 30KHZ;TS;";
500   END
```

SENTER

Segment Enter

Syntax



xf273a

Description

This command can be used to create a complete limit-line segment within a DLI? Define which limit-line segment to create using the SEDI command.

Related command: SADD.

SETDATE

Set Date

Syntax

xf274a

Description Use this command to set the date.

Parameter Where integer = MMDDYY

Program Example

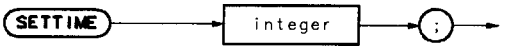
```
10    ! The following examples show the use of the SETDATE command<M>.
20    ! The date can be specified directly or generated from another
30    ! source such as the HP BASIC TIMEDATE command.
40    !
50    OUTPUT 718;"TIMEDATE ON;";          ! Turn on the time and date display
60                                        ! so that date changes can be observed.
70    DISP "Setting date to 9/12/88"
80    OUTPUT 718;"SETDATE 091288;";        ! Set the date to 9/12/88 directly.
90    !
100   WAIT 5                               ! Note the date on the display.
110   !
120   DISP "Setting date to Series 200/300 Internal clock"
130   Day_mon_year$=DATE$(TIMEDATE)        ! \
140   Day$=Day_mon_year$[1;2]              !  \
150   IF VAL(Day$) <10 THEN Day$[1;1]="0" !    Fill in leading "0".
160   Mon$=Day_mon_year$[4;3]              !     Convert date from TIMEDATE.
170   Year$=Day_mon_year$[10;2]            ! / format to spectrum analyzer
180   GOSUB Translate-month                ! /    format.
190   !
200   OUTPUT 718;"SETDATE "&Month$&Day$&Year$&";";
                                           ! Set the new date.
210   STOP
220   !
230 Translate-month: !
240   ! Converts the month from alpha characters to 'numerics'.  The numbers
250   ! are left as strings so that they can be concatenated later.
260   !
270   SELECT Mon$
280   CASE "Jan"
290      Month$="01"
300   CASE "Feb"
310      Month$="02"
320   CASE "Mar"
330      Month$="03"
340   CASE "Apr"
350      Month$="04"
360   CASE "May"
```

```
370       Month$="05"
380    CASE "Jun"
390       Month$="06"
400    CASE "Jul"
410       Month$="07"
420    CASE "Aug"
430       Month$="08"
440    CASE "Sep"
450       Month$="09"
460    CASE "Oct"
470       Month$="10"
480    CASE "Nov"
490       Month$="11"
500    CASE "Dec"
510       Month$="12"
520    END SELECT
530    RETURN
540    END
```

SETTIME

Set Time

Syntax



xf275a

Description Use this command to set the time. (Enter the 24-hour time in this format: HHMMSS.)

Parameter Where integer = HHMMSS

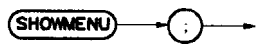
Program Example

```
10    ! The following example shows the use of the SETTIME command.  The clock
20    ! is set using 24-hour notation. When time is displayed on the spectrum
30    ! analyzer screen, it appears in the current time mode, that is, the
40    ! 12- or 24-hour mode.
50   !
60    OUTPUT 718;"TIMEDATE ON;"       ! Turn on the time and date display to
70                                    ! observe the results of the next command.
80    OUTPUT 718;"SETTIME 183000;"    ! The clock is set using 24-hour notation.
90   !
100   END
```

SHOWMENU

Show the Menu

Syntax



xf276a

Description

This command displays labels in the softkey area on the display. The user specifies the softkey labels using the SKYCLR and SKYDEF commands. This command has no meaning if the spectrum analyzer is in remote mode. It must be used in a user-defined function, or DLI? If used from an external controller, an error results.

Program Example

```
10    ! The following example shows the use of the SHOWMENU command. The
20    ! example creates and displays a softkey which can be used to execute
30    ! a DLP (downloadable program).
40    ! ,
50    ! Note: Since SHOWMENU is not executable over HP-IB, the function
60    ! KEYS needs to be executed from the front panel of the analyzer
        after being loaded.  Press
70    ! {LCL}[MODULE] {AUTOEXEC MENU} (EDIT AUTOEXEC} (CHOOSE DLP}.
80    ! Scroll knob to 'KEYS' and press (EXECUTE NOW}.
90    !
100   ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
110   OUTPUT @Sa;"FUNCDEF KEYS,$;";        ! Logical start of function 'KEYS'.
120   OUTPUT @Sa;"SKYCLR;";                ! Clear softkeys.
130   OUTPUT @Sa;"SKYDEF 1,BOX,%DRAW BOX%;";
                                           ! Define softkey 1 to execute
140                                        ! function BOX.  Label key with
150                                        ! DRAW BOX.
160   OUTPUT @Sa;"SHOWMENU;";              ! Display the SKYDEF'ed label.
170   OUTPUT @Sa;"$;";                     ! Logical end of function.
180   !
190   OUTPUT @Sa;"FUNCDEF BOX,@;";         ! Logical start of function 'BOX'.
200   OUTPUT @Sa;" IP;";                   ! Instrument preset.
210   OUTPUT @Sa;" CLRDSP;";               ! Clear the analyzer screen.
220   !
230   OUTPUT @Sa;" PU;PA 300,300;";        ! Move pen to starting point.
240   OUTPUT @Sa;" PD;PR 240,0;";          ! \
250   OUTPUT @Sa;"PR 0,240;";              ! \ Draw
260   OUTPUT @Sa;" PR -240,0;";            ! / rectangle.
270   OUTPUT @Sa;" PR 0,-240;";            ! /
280   OUTPUT @Sa;"@;";                     ! Logical end of function.
290   !
300   ASSIGN @Sa TO *                      ! Close I/O path.
310   END
```

SKYCLR

Clear User Softkeys

Syntax

xf277a

Description

Use this command to clear all user-definable softkeys set up in DLPs. The command SKYDEF can then be used to define other DLP-related softkey labels.

Related commands: SKYDEF and SHOWMENU.

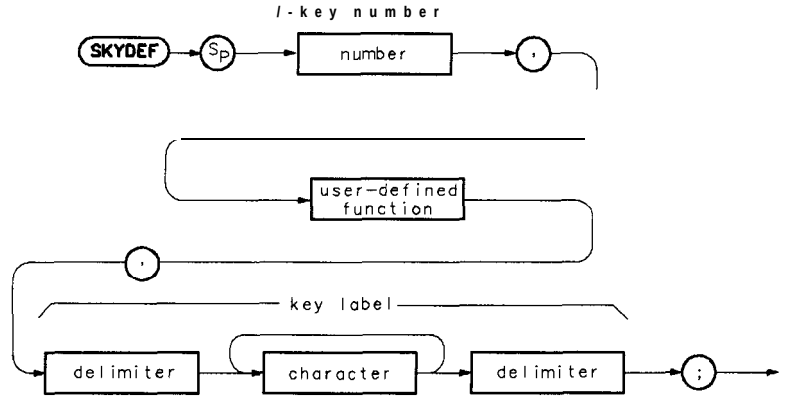
Program Example

```
10    ! The following example shows the use of the SKYCLR command.  The
20    ! example creates and displays a softkey which can be used to execute
30    ! a DLP (downloadable program).
40    !
50    ! Note: Since SHOWMENU is not executable over the HP-IB, the function
60    ! KEYS needs to be executed from the front panel of the analyzer
        after it is loaded.  Press
70    ! {LCL} [MODULE] {AUTOEXEC MENU} {EDIT AUTOEXEC} (CHOOSE DLP}.
80    ! Scroll knob to 'KEYS' and press (EXECUTE NOW).
90    !
100   ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
110   OUTPUT @Sa;"FUNCDEF KEYS,$;";    ! Logical start of function 'KEYS'.
120   OUTPUT @Sa;"SKYCLR;";            ! Clear softkeys.
130   OUTPUT @Sa;"SKYDEF 1,BOX,%DRAW BOX%;";
                                       ! Define softkey 1 to execute
140                                    ! function BOX.  Label key with
150                                    ! DRAW BOX.
160   OUTPUT @Sa;"SHOWMENU;";          ! Display the SKYDEF'ed label.
170   OUTPUT @Sa;"$;";                 ! Logical end of function.
180   !
190   OUTPUT @Sa;"FUNCDEF BOX,@;";     ! Logical start of function 'BOX'.
200   OUTPUT @Sa;" IP;";               ! Instrument preset.
210   OUTPUT @Sa;" CLRDSP;";           ! Clear the analyzer screen.
220   !
230   OUTPUT @Sa;"  PU;PA  300,300;";! Move pen to starting point.
240   OUTPUT @Sa;" PD;PR 240,0;"; ! \
250   OUTPUT @Sa;" PR 0,240;";         ! \ Draw
260   OUTPUT @Sa;" PR -240,0;";        ! / rectangle.
270   OUTPUT @Sa;" PR 0,-240;";        ! /
280   OUTPUT @Sa;"@;";                 ! Logical end of function.
290   !
300   ASSIGN @Sa TO *                  ! Close I/O path.
310   END
```

SKYDEF

Define a User Keys Menu Softkey

Syntax



xf278a

Description

In a DLP, use this command to attach a program to a softkey. SKYDEF must be followed in the DLP with SHOWMENU to display the softkeys for the DLP operation. This then keeps the softkey labels within the DLP; they are activated only when the DLP is operating.

Related commands: SKYCLR and SHOWMENU.

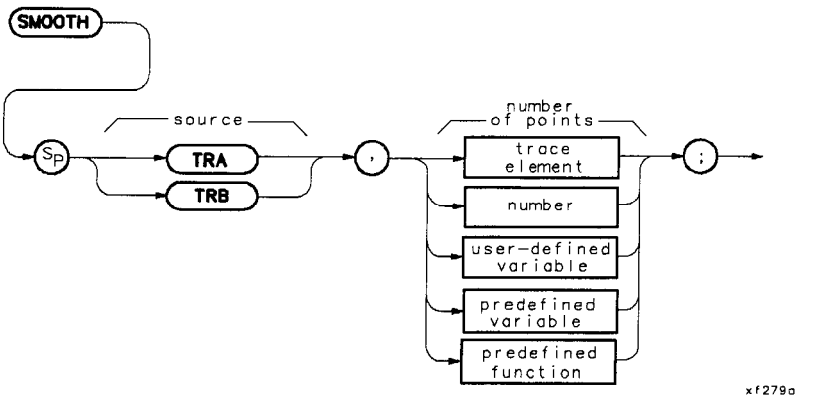
Program Example

```
10    ! The following example shows the use of the SKYDEF command.  The
20    ! example creates and displays a softkey which can be used to execute
30    ! a DLP (downloadable program).
40    !
50    ! Note: Since SHOWMENU is not executable over HP-IB, the function
60    ! KEYS needs to be executed from the front panel of the analyzer
        after it is loaded. Press
70    ! {LCL} [MODULE] {AUTOEXEC MENU) (EDIT AUTOEXEC) {CHOOSE DLP}.
80    ! Scroll knob to 'KEYS' and press (EXECUTE NOW).
90    !
100   ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
110   OUTPUT @Sa;"FUNCDEF KEYS,$;"; ! Logical start of function 'KEYS'.
120   OUTPUT@Sa;"SKYCLR;";             ! Clear softkeys.
130   OUTPUT @Sa;"SKYDEF 1,BOX,%DRAW BOX%;";
                                       ! Define softkey 1 to execute
140                                    ! function BOX. Label key with
150                                    ! DRAW BOX.
160   OUTPUT@Sa;"SHOWMENU;";           ! Display the SKYDEF'ed label.
170   OUTPUT @Sa;"$;";                 ! Logical end of function.
180   !
190   OUTPUT @Sa;"FUNCDEF BOX,@;";     ! Logical start of function 'BOX'.
200   OUTPUT  @Sa;"IP;";               ! Instrument preset.
210   OUTPUT  @Sa;" CLRDSP;";          ! Clear the analyzer screen.
220   !
230   OUTPUT @Sa;" PU;PA 300,300;";! Move pen to starting point.
240   OUTPUT @Sa;"  PD;PR 240,0;"; ! \
250   OUTPUT @Sa;" PR 0,240;";         ! \ Draw
260   OUTPUT @Sa;" PR -240,0;";        ! / rectangle.
270   OUTPUT @Sa;" PR 0,-240;";        ! /
280   OUTPUT @Sa;"@;";                 ! Logical end of function.
290   !
300   ASSIGN @Sa TO *                  ! Close I/O path.
310   END
```

SMOOTH

Smooth Trace

Syntax



Description

This command smoothes **the** trace according to the number of points specified as the running average. Point values are replaced with the average value (in measurement units) of a given quantity of points centered about it. As the number of points increases, smoothing increases, but resolution decreases.

This function provides spatial video-averaging as compared with time-based video-averaging from an HP 856X VAVG command. Using averaging for the point value, any high-frequency noise or signals are attenuated without affecting the corresponding low-frequency signals. The end result is similar to reducing the video bandwidth, but without changing the sweep time. The frequency resolution, however, is reduced.

Parameters

number of points = an odd integer from 3 to 601. If an even number is specified, it will be converted to an odd integer having the next greater value.

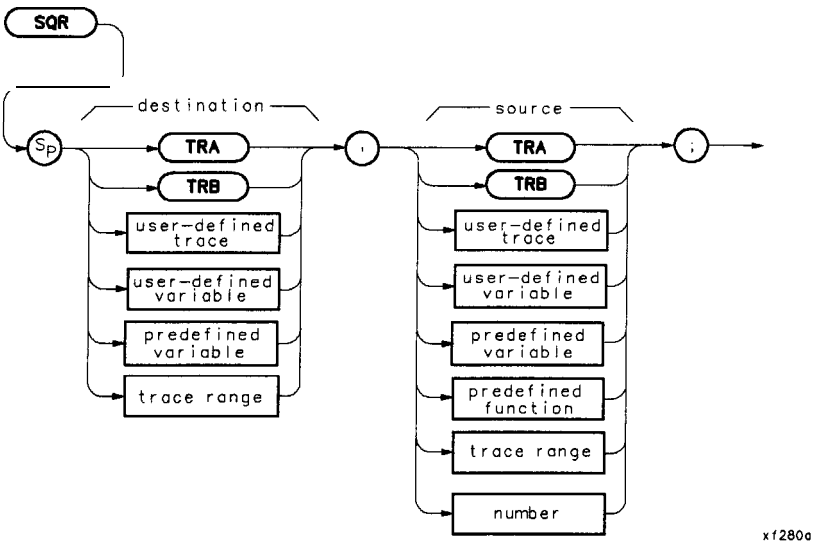
Program Example

```
10    ! The following example shows the use of the SMOOTH command. The
20    ! instructions within the FUNCDEF '@' delimiters form a structure
30    ! called a DLP (downloadable program).
40    !
50    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60
70    OUTPUT @Sa;"FUNCDEF S_MOOTH_EX,@;"; ! Logical start of the DLP.
80    OUTPUT @Sa;"IP;";                    ! Instrument preset.
90    !
100   OUTPUT @Sa;"TS; VIEW TRA;";          ! Take a sweep and put trace into
110                                        View mode.
120   !
130   OUTPUT @Sa;"SMOOTH TRA,5;";          ! Smooth the trace with a five-point
140                                        ! running average.
150   !
160   OUTPUT @Sa;"@;";                     ! Logical end of the DLP.
170   !
180   OUTPUT @Sa;"S_MOOTH_EX;";            ! Have the analyzer execute the
190                                        ! DLP S_MOOTH_EX
200   ASSIGN @Sa TO *                      ! Close I/O path.
210   END
```

SQR

Square Root

Syntax



Description

Computes the square root of the source and sends the result to the destination. If the source is negative, an error message is generated, and the absolute value of the source is returned.

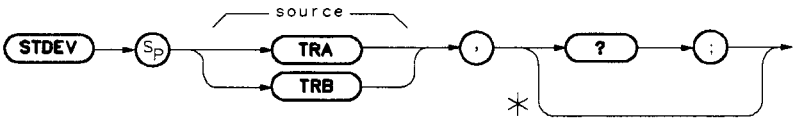
Program Example

```
10    ! The following example shows the use of the SQR command.
20    !
30    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
40    !
50    OUTPUT@Sa;"IP;CLRDSP;";              ! Instrument preset;
60     ! Clear CRT for text display.
70    OUTPUT @Sa;"VARDEF NUMBER,123;";     ! \ Create variable and
80    OUTPUT @Sa;"VARDEF ROOT,0;";         ! / initialize.
90    OUTPUT @Sa;"SQR ROOT,NUMBER;";       ! Take the square root.
100   !
110   OUTPUT @Sa;"PU;PA 10,500;";          ! Move "pen" to starting point.
120   OUTPUT @Sa;"TEXT %The Square Root of %;";
                                           ! Write text.
130   OUTPUT @Sa;"DSPLY NUMBER,7,5;";      ! Write value.
140   OUTPUT @Sa;"TEXT % = %;";            ! Write text.
150   OUTPUT @Sa;"DSPLY ROOT,7,5;";        ! Write value.
160   !
170   ASSIGN @Sa TO *                      ! Close I/O path.
180   END
```

STDEV

Standard Deviation of Trace Amplitudes

Syntax



xf289a

Note This bypass command path is only legal if you use STDEV as a predefined function. It must reside within a compatible-function operation.

Description

Return the standard deviation of the trace amplitude in measurement units.

Prerequisite Commands: TS when using TRA, TRB, or trace range for source.

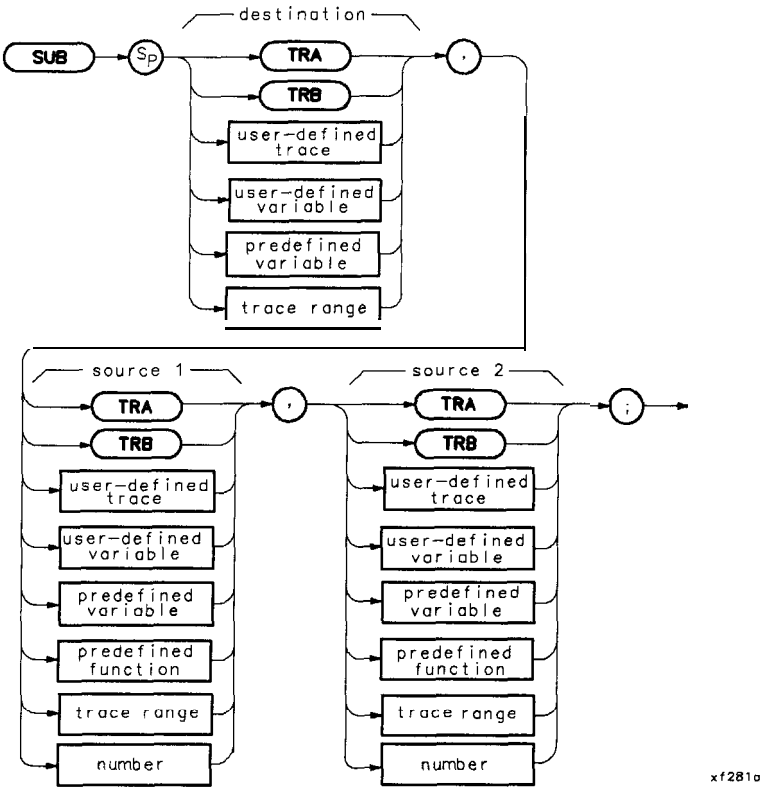
Program Example

```
10    ! The following example shows the use of the STDEV function to return
20    ! the standard deviation of the trace to the controller. The example
30    ! uses an input signal of 300 MHz such as the CAL OUTPUT.
40    !
50    INTEGER Mean-value                    ! Define an INTEGER variable.
60    ASSIGN @Sa TO 718                     ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"IP;CF 300MHZ;SP 1MHZ;TS;";
                                            ! Set up the analyzer.
90    OUTPUT @Sa;"MEAN TRA,?;";             ! Determine the mean of trace A.
100   ENTER @Sa;Mean_value                  ! Read value from analyzer.
110   PRINT "MEAN of trace A in measurement units = ";Mean_value
120   OUTPUT @Sa;"STDEV TRA,?;";
130   ENTER @Sa;Stdev_value
140   PRINT "STANDARD DEVIATION of trace A in measurement units = ";Stdev_value
150   !
160   ASSIGN @Sa TO *                       ! Close I/O path.
170   !
180   END
```

SUB

Subtract

Syntax



Description

Subtract the value of source 1 from source 2 and send the results to the destination.

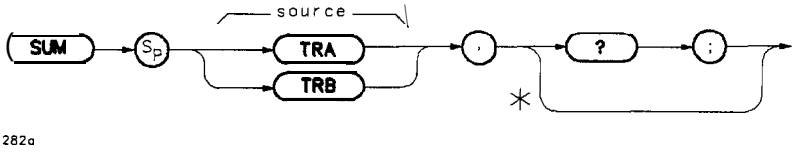
Program Example

```
10   ! The following example shows the use of the SUB command.  The example
20   ! uses an input signal of 300 MHz, such as the CAL OUTPUT signal, and
30   ! looks at its harmonics. An input signal is not necessary to the
40   ! function of this example, but acts as a visual aid.
50   !
60   ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70   !
80   OUTPUT @Sa;"FUNCDEF SUB_EX,@;";      ! Logical start of the DLP function.
90   OUTPUT @Sa;"VARDEF FREQ,3E9;";       ! Create variable and initialize to 3 GHz.
100  OUTPUT @Sa;"IP;SP 1MHZ;";           ! Instrument preset; set span.
110  !
120  OUTPUT@Sa;"REPEAT;";                 ! Begin loop.
130  OUTPUT @Sa;" MOV CF,FREQ;";          ! Set center frequency.
140  OUTPUT @Sa;" TS;";                   ! Take a sweep to update display.
150  OUTPUT @Sa;" SUB FREQ,FREQ,300E6;";! Decrease FREQ by 300 MHz.
160  OUTPUT @Sa;"UNTIL FREQ,LT,300E6;";   ! End of loop.
170  OUTPUT@Sa;"@;";                      ! Logical end of DLP function.
180  !
190  OUTPUT@Sa;"SUB_EX;";                 ! Execute function.
200  !
210  ASSIGN @Sa TO *                      ! Close I/O path.
220  END
```

SUM

Sum of Trace Amplitudes

Syntax



Note This bypass command path is only legal if you use SUM as a predefined function. It must reside within a compatible-function operation.

Description

Compute the sum of the given trace.

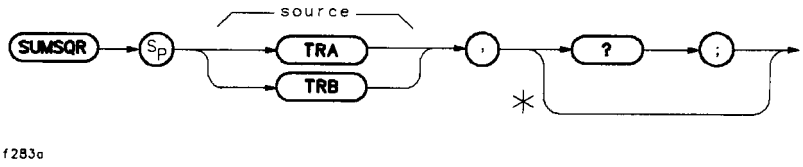
Program Example

```
10    ! The following example shows the use of the SUM command.  The example
20    ! uses an input signal of 300 MHz such as the CAL OUTPUT.
30    !
40    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
50    !
60    OUTPUT @Sa;"IP;";                    ! Instrument preset.
70    OUTPUT @Sa;"CF 300MZ; SP 1MZ;";      ! \
80    OUTPUT @Sa;";SNGLS;TS;";             ! Set up analyzer.
90    OUTPUT @Sa;"MKPK HI;MKRL;TS;HD;";    ! /
100   !
110   OUTPUT @Sa;"SUM TRA,?;";             ! Returns sum in measurement units.
120   ENTER @Sa;Sum_trace                  ! Bring result into computer.
130   PRINT "The sum of all the trace points equals ";Sum_trace
140   !
150   ASSIGN @Sa TO *                      ! Close I/O path.
160   END
```

SUMSQR

Sum of Squared Trace Amplitudes

Syntax



xf283a

Note This bypass command path is only legal if you use SUMSQR as a predefined function. It must reside within a compatible-function operation.

Description

Squares the amplitude of each trace element, and returns the sum of the squares to the controller in measurement units.

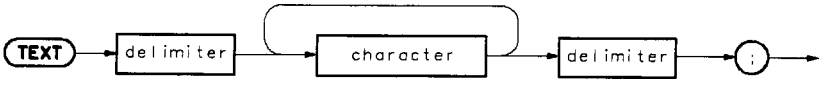
Program Example

```
10   ! The following example shows the use of the SUMSQR command. The
20   ! example uses an input signal of 300 MHz such as the CAL OUTPUT.
30   !
40   ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
50   !
60   OUTPUT @Sa;"IP;";                    ! Instrument preset.
70   OUTPUT @Sa;"CF 300MZ; SP 1MZ;";      ! \
80   OUTPUT @Sa;"RB 30KHZ;";              !   Set up the analyzer.
90   OUTPUT @Sa;"TS;MKPK HI;MKRL;TS;HD;";!/
100  !
110  OUTPUT @Sa;"SUMSQR TRA,?;";          ! Query the analyzer.
120  ENTER @Sa;Sum_sqr                    ! Get the value from the analyzer.
130  PRINT "The Sum of the Squares of the trace points = ";Sum_sqr;
140  PRINT "measurement units."
150  !
160  ASSIGN @Sa TO *                      ! Close I/O path.
170  END
```

TEXT

Text

Syntax



xf284a

Description

This command is used to display the user-defined text on the spectrum analyzer screen at the current graphics pen location. Related commands are PU, PA, and PD.

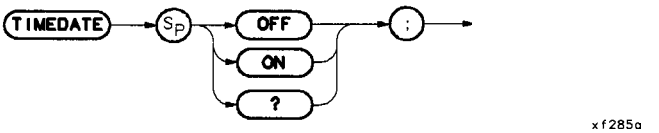
Program Example

```
10    ! The following example shows the use of the REPEAT/UNTIL commands
20    ! in a FOR/NEXT loop context. This is an immediate-execute DLP
30    ! (downloadable program).  This is another way of nesting REPEATs.
40    !
50    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
60    !
70    OUTPUT @Sa;"IP;";                    ! Instrument preset.
80    OUTPUT @Sa;"VARDEF OUTER_LP,0;";     ! Create variable and initialize to 0.
90    OUTPUT @Sa;"VARDEF TOTAL,0;";        ! Create variable and initialize to 0.
100   !
110   OUTPUT @Sa;"REPEAT;";                ! Begin outer loop.
120   OUTPUT @Sa;" VARDEF INNER-LP,0;";    ! Create and initialize inner loop counter.
130   OUTPUT @Sa;" REPEAT;";               ! Begin inner loop.
140   OUTPUT @Sa;"    ADD TOTAL,TOTAL,1;";! Increment running total.
150   OUTPUT @Sa;"    ADD INNER_LP,INNER_LP,1;";
                                           ! Increment inner loop counter.
160   OUTPUT @Sa;" UNTIL INNER_LP,EQ,3;";! End of inner loop.
170   OUTPUT @Sa;" ADD OUTER_LP,OUTER_LP,1;";
                                           ! Increment outer loop counter.
180   OUTPUT @Sa;"UNTIL OUTER_LP,EQ,4;";   ! End of outer loop.
190   !
200   OUTPUT @Sa;"CLRDSP;";
210   OUTPUT @Sa;"PU;PA 10,500;TEXT %INNER LOOP COUNTER=%;";
220   OUTPUT @Sa;"DSPLY INNER_LP,5,2;";
230   OUTPUT @Sa;"PU;PA 10,400;TEXT %OUTER LOOP COUNTER=%;";
240   OUTPUT @Sa;"DSPLY OUTER_LP,5,2;";
250   OUTPUT @Sa;"PU;PA 10,300;TEXT %TOTAL ITERATIONS=%;";
260   OUTPUT @Sa;"DSPLY TOTAL,5,2;";
270   !
280   ASSIGN @Sa TO *                      ! Close I/O path.
290   END
```

TIMEDATE

Time Date

Syntax



Description Use this command to turn the time and date display on or off. The default setting is OFF.

Note The time/date display must be turned off in order to display HP-IB errors properly on the spectrum analyzer display.

Query Response The time/date setting of the module is returned in the MMDDYY format.

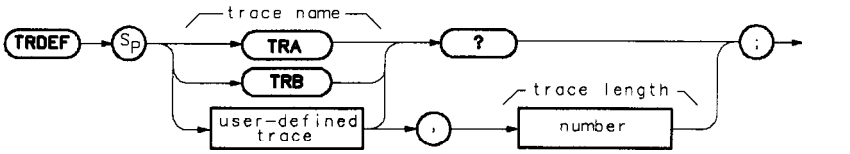
Program Example

```
10   ! The following example shows the use of the TIMEDATE command.
20   !
30   ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
40   OUTPUT @Sa;"IP;";                ! Instrument preset.
50   DISP "Activate 856X Time and Date Display"
60   OUTPUT @Sa;"TIMEDATE ON;";
70   !
80   WAIT 5                           ! Note that time and date are displayed.
90   !
100  DISP "De-activate 8562 Time and Date Display"
110  OUTPUT @Sa;"TIMEDATE OFF;";
120  !
130  ASSIGN @Sa TO *                  ! Close I/O path.
140  END
```

TRDEF

Trace Definition

Syntax



xf286a

Description

Defines the name and length of a user-defined trace. Any number of points from 0 to 65,000 may be used for a trace length. Changing the length of predefined traces results in an error. The length of a predefined trace can be queried.

User memory is required to execute the TRDEF command.

Parameters

<trace length>:: = integer from 1 to 65,000
(there are 601 points in a predefined trace)

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Related Command: DISPOSE

Querying a User-Defined Trace

For user-defined trace data transfer to and from an external controller, only M format is supported. A, B, I, and P block-data field formats are not currently supported.

User-Defined Trace Query Response

Response Syntax Notation: <trace length>

Parameters

Minimum Range: 1

Maximum Range: 65000

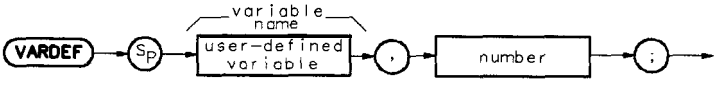
Program Example

```
10    ! The following example shows the use of the TRDEF command. The example
20    ! creates a sine wave in the computer and sends it to trace A of the
30    ! analyzer. It is then moved to the user-defined trace where it can be
40    ! manipulated to fit the user's needs.
50    !
60    ASSIGN @Sa TO 718              ! Assign I/O path to address 718.
70    DIM Y_axis(1:601)              ! Create an array in the computer.
80    RAD                            ! Angles measured in radians.
90    GINIT ! Graphics Init (computer).
100   GRAPHICS ON                    ! Graphics On (computer).
110   WINDOW1,601,1,601              ! Set up the calculator screen to
120                                  ! have the same number of points as
130                                  ! the spectrum analyzer.
140   MOVE 0,SIN(0)                  ! Move the pen (computer).
150   X=0
160                                  ! Create the array in the computer.
170   FOR Angle=0 TO 20*PI STEP (2*PI)/60
180      X=X+1                       ! Increment array pointer.
190      Y=SIN(Angle)*120+300        ! 120 gives +/- 2 divs of amplitude.
200                                  ! 300 offsets to mid-screen
210      PLOT X,Y                    ! Draw sine wave on computer screen.
220      Y_axis(X)=Y                 ! Load the array.
230   NEXT Angle
240   !
250   ! Set up the analyzer to receive the trace array from the computer.
260   !
270   OUTPUT@Sa;"IP;SNGLS;TS;";      ! Instrument preset. Single sweep
280                                  ! so that the trace is not over-
290                                  ! written by another sweep.
300   OUTPUT @Sa;"VIEW TRA;TDF A;";  ! View trace A. Set to 'A' format.
310   OUTPUT @Sa USING "#,K,W,601(W)";"TRA#A",1202,Y_axis(*),";";
                                     ! Send the trace.
320   !
330   OUTPUT @Sa;"TRDEF SINE,601;";  ! Create a user-defined trace that
340                                  ! is the same size as a default
350                                  ! screen trace.
360   OUTPUT @Sa;"MOV SINE,TRA;";    ! Copy trace A to the user-defined
370                                  ! trace.
380   OUTPUT @Sa;"ADD SINE,SINE,60;"; ! Add 60 to each point in SINE.
390   OUTPUT @Sa;"MOV TRB,SINE;";    ! Copy the modified SINE trace to
400                                  ! trace B.
410   OUTPUT @Sa;"VIEW TRA; VIEW TRB;";
                                     ! View both traces.
420   !
430   ! Note that 60 offsets the sine wave one division from the original trace.
440   !
450   ASSIGN @Sa TO *                ! Close I/O path.
460   END
```

VARDEF

Variable Definition

Syntax



xf287a

Description

Defines the name of a user-defined variable and assigns its initial value. If a command mnemonic and the label of the user-defined variable match, an error results.

Note

In Mass Memory Modules with firmware datecode 910116 and later, the value of a user-defined variable can be modified using the secondary keyword **EP**. Refer to "Using EP to Modify User-Defined Variables (firmware revision 910116 and later)" in this chapter.

User memory is required to execute the VARDEF command. After using VARDEF to define a label, other commands may be used as described below.

Parameters

<initial value>:: = <real>

Restrictions: Subject to available memory. The following commands consume memory: ONEOS, ARRAYDEF, TRDEF, KEYDEF, LCLVAR, VARDEF REPEAT/UNTIL, and IF/THEN.

Prerequisite Commands: VARDEF when using user-defined variable.

Related Command: DISPOSE

Program Example

```
10    ! The following example shows the use of the VARDEF command.  The
20    ! example uses an input signal of 300 MHz, such as the CAL OUTPUT signal
30    ! and looks at its harmonics.  An input signal is not necessary to the
40    ! function of this example, but acts as a visual aid.
50    !
60    ASSIGN @Sa TO 718                    ! Assign I/O path to address 718.
70    !
80    OUTPUT @Sa;"FUNCDEF INCRFREQ,@;";    ! Logical start of the DLP function.
90    OUTPUT @Sa;"VARDEF FREQ,300E6;";     ! Create variable and initialize to
                                           ! 300 MHz.
100   OUTPUT @Sa;"IP;SP 1MHZ;";            ! Instrument preset.
110   !
120   OUTPUT @Sa;"REPEAT;";                ! Begin loop.
130   OUTPUT @Sa;"  MOV CF,FREQ;";         ! Set center frequency.
140   OUTPUT @Sa;" TS;";                   ! Take a sweep to update display.
150   OUTPUT @Sa;"  ADD FREQ,FREQ,300E6;";
                                           ! Increase FREQ by 300 MHz.
160   OUTPUT @Sa;"UNTIL FREQ,GT,3E9;";     ! End of loop.
170   OUTPUT @Sa;"@;";                     ! Logical end of DLP function.
180   !
190   !
200   OUTPUT @Sa;" INCRFREQ;";             ! Execute function.
210   !
220   ASSIGN @Sa TO *                      ! Close I/O path.
230   END
```

Query Value of Current Variable

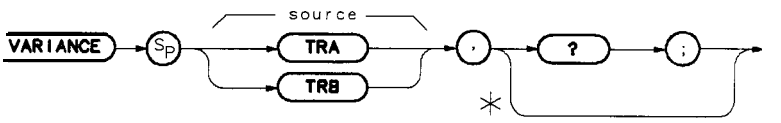
Variable value may be queried by executing the command as shown:

```
10 OUTPUT 718;"FREQ?;"
20 OUTPUT 718;FREQUENCY
```

VARIANCE

Variance

Syntax



xf288a

Note

This bypass command path is only legal if you use VARIANCE as a predefined function. It must reside within a compatible-function operation.

Description

The VARIANCE command returns the amplitude variations of the specified trace to **the** controller in measurement units.

Prerequisite Commands: TS when using TRA, TRB, or trace range for source.

Program Example

```
10    ! The following example shows the use of the VARIANCE command.
20    ! The example uses an input signal of 300 MHz such as the CAL OUTPUT.
30    !
40    ASSIGN @Sa TO 718                    ! Assign I/O path to -address 718.
50    !
60    OUTPUT @Sa;"IP;SNGLS;"               ! Instrument preset.
70    OUTPUT @Sa;"CF 300 MZ;SP 1KHZ;"      ! \ Set up analyzer.
80    OUTPUT @Sa;"RB 300HZ; TS;"           ! /
90    !
100   OUTPUT @Sa;"VARIANCE TRA,?;"         ! Query the trace variance.
110   ENTER @Sa;Variance                   ! Get the value from the analyzer.
120   PRINT "The variance of trace A is ";Variance
130   !
140   ASSIGN @Sa TO *                      ! Close I/O path.
150   END
```

5

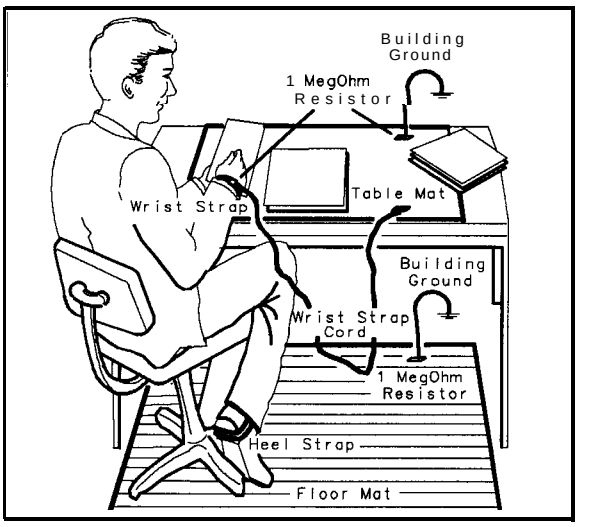
Service

Turning on the Module

The HP 85620A Mass Memory Module requires no specific performance verification tests nor adjustment procedures. If the module should fail to power up at turn-on, turn the spectrum analyzer off, then verify that the module is installed correctly. Refer to Chapter 1, "Installation," for module connection information. If the connection appears to be correct, contact one of the Hewlett-Packard Sales and Service Offices listed in Chapter 1, Table 1-7.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage or destroy electronic components. All work performed on assemblies containing electronic components should be done ONLY at a static-safe workstation. See Figure 5-1. Static-safe accessories may be ordered from any Hewlett-Packard Sales and Service Office listed in Chapter 1, Table 1-7. Refer to Table 5-1 for a list of the part numbers for these accessories.



FORMAT46/DF239

Figure 5-1. Static-Safe Workstation

Static-Safe Accessories

Table 5-1. Static-Safe Accessories

HP Part Number	Description
9300-0797	Set includes: 3M static control mat 0.6 m x 1.2 m (2 ft x 4 ft) and 4.6 cm (15 ft) ground wire. (The wrist-strap and wrist-strap cord are not included. They must be ordered separately.)
9300-0980	Wrist-strap cord 1.5 m (5 ft)
9300-1383	Wrist-strap, color black, stainless steel, without cord, has four adjustable links and a 7 mm post-type connection.
9300-1169	ESD heel-strap (reusable 6 to 12 months).

Returning Modules for Service

If you are returning a module to Hewlett-Packard for servicing, fill in and attach one of the blue service tags located at the end of this chapter. Please be as specific as possible about the nature of the problem. If you have recorded any error messages that appeared on the screen or have any other specific data on the performance of the module, please send a copy of this information along with the unit.

Back-Up Battery Voltage Test

lest the module back-up battery by connecting a DVM between A1TP1-3 and A1TP1-2 (ground). The dc voltage measurement should be about 2.8 Vdc ±0.5 Vdc. See Figure 5-2.

Test the memory card battery by connecting a DVM between A1TP1-1 and A1TP1-2 (ground). The dc voltage measurement should be about 2.7 Vdc ±0.5 Vdc. (Option T01 does not include memory card capability.) See Figure 5-2.

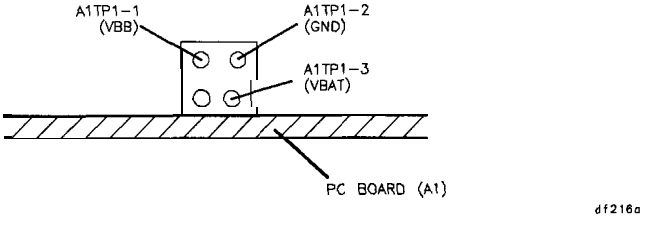


Figure 5-2. A1TP1 Configuration

Replacement Procedures

Introduction

Replacement procedures provide specific disassembly and assembly information. Refer to the appropriate replacement procedures for the assembly you are replacing.

- Al Memory Board Replacement
- B1 Module Battery Replacement
- Memory Card Battery Replacement

Al Memory Board Assembly Replacement

Caution

- The module and board assembly are static sensitive. Be sure to perform any disassembly at a static-safe workstation as illustrated in Figure 5-1.
- Store or transport these items ONLY in static-shielding containers.
- Personnel should be grounded with a resistor-isolated wrist strap before touching any connector pins or before removing any assembly from the module.
- Be sure that all instruments are properly earth-grounded to prevent build up of static charge.

1. Remove the four module-assembly screws (1). See Figure 5-3 or Figure 5-4.
2. Open the module from the left-hand side (2) with the front-panel label facing you.
3. With the module laying flat, remove the brace (3) and the eight board-assembly screws (4). Lift the board assembly out of the module.
4. Replace the board assembly into the module and secure it with the eight board-assembly screws (4). Torque each one to three inch-pounds.
5. Replace the brace (3), then close the module halves.
6. Replace the four module screws (1) and torque each one to six inch-pounds.

B1 Module Battery Replacement

1. Refer to the Al Memory Board Assembly Replacement procedure to remove the Al assembly.
2. Carefully desolder the battery (5). * See Figure 5-3 or Figure 5-4.

Warning **The battery case becomes very hot during desoldering. Use care when handling it.**

3. Replace the battery and solder it into place. *
4. Replace the board assembly into the module and secure it with the eight board-assembly screws (4). Torque each one to three inch-pounds.
5. Replace the brace (3), then close the module halves.
6. Replace the four module screws (1) and torque each one to six inch-pounds.

* For modules with serial prefix 3143A and above, the battery mounts in a clip and does not need to be soldered in place.

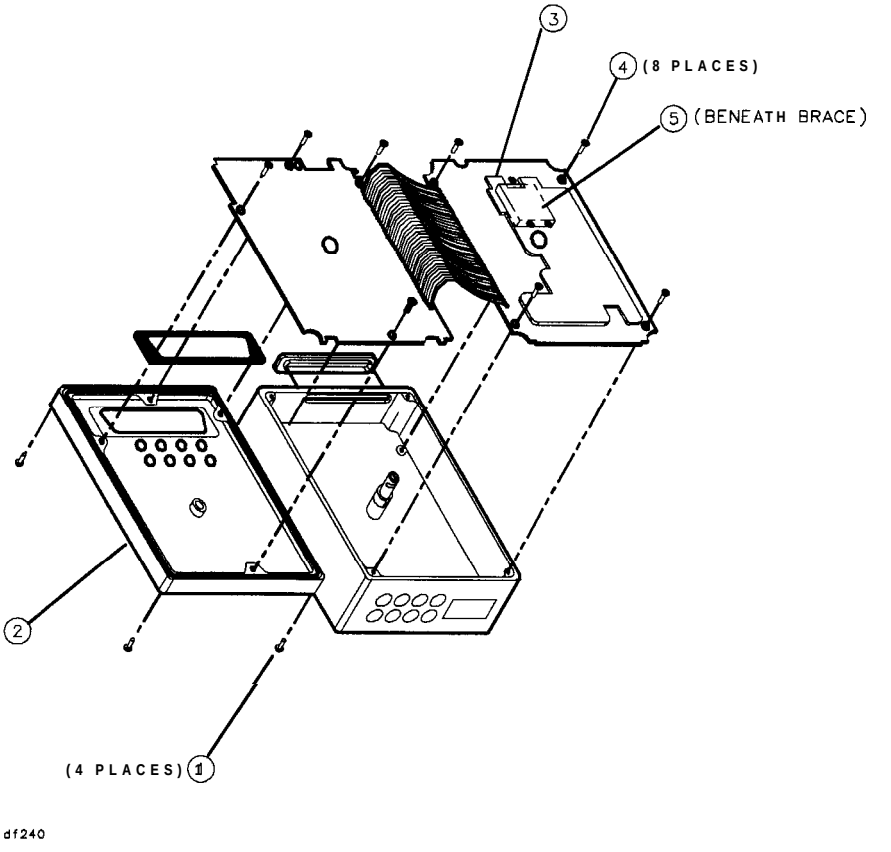


Figure 5-3.
Al Board Assembly & Battery Replacement (Serial Prefix <3143A)

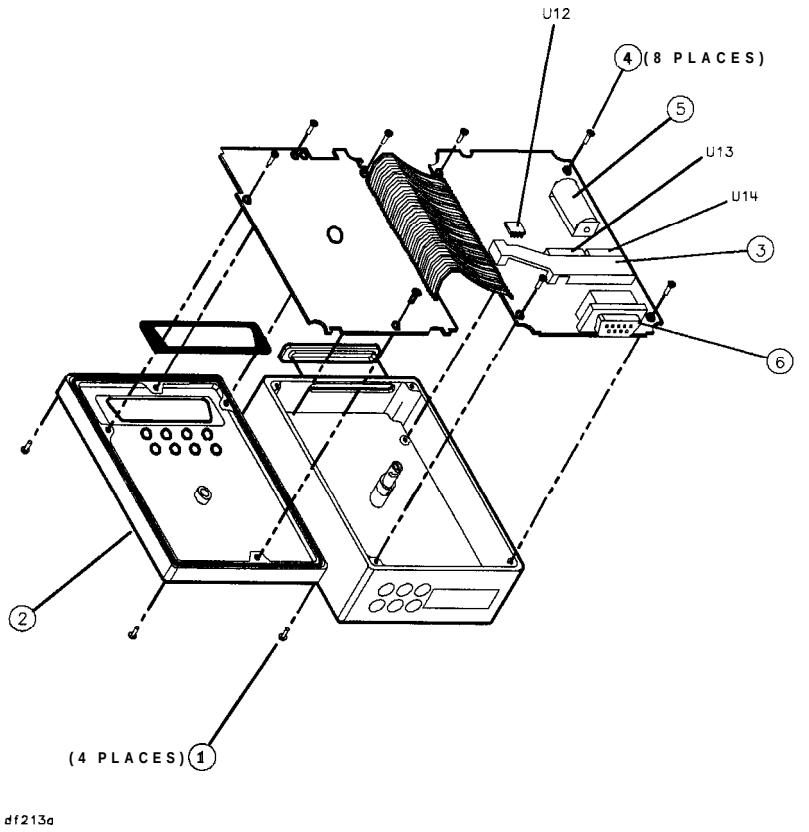


Figure 5-4.
Al Board Assembly & Battery Replacement (Serial Prefix ≥3143A)

Memory Card Battery Replacement

The battery is located beside the card write-protect switch on the end opposite the connector. Table 1-5 in Chapter 1 contains battery specifications and characteristics. (Option T01 does not include memory card capability.)

Caution

Unless you replace the battery with the card installed and the module powered up by the spectrum analyzer, you lose memory-card data when the battery is removed. Back up memory-card data on some other medium before beginning the battery replacement procedure that follows.

1. Locate the groove (1) along the edge of the battery clip. See Figure 5-5.
2. Gently pry the battery clip out of the card. The battery fits within this clip.
3. Replace the battery, HP part number 1420-0383, making sure the plus (+) sign (2) on the battery is on the same side as the plus (+) sign (3) on the clip.
4. Insert the battery clip into the memory card, holding the clip as oriented in Figure 5-5. (Face the "open" edge of the clip toward the write-protect switch.)

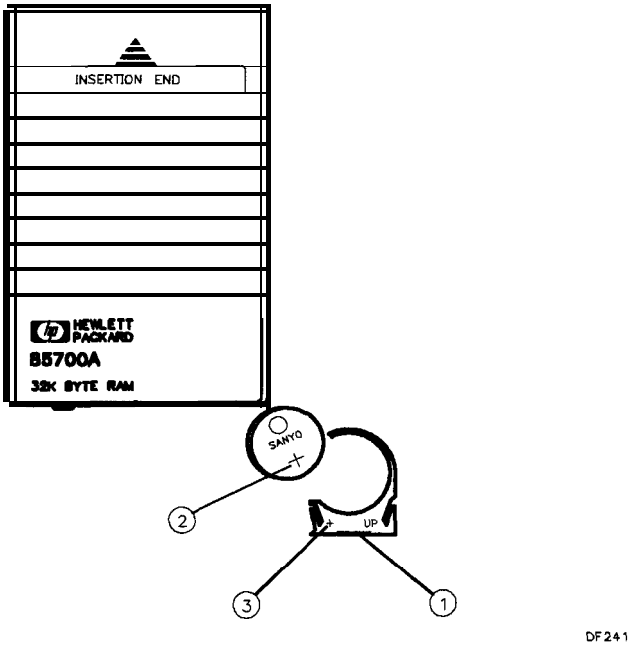


Figure 5-5. Memory Card Battery Replacement

Troubleshooting and Replaceable Parts

Introduction

The HP 85620A Mass Memory Module is supported to the component level. Refer to the "Troubleshooting" section when troubleshooting the module. Table 5-3 contains the list of components in the module. Refer to Figure 5-6 or Figure 5-7 for the illustration of replaceable hardware. Figure 5-8 is the block diagram. Component level information is at the end of this chapter.

Troubleshooting

Missing Features

It is possible to get a different set of features from the HP 85620A if you connect it to the rear panel of a different spectrum analyzer, depending on the firmware revision of the host spectrum analyzer. In spectrum analyzers with firmware revision 960401 and later, the firmware that controls the mass memory module actually resides in the host spectrum analyzer and contains a more recent set of features and functionality. If the same mass memory module is installed on a host spectrum analyzer with firmware revision 941028 or earlier, the firmware that resides in the mass memory module (revision A, B, or C) will control the features and functionality of the module.

Verify the mass memory firmware revision by pressing (MODULE). The firmware revision that controls the features and functionality of the module is displayed. Firmware revision 910116 or earlier will be displayed when the host spectrum analyzer firmware revision is 941028 or earlier. Firmware revision 950829 or later will be displayed when the host spectrum analyzer firmware revision is 960401 or later.

If the HP 85620A mass memory module does not exhibit the set of features and functionality that you expect it to have, check its firmware revision as indicated above. New features and functionality that were added in firmware revisions 950829 and later require the use of a host spectrum analyzer with firmware revision 960401 or later.

Back-up Battery Voltage Test

Test the module back-up battery at least annually by connecting a DVM between A1TP1-3 and A1TP1-2 (ground). The dc voltage measurement should be about 2.8 Vdc ±0.5 Vdc. See Figure 5-2.

Test the memory card battery at least annually by connecting a DVM between A1TP1-1 and A1TP1-2 (ground). The dc voltage measurement should be about 2.7 Vdc ±0.5 Vdc. See Figure 5-2.

Memory Card Connector

If there appear to be intermittent problems and other failures related to using the memory card, a possible cause is memory card connector wear Connector life can be shortened by frequent memory card insertion. In applications where the memory card is inserted more than twice daily, we recommend that you change the connecter on the Al board assembly at least every 5 years. Replacement part

numbers for the connector and the board assembly are included in the component level information packets.

Error Codes

Refer to “Error Codes” in Chapter 1 for an explanation of error-code numbers 800 to 899, which are reserved for the mass memory module and its memory card.

Replaceable Parts

Table 5-3 lists the mechanical parts illustrated in the parts identification drawing, Figure 5-6 or Figure 5-7, depending on the serial prefix of the mass memory module. The component-level replaceable parts, component location diagram, and schematic for each board assembly are contained in individual packets for each board assembly. Refer to component-level information at the end of this chapter.

Table 5-2. Manufacturer's Code List

Mfr. Code	Manufacturer Name	Address	ZIP Code
C1433	ABELEKTRONIK GMBH	SALZBURG, AU	A-501
K7253	STD/STANTEL	DEVON, EG	
S4013	HITACHI AMERICA LTD	SUNNYVALE, CA, US	94086
00779	AMP INC	HARRISBURG, PA, US	17111
08709	EPSON AMERICA	TORRANCE, CA, US	75265
01295	TEXAS INSTRUMENTS INC	DALLAS, TX, US	90505
04222	AVX CORP	GREAT NECK, NY, US	11021
10421	PANASONIC, INC	SECAUCUS, NJ, US	07094
06383	PANDUIT CORP	TINLEY PARK, IL, US	69477
06424	SPERRY RAND μ - WAVE ELEK DIV	CLEARWATER, FL, US	33518
10899	EASTERN AIR DEVICES INC	GREAT NECK, NY, US	11021
18873	DUPONT E I DE NEMOURS & CO	WILMINGTON, DE, US	19801
2M627	ROHM CORP	IRVINE, CA, US	92713
28480	HEWLETT-PACKARD CO CORP HQ	PALO ALTO, CA, US	94304
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE, CA, US	94086
71468	ITT CORP	NEW YORK, NY, US	10022
72794	DZUS FASTENER CO INC	WEST ISLIP, NY, US	11795

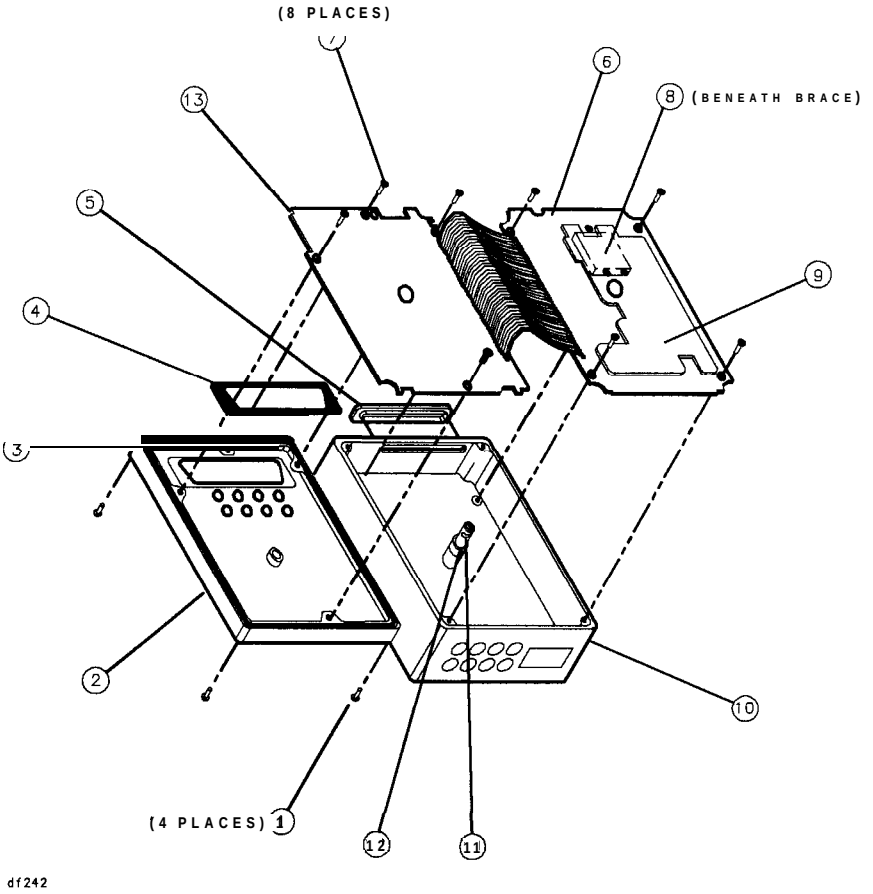


Figure 5-6. HP 85620A Parts Identification (Serial Prefix <3143A)

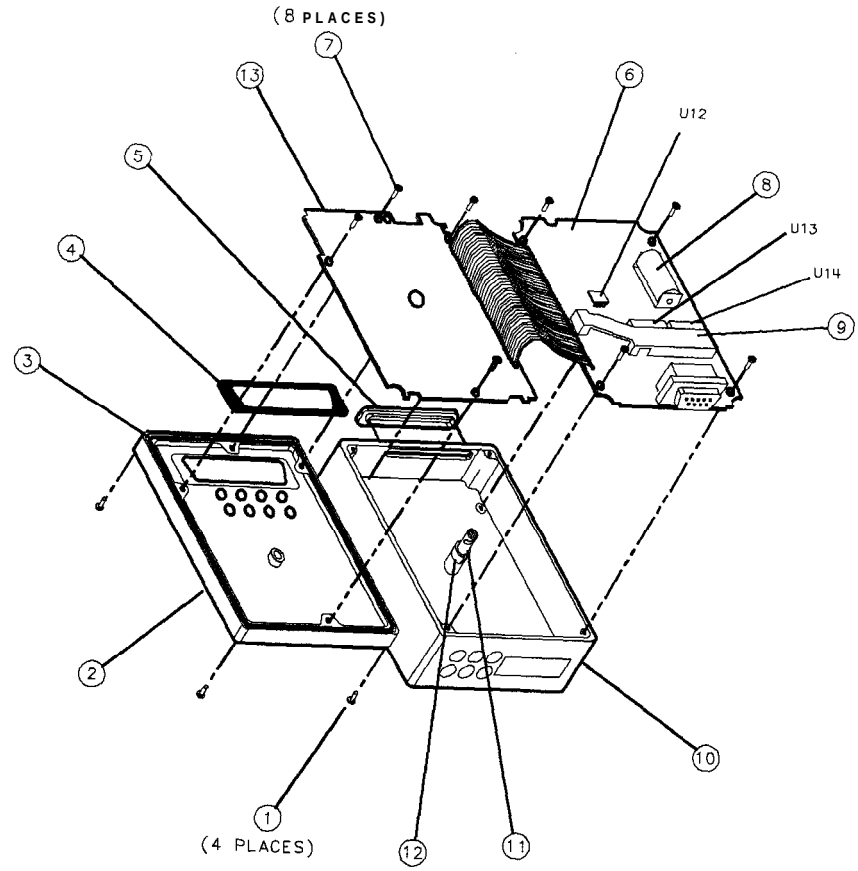


Figure 5-7. HP 85620A Parts Identification (Serial Prefix ≥3143A) df215a

Table 5-3. HP 85620A Parts Identification

Item	HP Part Number	C D	Qty	Description	Mfg Code	Mfg Part Number
1	0515-1236	9	4	SCREW-MACH M3 X 0.5 14MM-LG	28480	0515-1236
2	5021-9304	6	1	COV-BTM TEST	28480	5021-9304
3	8160-0448	8	1	RFI ROUND STRIP BE-CU SN-PL .062-IN-OD	10899	SS-04
4	8160-0650	4	1	GASKET-OPTION MODULE CONNECTOR	28480	8160-0650
5	85620-40002*	0	1	BEZEL MEMORY CARD SLOT	28480	85620-40002
6	85620-60001†	1	1	BD AY-PORT MEM	28480	85620-60001
6	85620-60006‡	6	1	BD AY-PORT MEM	28480	85620-60006
6	85620-60008§	8	1	BD AY-PORT MEM	28480	85620-60008
6	85620-60014‖	6	1	BD AY-PORT MEM	28480	85620-60014
7	0515-0894	3	8	SCREW-MACH M2.5 X 0.45 6MM-LG PAN-HD	28480	0515-0894
8	1420-0370†	0	1	BATTERY, 2.8 V 1.0AH	28480	1420-0370
8	1420-0341‡‖		1	BATTERY, 3 V 1.2AH	28480	1420-0341
8	1420-0394§		1	BATTERY, 3 V 1 .OAH	08709	CR2477-1HF
9	85620-40001#	9	1	BRACE	28480	85620-40001
9	5041-8980§**	4	1	BRACE	28480	5041-8980
10	85620-20005†	1	1	COVER-TOP	28480	85620-20005
10	5021-9303§‖	5	1	COVER-TOP	28480	5021-9303
10	5022-0002‡	5	1	COVER-TOP	28480	5022-0002
11	1390-0750	5	1	FASTENER-1/4-TURN RCPT	72794	A3.5T127B1100-Z
12	5041-7247	4	1	SPACER	28480	5041-7247
	85620-80003	5	1	LABEL SET	28480	85620-80003

: Option TO1 does not include memory card capability.
Serial prefix 2929A and below
Standard Serial prefix 3143A and above
Serial prefix 3003A
Option TO1 Serial prefix 3143A and above
ᶠ Serial prefix 3003A and below
* Serial prefix 3143A

Table 5-4. Firmware Revision and ROM Fart Numbers

HP 85620A Firmware Revision/Date Code	ROM Fart Number*		
	U1	U2	U3
A/890214	85620-80005	85620-80007	85620-80009
B/890524	85620-80014	85620-80015	85620-80016
C/910116†	85620-80023	85620-80024	85620-80025
	U7 ROM Fart Number‡		
C/910116†	85620-8002 1		

* Serial prefix 3003A and below.

† The HP part number for the current firmware revision label is 85620-80003.

‡ Serial prefix 3143A and above.

See Firmware Note, HP part number 5962-0452, for descriptions of the firmware revisions.

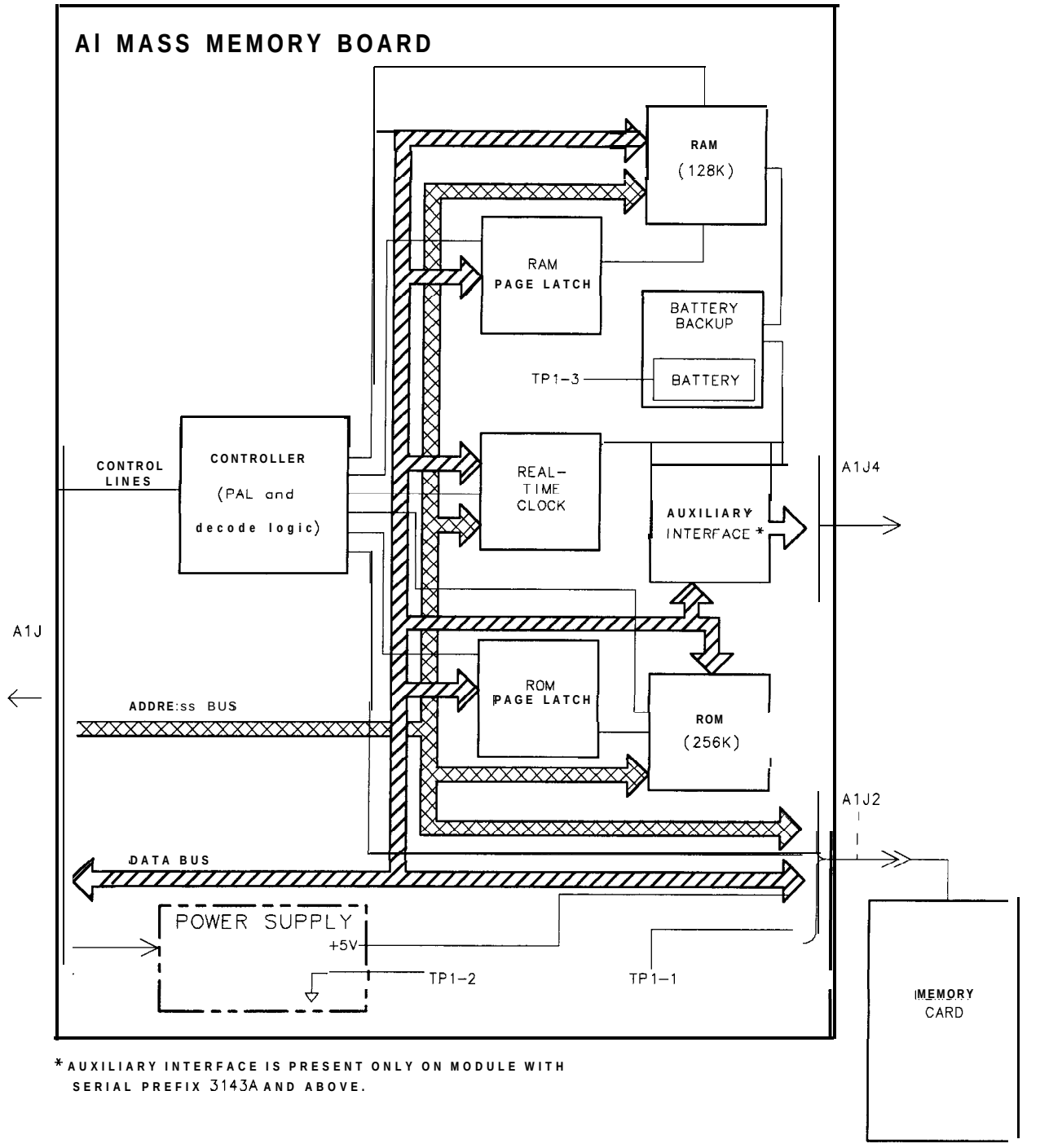


Figure 5-8. HP 85620A Block Diagram

Component-Level Information

Component-Level information is available for selected instrument assemblies.

Table 5-5 lists board assembly part numbers and where they are used.

Note Drawings may not be available for recently introduced assemblies.

Table 5-5. HP 85620A Mass Memory Module Documented Assemblies

Board Assembly	Instrument Serial Prefix	Assembly Part Number	CLIP Part Number
Mass Memory Assembly	2929A and below	85620-60001	85620-90033
Mass Memory Assembly	3003A	**85620-60008**	**85620-90034**
Mass Memory Assembly	Standard only (3143A)	**85620-60006**	**85620-90035**
Mass Memory Assembly	3526A and above	85620-60018	85620-90038
Mass Memory Assembly	Option T01 only 3143A and above	85620-60014	Contact HP (MID)

Component-Level Information Packet for 85620-6000 1

Mass Memory Assembly

HP Part No. 85620-90033
Printed in USA April 1995

HP Part Number 85620-60001
A1 Mass Memory Assembly

Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BT1	1420-0307	1	BATTERY 7.2V .45A-HR NI-CD FLAT	28480	1420-0307
C1	0180-0374	1	CAP-FXD 10uF +-10% 20 V TA	28480	0180-0374
C2	0180-0229	1	CAP-FXD 33uF +-10% 10 V TA	28480	0180-0229
C3	0160-4832	6	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C4	0160-4832		CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C5	0160-4832		CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C6	0160-4832		CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C7	0160-4832		CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C8	0160-4832		CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C9	0160-5098	1	CAP-FXD 0.22uF +-10% 50 V CER X7R	28480	0160-5098
C10	0160-4814	1	CAP-FXD 150pF +-5% 100 V CER COG	28480	0160-4814
C11	0160-4835	1	CAP-FXD 0.1uF +-10% 50 V CER X7R	28480	0160-4835
E1	1251-6939	1	CONNECTOR-SGL CONT SKT .032-IN-BSC-SZ	01075	0064801
E2	1251-2229	2	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	01380	1-331677-3
E3	1251-2229		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	01380	1-331677-3
J1	12521263	1	CONN-RECT D-SUBMIN 50-CKT 50-CONT	28480	1252-1263
J2	1252-2906	1	CONN-POST TYPE 0-CONT	28480	1252-2906
J3	8120-4857	1	CABLEMCNDCT	28480	8120-4857
R1	0698-8615	1	RESISTOR 75K +-1% .05W TF TC=0+-100	28480	0698-8615
R2	0757-0346	2	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R3	0757-0346		RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R4	0698-7252	3	RESISTOR 4.64K +-1% .05W TF TC=0+-100	28480	06967252
R5	0757-0465	2	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R7	0757-0465		RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R9	06987252		RESISTOR 4.64K +-1% .05W TF TC=0+-100	28480	0698-7252
R10	06987252	1	RESISTOR 4.64K +-1% .05W TF TC=0+-100	28480	0698-7252
TP1	1251-7819	1	CONN-POST TYPE .100-PIN-SPCG-MTG-END	28480	1251-7819
TP2	0360-2050	2	CONNECTOR-SGL CONT	04055	
TP3	0360-2050		CONNECTOR-SGL CONT	04055	
U1	8562~80005	1	EPROM-PRGMED U1	28480	85620-80005
U2	85620-80007	1	EPROM-PRGMED U2	28480	85620-80007
U3	85620-80009	1	EPROM-PRGMED U3	28480	85620-80009
U5	1820-1437	1	IC MV TTL/LS MONOSTBL CLEAR DUAL	28480	1820-1437
U6	1820-5384	1	IC-INTERFACE CMOS -888-BIT	28480	1820-5384
U7	1818-4160	1		28480	1818-4160

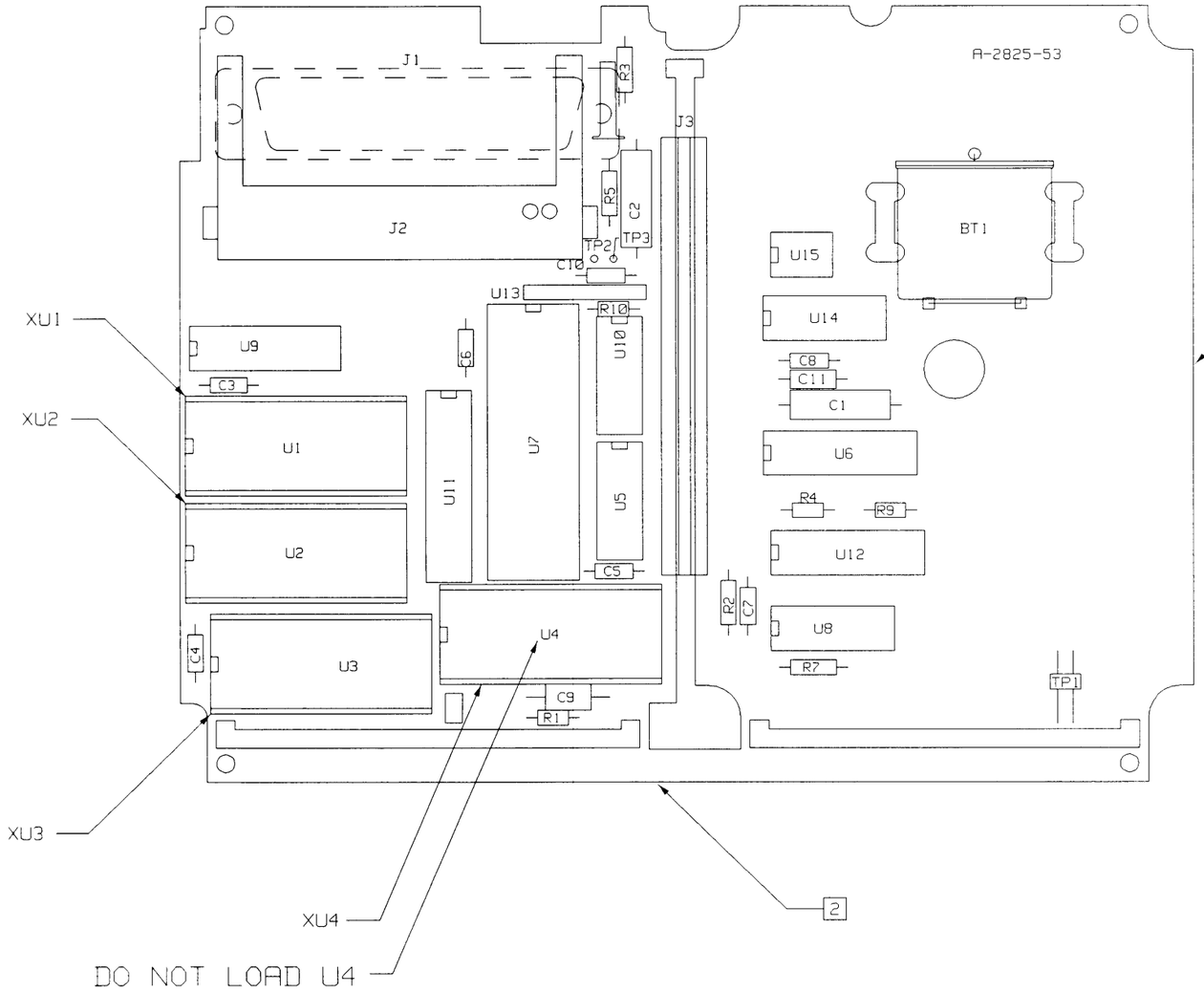
**Indicates factory-selected* value

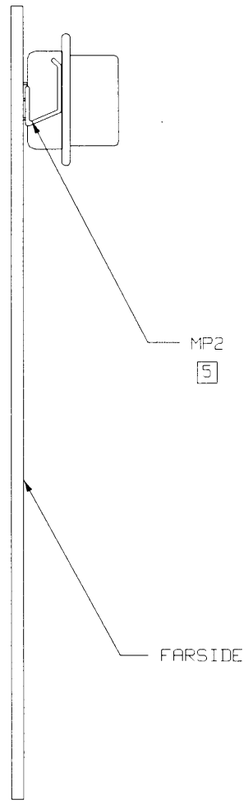
HP Part Number 85620-60001
A1 Mass Memory Assembly (continued)

Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
U8	1826-1858	1	IC PWR MGT-BAT-MGT	28480	1826-1858
U9	35620-80001	1	PAL-PROGRAMMED U9	28480	85620-80001
U10	1820-1198	1	IC GATE TTL/LS NAND QUAD 2-INP	28480	1820-1198
U11	1820-3143	1	IC FF TTL/ALS D-TYPE POS-EDGE-TRIG COM	28480	1820-3143
U12	1820-2024	1	IC DRVR TTL/LS BUS OCTL	28480	1820-2024
U13	1810-0205	1	NETWORK-RES &SIP 4.7K OHM X 7	28480	1810-0205
U14	1820-1199	1	IC INV TTL/LS HEX 1-INP	28480	1820-1199
U15	1820-5497	1	IC-NONVOLATILE MEMORY CONTROLLER	28480	1820-5497
XU1	1200-0567	1	SOCKET-IC28-CONT DIP DIP-SLDR	00779	641605-1
XU2	1200-0567	1	SOCKET-IC28-CONT DIP DIP-SLDR	00779	641605-1
XU3	1200-0567	1	SOCKET-IC28-CONT DIP DIP-SLDR	00779	641605-1
			HP 85620A ACCESSORIES PARTS LIST		
	0950-1964	1	MEMORY CARD, SRAM	10421	RBCO32IE00
	1420-0383	1	MEMORY CARD BATTERY	38709	CR2016

**Indicates factory-selected value*

		D-85620-60001-2	
SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED		11-1-88





NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.
2. REMOVE BREAK-OFF TABS AFTER MACHINE SOLDER.
3. MAXIMUM COMPONENT HEIGHT .400.
4. MAXIMUM LEAD TRIM LENGTH .118.
5. BEND PART AS SHOWN. SOLDER IN PLACE.

SEE 85620-60001 MATERIAL LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: XX±.XXX ±.015 SEE CORP. STD. 608	DRAWN BY / DATE ENGINEER/CHECKER RELEASED TO PROD. SUPERSEDES DWG.	BOARD ASSEMBLY-MASS MEMORY MODULE TITLE	HEWLETT PACKARD PART NUMBER
		NONE / 1 / 1 SCALE / SHEET / OF	D-85620-60001-2

MODEL HP85620

MASS MEMORY MODULE BOARD ASSEMBLY
85620-60001

D-85620-60001-1

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED		

Ⓐ POWER SUPPLY & BUS CONNECT

Ⓑ BATTERY BACK-UP

Ⓒ SRAM AND IC CARD

Ⓓ CONTROL LOGIC

Ⓔ ROM

Ⓕ REAL TIME CLOCK

J1

PIN	SIGNAL	TO-FROM	FUNCTION BLOCK
1	OD8		A
2	DGND		A
3	OD1		A
4	OD9		A
5	DGND		A
6	OD3		A
7	OD4		A
8	DGND		A
9	OD5		A
10	OD6		A
11	DGND		A
12	OD7		A
13	OA8		A
14	DGND		A
15	OA9		A
16	OA10		A
17	DGND		A
18	OA11		A
19	OA12		A
20	DGND		A
21	OA13		A
22	OA14		A
23	DGND		A
24	OA15		A
25	+5V		A
26	OA16		A
27	+5V		A
28	HP_PROT		A
29	OA17		A
30	OA18		A
31	OA19		A
32	+5V		A
33	OA20		A
34	OA21		A
35	LOPTION_ID		D
36	OA22		A
37	LOPTPROG		D
38	OA23		A
39	LOPTLCD		D
40	OPTCONTRG		F
41	+15V		A
42	LVBAT		F
43	+15V		A
44	OPTR/LW		D
45	+5V		A
46	+5V		A
47	+28V		A
48	BRDC		A
49	DGND		A
50	LOPT STROBE		D

J2

PIN	SIGNAL	TO-FROM	FUNCTION BLOCK
1	VCC		C
2	VBB		C
3	AB		C
4	A1		C
5	A2		C
6	A3		C
7	A4		C
8	A5		C
9	A6		C
10	A7		C
11	A8		C
12	A9		C
13	A10		C
14	A11		C
15	A12		C
16	A13		C
17	A14		C
18	A15		C
19	A16		C
20	LMC		C
21	LOE		C
22	LWE		C
23	A17		C
24	A18		C
25	NC		C
26	NC		C
27	NC		C
28	LMPOUT		C
29	NC		C
30	D7		C
31	D6		C
32	D5		C
33	D4		C
34	D3		C
35	D2		C
36	D1		C
37	D0		C
38	CE1		C
39	CE2		C
40	DGND		C

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (UF) INDUCTANCE IN MICROHENRIES (U)
3. MNEMONIC TABLE

MNEMONIC	DESCRIPTION

UNUSED PACKAGES

ITEM	QTY.	PART/MATERIAL-DESCRIPTION	MAT'L-PART NO.	MAT'L-DWG. NO.	MAT'L-SPEC.

DRAWN BY | DATE
ENGINEER/CHECKER
RELEASE TO PROD.
SUPERSEDES DWG.

TITLE: BOARD ASSEMBLY-MASS MEMORY MODULE (SCHEMATIC)

HEWLETT PACKARD

PART NUMBER: 85620-60001

SCALE NONE | FILENAME=5001A025 | SHEET 1 OF 1

D-85620-60001-1

Component-Level Information Packet for 85620-60006

Mass Memory Assembly

HP Part No. 85620-90035
Printed in USA April 1995

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HP Part Number 85620-60006
Al Mass Memory Assembly

Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BT1	1420-0341	1	BATTERY 3V 1.2A-HR LITHIUM POLYCARBON	28480	1420-0341
Cl	0180-4135	1	CAP-FXD 33uF +-10% 10 V TA	28480	0180-4135
C2	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C3	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C4	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C5	0160-4835	1	CAP-FXD 0.1uF +-10% 50 V CER X7R	28480	0160-4835
C6	0180-4136	1	CAP-FXD 10uF +-10% 20 V TA	28480	0180-4136
C7	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C8	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C9	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C10	0180-3817	1	CAP-FXD 100uF +-20% 50 V AL-ELCTLT	28480	0180-3817
C11	0180-3817	1	CAP-FXD 100uF +-20% 50 V AL-ELCTLT	28480	0180-3817
C12	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C13	0180-4214	1	CAP-FXD 220uF +-10% 10 V TA	28480	0180-4214
El	91001788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E2	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E3	91001788	1	CORE-FERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E4	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E5	91001788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E6	91001788	1	CORE-FERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
J1	1252-1263	1	CONN-RECT D-SUBMIN 50-CKT 50-CONT	28480	1252-1263
J2	1252-2906	1	CONN-POST TYPE 0-CONT	28480	1252-2906
J3	8120-4857	1	CABLEMCNDCT	28480	8120-4857
J4	1252-1327	1	CONN-RECT D-SUBMIN 9-CKT 9-CONT	28480	1252-1327
MP2	5001-8737	1	CONTACT-GROUND	28480	5001-8737
MP4	0590-1361	2	THREADED INSERT-NUT M2.5 X 0.45	03981	KF2-2.5M-ET
MP6	0515-0367	2	SCREW-MACHINE ASSEMBLY M2.5 X 0.45	28480	0515-0367
R1	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R2	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R3	0698-3155	1	RESISTOR 4.64K +-1% .125W TF TC=0+-100	28480	0698-3155
R4	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R5	0698-8816	1	RESISTOR 2.15 +-1% .125W TF TC=0+-100	28480	0698-8816
R6	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R7	0698-8816	1	RESISTOR 2.15 +-1% .125W TF TC=0+-100	28480	0698-8816
R8	0696-8816	1	RESISTOR 2.15 +-1% .125W TF TC=0+-100	28480	0698-8816

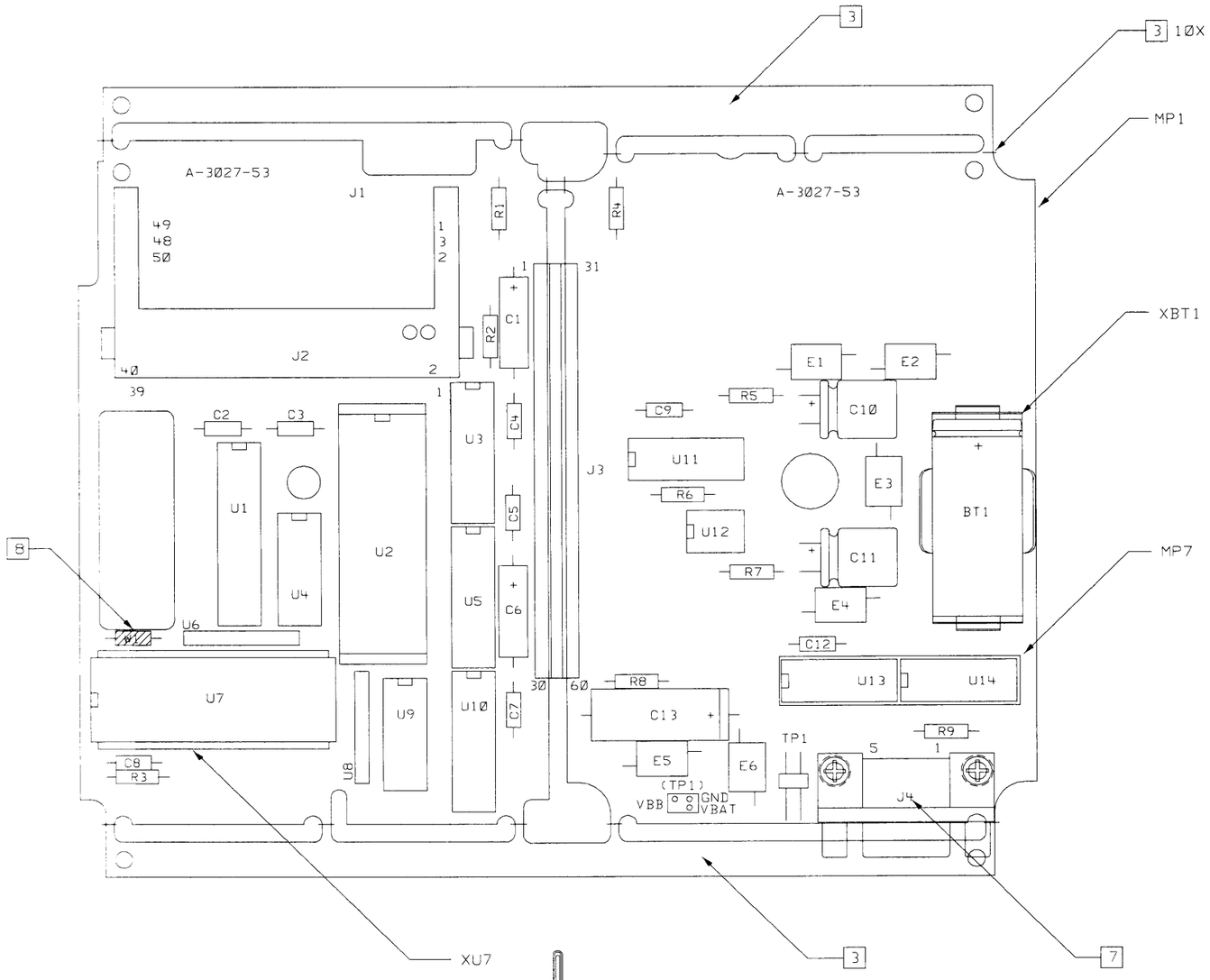
**Indicates factory-selected value*

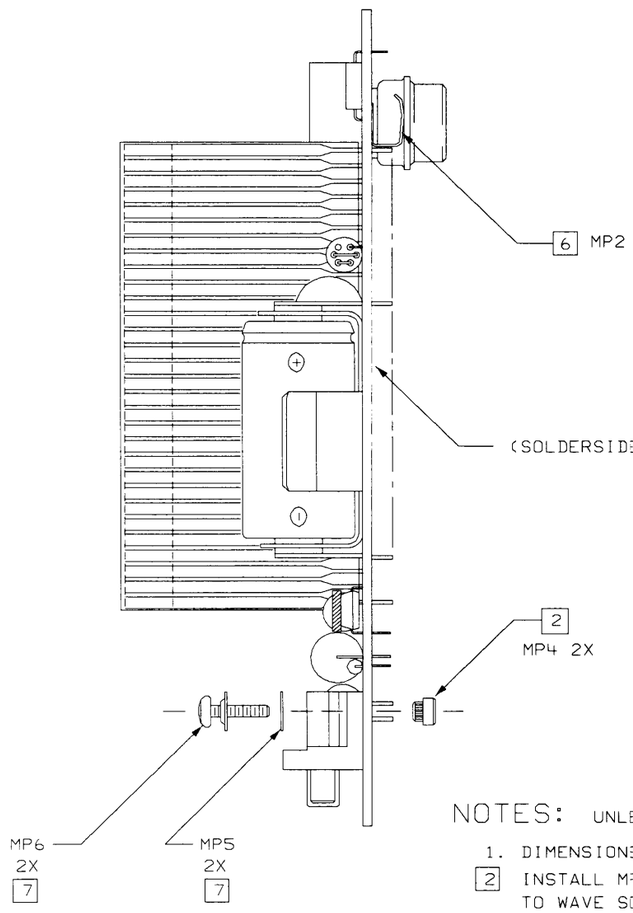
HP Part Number 85620-60006
A1 Mass Memory Assembly (continued)

Reference Designato	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
R9	0757-0442	1	RESISTOR 10K +-1% .125W TF TC=0+-100	28480	0757-0442
TP1	1251-7819	1	CONN-POST TYPE .100-PIN-SPCG-MTG-END	28480	1251-7819
U1	1820-3143	1	IC FF TTL/ALS D-TYPE POS-EDGETRIG COM	28480	1820-3143
U2	1818-4604	1	IC 1M-BIT SRAM 120-NS CMOS	28480	1818-4604
U3	35620-80020	1	PAL-PRGM U3	28480	85620-80020
U4	1820-1198	1	IC GATE TTL/LS NAND QUAD 2-INP	28480	1820-1198
U5	1820-5384	1	IC-INTERFACE CMOS -888-BIT	28480	1820-5384
U6	1810-0205	1	NETWORK-RES 8-SIP 4.7K OHM X 7	28480	1810-0205
U7	35620-80021	1	EPROM, PROGRAMMED	28480	85620-80021
U8	1810-0205	1	NETWORK-RES 8-SIP 4.7K OHM X 7	28480	1810-0205
U9	1820-1199	1	IC INV TTL/LS HEX 1-INP	28480	1820-1199
U10	1820-2024	1	IC DRVR TTL/LS BUS OCTL	28480	1820-2024
U11	1826-1858	1	IC PWR MGT-BAT-MGT	28480	1826-1858
U12	1820-5497	1	IC-NONVOLATILE MEMORY CONTROLLER	28480	1820-5497
U13	1820-3465	1	IC FF TTL/ALS D-TYPE POS-EDGETRIG COM	28480	1820-3465
U14	1906-0229	1	DIODEARRAY 50V 400MA TO-116	28480	1906-0229
W1	81540005	1	RESISTOR 0 CWM	28480	8159-0005
XBT1	1400-1465	1	HOLDER-BAT .625-WD AL-2024-T4	05535	131
XU7	1200-1314	1	SOCKET-IC-DIP 32-CONT DIP-SLDR	01380	2-644018-1
			HP 85620A ACCESSORIE PARTS LIST		
	0950-1964	1	MEMORY CARD, SRAM	10421	RBC032IE00
	1420-0383	1	MEMORY CARD BATTERY	08709	CR2016

**Indicates factory-selected value*

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PER PCO # 53-07076		10-14-91
B	PER PCO 53-07353 /GH		04-08-92





7	THIS DWG. ALSO USED FOR FOLLOWING ASSYS:		
	85620-60014	85620-60014	SEE NOTES
	PART#	MATL LIST	REMARKS

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.
2. INSTALL MP4 FROM FARSIDE PRIOR TO WAVE SOLDER.
3. REMOVE TABS AFTER WAVE SOLDER. TRIM TABS FLUSH TO BOARD.
4. MAXIMUM COMPONENT HEIGHT .750.
5. MAXIMUM LEAD TRIM LENGTH .118.
6. BEND GROUND TAB AND HAND SOLDER AS SHOWN.
7. J4 NOT LOADED FOR ASSY 85620-60014.
8. LOAD W1 ON BOTTOM SIDE OF BOARD. AFTER WAVE SOLDER.

SEE MATERIAL LIST 85620-60006

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.
TOLERANCES: XX.XXX ±.015
SEE CORP. STD. 608

DRAWN BY | DATE
ENGINEER/CHECKER
RELEASED TO PROD. 04-08-92
SUPERSEDES DWG.

TITLE: BOARD ASSEMBLY-MASS MEMORY MODULE
SCALE: NONE | SHEET 1 OF 1

HEWLETT PACKARD
PART NUMBER: SEE TABLE
D-85620-60006-2

D-85620-60006-1

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PER PCO 53-07076		

J1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VDD		A
2	DGND		A
3	DD1		A
4	DD0		A
5	DGND		A
6	DD3		A
7	DD4		A
8	DGND		A
9	DD6		A
10	DD5		A
11	DGND		A
12	DD7		A
13	DD8		A
14	DGND		A
15	DA1		A
16	DA2		A
17	DGND		A
18	DA3		A
19	DA4		A
20	DGND		A
21	DA5		A
22	DA6		A
23	DGND		A
24	DA7		A
25	DA8		A
26	WR PROT		A
27	DA9		A
28	DA10		A
29	+5V		A
30	DA11		A
31	DA12		A
32	-15V		A
33	DA13		A
34	NC		A
35	LOPTION_ID		A
36	DA14		A
37	LOPTSTROBE		A
38	DGND		A
39	DA15		A
40	OPTION STROBE		A

J2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VDD		A
2	VBB		C
3	A0		C
4	A1		C
5	A2		C
6	A3		C
7	A4		C
8	A5		C
9	A6		C
10	A7		C
11	A8		C
12	A9		C
13	A10		C
14	A11		C
15	A12		C
16	A13		C
17	A14		C
18	A15		C
19	A16		C
20	WE		C
21	CK		C
22	CLK		C
23	DB		C
24	D7		C
25	D6		C
26	D5		C
27	D4		C
28	D3		C
29	D2		C
30	D1		C
31	D0		C
32	NC		C
33	NC		C
34	NC		C
35	NC		C
36	NC		C
37	NC		C
38	LWPOUT		C
39	GND		C
40	GND		C

J3

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VBB		C
2	DGND		A
3	-15V		D
4	+15V		D
5	DGND		A
6	RST		D
7	LPOUT		D
8	DGND		A
9	DD8		RESTRICTED
10	DD7		RESTRICTED
11	DGND		A
12	DD2		RESTRICTED
13	NC		
14	DGND		A
15	NC		
16	BF		D
17	DGND		A
18	+5V		A
19	LRAMCS		C
20	DGND		A
21	LDD0		C
22	DD1		RESTRICTED
23	DGND		A
24	NVCCK		C
25	CNTL1		D
26	DGND		A
27	NC		
28	NC		
29	DGND		A
30	NC		
31	VBB		C
32	DGND		A
33	+15VA		D
34	-15VA		D
35	DGND		A
36	RST		D
37	LPOUT		D
38	DGND		A
39	-5VA		D
40	LRAMCSA		C
41	DGND		A
42	DD10		RESTRICTED
43	DGND		A
44	DD9		RESTRICTED
45	NC		
46	DGND		A
47	NC		
48	BF		C
49	DGND		A
50	-5VA		D
51	LRAMCSA		C
52	DGND		A
53	NC		
54	LVCCCA		C
55	DD11		RESTRICTED
56	DGND		A
57	NC		
58	NC		
59	DGND		A
60	NC		

J4

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	CNTL4		D
2	CNTL3		D
3	CNTL2		D
4	CNTL1		D
5	CNTL0		D
6	DGND		A
7	-15VF		D
8	+5VF		D
9	+15VF		D

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (uF) INDUCTANCE IN MICROHENRIES (u)
3. MNEMONIC TABLE

MNEMONIC	DESCRIPTION

4 DELETE J4 FROM 85620-60014

Ⓐ POWER SUPPLY & BUS CONNECT

Ⓑ BATTERY BACK-UP

Ⓒ SRAM AND IC CARD

Ⓓ CONTROL LOGIC

Ⓔ ROM

Ⓕ REAL TIME CLOCK

Ⓖ AUXILIARY INTERFACE

UNUSED PACKAGES

THIS DRAWING ALSO USED FOR THE FOLLOWING ASSEMBLY:		
85620-60014	85620-60014	4 DELETE J4
PART NO.	MATERIAL LIST	REMARKS
	TABLE 1	

ITEM	QTY.	PART/MATERIAL-DESCRIPTION	MAT'L-PART NO.	MAT'L-DWG. NO.	MAT'L-SPEC.

DRAWN BY | DATE
ENGINEER/CHECKER
RELEASE TO PROD.
SUPERSEDES DWG.

TITLE: BOARD ASSEMBLY-MASS MEMORY MODULE (SCHEMATIC)

HEWLETT PACKARD

PART NUMBER: SEE TABLE 1

SCALE NONE | FILENAME-8086AB27 | SHEET 1 OF 1

D-85620-60006-1

Component-Level Information Packet for 85620-60008

Mass Memory Assembly

HP Part No. 85620-90034
Printed in USA April 1995

HP Part Number 85620-60008
Al Mass Memory Assembly

Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BT1	1420-0394	1	BATTERY 3V IA-HR LI MANGANESE DIOXIDE	28480	1420-0394
C1	0180-4136	1	CAP-FXD 10uF +-10% 20 V TA	28480	0180-4136
C2	0180-4135	1	CAP-FXD 33uF +-10% 10 V TA	28480	0180-4135
C3	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C4	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C5	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C6	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C7	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C8	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C9	0160-5098	1	CAP-FXD 0.22uF +-10% 50 V CER X7R	28480	0160-5098
C10	0160-4814	1	CAP-FXD 150pF +-5% 100 V CER COG	28480	0160-4814
C11	0160-4835	1	CAP-FXD 0.1uF +-10% 50 V CER X7R	28480	0160-4835
J1	1252-1263	1	CONN-RECT D-SUBMIN 50-CKT 50-CONT	28480	1252-1263
J2	12522906	1	CONN-POST TYPE 0-CONT	28480	1252-2906
J3	8120-4857	1	CABLEMCNDCT	28480	8120-4857
NONE0033	0515-1717	1	SCREW-MACHINE ASSEMBLY M2.5 X 0.45	01125	
NONE0034	0590-1355	1	THREADED INSERT-NUT M2.5 X 0.45	03981	F-M2.5-1
NONE0035	3050-0890	1	WASHER-FL MTLC 2.5 2.78-MM-ID 6.35-MM-0D	06691	
NONE0036	5022-0008	1	BATTERY SUPPORT	28480	5022-0008
NONE0037	5041-7282	1	B-INSUL TO-220	28480	5041-7282
NONE0038	7121-4611	1	LABEL-INFORMATION .15-IN-WD .06-IN-LG	09002	
R1	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R2	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R3	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R4	0698-7252	1	RESISTOR 4.64K +-1% .05W TF TC=0+-100	28480	0698-7252
R5	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R7	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R9	06987252	1	RESISTOR 4.64K +-1% .05W TF TC=0+-100	28480	0698-7252
R10	0698-7252	1	RESISTOR 4.64K +-1% .05W TF TC=0+-100	28480	0698-7252
TP1	1251-7819	1	CONN-POST TYPE .100-PIN-SPCG-MTG-END	28480	1251-7819
TP2	0360-1682	1	TERMINAGSTUD SGL-TUR PRESS-MTG	05364	147588
TP3	0360-1682	1	TERMINAL-STUD SGGTUR PRESS-MTG	05364	14758-8
U1	85620-80014	1	EPROM-PRGMEDU1	28480	85620-80014
U2	85620-80015	1	EPROM-PRGMEDU2	28480	85620-80015
U3	85620-80016	1	EPROM-PRGMEDU3	28480	85620-80016

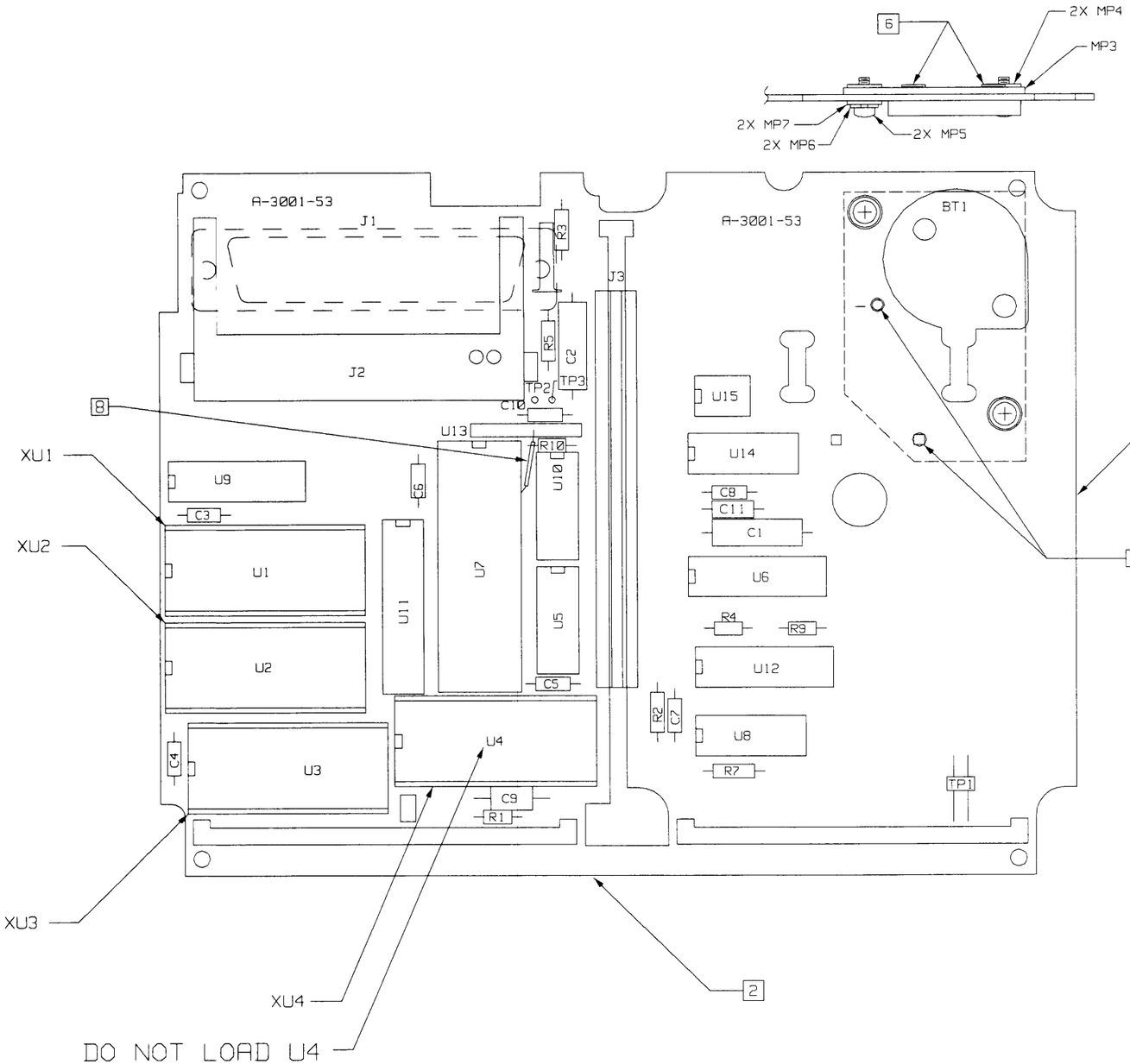
**Indicates factory-selected value*

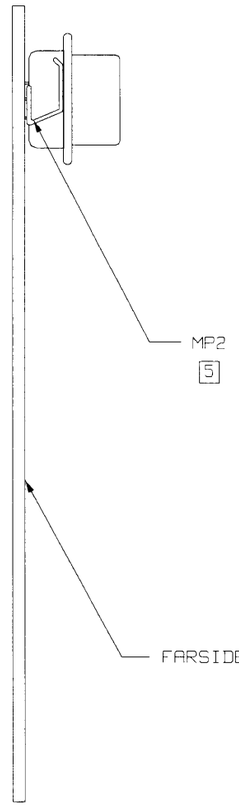
HP Part Number 85620-60008
Al Mass Memory Assembly (continued)

Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
U5	1820-1437	1	IC MV TTL/LS MONOSTBL CLEAR DUAL	28480	1820-1437
U6	1820-5384	1	IC-INTERFACE CMOS -888-BIT	28480	1820-5384
U7	1818-4604	1	IC 1M-BIT SRAM 120-NS CMOS	28480	1818-4604
U8	1826-1858	1	IC PWR MGT-BAT-MGT	28480	1826-1858
U9	85620-80001	1	PAL, PROGRAMMED	28480	85620-80001
U10	1820-1198	1	IC GATE TTL/LS NAND QUAD 2-INP	28480	1820-1198
U11	1820-3143	1	IC FF TTL/ALS D-TYPE POS-EDGE-TRIG COM	28480	1820-3143
U12	1820-2024	1	IC DRVR TTL/LS BUS OCTL	28480	1820-2024
U13	1810-0205	1	NETWORK-RES 8-SIP 4.7K OHM X 7	28480	1810-0205
U14	1820-1199	1	IC INV TTL/LS HEX l-INP	28480	1820-1199
U15	1820-5497	1	IC-NONVOLATILE MEMORY CONTROLLER	28480	1820-5497
XU1	1200-0567	1	SOCKET-IC28-CONT DIP DIP-SLDR	00779	641605-1
XU2	1200-0567	1	SOCKET-IC28-CONT DIP DIP-SLDR	00779	641605-1
XU3	1200-0567	1	SOCKET-IC28-CONT DIP DIP-SLDR	00779	641605-1
			HP 85620A ACCESSORIES PARTS LIST		
	0950-1964	1	MEMORY CARD, SRAM	10421	RBCO32IE00
	1420-0383	1	MEMORY CARD BATTERY	08709	CR2016

*Indicates *factory-selected value*

		D-85620-60008-2	
SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PER PCO 53-06566		
B	ADDED WIRE NOTE 8 PER PCO 53-06965.		





NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.
2. REMOVE BREAK-OFF TABS AFTER MACHINE SOLDER.
3. MAXIMUM COMPONENT HEIGHT .400.
4. MAXIMUM LEAD TRIM LENGTH .118.
5. BEND PART AS SHOWN. SOLDER IN PLACE.
6. BEND BATTERY LEADS AS SHOWN. SOLDER IN PLACE.
7. SOLDER SOLID WIRE FROM PADS ON MP1 TO ALIGNED PADS ON MP3.
8. ADD A WIRE FROM PIN 30 OF U7 TO PIN 5 OF U5.

SEE 85620-60008 MATERIAL LIST

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES	DRAWN BY	DATE	BOARD ASSEMBLY-MASS MEMORY MODULE
TOLERANCES: XX .XXX ±.015	ENGINEER/CHECKER		HEWLETT PACKARD
SEE CORP. STD. 608	RELEASED TO PROD.		85620-60008 PART NUMBER
	SUPERSEDES DWG.		NONE SCALE, 1 SHEET, 1 OF, D-85620-60008-2

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PER PCO 53-06566		
B	U7 CHANGED AND RESISTOR ON PIN30 ADDED PER PCO 53-06965.		

J1

PIN	SIGNAL	TO-FROM	FUNCTION BLOCK
1	ODR		A
2	DGND		A
3	OD1		A
4	OD2		A
5	DGND		A
6	OD3		A
7	OD4		A
8	DGND		A
9	OD5		A
10	OD6		A
11	DGND		A
12	OD7		A
13	OR8		A
14	DGND		A
15	OR1		A
16	OR2		A
17	DGND		A
18	OR3		A
19	OR4		A
20	DGND		A
21	OR5		A
22	OR6		A
23	DGND		A
24	OR7		A
25	HW_PROT		A
26	OR9		A
27	OR10		A
28	+5V		A
29	OR11		A
30	OR12		A
31	-15V		A
32	OR13		A
33	OR14		A
34	LOPTION_ID		A
35	OR15		A
36	LOPTPROG		A
37	DGND		A
38	LOPTLOD		A
39	OPTIONIRQ		A
40	+15V		A
41	LHALT		A
42	+15V		A
43	OPTRSLH		A
44	+5V		A
45	+5V		A
46	+28V		A
47	LRTC		A
48	DGND		A
49	LOPT STROBE		A

J2

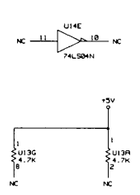
PIN	SIGNAL	TO-FROM	FUNCTION BLOCK
1	VCC		C
2	VBB		C
3	PA0		C
4	PA1		C
5	PA2		C
6	PA3		C
7	PA4		C
8	PA5		C
9	PA6		C
10	PA7		C
11	PB0		C
12	PB1		C
13	PB2		C
14	PB3	A18	C
15	PB4	A17	C
16	PB5	A16	C
17	PB6	A15	C
18	PB7		C
19	LWE		C
20	LOE		C
21	LCE		C
22	D0		C
23	D1		C
24	D2		C
25	GND		C
26	D3		C
27	D4		C
28	D5		C
29	D6		C
30	D7		C
31	A17		C
32	NC		C
33	NC		C
34	NC		C
35	NC		C
36	NC		C
37	LMPOUT		C
38	+5V		C
39	GND		C
40	DGND		C

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (ΩF)
   INDUCTANCE IN MICROHENRIES (Ω)
3. MNEMONIC TABLE

MNEMONIC	DESCRIPTION

UNUSED PACKAGES



ITEM	QTY.	PART/MATERIAL-DESCRIPTION	MAT'L-PART NO.	MAT'L-DWG. NO.	MAT'L-SPEC.

DRAWN BY | DATE
ENGINEER-CHECKER
RELEASE TO PROD.
SUPERSEDES DWG.

TITLE: BOARD ASSEMBLY-MASS MEMORY MODULE (SCHEMATIC)

HEWLETT PACKARD

PART NUMBER: 85620-60008

SCALE NONE | FILENAME-5008PA | SHEET 1 OF 1

D-85620-60008-1

Component-Level Information Packet for 85620-60018

Mass Memory

HP Part No. 85620-90038
Printed in USA May 1998

HP Part Number 85620-60018
Mass Memory

Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BT1	1420-0341	1	BATTERY 3V 1.2A-HR LITHIUM POLYCARBON	28480	1420-0341
C1	0180-4135	1	CAP-FXD 33uF +-10% 10 V TA	28480	0180-4135
C2	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C3	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C4	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C5	0160-4835	1	CAP-FXD 0.1uF +-10% 50 V CER X7R	28480	0160-4835
C6	0180-4136	1	CAP-FXD 10uF +-10% 20 V TA	28480	0180-4136
C7	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C8	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C9	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C10	01803817	1	CAP-FXD 100uF +-20% 50 V AL-ELCTLT	28480	0180-3817
C11	01803817	1	CAP-FXD 100uF +-20% 50 V AL-ELCTLT	28480	0180-3817
C12	0160-4832	1	CAP-FXD 0.01uF +-10% 100 V CER X7R	28480	0160-4832
C13	0180-2208	1	CAP-FXD 220uF +-10% 10 V TA	28480	0180-2208
E1	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E2	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E3	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E4	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E5	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
E6	9100-1788	1	COREFERRITE CHOKE-WIDEBAND;IMP:>680	28480	9100-1788
J1	1252-1263	1	CONN-RECT D-SUBMIN 50-CKT 50-CONT	28480	1252-1263
J2	1252-2906	1	CONN-POST TYPE 0-CONT	28480	1252-2906
J3	8120-4857	1	CABLEMCNDCT	28480	8120-4857
J4	1252-1327	1	CONN-RECT D-SUBMIN 9-CKT 9-CONT	28480	1252-1327
MP3	5001-8737	1	CONTACT-GROUND	28480	5001-8737
MP4	0590-1361	1	THREADED INSERT-NUT M2.5 X 0.45	03981	KF2-2.5M-ET
MP5	0590-1361	1	THREADED INSERT-NUT M2.5 X 0.45	03981	KF2-2.5M-ET
MP6	0515-0367	1	SCREW-MACHINE ASSEMBLY M2.5 X 0.45	05610	
MP7	0515-0367	1	SCREW-MACHINE ASSEMBLY M2.5 X 0.45	05610	
MP8	1400-2112	1	ACCESS .89-WD ABS	05535	1029C
MP9	0361-0009	1	RIVET-SEMITUB OVH .123DIA .188LG	02531	R-4012
MP10	0361-0009	1	RIVET-SEMITUB OVH .123DIA .188LG	02531	R-4012
NONE	8567190007	1	DEMO QR CARD	28480	85671-90007
NONE	0470-0440	1	COATING DOW CORNING 3140 SIGRBR-RTV 1P	04514	3140
R1	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346

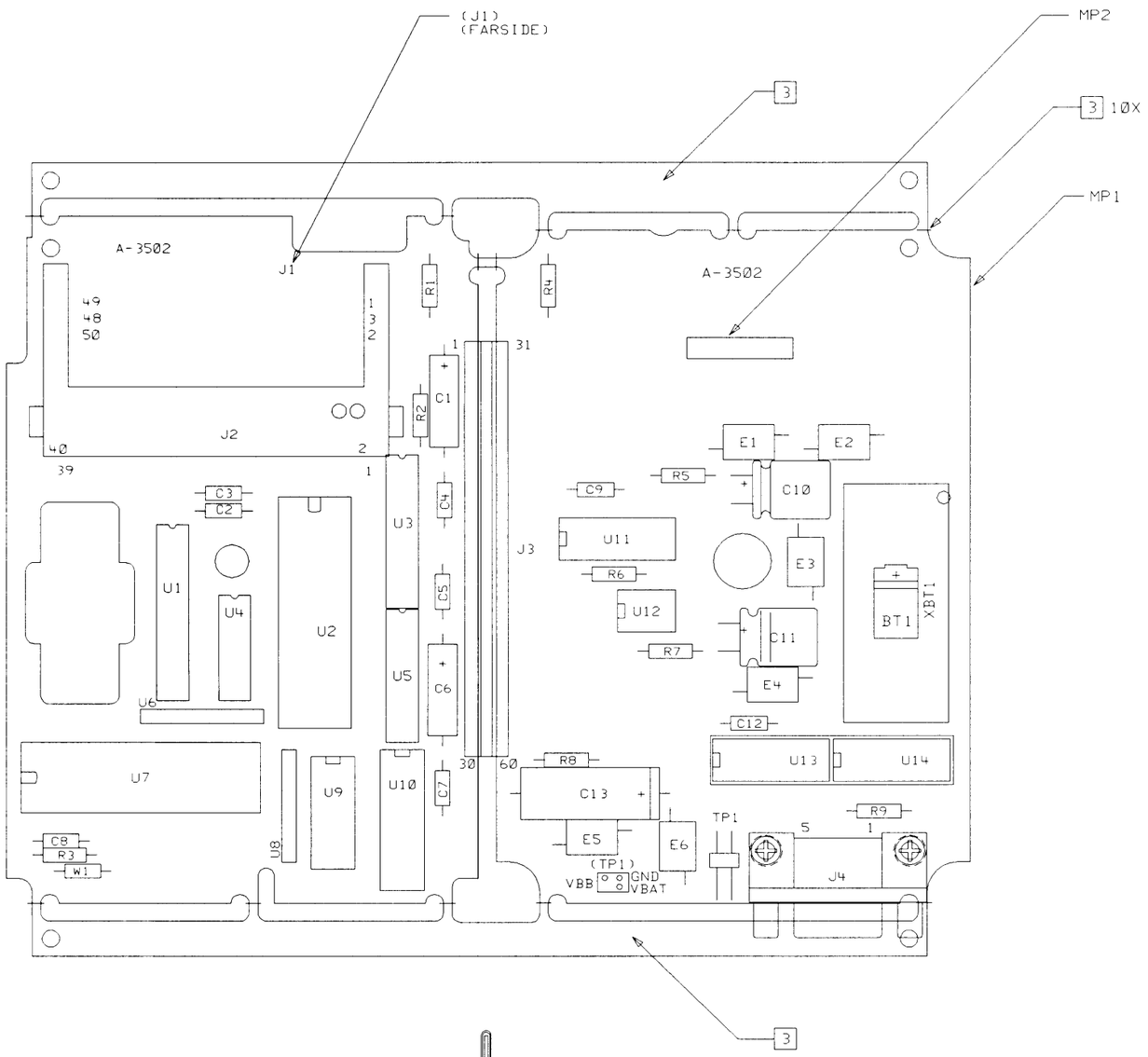
HP Part Number 85620-60018
Mass Memory (continued)

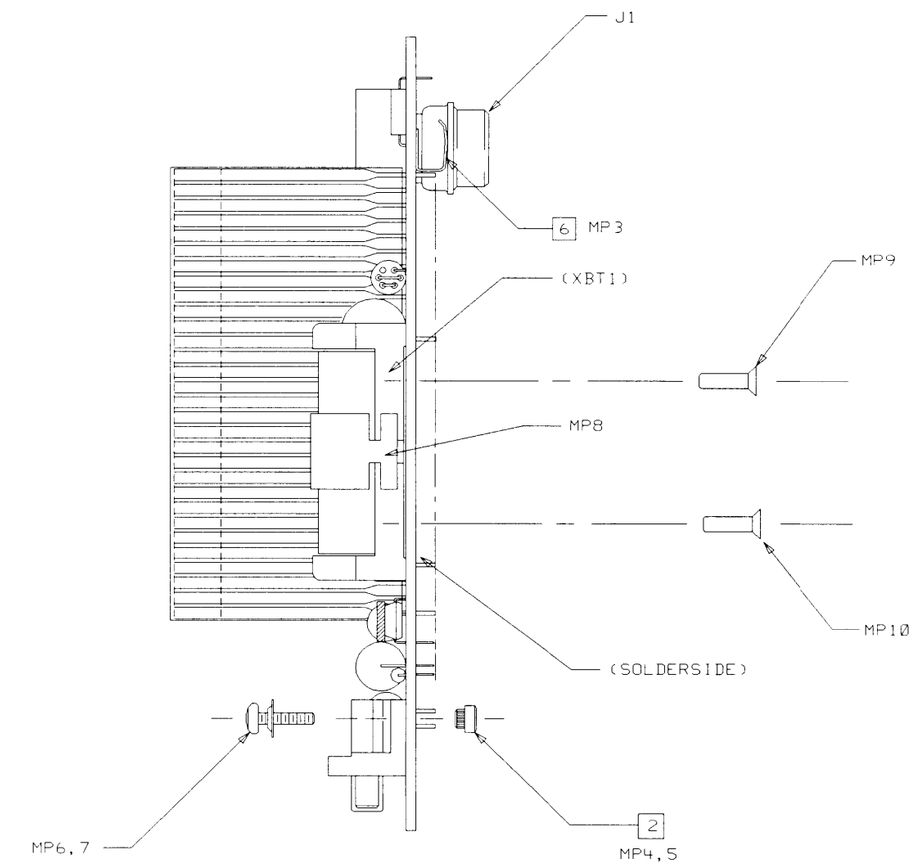
Reference Designator	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
R2	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R3	0698-3155	1	RESISTOR 4.64K +-1% .125W TF TC=0+-100	28480	06983155
R4	0757-0346	1	RESISTOR 10 +-1% .125W TF TC=0+-100	28480	0757-0346
R5	06988816	1	RESISTOR 2.15 +-1% .125W TF TC=0+-100	28480	0698-8816
R6	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100	28480	0757-0465
R7	06988816	1	RESISTOR 2.15 +-1% .125W TF TC=0+-100	28480	06988816
R8	0698-8816	1	RESISTOR 2.15 +-1% .125W TF TC=0+-100	28480	06988816
R9	0757-0442	1	RESISTOR 10K +-1% .125W TF TC=0+-100	28480	0757-0442
TP1	1251-7819	1	CONN-POST TYPE .100-PIN-SPCG-MTG-END	28480	1251-7819
U1	1820-3143	1	IC FF TTL/ALS D-TYPE POS-EDGETRIG COM	28480	1820-3143
U2	18164604	1	IC 1M-BIT SRAM 120-NS CMOS	28480	1818-4604
U3	85620-80020	1	PAL-PRGM U3	28480	85620-80020
U4	1820-1198	1	IC GATE TTL/LS NAND QUAD 2-INP	28480	1820-1198
U5	1820-5384	1	IC-INTERFACE CMOS -888-BIT	28480	1820-5384
U6	1810-0205	1	NETWORK-RES 8-SIP 4.7K OHM X 7	28480	1810-0205
U7	85620-80021	1	EPROM-PROGRAMMED	28480	85620-80021
U8	1810-0205	1	NETWORK-RES 8-SIP 4.7K OHM X 7	28480	1810-0205
U9	1820-1199	1	IC INV TTL/LS HEX 1-INP	28480	1820-1199
U10	1820-2024	1	IC DRVR TTL/LS BUS OCTL	28480	1820-2024
U11	18261858	1	IC PWR MGT-BAT-MGT	28480	18261858
U12	1820-5497	1	IC-NONVOLATILE MEMORY CONTROLLER	28480	1820-5497
U13	1820-3465	1	IC FF TTL/ALS D-TYPE POS-EDGETRIG COM	28480	1820-3465
U14	19060229	1	DIODEARRAY 50V 400MA TO-116	28480	19060229
W1	8159-0005	1	RESISTOR 0 CWM	28480	81540005
XBT1	14062111	1	HOLDER-BAT FOR 1 A CELLS .72-WD	05535	1029

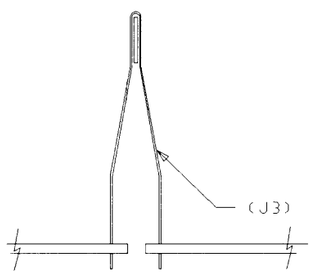
**Indicates factory-selected value*

S300 D-85620-60018-2

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PER PCO 53-08579		







NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES.
2. INSTALL MP4 AND MP5 FROM FARSIDE PRIOR TO WAVE SOLDER.
3. REMOVE TABS AFTER WAVE SOLDER. TRIM TABS FLUSH TO BOARD.
4. MAXIMUM COMPONENT HEIGHT ____.750____.
5. MAXIMUM LEAD TRIM LENGTH ____.118____.
6. BEND GROUND TAB AND HAND SOLDER AS SHOWN, (FARSIDE).

SEE MATERIAL LIST 85620-60018

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.
TOLERANCES: XX.XXX ±.010, XX.XX ±.02
THIRD ANGLE PROJECTION
DO NOT SCALE THIS DRAWING

DRAWN BY | DATE
ENGINEER/CHECKER | DATE
RELEASE TO PROD. | DATE
SUPERSEDES DWG.

TITLE: ASSEMBLY, PWB MASS MEMORY MOD

FILENAME: alaa-018
SCALE: NONE
SHEET 1 OF 1
PART NUMBER: 85620-60018
D-85620-60018-2

HEWLETT PACKARD

S300 AA3502 D-85620-60018-1

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PER PCO 53-08579		03-27-95

Ⓐ POWER SUPPLY & BUS CONNECT

Ⓑ BATTERY BACK-UP

Ⓒ SRAM AND IC CARD

Ⓓ CONTROL LOGIC

Ⓔ ROM

Ⓕ REAL TIME CLOCK

Ⓖ AUXILIARY INTERFACE

UNUSED PACKAGES

J1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GDB		A
2	DGND		A
3	GD1		A
4	GD9		A
5	DGND		A
6	GD2		A
7	GDA		A
8	DGND		A
9	GD5		A
10	GD6		A
11	DGND		A
12	GD7		A
13	GDC		A
14	DGND		A
15	GDD		A
16	GDE		A
17	GDF		A
18	DGND		A
19	GA7		A
20	GA6		A
21	DGND		A
22	GA5		A
23	GA4		A
24	DGND		A
25	GA3		A
26	GA2		A
27	GA1		A
28	GA0		A
29	WR_PROT		A
30	GA14		A
31	+5V		A
32	GA13		A
33	GA12		A
34	GA11		A
35	LOPTION_ID		D
36	GA15		A
37	LOPTPROG		E
38	DGND		A
39	LOPTI/O		D
40	OPTIONIRQ		F
41	+15V		G
42	LHALT		C
43	-15V		G
44	OPTR/LW		D
45	+5V		A
46	+5V		A
47	+28V		A
48	BARC		A
49	DGND		A
50	LOPT STROBE		D

J2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VCC		C
2	VBB		C
3	A0		C
4	A1		C
5	A2		C
6	A3		C
7	A4		C
8	A5		C
9	A6		C
10	A7		C
11	A8		C
12	A9		C
13	A10		C
14	A11		C
15	A12		C
16	A13		C
17	A14		C
18	A15		C
19	A16		C
20	LWE		C
21	OE		C
22	LCE		C
23	D0		C
24	D1		C
25	D2		C
26	D3		C
27	D4		C
28	D5		C
29	D6		C
30	D7		C
31	A17		C
32	VCC		C
33	NC		C
34	NC		C
35	NC		C
36	NC		C
37	LWPOUT		C
38	CST		C
39	CRD		C
40	DGND		C

J3

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VBB		A
2	DGND		A
3	+15V		G
4	DGND		A
5	-15V		G
6	VBB		C
7	VOUT		C
8	DGND		A
9	GDB		MC68DC 3
10	GD1		MC68DC 3
11	DGND		A
12	GD2		MC68DC 3
13	GD9		A
14	NC		A
15	NC		A
16	DGND		A
17	+28V		A
18	BARC		A
19	DGND		A
20	LOPT STROBE		D
21	OPTR/LW		D
22	OPTI/O		D
23	OPTIONIRQ		F
24	LHALT		C
25	+15V		G
26	OPTR/LW		D
27	+5V		A
28	+5V		A
29	+28V		A
30	BARC		A
31	DGND		A
32	LOPT STROBE		D

J4

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
A	CNTL4		G
B	CNTL3		G
C	CNTL2		G
D	CNTL1		G
E	CNTL0		G
F	DGND		A
G	+5V		G
H	+5V		G
J	-15V		G

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (uF) INDUCTANCE IN MICRONENRIES (u)
3. MNEMONIC TABLE

MNEMONIC	DESCRIPTION

DRAWN BY	DATE	SCHEMATIC, PWA MASS MEMORY MOD
ENGINEER/CHECKER	DATE	
RELEASE TO PROD.	DATE	
SUPERSEDES DWG.		TITLE

slaax018 FILENAME
SCALE NONE
SHEET 1 OF 1
85620-60018 PART NUMBER
D-85620-60018-1

HEWLETT PACKARD