

# Notice

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**Agilent Technologies**

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# **Installation, Operation, Programming, and Service Guide**

## **HP 85620A Mass Memory Module**



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

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## 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.

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### 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.

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### 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.**

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## General Safety Considerations

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### 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.**

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### 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.**

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### 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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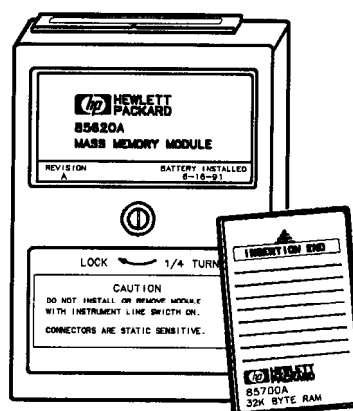
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## Installation

### 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.



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**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.

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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.)

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## 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 1-1** 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.

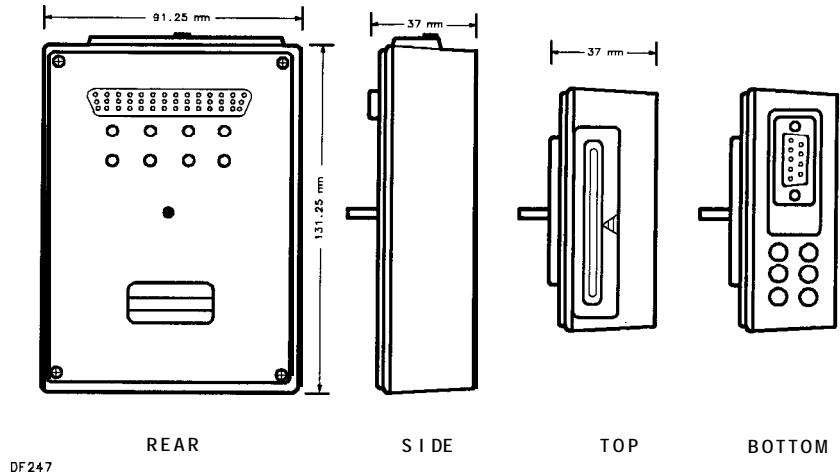


**Table I-1.  
HP 85620A and HP 856X Firmware Compatibility**

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 <b>firmware</b> 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**

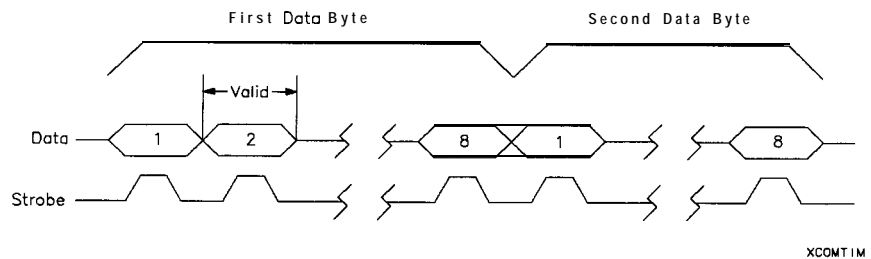
Electrical Specifications	General Specifications	Characteristics
<p>Operating Power Requirement 5.0 W at +5 Vdc, supplied by the analyzer, not by the battery.</p> <p>Read Only Memory (ROM) 256 kilobytes</p> <p>User Memory 128 kilobytes (battery-backed RAM)</p> <p>Real-Time Clock + 50, - 120 ppm over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

## 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.



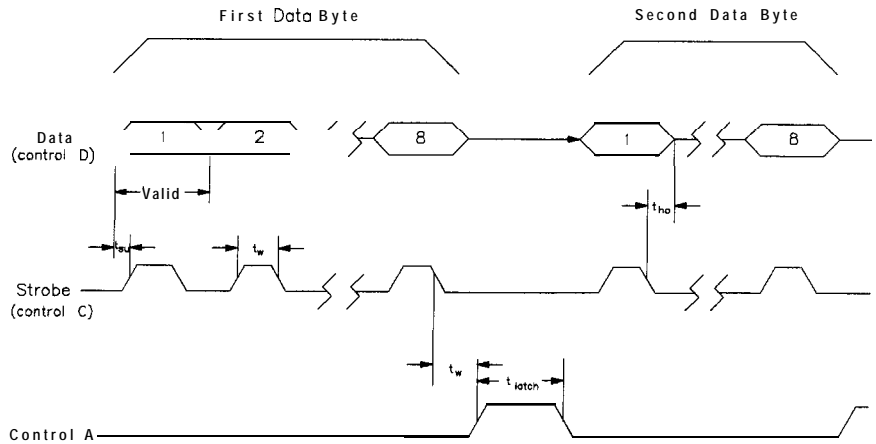
**Figure 1-3.**  
**Command Timing**  
**OUTPUT 98-LSB First or OUTPUT 99-MSB First**

**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 $\pm 5\%$	150 ma		
8	+5 Vdc $\pm 5\%$	150 ma		
9	+15 Vdc $\pm 5\%$	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.



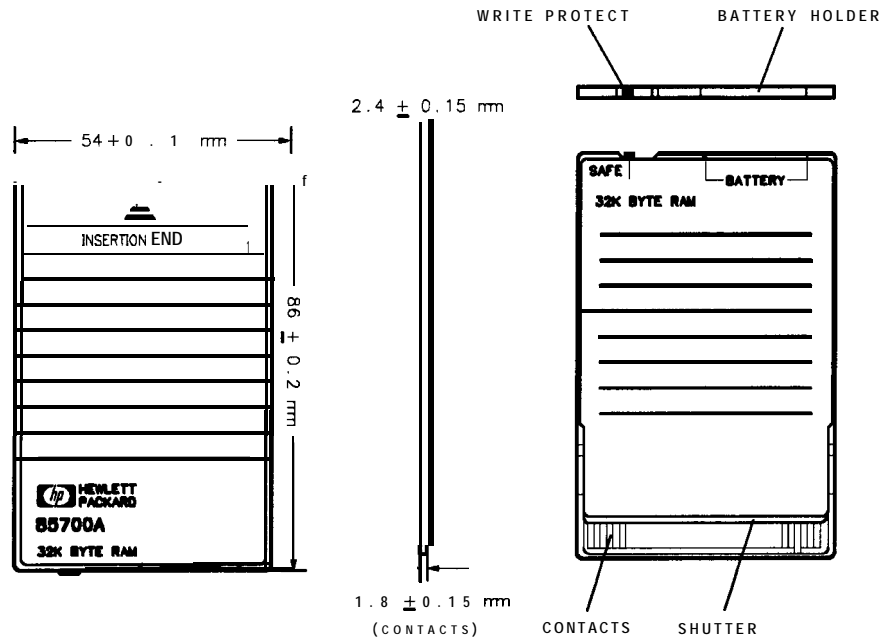
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**Figure 1-4.**  
**Auxiliary Connector Timing**  
**OUTPUT 98/OUTPUT 99**

**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 $\mu$ s

## Memory Card Specifications and Characteristics



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**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)	Operating Temperature 0°C to +60°C	Card Weight with battery: 20.9 grams without battery: 19.0 grams
Battery Voltage (RAM back-up) 3 Vdc (nominal)	Storage Temperature -20°C to +60°C	Card Dimensions ( <i>Figure 1-5</i> ) Length: 86 mm ±0.2 mm Width: 54 mm ±0.1 mm Thickness: 2.4 mm ±0.15 mm
	Memory Size 32 kilobyte, battery-backed RAM	Battery Type Lithium
	Type CMOS	Commercial Part Number: <b>CR2016</b> 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

---

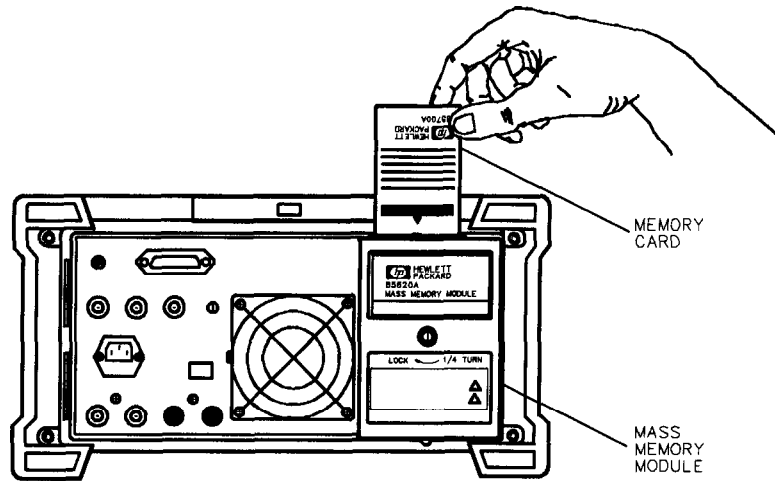
The portable spectrum analyzer must be turned OFF before the module is connected. Connecting the module while the spectrum analyzer is ON can damage both the spectrum analyzer and the module circuitry.

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.



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**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

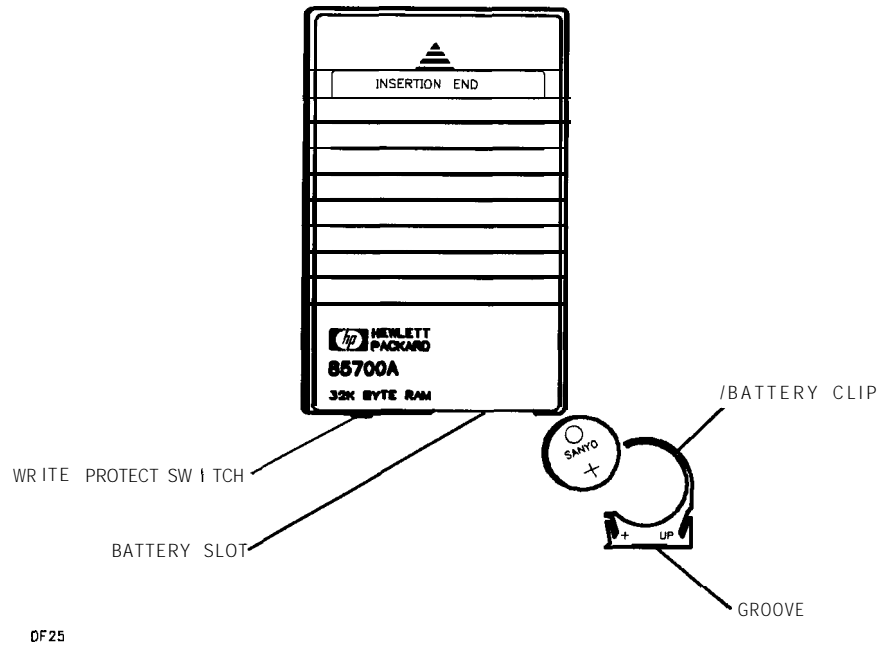
---

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

To 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

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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

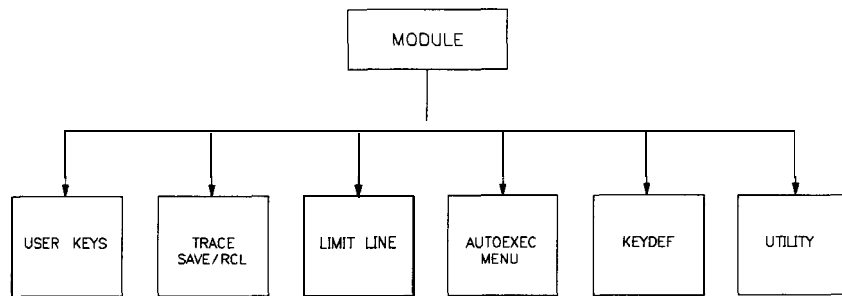
## Introduction

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.



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**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.)

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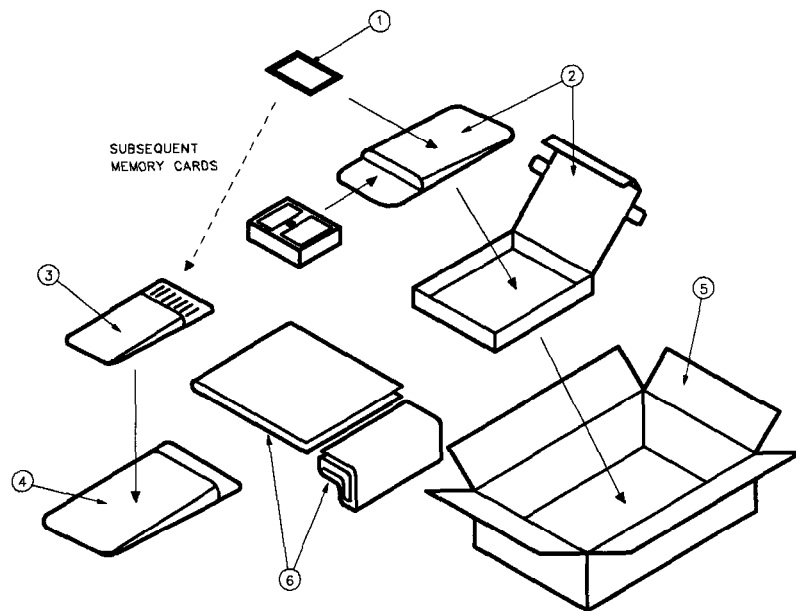
## Packaging

### 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.



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**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**

<b>Item</b>	<b>Description</b>	<b>HP Part Number</b>	<b>Check Digit</b>	<b>Qty</b>
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.

---

- |            |  |
|------------|--|
| <b>800</b> | <b>U1</b> EPROM Check Sum Error, hardware failure.   |
| <b>801</b> | <b>U2</b> EPROM Check Sum Error, hardware failure.   |
| <b>802</b> | <b>U3</b> EPROM Check Sum Error, hardware failure.   |
| <b>803</b> | <b>U4</b> EPROM Check Sum Error, hardware failure.   |
| <b>804</b> | Mass Memory Initialized. RAM data has been erased. Hardware failure or the module battery is intermittent or has failed. |
| <b>805</b> | Mass Memory Module Usage Error. The command used was invalid and cannot be executed.                                     |
| <b>806</b> | Mass Memory RAM full. Available memory is insufficient for command execution.  |
| <b>807</b> | 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.



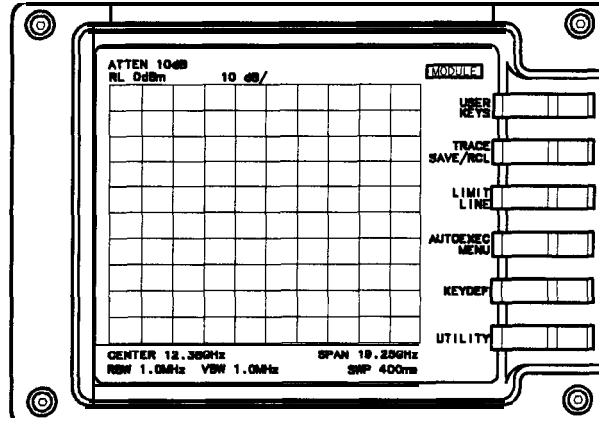
**Table 1-7. Hewlett-Packard Sales and Service Offices**

<b>US FIELD OPERATIONS</b>		
<p><b>Headquarters</b> Hewlett-Packard Co. 19320 Pruneridge Avenue Cupertino, CA 96014 (800) 752-0900</p> <p><b>Colorado</b> Hewlett-Packard Co. 24 Inverness Place, East <b>Englewood, CO 80112</b> (303) 649-5512</p> <p><b>New Jersey</b> Hewlett-Packard Co. 150 Green Pond Rd. Rockaway, NJ 07866 (201) 686-6400</p>	<p><b>California, Northern</b> Hewlett-Packard Co. 301 E. Evelyn Mountain View, CA 94041 (415) 694-2000</p> <p><b>Atlanta Annex</b> Hewlett-Packard Co. 2124 Barrett Park Drive Kennesaw, GA 30144 (404) 648-0000</p> <p><b>Texas</b> Hewlett-Packard Co. 930 E. Campbell Rd. Richardson, TX 75081 (214) 231-6101</p>	<p><b>California, Southern</b> Hewlett-Packard Co. 1421 South Manhattan Ave. Fullerton, CA 92631 (714) 999-6700</p> <p><b>Illinois</b> Hewlett-Packard Co. 5201 Tollview Drive Rolling Meadows, IL 60008 (708) 255-9800</p>
<b>EUROPEAN FIELD OPERATIONS</b>		
<p><b>Headquarters</b> Hewlett-Packard S.A. 160, Route du Nant-d'Avril 12 17 Meyrin 2/Geneva Switzerland (41 22) 780.8111</p> <p><b>Great Britain</b> Hewlett-Packard Ltd. Eskdale Road, Winnersh Triangle Wokingham, Berkshire RG41 5DZ England (44 734) 696622</p>	<p><b>France</b> Hewlett-Packard France 1 Avenue Du Canada Zone D'Activite De Courtaboeuf F-91947 Les Ulis Cedex France (33 1) 69 82 60 60</p>	<p><b>Germany</b> Hewlett-Packard GmbH Hewlett-Packard Strasse 61362 Bad Homburg v.d.H Germany (49 6172) 16-0</p>
<b>INTERCON FIELD OPERATIONS</b>		
<p><b>Headquarters</b> Hewlett-Packard Company 3495 Deer Creek Road Palo Alto, California, USA 94304-1316 (415) 857-5027</p> <p><b>China</b> China Hewlett-Packard Company 38 Bei San Huan X1 Road Shuang Yu Shu Hai Dian District Beijing, china (86 1) 266-6888</p> <p><b>Taiwan</b> Hewlett-Packard Ibiwan 8th Floor, H-P Building 137 Fu Hsing North Road Taipei, Ibiwan (886 2) 712-0404</p>	<p><b>Australia</b> Hewlett-Packard Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 (61 3) 896-2895</p> <p><b>Japan</b> Hewlett-Packard Japan, Ltd. 1-27-15 Yabe, Sagamihara Kanagawa 229, Japan (81 427) 59-1311</p>	<p><b>Canada</b> Hewlett-Packard (Canada) Ltd. 17600 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 Canada (614) 697-4232</p> <p><b>Singapore</b> Hewlett-Packard Singapore (Pte.) Ltd. 150 Beach Road #29-00 Gateway West Singapore 0718 (65) 291-9088</p>

## 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.



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**Figure 2-1. HP 85620A Main Menu Softkeys**

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## 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.

---

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## 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.

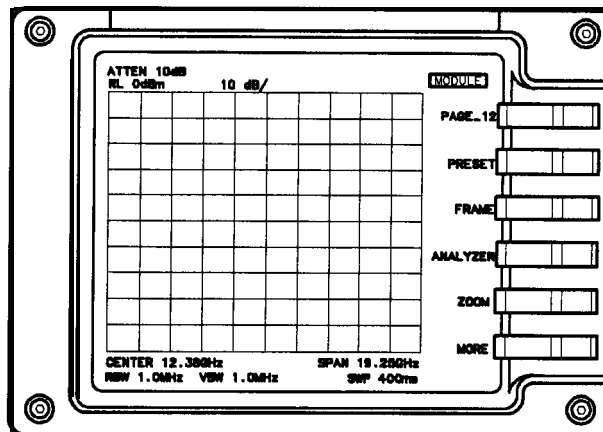
- Press **USER KEYS** to access the module ten user-definable softkeys. After you have loaded a program onto one of these softkeys, you can activate it from this menu by pressing its **softkey**. There are two menu pages: one appears when you press **USER KEYS** and the other is accessed by pressing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

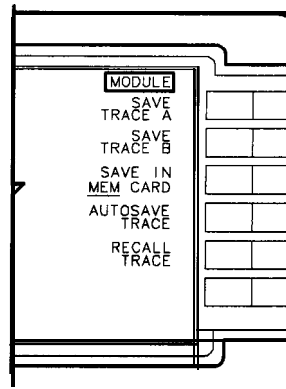
If you want to save traces automatically, select **AUTOSAVE TRACE**, determine whether to save, trace A or B by underlining your preference with the **AUTOSAVE TRA TRB** softkey. Move the cursor to the position of **priority you desire in the AUTOEXEC/AUTOSAVE SCHEDULE** (placing the trace at position 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.

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**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 **datecode** 910116 or later.

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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.

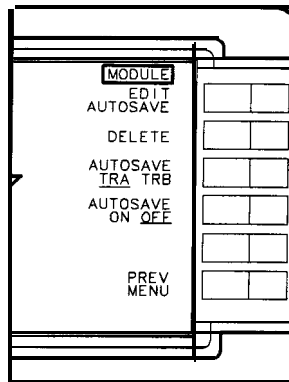
The trace is stored by its assigned name and according to your start/stop time settings and trigger conditions. Recall stored traces by using the **RECALL TRACE** softkey. Autosave Trace menu softkeys are illustrated in Figure 2-4.

## 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.

---



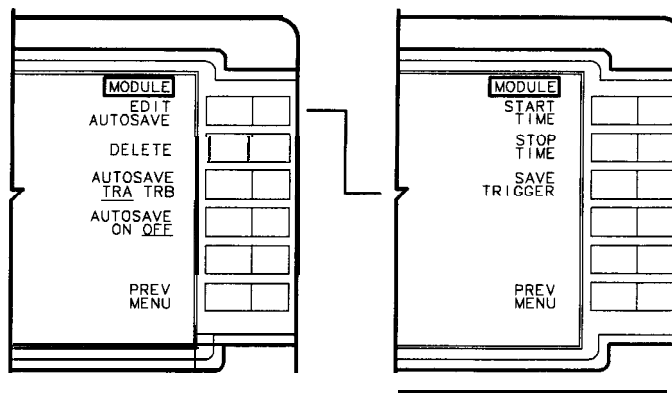


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**Figure 2-4. Autosave Trace Menu Softkeys**

**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.



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**Figure 2-5. Edit Autosave Menu Softkey**

### START TIME

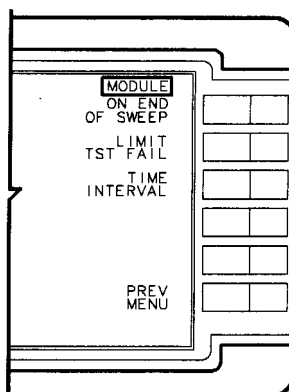
allows entry of the start-time value which determines the time, as well as the date, that the Autosave function begins operation. Use the spectrum analyzer data keys and terminate the entry with any units key. After being entered, the time and date appear beside START TIME in the AUTOEXEC/AUTOSAVE SCHEDULE.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



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**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**

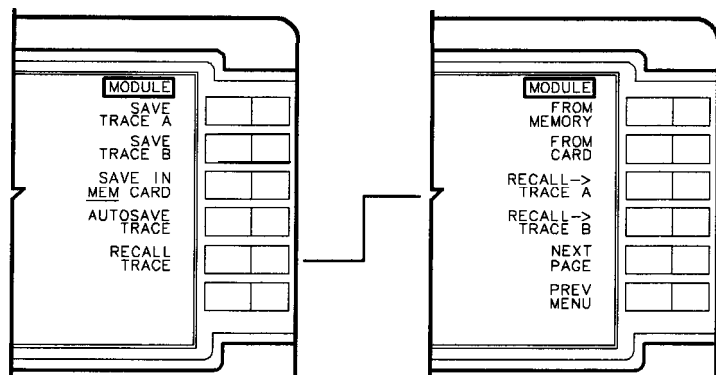
displays the main menu of **TRACE SAVE/RCL**.

**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.



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**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**

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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.

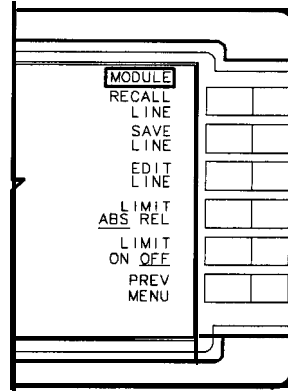
- Upper/Lower: input upper and/or lower amplitude values. If an upper-limit value is not entered, the upper limit assumes a default value of **+50 dBm**. If a lower-limit value is not entered, the lower limit assumes the default value of **-175 dBm**. If the lower-limit value is greater than the upper-limit 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.

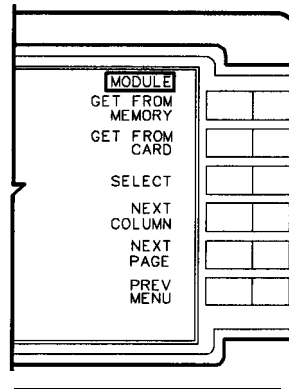


d126a

**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 corner 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**


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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.

---

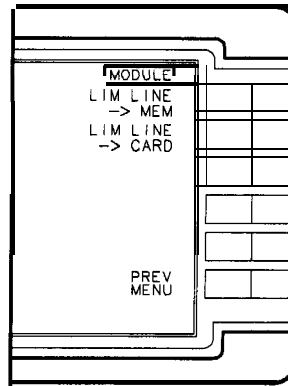
**Note**


---

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.

---

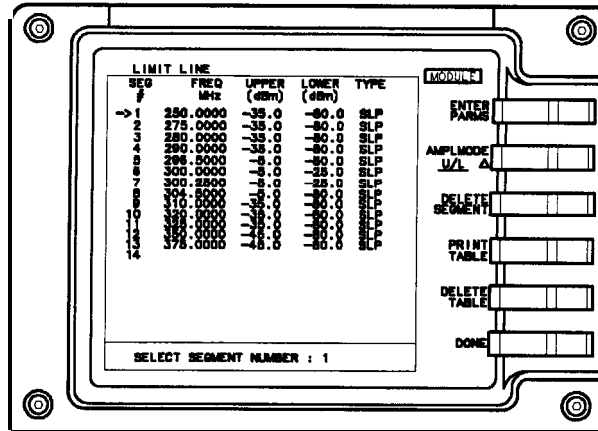
**PREV MENU**

returns you to the previous menu displaying the **SAVE LINE** softkey.

**EDIT LINE**

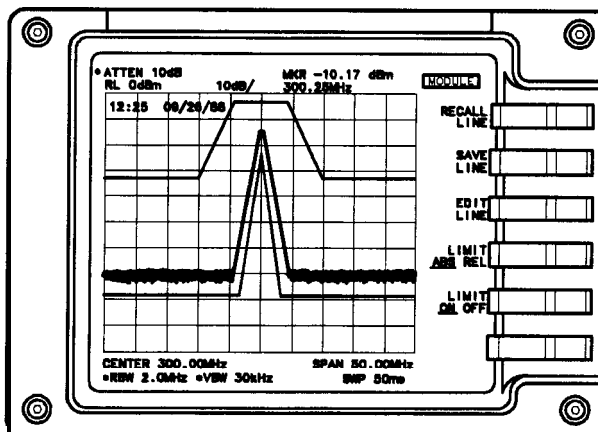
displays the table of limit-line segments and the menu of **softkeys** illustrated in Figure 2-11. The **softkeys** are explained below. Refer to Figure 2-12 for the screen display of the limit line. You can create up to 18 limit-line segments per table. Determine whether you want a relative or absolute 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.



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

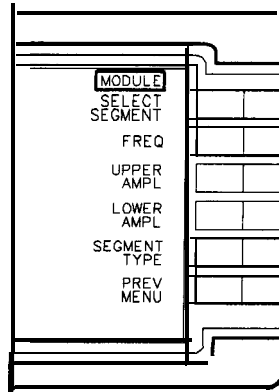


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Figure 2-12. Sample Limit Line Using Figure 2-11 Table Data

### 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**

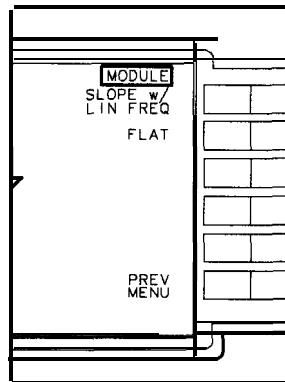
highlights and allows you to enter up to six characters (plus or minus sign, four digits, and a decimal point) for the lower or delta amplitude value using the data keys, RPG knob, or STEP keys. Terminate the data entry by pressing the appropriate units key, then any other parameter **softkey** to continue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



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**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**

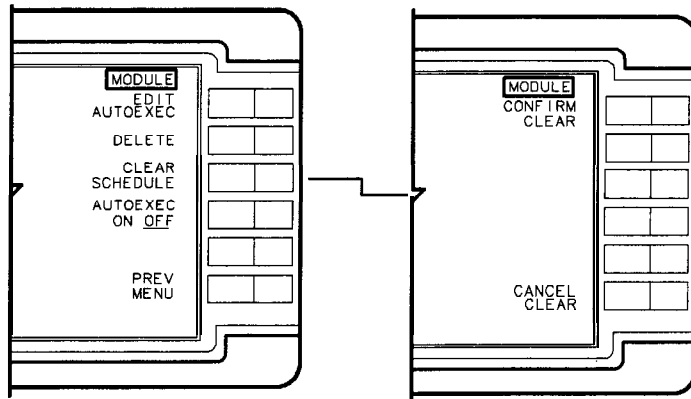
uses the current limit line as a reference for absolute frequency and amplitude values when the default **ABS** mode is activated. The **REL** setting causes the current limit-line value to be relative to the displayed center frequency and reference-level amplitude values.

**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.

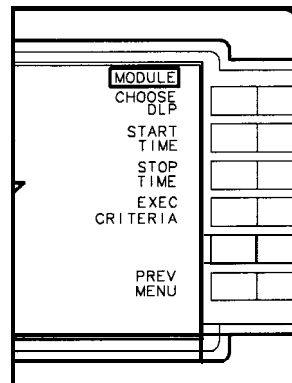


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**Figure 2-15. Autoexec Menu Softkeys**

### 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.



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**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

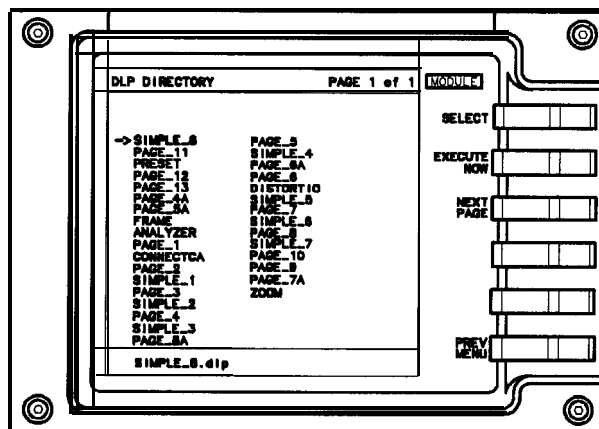
initiates the selected DLP immediately.

## 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**

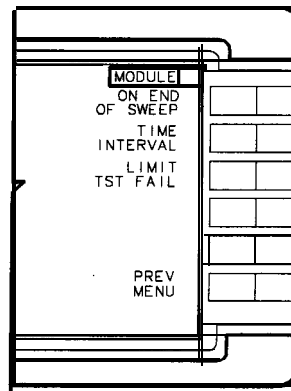
allows you to enter the date and time you want the Autoexecute function to begin. Enter the date and time in the format shown in the lower box of the schedule display. Any **DLPs** which were running when you selected **EDIT AUTOEXEC** are suspended during the editing process.

**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.



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**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.

### **AI 'TOEXEC ON OFF**

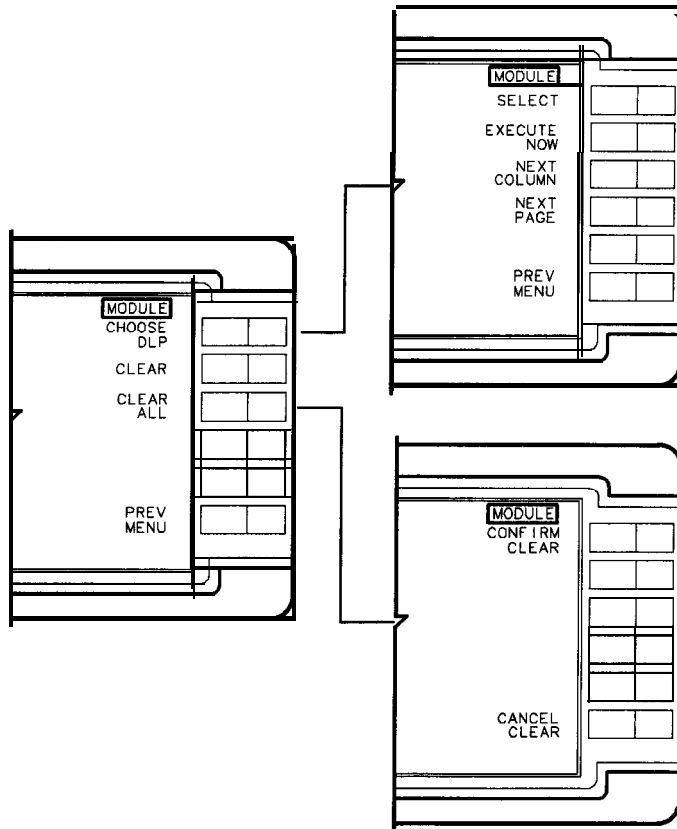
turns the Autoexec schedule on or off. While you are in this menu, no DLPs are allowed to execute. If **AUTOEXEC** is set to ON, DLP execution priority is determined by its location in the schedule. If a DLP is activated as soon as you turn Autoexec on, you will have to press **PRESET** on the spectrum 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**. To 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**

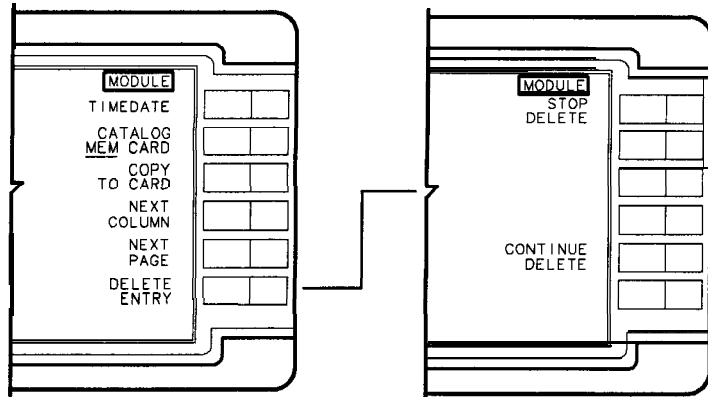
accesses the **CONFIRM CLEAR CANCEL CLEAR** softkeys. Press **CONFIRM CLEAR** to clear all the DLPs from the user keys. Otherwise, press **CANCEL CLEAR** to return to the previous menu displaying the **CLEAR ALL** softkey.

## **PREV MENU**

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

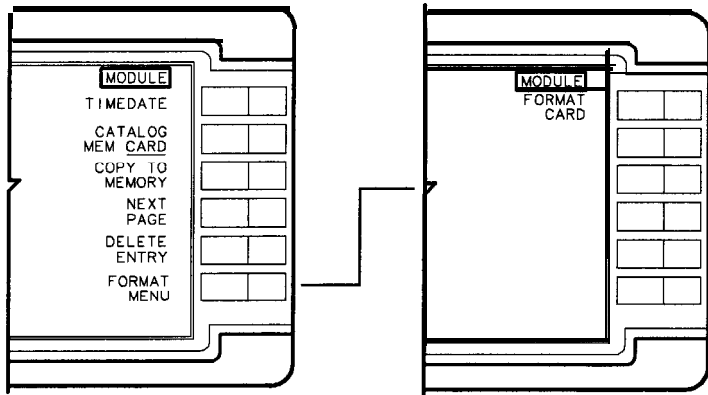
## UTILITY Menu

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



d129a

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

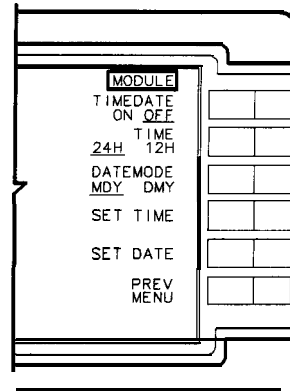


d1210a

**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.



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**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.

## Softkey Menu

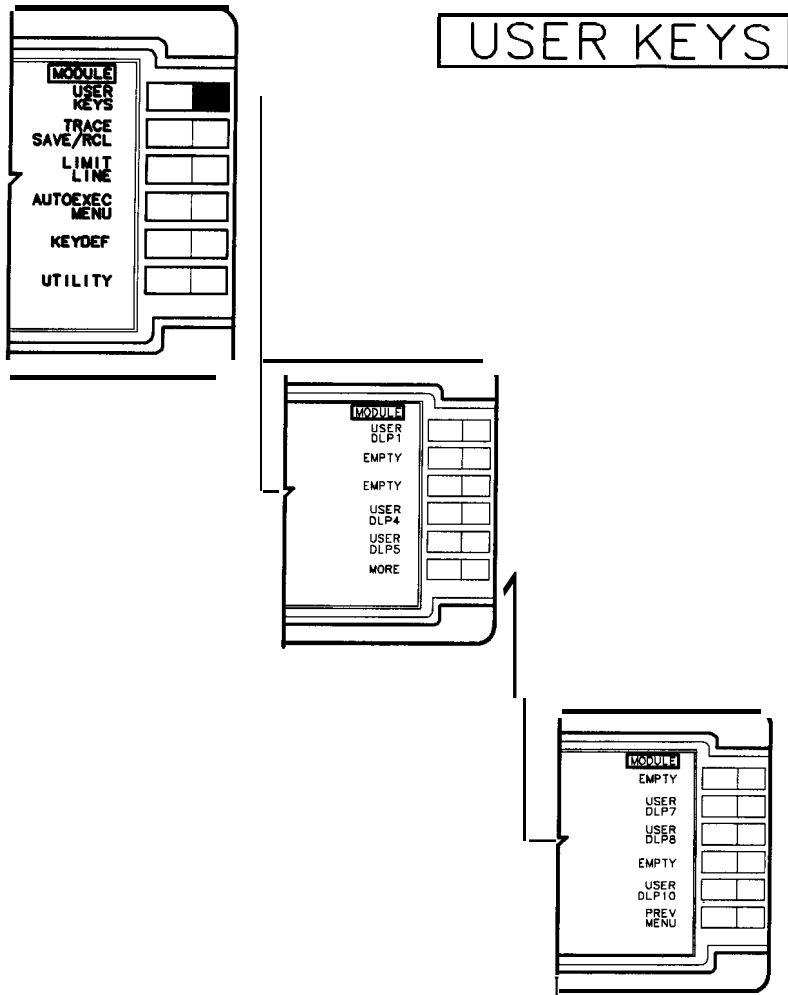
---

### 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:

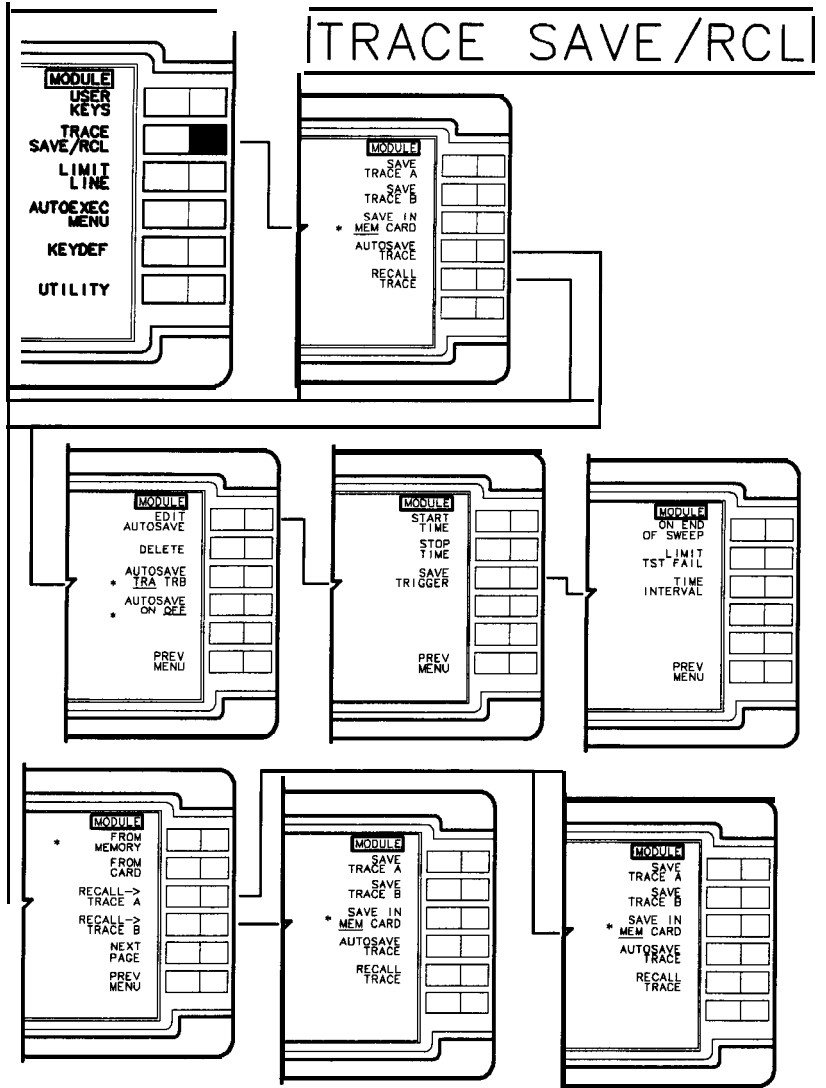
- USER KEYS
- TRACE SAVE/RCL
- LIMIT LINE
- AUTOEXEC MENU
- KEYDEF
- UTILITY





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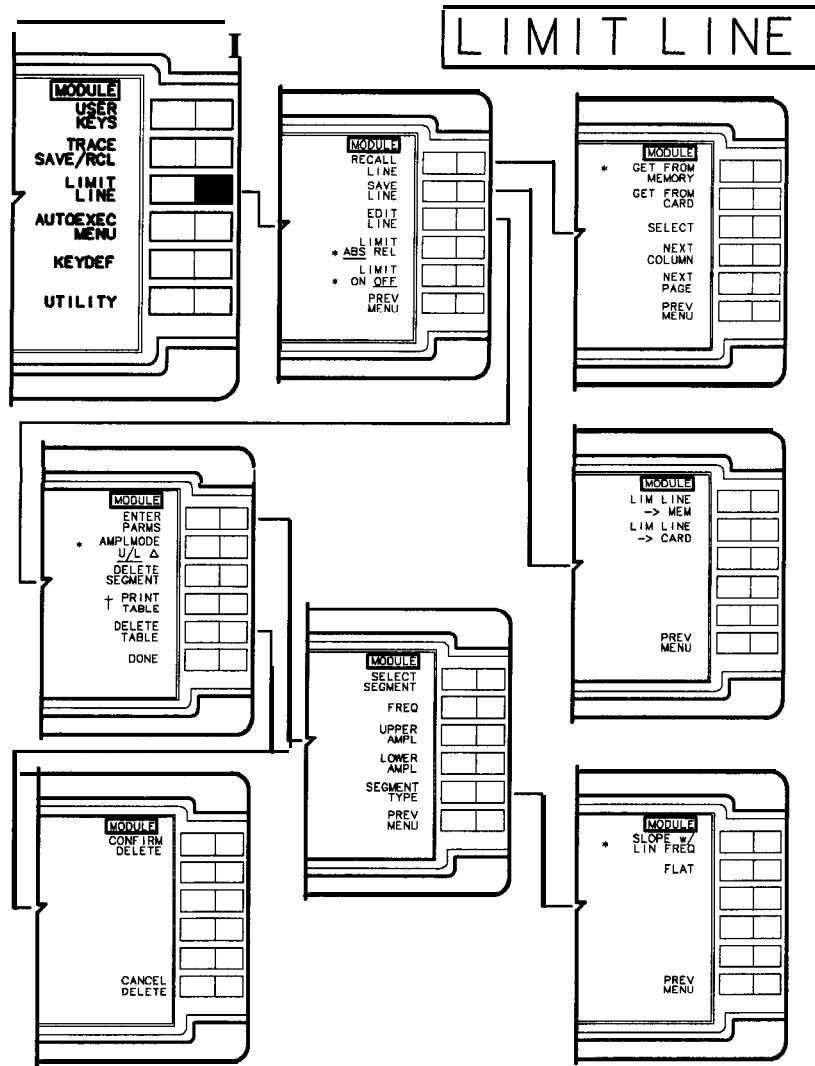
**Figure 3- 1. User Keys**



nf22a

**Figure 3-2. Trace Save/Rcl**

\* default

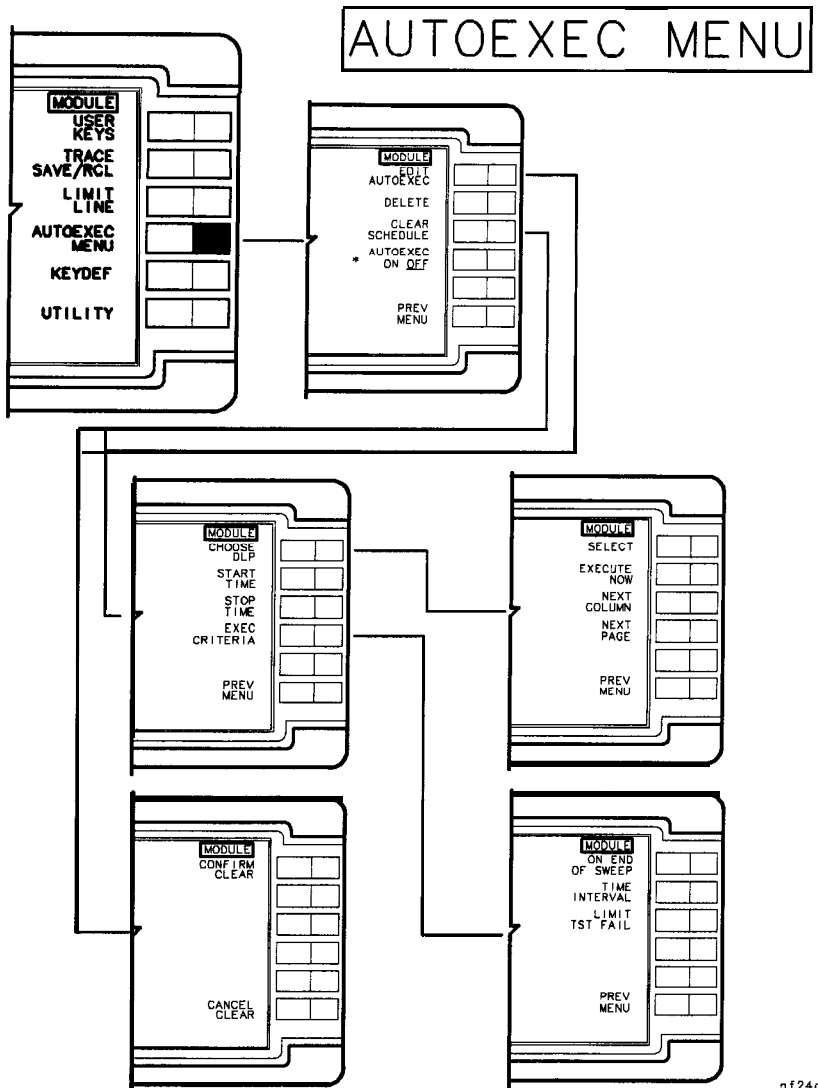


nf23a

**Figure 3-3. Limit Line**

\* default

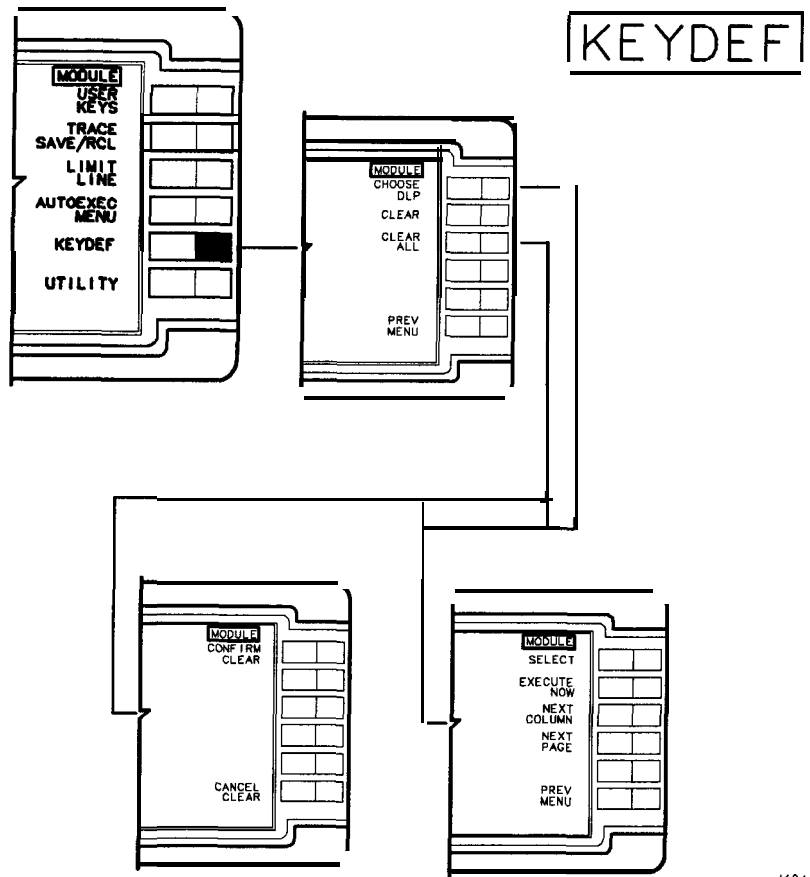
† This softkey label appears only if the spectrum analyzer has printing capability.



nf24a

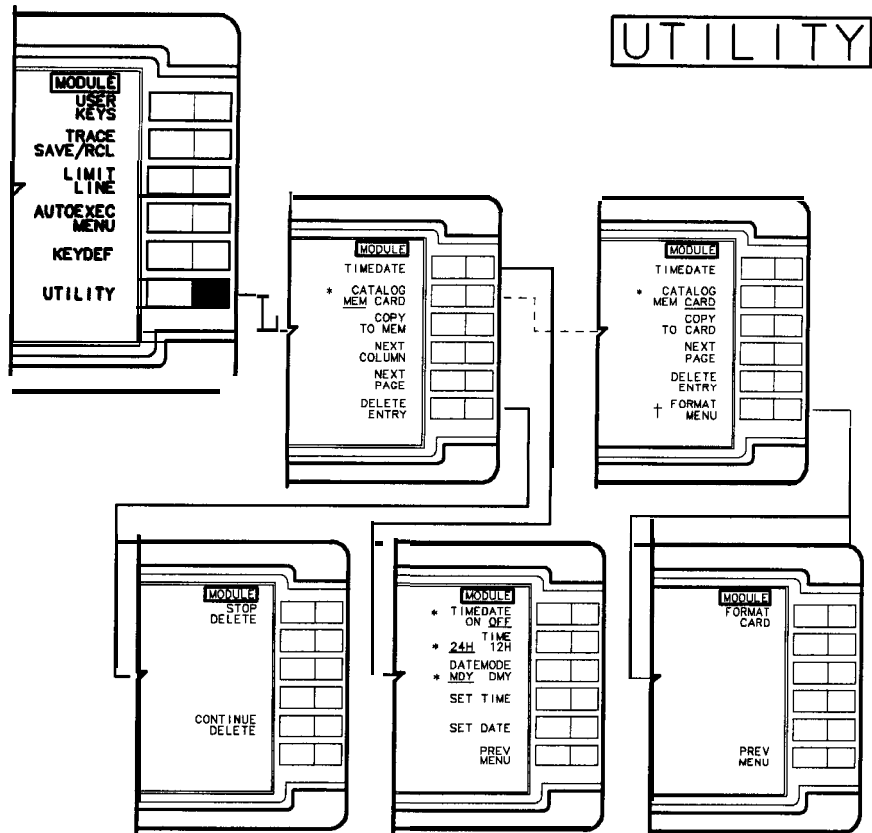
**Figure 3-4. Autoexec Menu**

- default



d124a

**Figure 3-5. Keydef**



nf25a

**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.

# 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

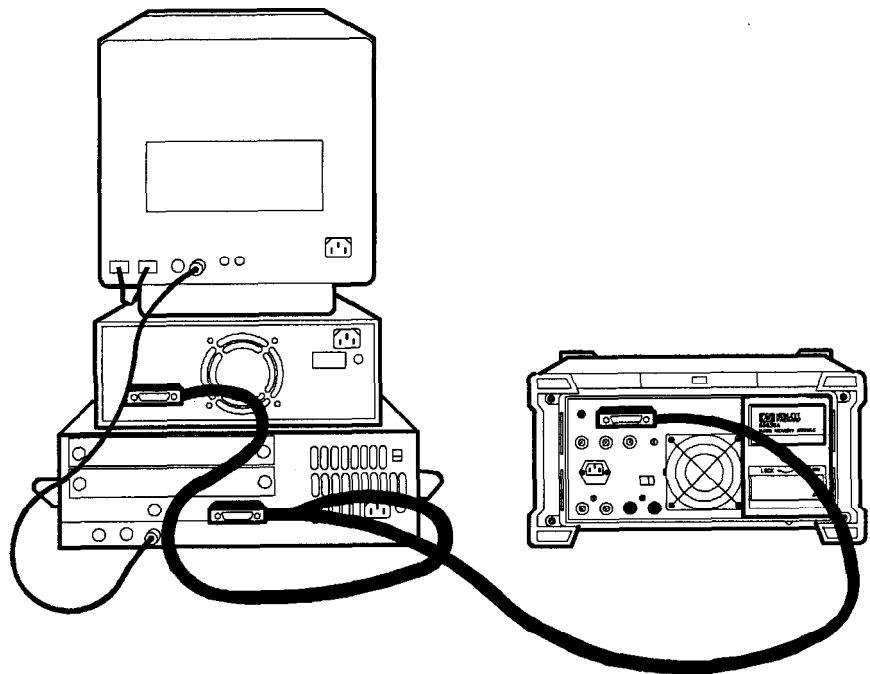
- HP 85620A Mass Memory Module
- HP 8560A/E, or HP 8561A/B/E, or HP 8562A/B/E, or HP 8563A/E Spectrum Analyzer
- HP Series 200/300 Controller
- 10833 A/B/C/D HP-IB Cable Assembly
- HP BASIC 2.0 (or greater)

### 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.



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**Figure 4-1. Equipment Setup**

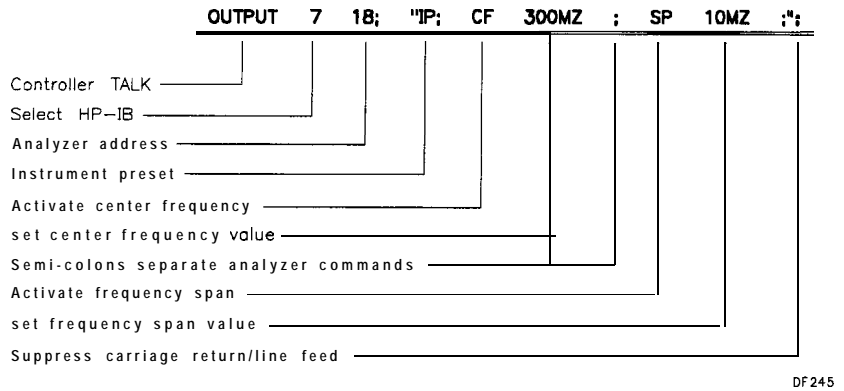


## Programming Front-Panel Functions

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.

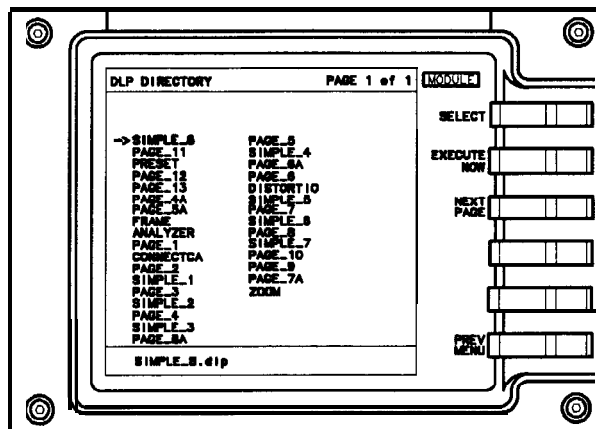
### Example 4-2

```
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.



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Figure 4-3. Typical DLP Listing

## Programming User-Defined Functions

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

```

10 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.

To 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

```

10 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 $1 \times 10^9$
MHz/-dBm/sec .....	Multiplies entered value by $1 \times 10^6$
kHz/mV/rms .....	Multiplies entered value by $1 \times 10^3$
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 i s 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.

## Programming Hints

### 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 1;BLANK TRA;VIEW TRB;";
                                           ! signal in trace B, and
```

```

530 OUTPUT 718;"@";
540                                     ! recalls the analyzer settings
550                                     ! 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.

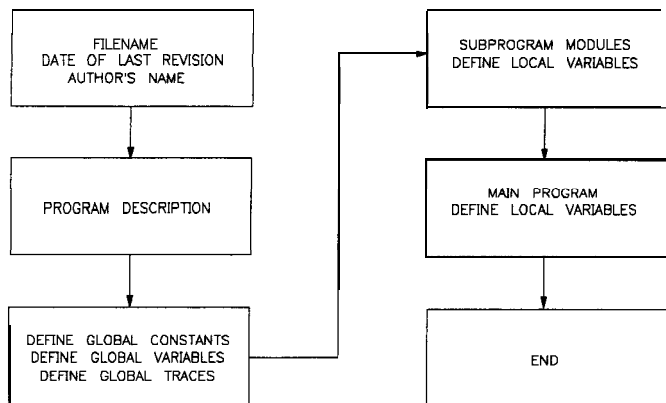
```

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.



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**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.

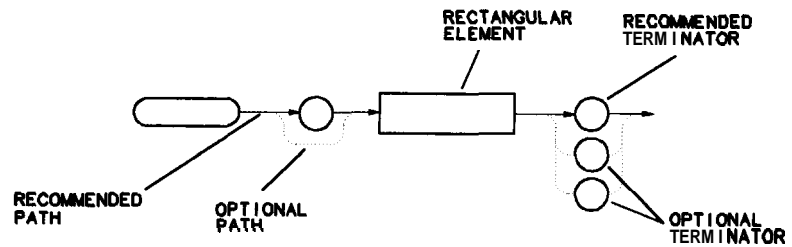
## **Programming Hints**

### **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



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### 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

## Command Syntax Diagrams

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.

<b>array range</b>	any segment or point of a user-defined array that specifies the array limits.
<b>character</b>	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
<b>compatible function</b>	any spectrum-analyzer command in this chapter that performs an action <b>on</b> 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
<b>data byte</b>	8-bit byte, containing numeric or character data.
<b>identifier</b>	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 <b>ZOOM_2</b> is an acceptable identifier, but <b>ZOOM2</b> or <b>ZOOM 2</b> is not.
<b>delimiter</b>	matching characters marking the beginning and end of character strings, user-defined functions, or pre-defined functions. They include these characters:  ! " \$ % & ' / \ : @ ^
<b>digit</b>	0 1 2 3 4 5 6 7 8 9
<b>DLP</b>	a user-defined function.
<b>LF with EOI</b>	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.
<b>measurement units</b>	apply to <b>TRA</b> and <b>TRB</b> and range from 0 to 600 points.



## Command Syntax Diagrams

**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	<b>SUMSQR</b>
RMS	VARIANCE

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

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

\* 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.

## Command Syntax Diagrams

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

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

<sup>1</sup> 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-defined 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.

## Command Syntax Diagrams

### Textual Notation Conventions

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

**Table 4-1. Functional Command Listing**

<b>Function</b>	<b>Mnemonic</b>	<b>Description</b>
Auto-function command	AUTOEXEC	Automatic execution
	AUTOFUNC	Automatic function
	AUTOSAVE	Automatic trace save
	CLRSCHED	Clear <b>autoexec</b> / 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	CLRDISP	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
	SENDER	Enter limit-line segment parameters

## Command Syntax Diagrams

**Table 4-1. Functional Command Listing (continued)**

<b>Function</b>	<b>Mnemonic</b>	<b>Description</b>
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 <b>softkey</b> labels
	KEYDEF	Define user <b>softkey</b> label
	MENU	Show user <b>softkey</b> menu
	SHOWMENU	Show all user <b>softkeys</b>
	SKYDEF	Define user <b>softkey</b>
	SKYCLR	Clear user <b>softkey</b>
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
	<b>MXM</b>	Maximum
	<b>SQR</b>	Square root
	SUB	Subtract
Trace Operation	MEAN	Trace mean
	<b>MODRCLT</b>	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
	<b>SUMSQR</b>	Sum of squared trace amplitude
	VARIANCE	Variance
	User definition command	ARRAYDEF
DISPOSE		Dispose
FUNCDEF		Function <b>definition</b>
LCLVAR		<b>Local</b> 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
<b>-A-</b>		
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
<b>-C-</b>		
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 <b>autoexec</b> / 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
<b>-D-</b>		
DATEMODE	Date mode	Clock control command
DISPOSE	Dispose	User definition command
DIV	Divide	Predefined math operation
DSPLY	Display	Graphics control command
<b>-E-</b>		
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

## Command Syntax Diagrams

**Table 4-2. Alphabetical Command Listing (continued)**

<b>Mnemonic</b>	<b>Description</b>	<b>Function</b>
<b>-F-</b>		
FORMAT	Format	Formats the memory card
FUNCDEF	Function definition	User definition command
<b>-I-</b>		
IF/THEN/ELSE/END IF	If/then/else/end if	User program control flow
INT	Integer	Predefined math operation
<b>-K-</b>		
KEYCLR	Clear a user key	Module menu command
KEYDEF	Define a user key	Module menu command
<b>-L-</b>		
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
LIMPURGE	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
LIMITSL	Slope limit-line segment	Limit-line command
LIMU	Upper limit value	Limit-line command
LOG	Logarithm	Predefined math operation
<b>-M-</b>		
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
<b>MODSAVT</b>	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)

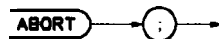
Mnemonic	Description	Function
<b>-O-</b>		
ONEOS	On end of sweep	User definition command
OR	Set Origin	Graphics control command
OUTPUT	Output to HP-IB	HP-IB control command
<b>-P-</b>		
PA	Plot absolute	Graphics control command
PD	Pen Down	Graphics control command
PDA	Probability distribution of amplitude	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
<b>-R-</b>		
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
<b>-S-</b>		
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
SENDER	Enter line segment	Limit-line command
SETDATE	Set date	Clock control command
SETTIME	Set time	Clock control command
SHOWMENU	Show menu	Menu command
SKYCLR	Clear user <b>softkey</b>	Menu command
SKYDEF	Define user <b>softkey</b>	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
<b>-T-</b>		
TEXT	<b>Text</b>	Graphics control command
TIMEDATE	Time and date mode	Clock control command
TRDEF	Trace definition	User definition command
<b>-V-</b>		
VARDEF	Variable definition	User definition command
VARIANCE	Variance	Trace operation command

---

# ABORT

## Abort Operation

### Syntax



x.f21c

### 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;"CLRDSPL;";          ! 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%DLPABORTED%; ";
                                           ! Print text.

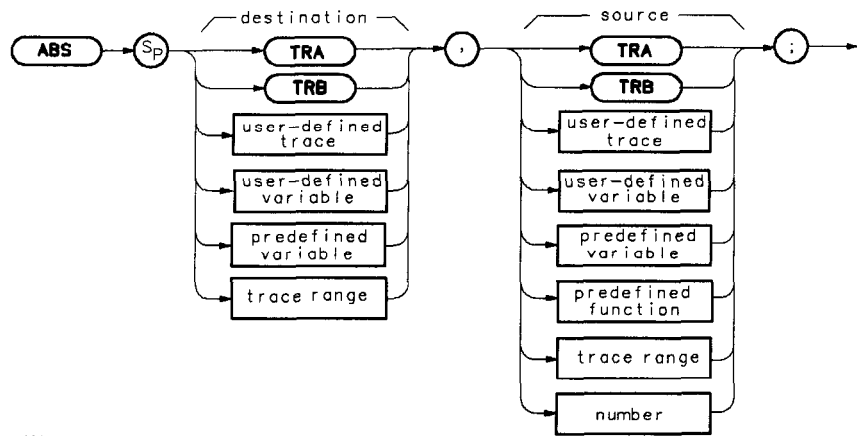
150     OUTPUT @Sa;" ABORT; ";
160     OUTPUT @Sa;" ELSE; ";
170     OUTPUT @Sa;" PU;PA 100,X;";      ! Move pen.
180     OUTPUT @Sa;"DSPLY Y,5,2;";      ! Display 'Y'.
190     OUTPUT @Sa;" SUB X,X,40;";      ! Decrement pen pointer.
200     OUTPUT @Sa;" SUB Y,Y,100;";     ! Decrement variable.
210     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



xf22a

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

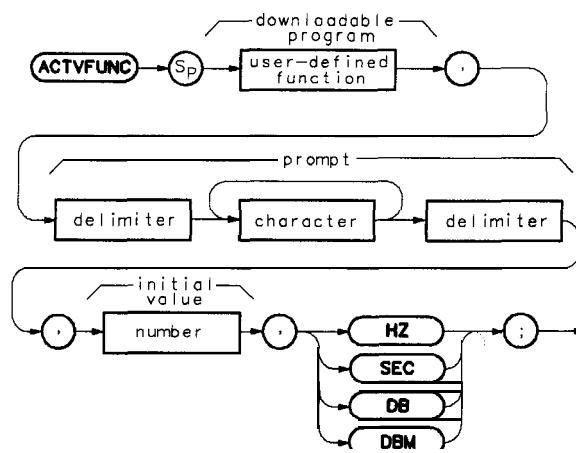
### Program Example

```
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.

## ACTVFUNC

### 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.

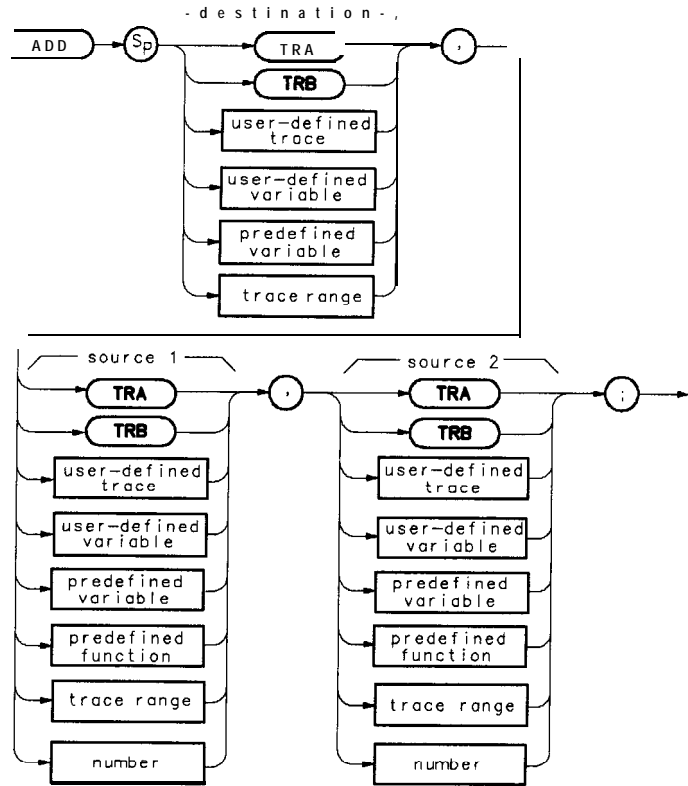
### Program Example

```
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} to run 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



xf24a

**Description**

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

## ADD

### Program Example

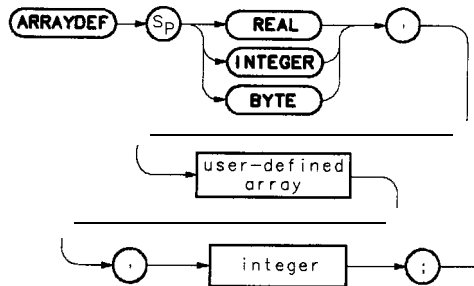
```
10      ! The following example shows the use of the ADD command.  The example
20      ! uses an input signal of 300 MHz, such as the CAL OUTPUT signal, and
30      ! looks at its harmonics.  An input signal is not necessary to the
40      ! function of this example, but acts as a visual aid.
50      !
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.

## ARRAYDEF

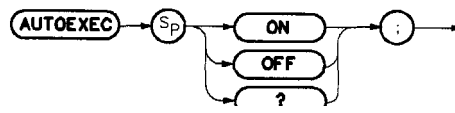
### Program Example

```
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 10-element REAL array.
80      OUTPUT @Sa;"ARRAYDEF REAL,AMPLS,10;"; ! Create another REAL array.
90      OUTPUT @Sa;"VARDEF X,1;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



x f 26 c

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

Prerequisite Command: AUTOFUNC

Related Commands: AUTOSAVE, CLRSCHED

### Program Example

```

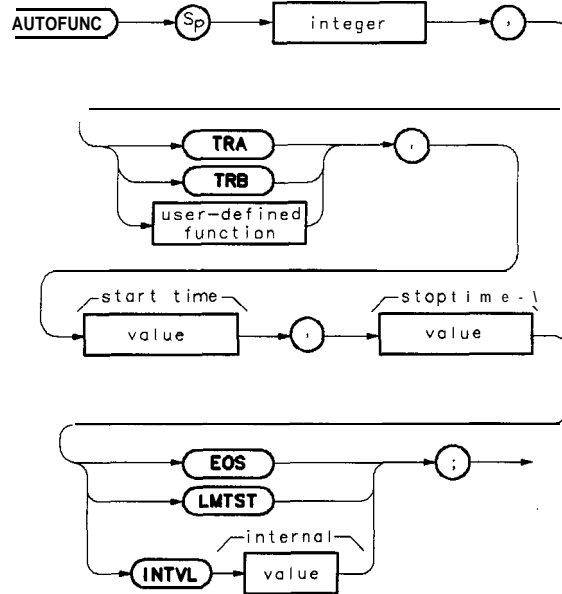
10      ! The following example shows the use of the AUTOEXEC command.
20      !
30      ASSIGN @Sa TO 718          ! Assign I/O path to address 718.
40      !
50      Autoexec_status=999      ! Initialize status variable to
60      ! ELSE case value.
70      OUTPUT @Sa;"AUTOEXEC ON;"; ! Turn AUTOEXEC 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



x127a

### 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

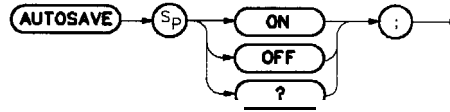
```

---

# AUTOSAVE

## Automatically Save Traces

### Syntax



xf28a

### Description

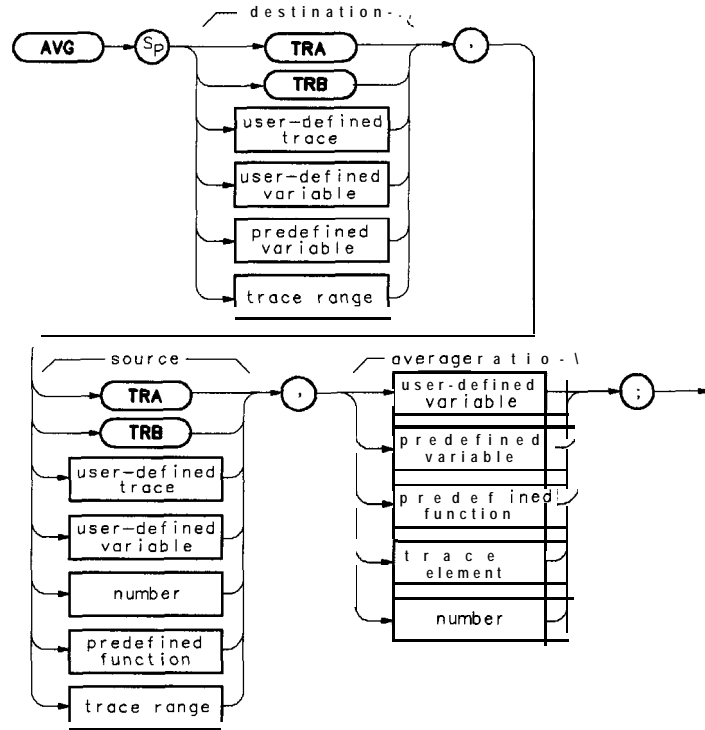
When set to ON, this command activates the automatic saving of traces. The data to be automatically saved must be identified in the AUTOFUNC command.

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**



x129a

**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**

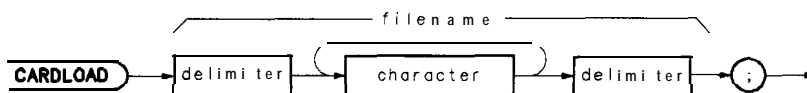
```
10      ! The following example shows the use of the AVG command.
20      !
30      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
40      !
50      OUTPUT @Sa;"IP;";                ! Instrument preset.
60      OUTPUT @Sa;"SNGLS;CLRW TRA;TS;"; ! \ Set up the analyzer.
70      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



xf210a

#### 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%;
```

## CARDLOAD

### 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.

---

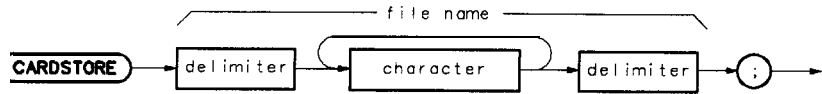
```
10 ! The following example shows the use of the CARDLOAD command. The
20 ! example creates a DLP (downloadable program) and stores it in memory.
30 ! It is then copied to the memory card, if available.
40 !
50 ASSIGN @Sa TO 718 ! Assign I/O path to address 718.
60 !
70 OUTPUT @Sa;"FUNCDEF BOX,@;"; ! 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.

## CARDSTORE

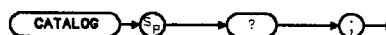
### Program Example

```
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.

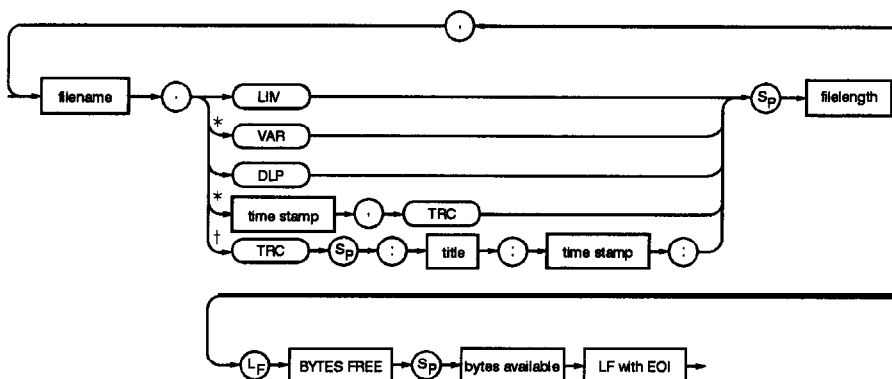
Related command: MSDEV

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 <b>VARDEF</b> , or <b>TRDEF</b> , or <b>ARRAYDEF</b> command.  It is only available when MSDEV is set to MEM.
filename.DLP	If MSDEV is set to MEM this is the downloadable program defined using the <b>FUNCDEF</b> command.
filename.timestamp.TRC	This file is a trace. It can be recalled by way of the front panel or by using filename.timestamp <b>as an</b> argument to <b>MODRCLT</b> when MSDEV is set to MEM
filename.TRC :title:timestamp	This trace file is <b>stored in</b> the memory card. When the file is copied to the module memory, it will be stored under filename title with the corresponding timest 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>
                                ! will go into Cat$; data up
80                                 ! to <lf-EOI> will go into
90                                 ! Bytes_avail$.
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)
```

CATALOG

```

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 OSa 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 SUBDisplay_cat(Class$,Ent$(*),INTEGERNum,entries)
1040 !Displays the previously parsed catalog retrieved from the 85620A+.
1050 Display-cat:!
1060 INTEGEREntry_name,Entry_length,Entry_type,Entry
1070 REALTotal_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."

```

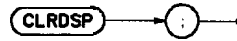
## CATALOG

```
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
```

# CLRDSF

## 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 CLRDSF command.
20      !
30      ASSIGN @Sa TO 718                      ! Assign I/O path to address 718.
40      !
50      OUTPUT @Sa;"CLRDSF;";                 ! 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

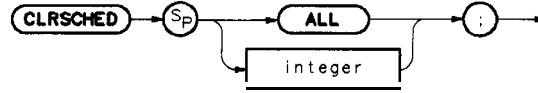
```

---

# CLRSCHED

## Clear Autosave/Autoexec Schedule Buffer

### Syntax



x1213a

**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.

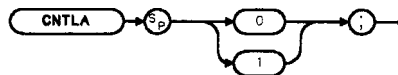
### Program Example

```
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
  
```

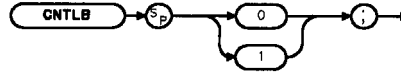
\* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

---

# CNTLB

## Auxiliary Control Line B

### Syntax



XCNTLB

**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
```

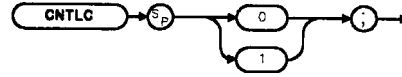
\* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPs and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

---

# 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

```

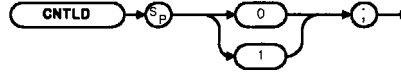
\* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPS and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

---

# 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
```

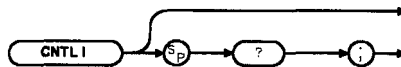
\* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPS and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.



# CNTLI

## Auxiliary Control Line Input

### Syntax



XCNTLI

### 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,@;";
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;" DISPLY I_VAL,2,0;";
90  OUTPUT @Sa;"@;";
100 OUTPUT@Sa;"AUX_GET_CTRLI;";
110 END

```

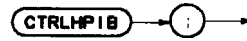
\* These auxiliary interface connector commands can only be accessed remotely by way of the HPIB and DLPS and are only available with 85620A with serial prefix 3143A or higher and firmware 910116 and later date codes.

---

## CTRLHPIB

### Control HP-IB

#### Syntax



x1214a

#### 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 1,KC,'THIS IS AN EXAMPLE OF THE ANALYZER
SENDING' ,",,
150     OUTPUT @Sa;" OUTPUT 1,KC,'DATA TO ANOTHER HPIB DEVICE';";
160     OUTPUT @Sa;II 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

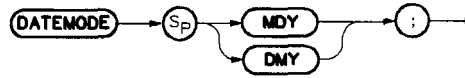
```

---

# DATEMODE

## Date Mode

### Syntax



x f215a

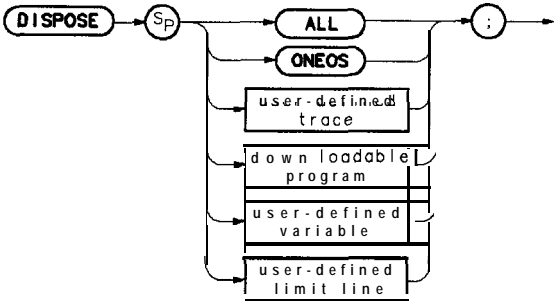
### Description

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	DISPOSED_DATA.VAR
3.	DLP (Down-Loadable Program)	DISPOSE F_PRCTAM.DLP
4.	Limit Line	DISPOSEB_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.

## **DISPOSE**

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

```

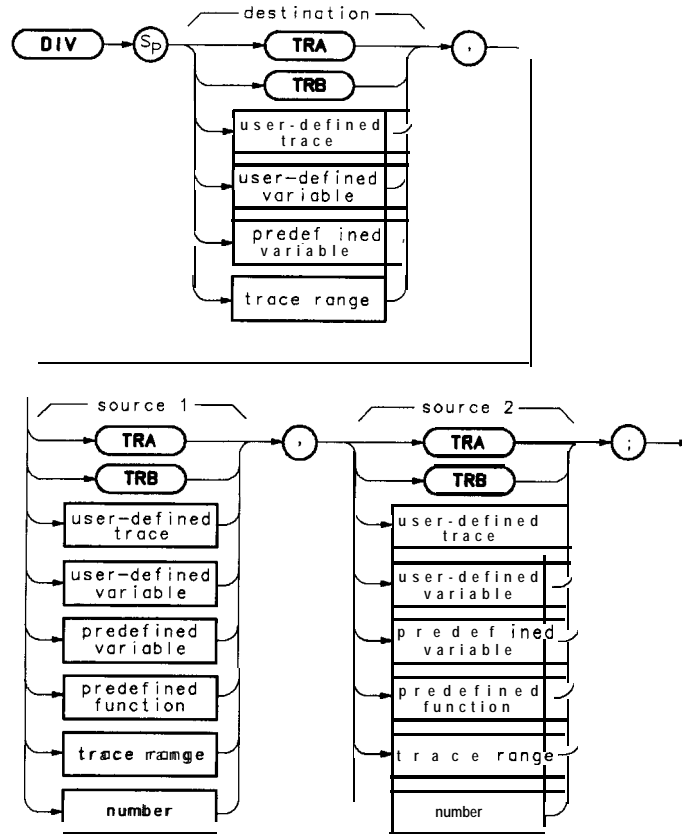
10  ! The following example shows the use of the DISPOSE command. First it
20  ! clears memory. Then it creates a DLP and a variable. Finally, it deletes
30  ! the variable. Since this example disposes EVERYTHING currently downloaded
40  ! into the memory module, it should be used with caution.
50  !
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



xf217a

## 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.

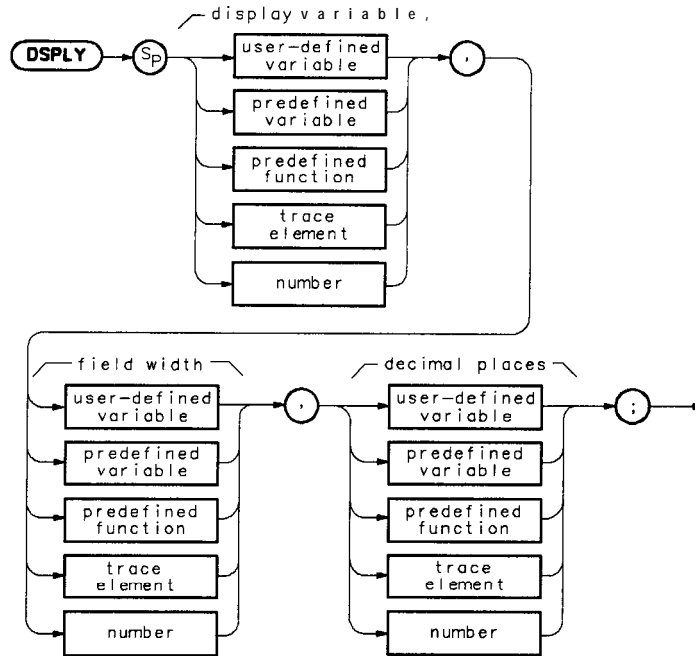
---

---

# DSPLY

## Display Variable

### Syntax



xf218a

### 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: CLRDSPL, 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$(I)&","1;";
140         ! Take the LOG and multiply
150         ! by scaling factor of 1.
160         OUTPUT @Sa;"PU;PA 20,YVAL;"; ! Position "pen" for text.
170         OUTPUT @Sa;"TEXT %The LOG of %;"; ! Write text.
180         OUTPUT @Sa;"DSPLY "&VAL$(I)&","6,3;";
190         ! Write a value.
200         OUTPUT @Sa;"TEXT % = %;";    ! Write text.
210         OUTPUT @Sa;"DSPLY LOG_TEN,5,3;"; ! Write a value.
220         OUTPUT @Sa;"SUB YVAL,YVAL,50;"; ! Calculate new "pen" position.
230     NEXT I                          ! End loop.
240     !
250     ASSIGN @Sa TO *                  ! Close I/O path.
260     END

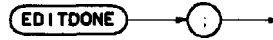
```

---

# 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;"LIMPURGE;"; ! 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

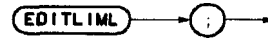
```

---

# EDITLIML

## Edit Limit Line

### Syntax



x1220a

### 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 `SENDER` and `SEDI`.

### Program Example

```

130 ! This program demonstrates the use of the EDITLIML command
140 ! to generate a limit line:
150 !
160 OUTPUT718;"LIMPURGE;";           ! 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
                                   ! the limit line.
505
510 END !

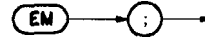
```

---

# E M

## Erase User Display Memory

### Syntax



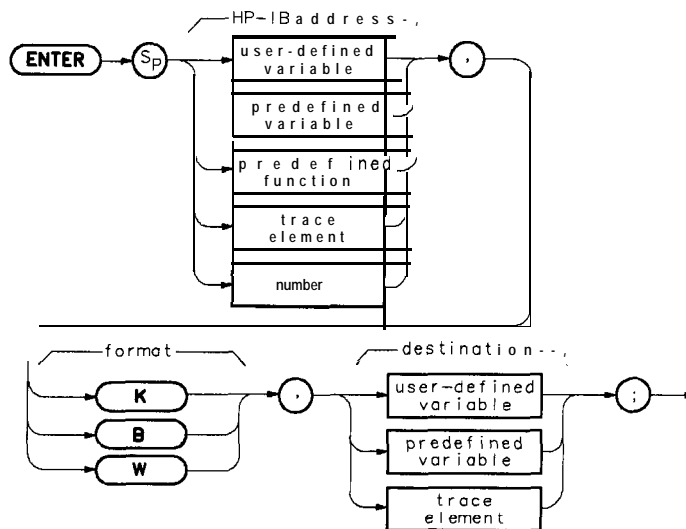
x f221a

### 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**

xf222a

**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:

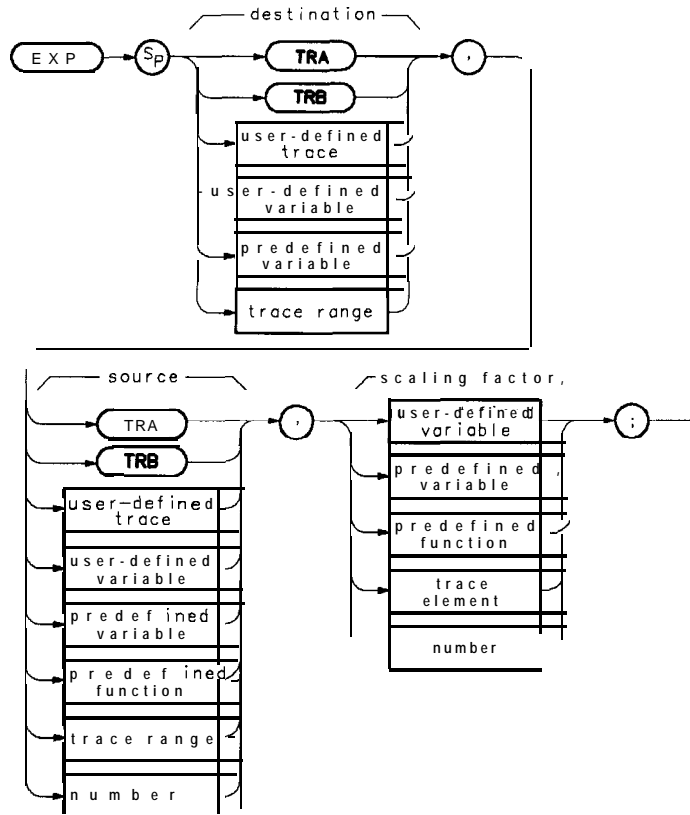
- K, a free field (ASCII real-number format)
- B, one binary byte
- W, one binary word (two bytes)

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

# EXP

## Exponent

### Syntax



xf223a

### 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

$\langle \text{scaling factor} \rangle ::= \langle \text{variable identifier} \rangle \mid \langle \text{numeric data field} \rangle$   
 $\langle \text{destination} \rangle = 10 \langle \text{source} \rangle / \langle \text{scaling factor} \rangle$

**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

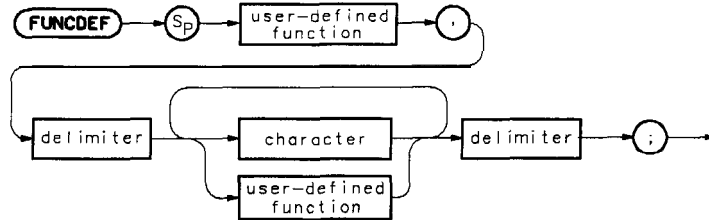
```

---

# 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**

```

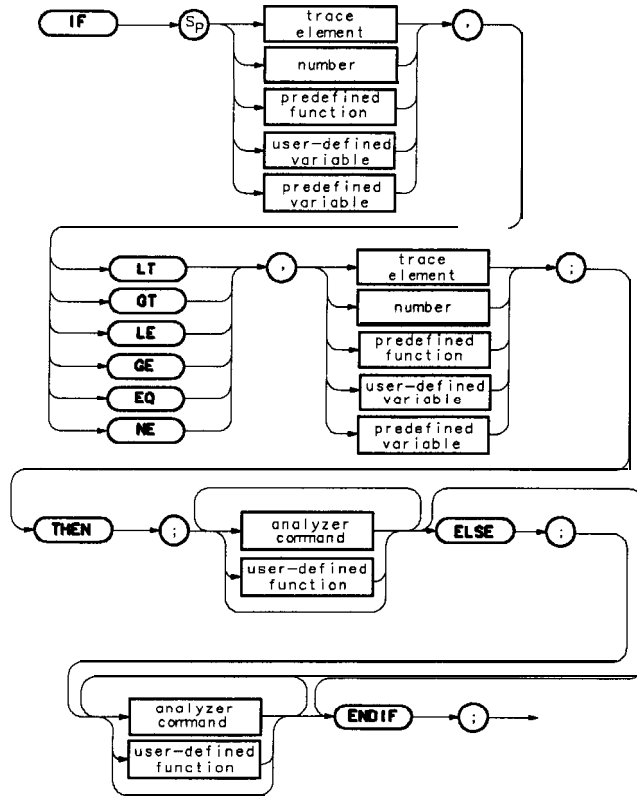
10  ! The following example shows the use of the FUNCDEF command.  The example
20  ! uses an input signal of 300 MHz, such as the CAL OUTPUT, and looks at
30  ! its harmonics.  An input signal is not necessary to the function of
40  ! this example, but acts as a visual aid.
50  !
60  ASSIGN @Sa TO 718                ! 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



x f225a

### 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).

**THEN** 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,100; THEN;";
                                   ! Test condition.
130 OUTPUT @Sa;" PU;PA 100,X;";    ! Move pen.
140 OUTPUT @Sa;" TEXT%DLPABORTED%;";
                                   ! 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

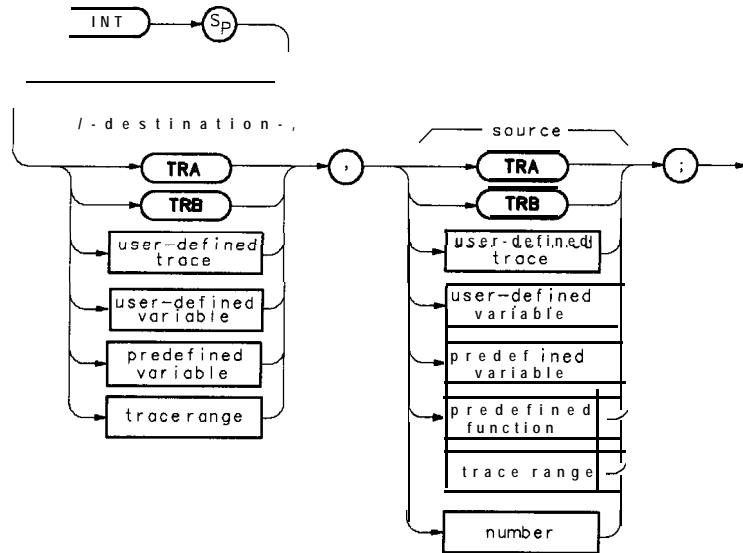
```

---

# INT

## Integer

### Syntax



xf226a

### 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**

```

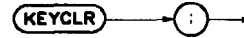
10      ! The following example shows the use of the INT command. The real
20      ! value is truncated by the INT command.
30      !
40      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50      !
60      OUTPUT @Sa;"VARDEF REAL_NUM,3.14;";
                                           ! 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
                                           ! to computer CRT.
160
170     !
180     ASSIGN @Sa TO *                 ! Close I/O path.
190     END

```

# KEYCLR

## Clear User Defined Keys

### Syntax



x1227a

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

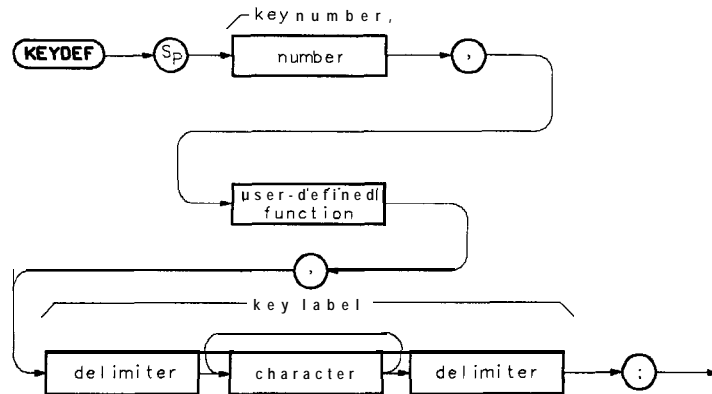
### Program Example

```
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**

```

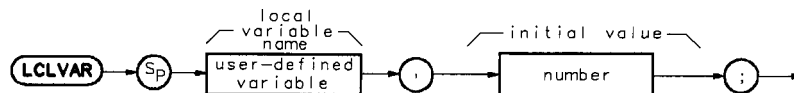
10      ! The following example shows the use of the KEYDEF command.
20      !
30      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
40      OUTPUT @Sa;"KEYDEF 2,BOX,%DRAW BOX%";
                                           ! Define softkey 2 to execute the
50                                           ! 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



xf229c

### 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.

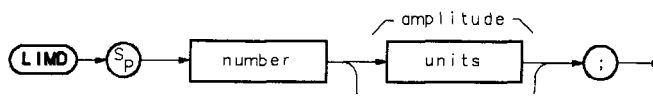
**Program Example**

```

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;LIMU -15DBM;LIML 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

```

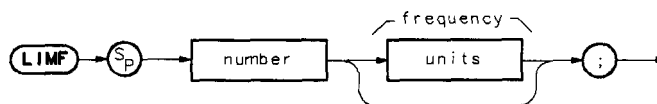


---

# LIMF

## Limit-Line Frequency

### Syntax



x1231c

**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.

## LIMF

### Program Example

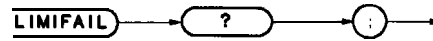
```
120 ! This program demonstrates the use of the LIMF command
130 ! to generate a limit line:
150 !
160 OUTPUT718;"LIMIPURGE;"; ! Purge current limit line.
170 OUTPUT718;"EDITLIML;"; ! Begin edit of limit line.
180 OUTPUT 718;"LIMIREL OFF;"; ! Make sure it's an absolute limit line.
190 OUTPUT 718;"SADD;"; ! 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



xf232o

#### 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 OUTPUT 718;"FDJT DONE;"; ! 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

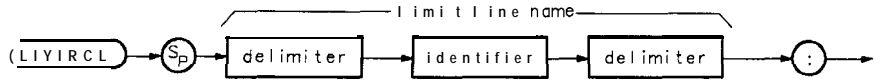
```

---

# 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.

---

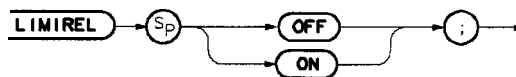
Recalls a limit-line set from the limit-line table in the module user memory. The table is stored in user memory with the LIMISAVE command. The command displays a limit line which is recalled by the name assigned to it. A limit line may be saved and given a name using the remote command LIMISAV, or entered from the front panel with the screen-title function. To 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



x f 235a

#### 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.

## LIMREL

### Program Example

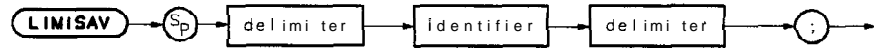
```
130 ! This program demonstrates the use of the LIMREL command
140 ! to generate a limit line:
150 !
160 OUTPUT 718;"LIMIPURGE;"; ! Purge current limit line.
170 OUTPUT 718;"EDITLIML;"; ! Begin edit of limit line.
180 OUTPUT 718;"LIMIREL ON;"; ! Make sure it's a relative limit line.
190 OUTPUT 718;"SADD;"; ! 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



x1236a

### 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.

---

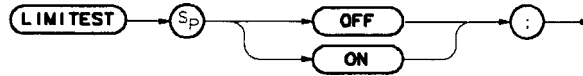
This command saves the active limit line to module memory under the name assigned to it. Any previously existing limit line having the same name is overwritten with the new limit-line table data. Refer also to the LIMIRCL command. To save a limit line to the memory card, execute CARDSTORE after the LIMISAV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

---

# LIMITEST

## Limit-Line Test

### Syntax



x1237a

### Description

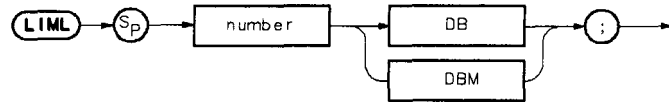
This command activates the limit-line test function, which compares the trace data in the current sweep with the limits set up in the limit table of the active limit line. The results of the current active trace compared with the active limit line can be read using the LIMIFAIL command. When this command 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



x f238e

### 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

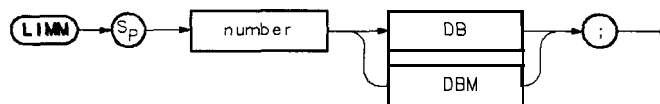
Number range: -175 dB to 50 dB

## LIML

### Program Example

```
130 ! This program demonstrates the use of the LIML 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 OUTPUT718;"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 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 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 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 OUTPUT718;"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;"LIMITSL;"; ! 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;LIMITSL;";
330 OUTPUT 718;"SDON;";
340 OUTPUT 718;"SADD;SEDI 4;";
350 OUTPUT 718;"LIMF 300MHZ;LIMM -15DBM;LIMD 10DBM;LIMITSL;";
360 OUTPUT 718;"SDON;";
370 OUTPUT 718;"SADD;SEDI 5;";
380 OUTPUT 718;"LIMF 303.5MHZ;LIMU -5DBM;LIML -80DBM;LIMITSL;";
390 OUTPUT 718;"SDON;";
400 OUTPUT 718;"SADD;SEDI 6;";
410 OUTPUT 718;"LIMF 304.5MHZ;LIMU -5DBM;LIML -80DBM;LIMITSL;";
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

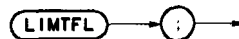
```

---

## LIMTFL

### Flat Limit-Line Segment

#### Syntax



x1240a

#### 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;"LIMPURGE;"; ! 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

```

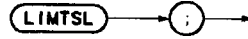


---

# 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;"LIMPURGE;"; ! 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 OUTPUT718;"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.
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

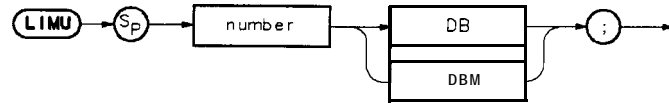
```

---

# 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

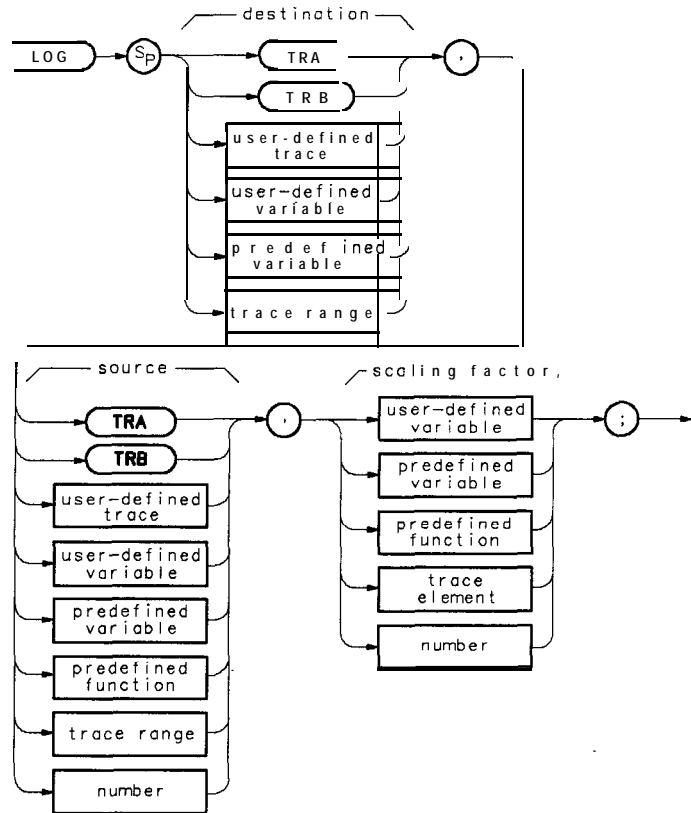
**Program Example**

```

130 ! This program demonstrates the use of the LIMU command
140 ! to generate a limit line:
150 !
160 OUTPUT718;"LIMPURGE;"; ! 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

```

---

**LOG**
**Logarithm****Syntax**

x1243a

**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;"CLR DSP;";          ! 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$(I)&",1;";
                                           ! Take the LOG and multiply
                                           ! by scaling factor of 1.
140         !
150         OUTPUT @Sa;"PU;PA 20,YVAL;"; ! Position "pen" for text.
160         OUTPUT @Sa;"TEXT %The LOG of %;";
                                           ! Write text.
170         OUTPUT @Sa;"DSPLY "&VAL$(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**

```

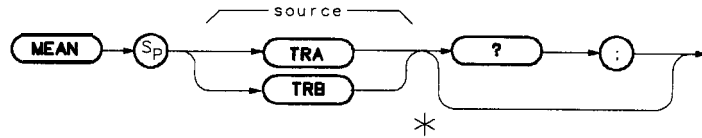
10  !The following example shows another use of the LOG command. This example
20  !performs the same function as the previous example, but is fully
30  !downloadable. Note that only minor changes need to be made to convert
40  !a program from computer-dependent to computer-independent! This method
50  !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



x1244a

### 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 CSa TO 718           ! Assign I/O path to address 718.
60      OUTPUT CSa;"VARDEF M_VALUE,0;"; ! Define an analyzer variable.
70      OUTPUT CSa;"MOV M_VALUE,MEAN TRA;"; ! Determine the mean of trace A.
80      OUTPUT CSa;"M_VALUE?;";      ! Return contents of variable.
90      ENTER CSa;Mean_value       ! Read value from analyzer.
100     PRINT "MEAN of trace A in measurement units = ";Mean_value
110     ASSIGN CSa TO *             ! Close I/O path.
120     END
```

### Example #2

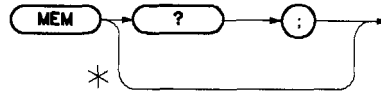
```
10      ! The following example shows how to use the trace MEAN function to return
20      ! the mean value of the specified trace to the controller.
30      !
40      INTEGER Mean-value           ! Define an INTEGER variable.
50      ASSIGN CSa TO 718           ! Assign I/O path to address 718.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



# MEM

## Memory Available

### Syntax



x1245a

### 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

```

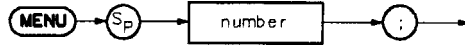
10  ! The following example shows the use of the MEM command.
20  !
30  ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
40  !
50  OUTPUT @Sa;"IP;";                ! Instrument preset.
60  !
70  OUTPUT @Sa;"MEM?;";              ! Query available memory.
80  ENTER @Sa;A_mem                  ! 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



x f246a

**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.

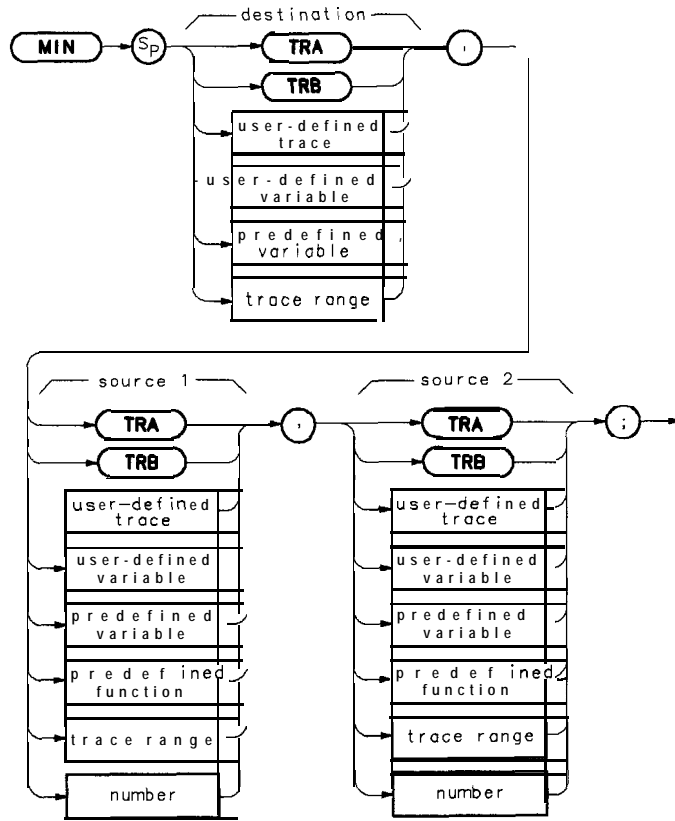
### Program Example

```
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



x1247a

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

MIN

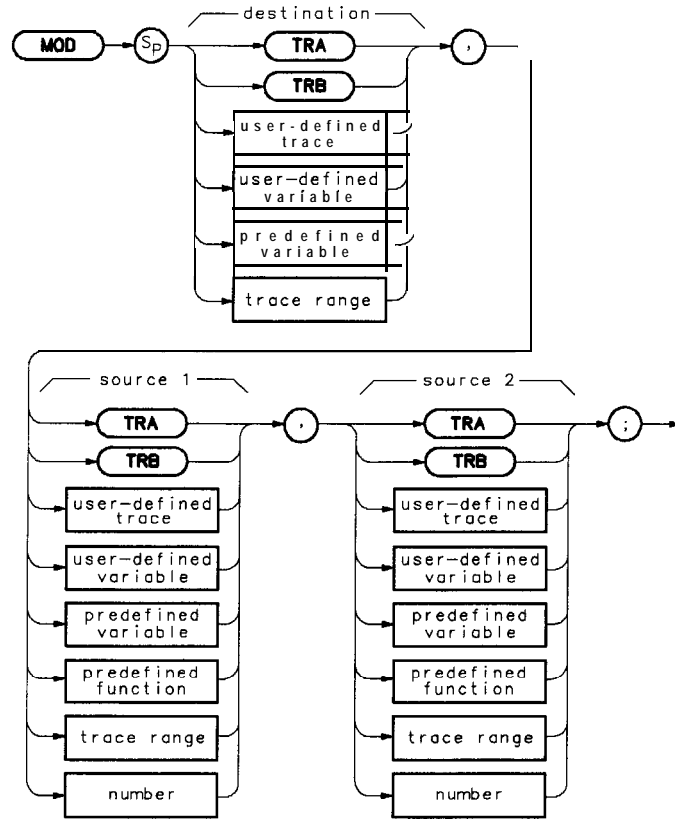
### Program Example

```
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



xf248a

## 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**

```

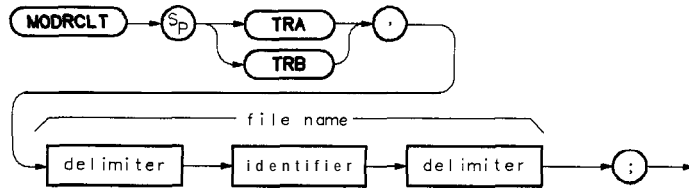
10      ! The following example shows the use of the MOD command.  The
20      ! instructions within the FUNCDEF '@' delimiters form a structure
30      ! called a DLP (downloadable program).
40      !
50      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
60      !
70      OUTPUT @Sa;"LP;";                ! 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 10.
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;"CLRDISP;";            ! 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



xf249o

#### 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

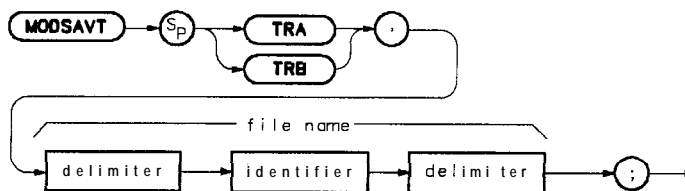
```

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.
```



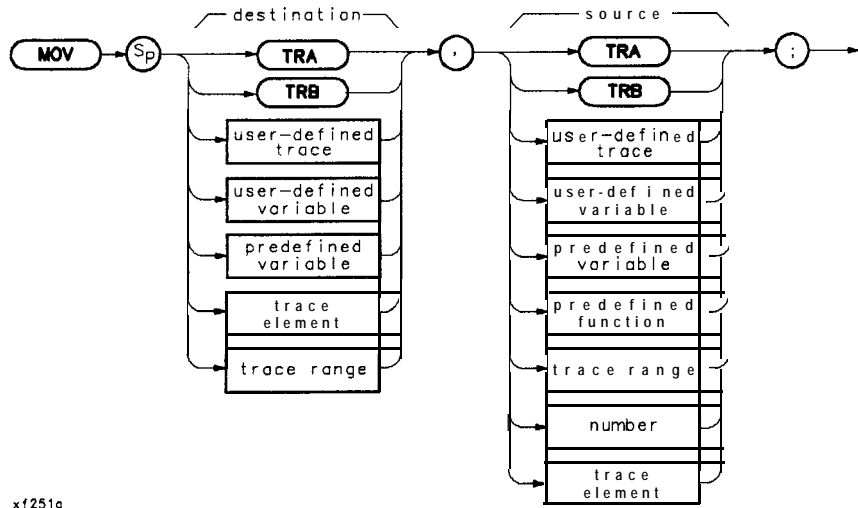
## MODSAVT

```
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.

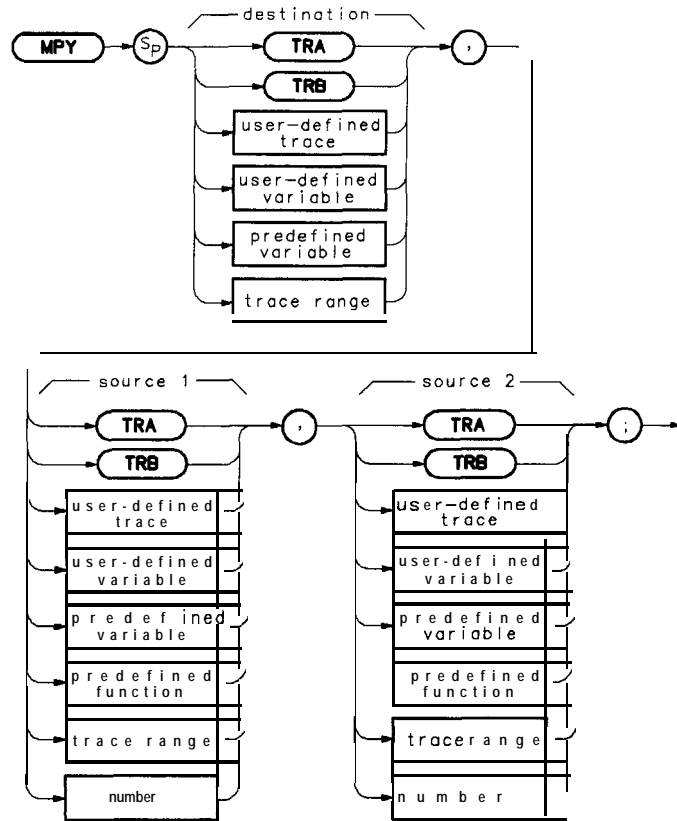
### Program Example

```
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



xf252a

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**

```

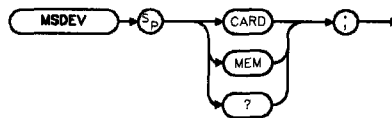
10      ! The following example shows the use of the MPY command.  The example
20      ! uses an input signal of 300MHz, such as the CAL OUTPUT) and looks at
30      ! its harmonics.  An input signal is not necessary to the function of
40      ! this example, but acts as a visual aid.
50      !
60      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

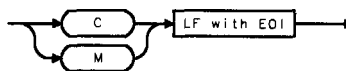


x f253a

#### Description

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

#### Query Response



QMSDEV

#### Program Example

```

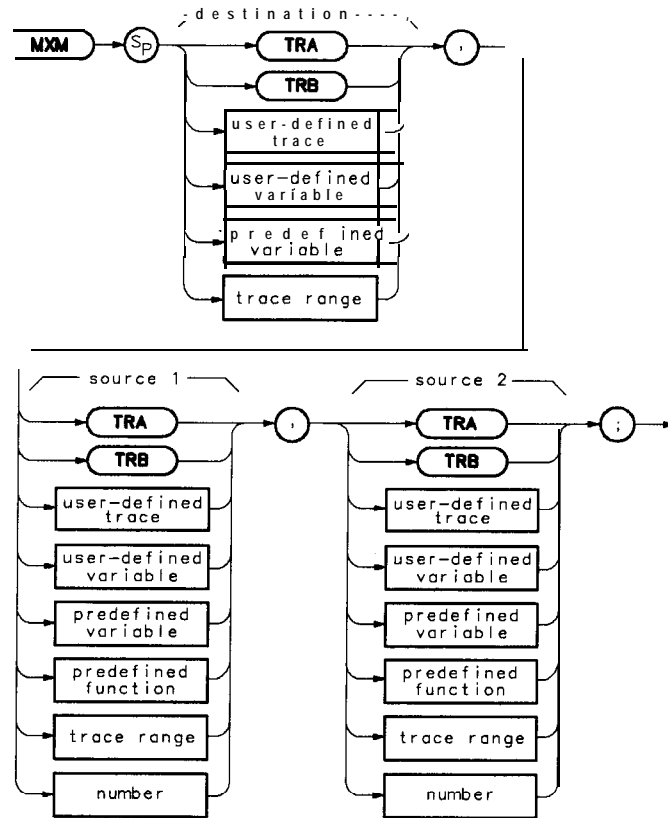
10      ! The following example shows the use of the MSDEV command. The
20      ! instructions within the FUNCDEF '@' delimiters form a structure
30      ! called a DLP (downloadable program).
40      !
50      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
60      !
70      OUTPUT @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



xf254a

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

**Program Example**

```

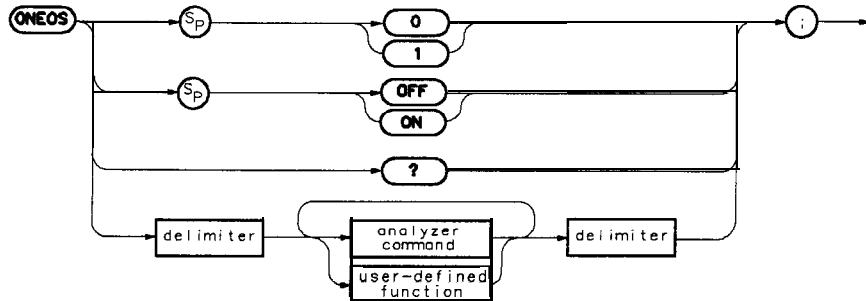
10      ! The following example shows a use of the MXM command.  The example
20      ! requires an input signal of 300 MHz, such as the CAL OUTPUT signal.
30      !
40      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50      !
60      OUTPUT @Sa;"IP;";                ! Instrument 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 IO
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



x1255a

### 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

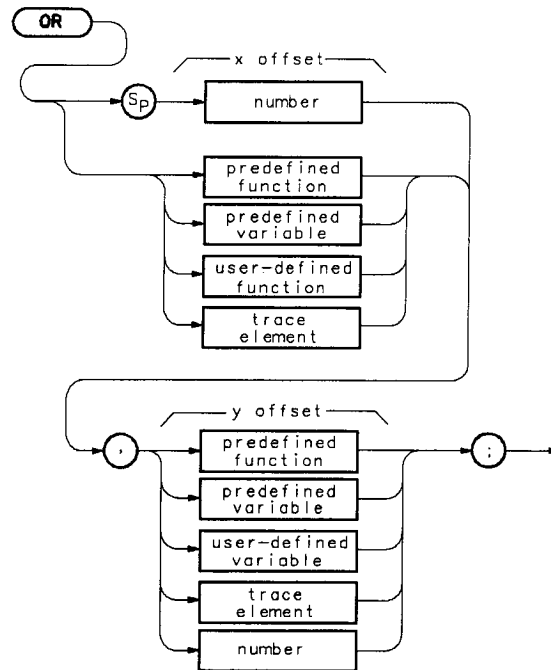
```
10      ! The following example shows the use of the ONEOS command. The
20      ! example uses an input signal of 300 MHz such as the CAL OUTPUT.
30      !
40      ASSIGN @Sa TO 718                ! Assign I/O path to address 718.
50      !
60      OUTPUT @Sa;"IP;ST 1SC;TS;";      ! Instrument preset; set sweep
70      ! time; take a sweep.
80      OUTPUT @Sa;"ONEOS $CF 300MHZ;SP 1MHZ;$";
90      ! At the end of the following
100     ! 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



x f256a

**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

## OR

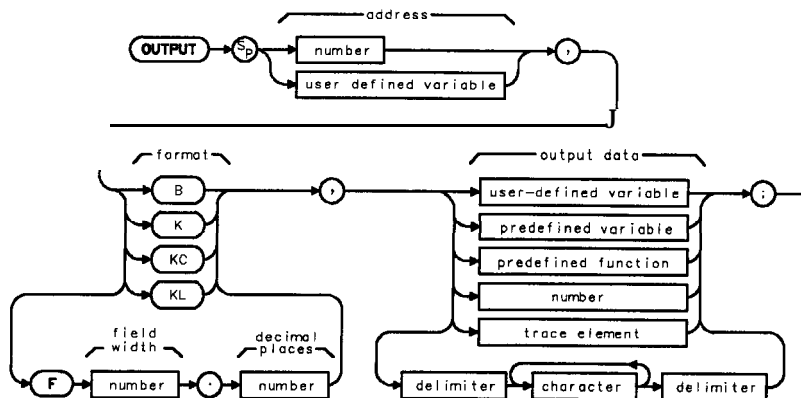
### Program Example

```
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 OOrigin.
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



x1257a

### 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

## OUTPUT

<b>Parameters</b>	Address	Integers 0 to 30 are for the GPIB 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 <b>8-bit</b> 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**

```

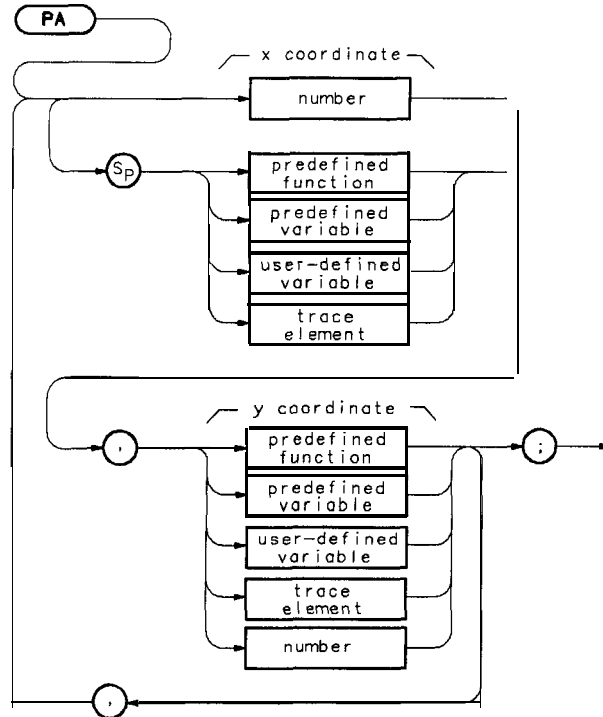
10      ! The following example shows how to use the OUTPUT command to have
20      ! the analyzer send data to another HP-IB device.  The instructions
30      ! within the FUNCDEF '@' delimiters form a structure called a
40      ! DLP (downloadable program).
50      !
60      ! NOTE: A printer (HP-IB 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



xf258a

### 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 (0,0), the lower left-hand corner of the spectrum analyzer graticule is at (100,100) and the upper right-hand corner 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;"CLRDSF;";           ! 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)&";";
220         ! Create plot statement using
230         ! calculated coordinates.
240     NEXT I
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;"CLR DSP;"; ! 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
! calculated coordinates.
220
230 NEXT I
240 !
250 ASSIGN @Sa TO * ! Close I/O path.
260 END
```

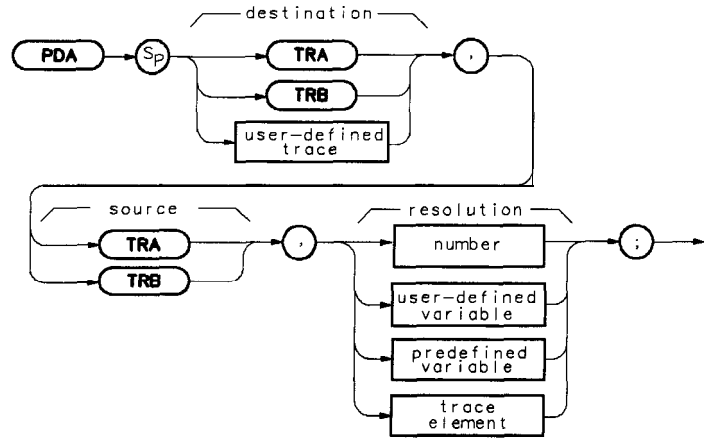




# PDA

## Probability Distribution of Amplitude

### Syntax



xf260a

### 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.

## PDA

### Program Example

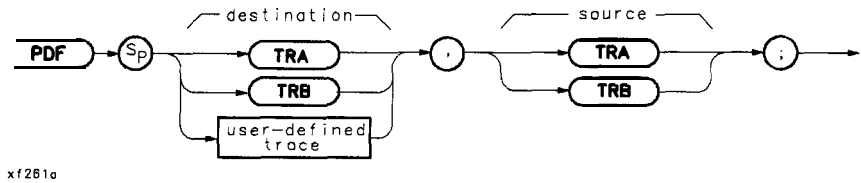
```
10      ! The following example shows how to use the PDA command to determine
20      ! the probability distribution of the amplitude values in trace A.
30      ! The results are placed in trace B and expanded by a factor of 20
40      ! to make the results more visible.
50      !
60      ASSIGN @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

```

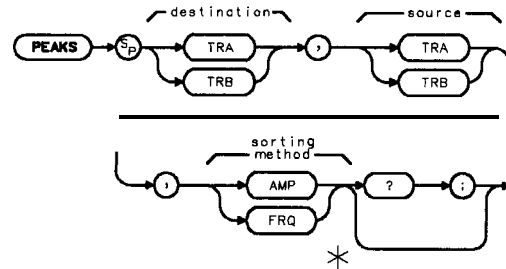
10 OUTPUT 718;"TRDEF SAMPLE,50;";
20 OUTPUT 718;"PDF SAMPLE,TRA;";
30 END
  
```

---

# PEAKS

## Trace Peaks

### Syntax



x1262o

---

### 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

```

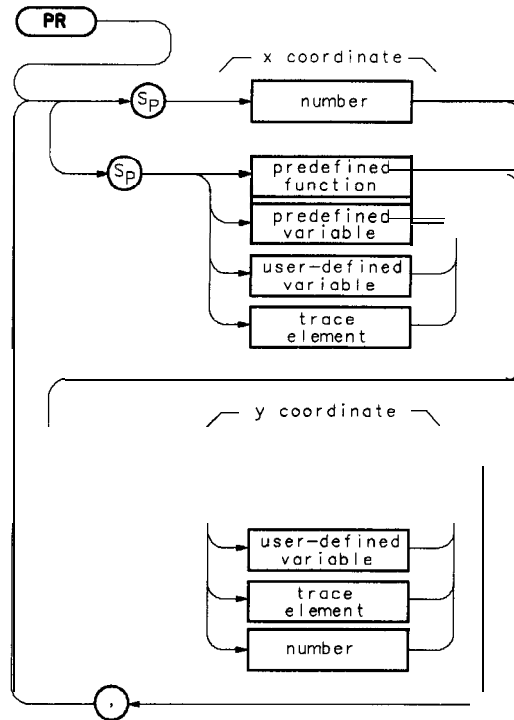
10      ! The following example shows the use of the PEAKS command. The example
20      ! uses an input signal of 300 MHz such as the CAL OUTPUT and looks at its
30      ! harmonics.
40      !
50      ASSIGN @Sa TO 718                      ! Assign I/O/ path to address 718.
60
70      OUTPUT @Sa;"FUNCDEF 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



xf263a

### 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;"CLRDSF;";           ! 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
                                         ! calculated coordinates.
220
230   NEXT I
240   !
250   ASSIGN @Sa TO *                ! Close I/O path.
260   END

```

---

# PU

**Pen Up**

**Syntax**



x1264a

**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;"CLRDSF;";           ! 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
                                           ! calculated coordinates.
220     NEXT I
230     !
240     !
250     ASSIGN @Sa TO *                  ! Close I/O path.
260     END

```

---

# RELHPIB

## Release HP-IB

### Syntax



x1265a

### 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

```

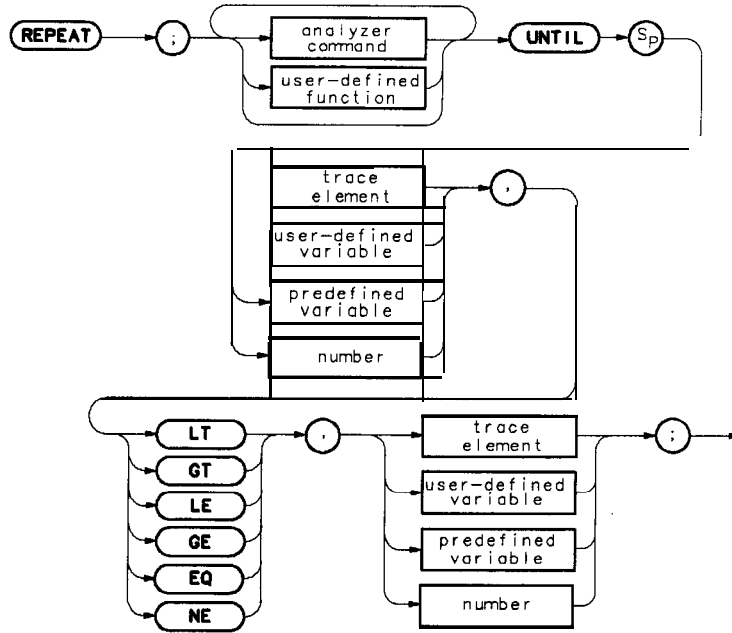
10      ! The following example shows how to use the RELHPIB command to have
20      ! the analyzer send data to another HP-IB device. The instructions
30      ! within the FUNCDEF '@' delimiters form a structure called a
40      ! DLP (downloadable program).
50      !
60      ! NOTE: A printer (HP-IB 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 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

```

# REPEAT/UNTIL

## Repeat/Until

### Syntax



x.f266e

## 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;"LP;";                ! 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,@;";  ! 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;"CLR DSP;";
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

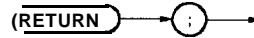
```

## REPEAT/UNTIL

### 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;"LP:";                ! 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**

(RETURN) → ( ; ) →

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

## RETURN

### Program Example

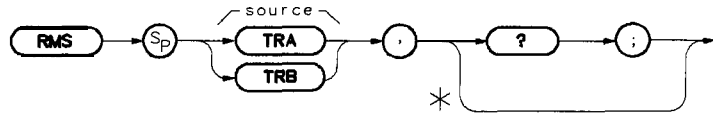
```
10 ! Program to test the RETURN command for use in DLPs. Two FUNCDEFs
20 ! are defined, C-ALLER and C-ALLEE. C,ALLER sets the spectrum analyzer
30 ! up in single sweep mode with a 1 second sweeptime, so instrument
40 ! state changes can be easily observed. C-ALLER first sets the CF to
50 ! 1 GHz 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,@";
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

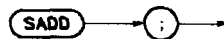
```

---

# 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

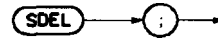
```

---

# 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

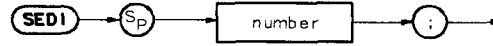
**Description** This command is used to terminate the SEDI command.

## SDON

### 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 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
```

---

**SEDI****Edit Limit-Line Segment****Syntax**

x1272a

**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.

## SEDI

### Program Example

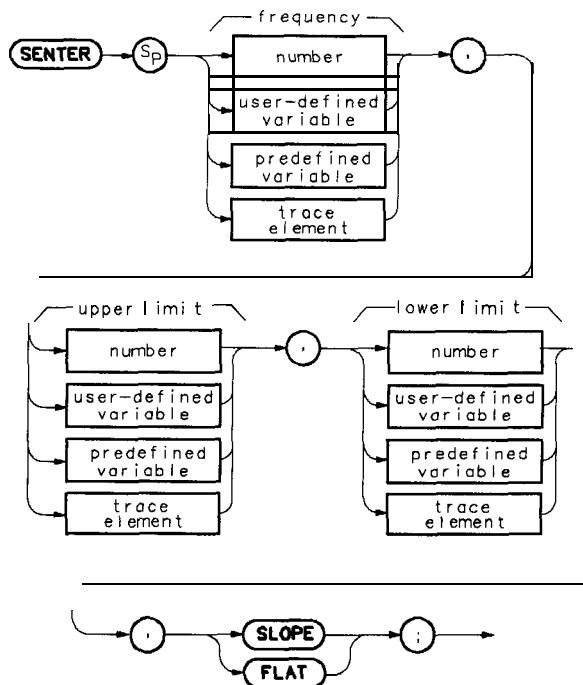
```
130 ! This program demonstrates the use of the SEDI command
140 ! to generate a limit line:
150 !
160 OUTPUT718;"LIMPURGE;"; ! Purge current limit line.
170 OUTPUT718;"EDITLIML;"; ! Begin edit of limit line.
180 OUTPUT 718;"LIMIREL OFF;"; ! Make sure it's an absolute line.
190 OUTPUT 718;"SADD;"; ! 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 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
```



**SENDER**

**Segment Enter**

**Syntax**



x1273a

**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.

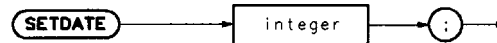
Related command: SADD.

---

# SETDATE

## Set Date

### Syntax



x1274a

**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"
```

## SETDATE

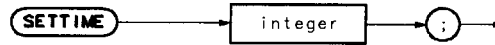
```
370     Month$="05"  
380 CASE "Jun"  
390     Month$="06"  
400 CASE "Jul"  
410     Month$="07"  
420 CASE "Aug"  
430     Month$="08"  
440 CASE "Sep"  
450     Month$="09"  
460 CASE "Oct"  
470     Month$="10"  
480 CASE "Nov"  
490     Month$="11"  
500 CASE "Dec"  
510     Month$="12"  
520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

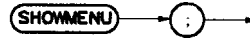
```
10 ! The following example shows the use of the SETTIME command. The clock
20 ! is set using 24-hour notation. When time is displayed on the spectrum
30 ! analyzer screen, it appears in the current time mode, that is, the
40 ! 12- or 24-hour mode.
50 !
60 OUTPUT 718;"TIMEDATE ON;" ! Turn on the time 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



x1276a

#### 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.

## SHOWMENU

### Program Example

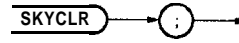
```
10 ! The following example shows the use of the SHOWMENU command. The
20 ! example creates and displays a softkey which can be used to execute
30 ! a DLP (downloadable program).
40 ! ,
50 ! Note: Since SHOWMENU is not executable over HP-IB, the function
60 ! KEYS needs to be executed from the front 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,$"; ! Logical start of function 'KEYS'.
120 OUTPUT @Sa;"SKYCLR,"; ! Clear softkeys.
130 OUTPUT @Sa;"SKYDEF 1,BOX,%DRAWBOX%";
   ! Define softkey 1 to execute
   ! function BOX. Label key with
140 ! DRAW BOX.
150 !
160 OUTPUT @Sa;"SHOWMENU,"; ! Display the SKYDEF'ed label.
170 OUTPUT @Sa;"$,"; ! 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



x1277a

#### 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,$";    ! Logical start of function 'KEYS'.
120     OUTPUT @Sa;"SKYCLR;";          ! Clear softkeys.
130     OUTPUT @Sa;"SKYDEF 1,BOX,%DRAW BOX%";
140                                     ! Define softkey 1 to execute
150                                     ! function BOX.  Label key with
160     OUTPUT @Sa;"SHOWMENU;";        ! Display the SKYDEF'ed label.
170     OUTPUT @Sa;"$";                ! 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

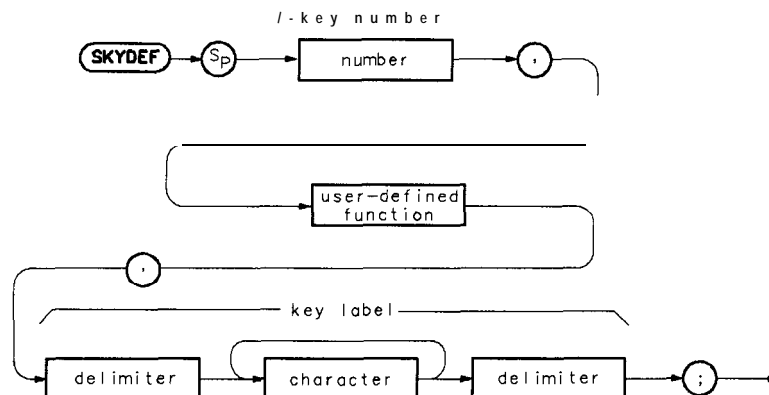
```



# 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.

## SKYDEF

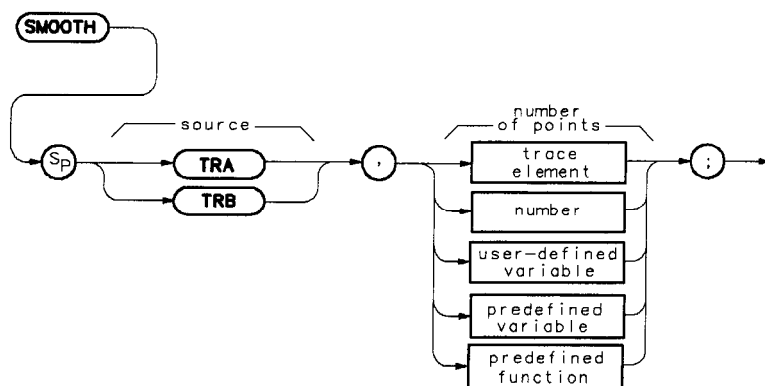
### Program Example

```
10      ! The following example shows the use of the SKYDEF command.  The
11      ! example creates and displays a softkey which can be used to execute
12      ! a DLP (downloadable program).
13      !
14      ! Note: Since SHOWMENU is not executable over HP-IB, the function
15      ! KEYS needs to be executed from the front panel of the analyzer
16      ! after it is loaded. Press
17      ! {LCL} [MODULE] {AUTOEXEC MENU} (EDIT AUTOEXEC) {CHOOSE DLP}.
18      ! Scroll knob to 'KEYS' and press (EXECUTE NOW).
19      !
20      ASSIGN @Sa TO 718          ! Assign I/O path to address 718.
21      OUTPUT @Sa;"FUNCDEF KEYS,$"; ! Logical start of function 'KEYS'.
22      OUTPUT @Sa;"SKYCLR;";      ! Clear softkeys.
23      OUTPUT @Sa;"SKYDEF 1,BOX,%DRAW BOX%";
24      ! Define softkey 1 to execute
25      ! function BOX. Label key with
26      ! DRAW BOX.
27      OUTPUT @Sa;"SHOWMENU;";    ! Display the SKYDEF'ed label.
28      OUTPUT @Sa;"$";           ! Logical end of function.
29      !
30      OUTPUT @Sa;"FUNCDEF BOX,@"; ! Logical start of function 'BOX'.
31      OUTPUT @Sa;"IP;";         ! Instrument preset.
32      OUTPUT @Sa;" CLRDSP;";    ! Clear the analyzer screen.
33      !
34      OUTPUT @Sa;" PU;PA 300,300;"; ! Move pen to starting point.
35      OUTPUT @Sa;" PD;PR 240,0;"; ! \
36      OUTPUT @Sa;" PR 0,240;";   ! \ Draw
37      OUTPUT @Sa;" PR -240,0;";  ! / rectangle.
38      OUTPUT @Sa;" PR 0,-240;";  ! /
39      OUTPUT @Sa;"@";           ! Logical end of function.
40      !
41      ASSIGN @Sa TO *          ! Close I/O path.
42      END
```

## SMOOTH

## Smooth Trace

## Syntax

**Description**

This command smooths **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**

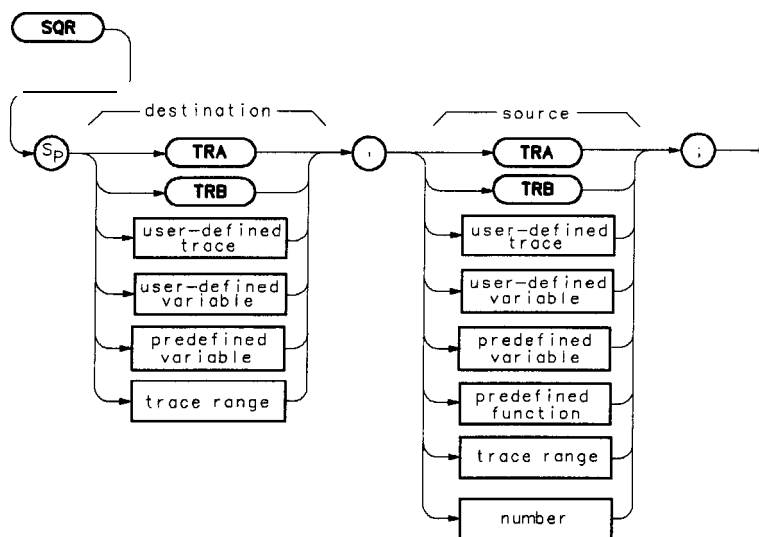
number of points = an odd integer from 3 to 601. If an even number is specified, it will be converted to an odd integer having the next greater value.

## SMOOTH

### 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**

x f280a

**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**

```

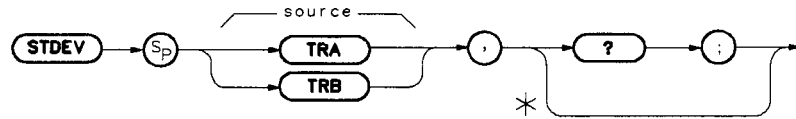
10      ! The following example shows the use of the SQR command.
20      !
30      ASSIGN @Sa TO 718                                ! Assign I/O path to address 718.
40      !
50      OUTPUT @Sa;"IP;CLRDSP;";                          ! Instrument preset;
60      ! Clear CRT for text display.
70      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

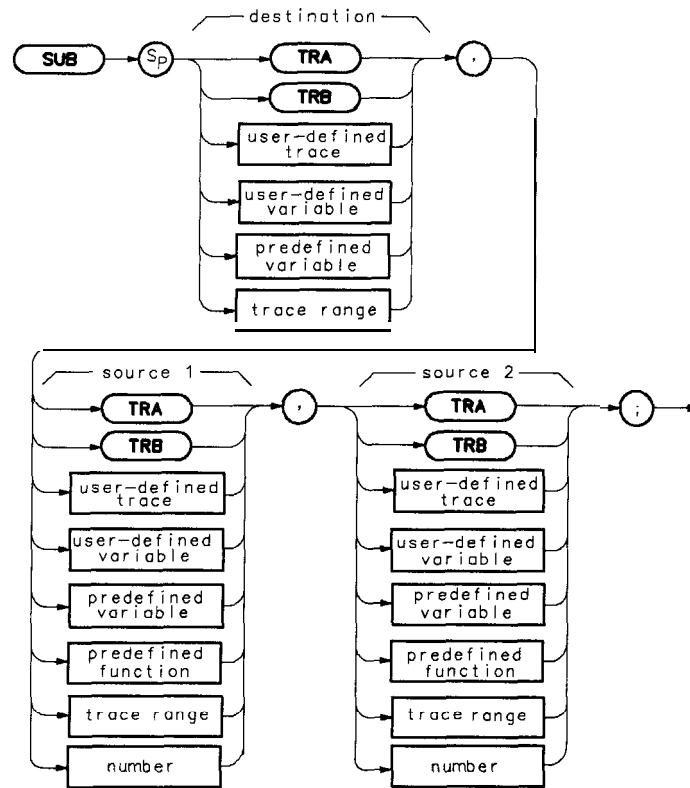
Return the standard deviation of the trace amplitude in measurement units.

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**

xf281a

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

SUB

### Program Example

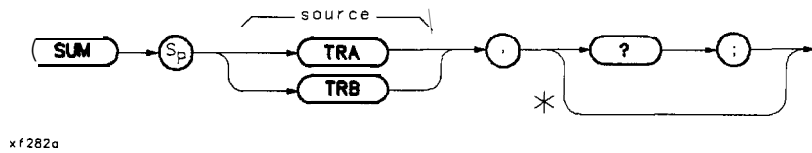
```
10  ! The following example shows the use of the SUB command.  The example
20  ! uses an input signal of 300 MHz, such as the CAL OUTPUT signal, and
30  ! looks at its harmonics. An input signal is not necessary to the
40  ! function of this example, but acts as a visual aid.
50  !
60  ASSIGN @Sa 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

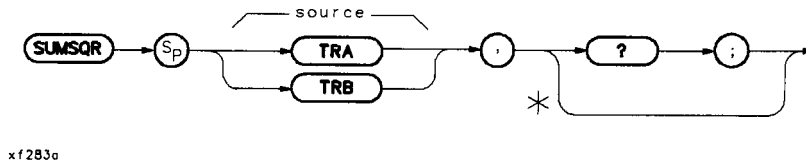
```

---

# SUMSQR

## Sum of Squared Trace Amplitudes

### Syntax



---

### 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.

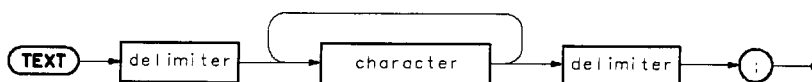
### Program Example

```
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



x1284a

**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

```

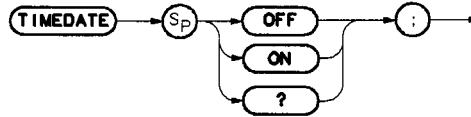
10 ! The following example shows the use of the REPEAT/UNTIL commands
20 ! in a FOR/NEXT loop context. This is an immediate-execute DLP
30 ! (downloadable program). This is another way of nesting REPEATs.
40 !
50 ASSIGN @Sa TO 718 ! Assign I/O path to address 718.
60 !
70 OUTPUT @Sa;"IP;"; ! Instrument 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;"CLR DSP;";
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



x f285a

**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.

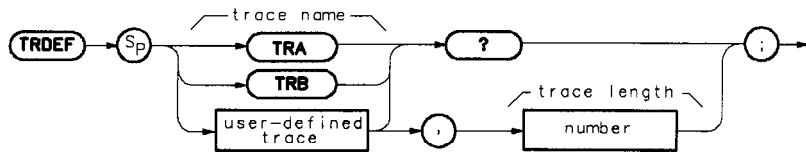
### Program Example

```
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

## TRDEF

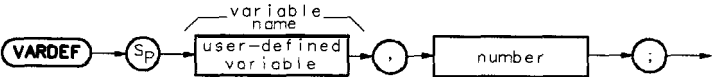
### Program Example

```
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

## VARDEF

### 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:

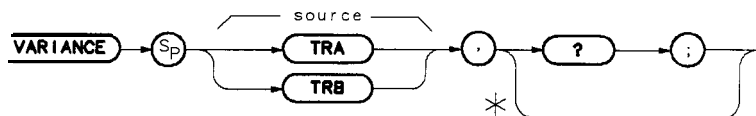
```
10 OUTPUT 718;"FREQ?;"
20 OUTPUT 718;FREQUENCY
```



# 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;"TP,SIGLS;"          ! 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

```

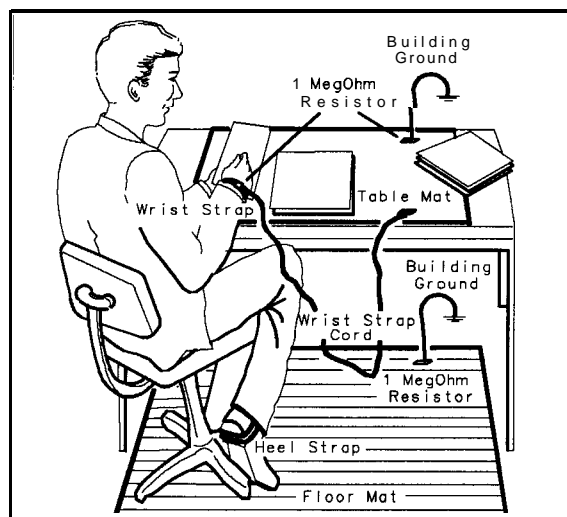
## Service

### 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.



FORMAT 46/DF259

**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).

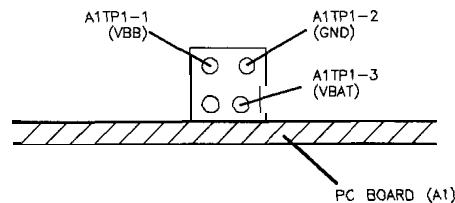
## Returning Modules for Service

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

Test 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  $\pm$ 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  $\pm$ 0.5 Vdc. (Option T01 does not include memory card capability.) See Figure 5-2.



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**Figure 5-2. A1TP1 Configuration**

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## Replacement Procedures

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

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

### AI 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

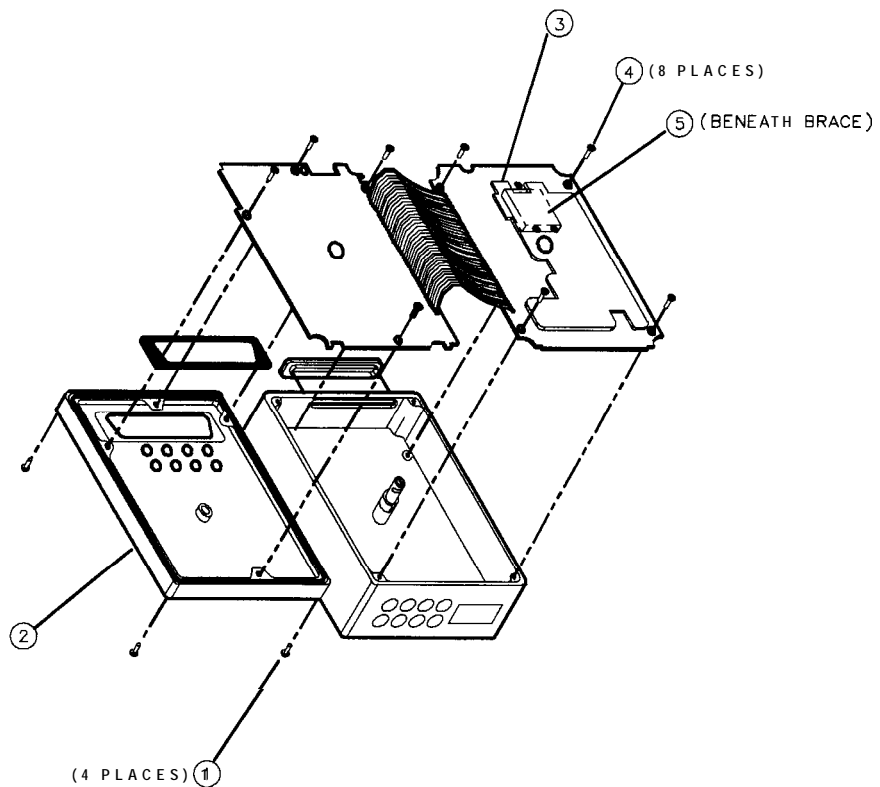
1. Refer to the AI Memory Board Assembly Replacement procedure to remove the AI assembly.
2. Carefully desolder the battery (5). \* See Figure 5-3 or Figure 5-4.

## Warning

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

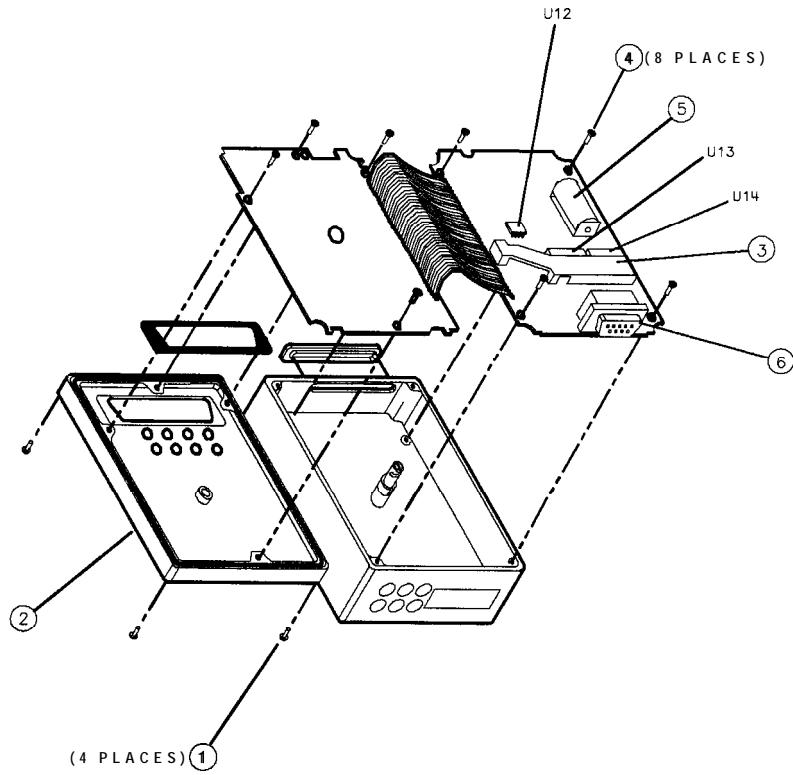
3. Replace the battery and solder it into place. \*
4. Replace the board assembly into the module and secure it with the eight board-assembly screws (4). Torque each one to three inch-pounds.
5. Replace the brace (3), then close the module halves.
6. Replace the four module screws (1) and torque each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



df240

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



df213a

**Figure 5-4.**  
**AI Board Assembly & Battery Replacement (Serial Prefix  $\geq$ 3143A)**

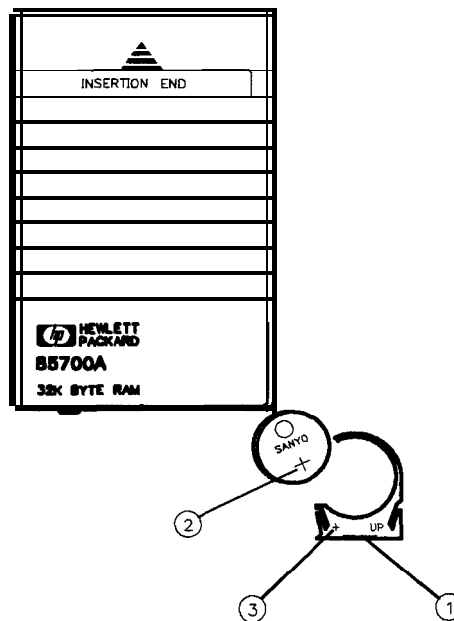
## Memory Card Battery Replacement

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.)



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**Figure 5-5. Memory Card Battery Replacement**

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## 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  $\pm$ 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  $\pm$ 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 connector on the AI 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**

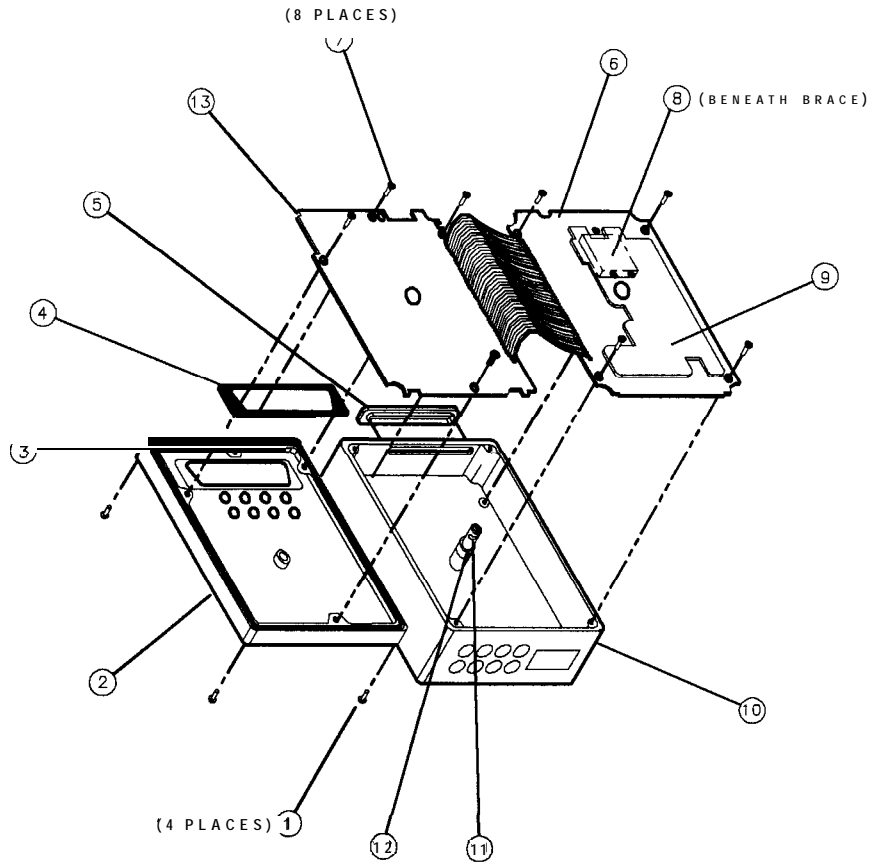
Refer to “Error Codes” in Chapter 1 for an explanation of error-code numbers 800 to 899, which are reserved for the mass memory module and its memory card.

## 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.

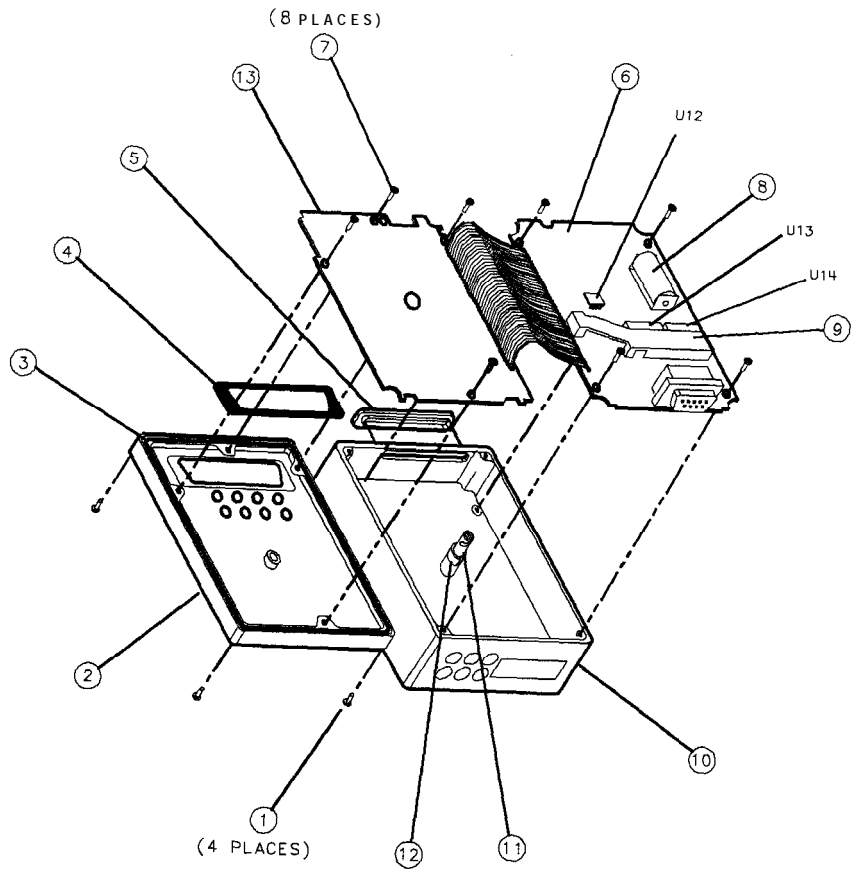
**Table 5-2. Manufacturer's Code List**

<b>Mfr. Code</b>	<b>Manufacturer Name</b>	<b>Address</b>	<b>ZIP Code</b>
<b>C1433</b>	ABELEKTRONIK GMBH	SALZBURG, AU	<b>A-501</b>
<b>K7253</b>	STD/STANTEL	DEVON, EG	
<b>S4013</b>	HITACHI AMERICA LTD	SUNNYVALE, CA, US	<b>94086</b>
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 $\mu$ - 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
<b>2M627</b>	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



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



**Figure 5-7. HP 85620A Parts Identification (Serial Prefix <sup>41215a</sup> ≥3143A)**

**Table 5-3. HP 85620A Parts Identification**

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

‡ 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

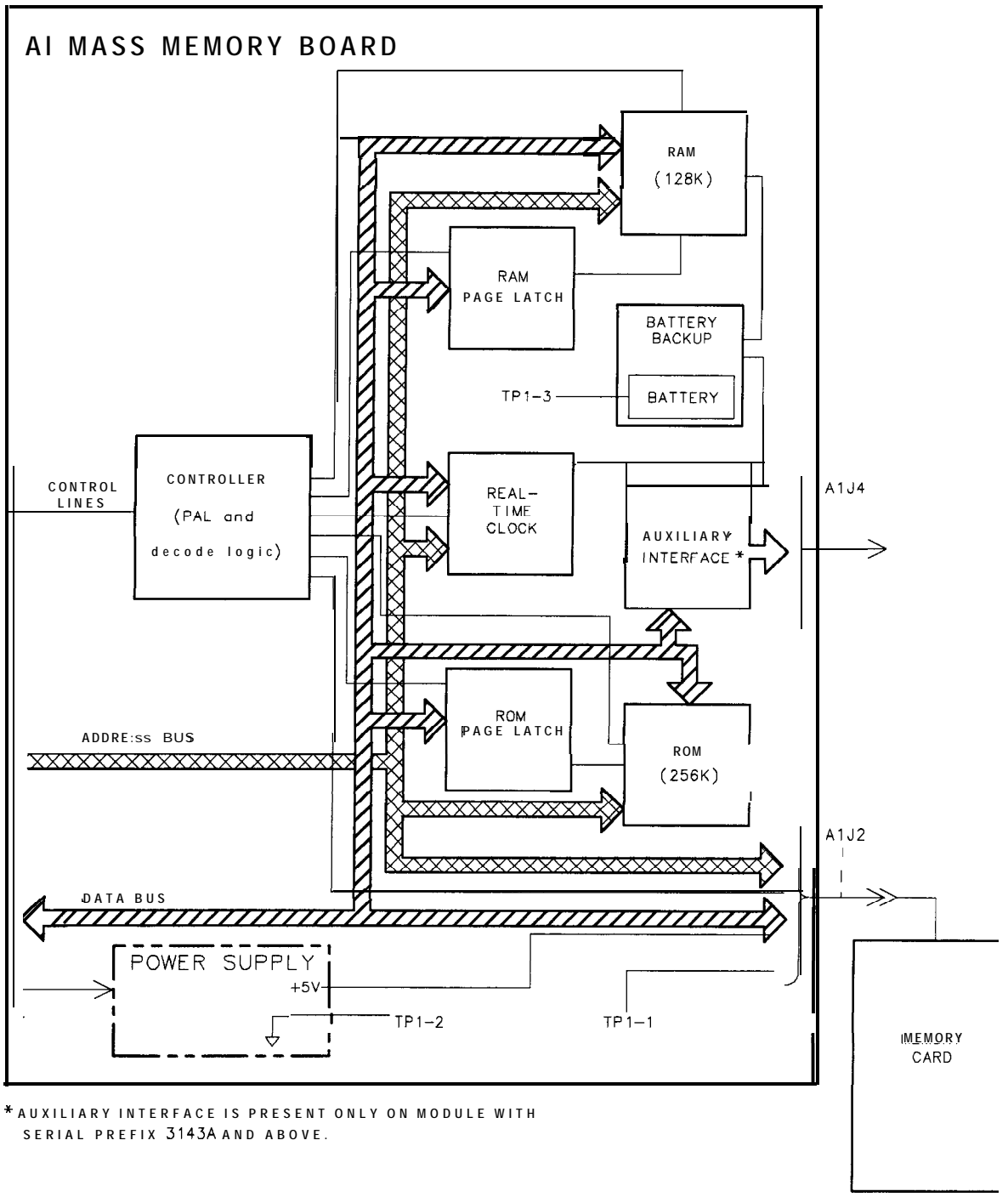
‡ Serial prefix 3003A and below

\* Serial prefix 3143A

**Table 5-4. Firmware Revision and ROM Part Numbers**

HP 85620A Firmware Revision/Date Code	ROM Part 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 Part Number‡		
C/910116†	85620-8002 1		
* Serial prefix 3003A and below. † The HP part number for the current <b>firmware</b> revision label is 85620-80003. ‡ Serial prefix 3143A and above.			

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



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**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**

<b>Board Assembly</b>	<b>Instrument Serial Prefix</b>	<b>Assembly Part Number</b>	<b>CLIP Part Number</b>
Mass Memory Assembly	2929A and below	85620-60001	85620-90033
Mass Memory Assembly	3003A	<b>85620-60008</b>	<b>85620-90034</b>
Mass Memory Assembly	Standard only (3143A)	<b>85620-60006</b>	<b>85620-90035</b>
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

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HP Part Number **85620-60001**  
AI 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	06987252
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

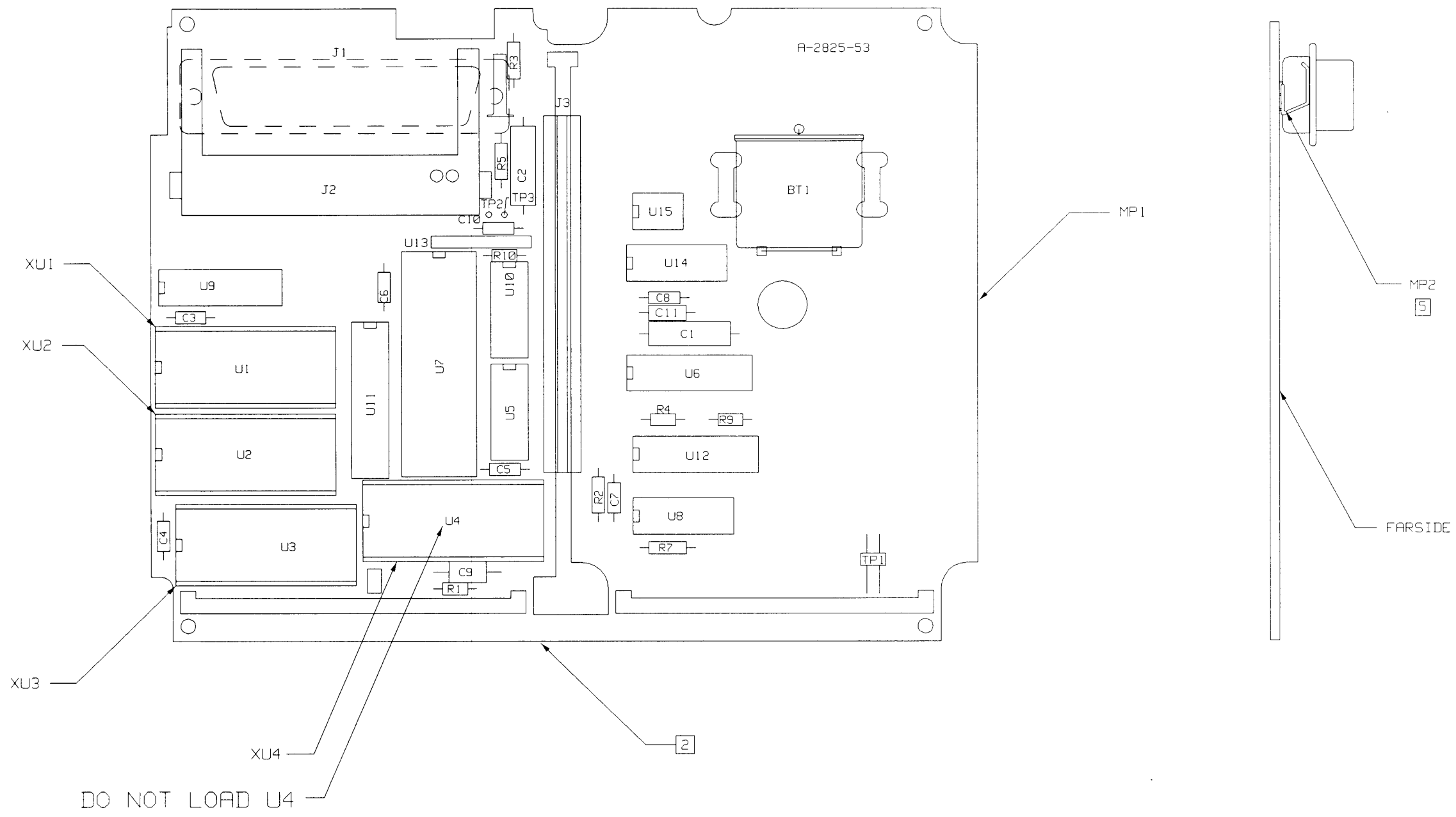
\*Indicates factory-selected value

CLIP **85620-90033** 1

HP Part Number 85620-60001  
AI 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
			<b>HP 85620A ACCESSORIES PARTS LIST</b>		
	0950-1964	1	MEMORY CARD, SRAM	10421	RBCO32IE00
	1420-0383	1	MEMORY CARD BATTERY	38709	CR2016

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED		11-1-88

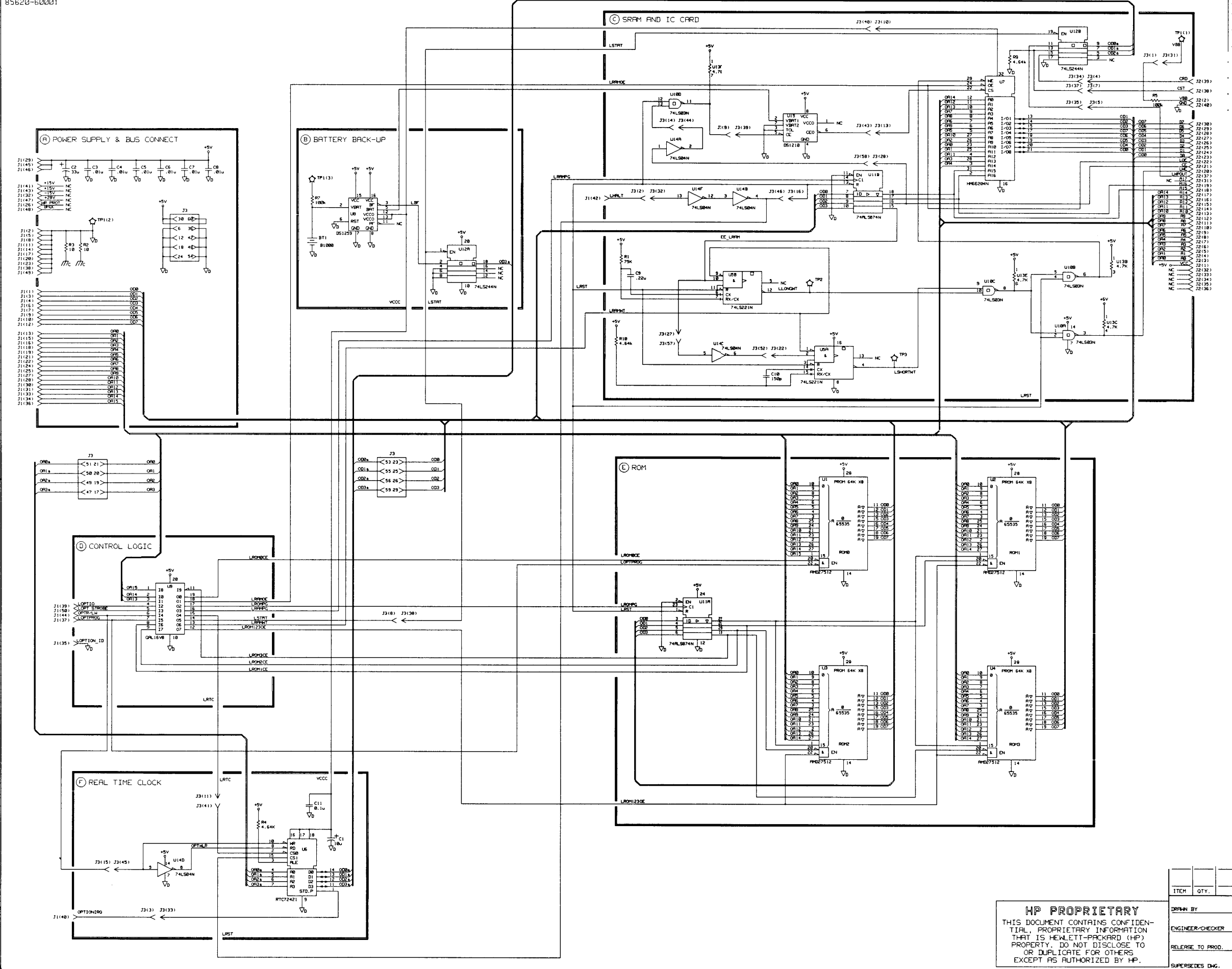


- NOTES: UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS ARE IN INCHES.
  - 2 REMOVE BREAK-OFF TABS AFTER MACHINE SOLDER.
  - 3 MAXIMUM COMPONENT HEIGHT .400.
  - 4 MAXIMUM LEAD TRIM LENGTH .118.
  - 5 BEND PART AS SHOWN. SOLDER IN PLACE.

SEE 85620-60001 MATERIAL LIST

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



REV	SYN	REVISIONS	APPROVED	DATE
	A	AS ISSUED		

J1

PIN	SIGNAL	TO-FROM	FUNCTION BLOCK
1	VCC		B
2	VDD		B
3	VDD		B
4	VDD		B
5	VDD		B
6	VDD		B
7	VDD		B
8	VDD		B
9	VDD		B
10	VDD		B
11	VDD		B
12	VDD		B
13	VDD		B
14	VDD		B
15	VDD		B
16	VDD		B
17	VDD		B
18	VDD		B
19	VDD		B
20	VDD		B
21	VDD		B
22	VDD		B
23	VDD		B
24	VDD		B
25	VDD		B
26	VDD		B
27	VDD		B
28	VDD		B
29	VDD		B
30	VDD		B
31	VDD		B
32	VDD		B
33	VDD		B
34	VDD		B
35	VDD		B
36	VDD		B
37	VDD		B
38	VDD		B
39	VDD		B
40	VDD		B

J2

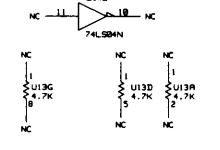
PIN	SIGNAL	TO-FROM	FUNCTION BLOCK
1	VCC		B
2	VDD		B
3	VDD		B
4	VDD		B
5	VDD		B
6	VDD		B
7	VDD		B
8	VDD		B
9	VDD		B
10	VDD		B
11	VDD		B
12	VDD		B
13	VDD		B
14	VDD		B
15	VDD		B
16	VDD		B
17	VDD		B
18	VDD		B
19	VDD		B
20	VDD		B
21	VDD		B
22	VDD		B
23	VDD		B
24	VDD		B
25	VDD		B
26	VDD		B
27	VDD		B
28	VDD		B
29	VDD		B
30	VDD		B
31	VDD		B
32	VDD		B
33	VDD		B
34	VDD		B
35	VDD		B
36	VDD		B
37	VDD		B
38	VDD		B
39	VDD		B
40	VDD		B

- NOTES:
- REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX IN ABBREVIATION WITH ALPHABETIC NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
  - UNLESS OTHERWISE INDICATED:  
RESISTANCE IN OHMS (Ω)  
CAPACITANCE IN MICROFARADS (μF)  
INDUCTANCE IN MICROHENRIES (μH)

3. PHONETIC TABLE

PHONETIC	DESCRIPTION

UNUSED PACKAGES



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

**BOARD ASSEMBLY-  
MASS MEMORY  
MODULE  
(SCHEMATIC)**

SCALE: NONE  
F71049E-9801R25  
SHEET 1 OF 1

**HEWLETT  
PACKARD**  
85620-60001  
PART NUMBER  
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**  
AI 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
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	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
E1	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

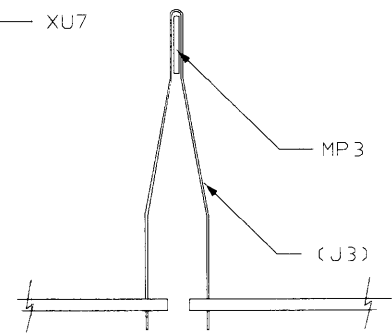
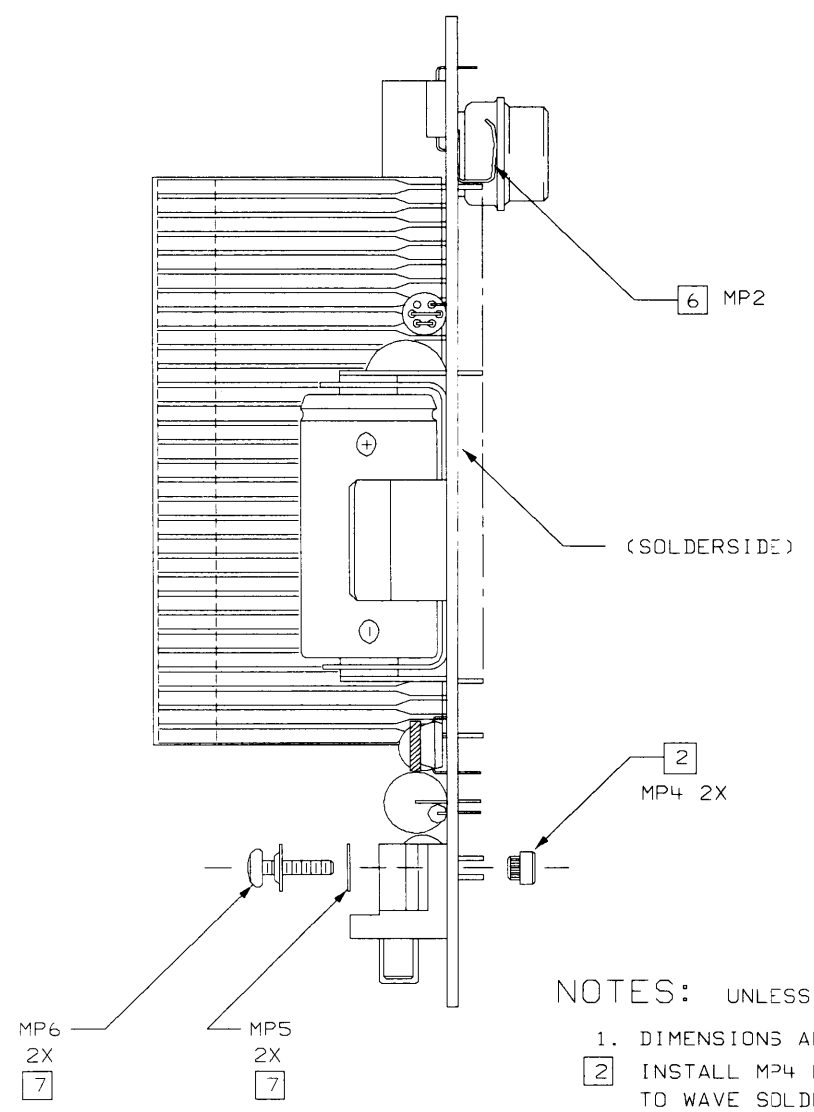
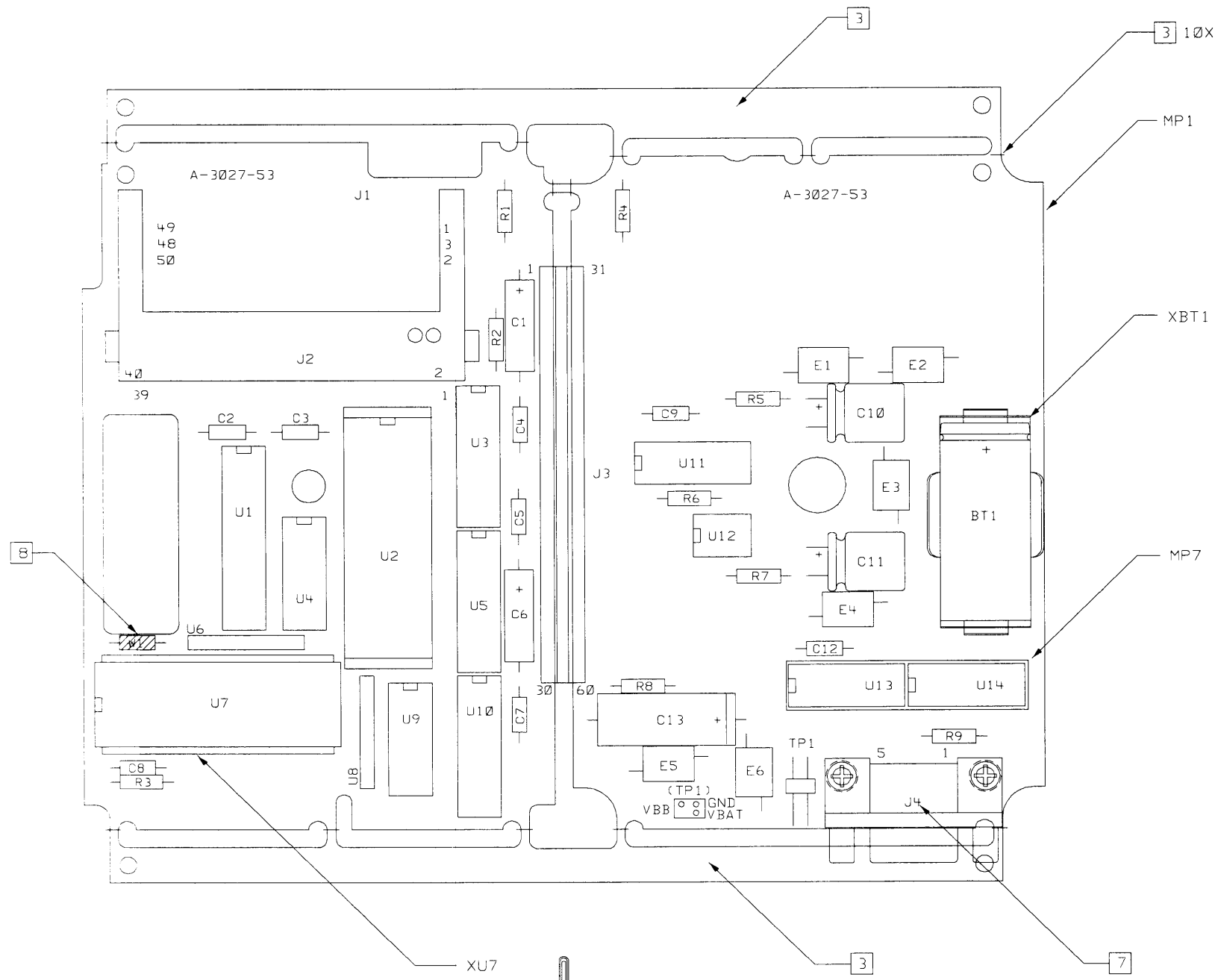
\*Indicates factory-selected value

CLIP 85620-90035 1

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

Reference Designator	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	35620-8002C	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	[C-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

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



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.

THIS DWG. ALSO USED FOR FOLLOWING ASSYS:

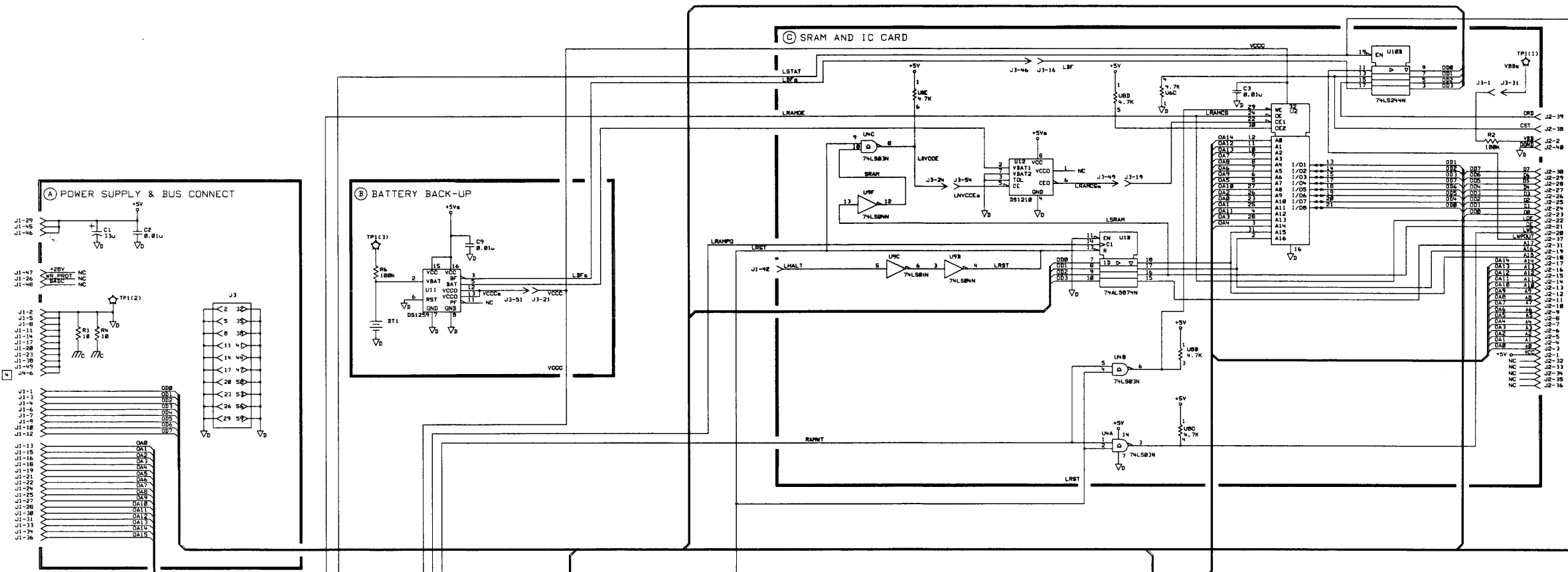
PART#	MATL LIST	REMARKS
85620-60014	85620-60014	SEE NOTES

SEE MATERIAL LIST 85620-60006

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OTHERS EXCEPT AS AUTHORIZED BY HP.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.	DRAWN BY	DATE	BOARD ASSEMBLY- MASS MEMORY MODULE	HEWLETT PACKARD SEE TABLE PART NUMBER
	TOLERANCES: XX.XXX ± .015	ENGINEER/CHECKER		
SEE CORP. STD. 608	RELEASED TO PRDD.		TITLE	
	SUPERSEDES DWG.		SCALE	NONE
			SHEET	1 OF 1
				D-85620-60006-2

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



J1

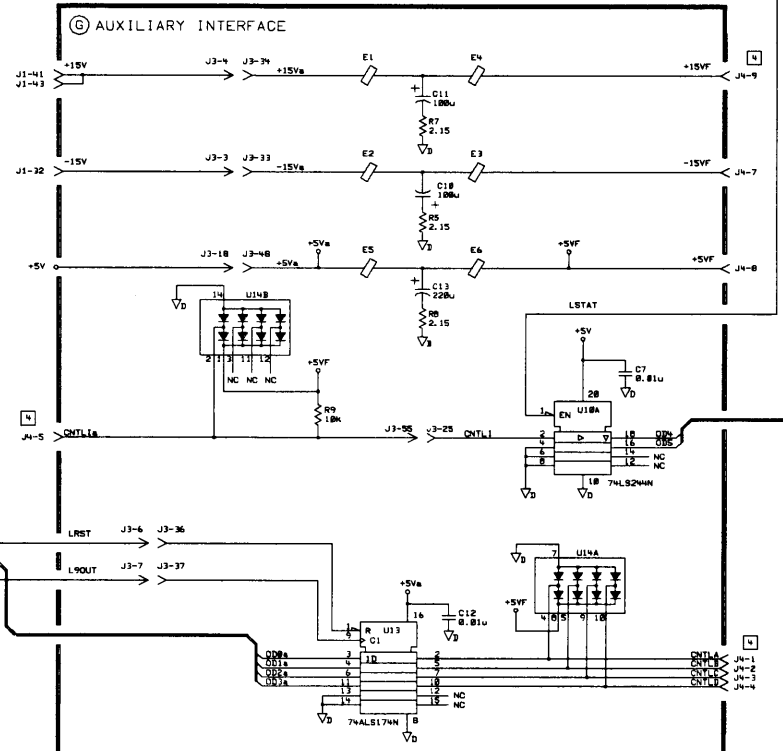
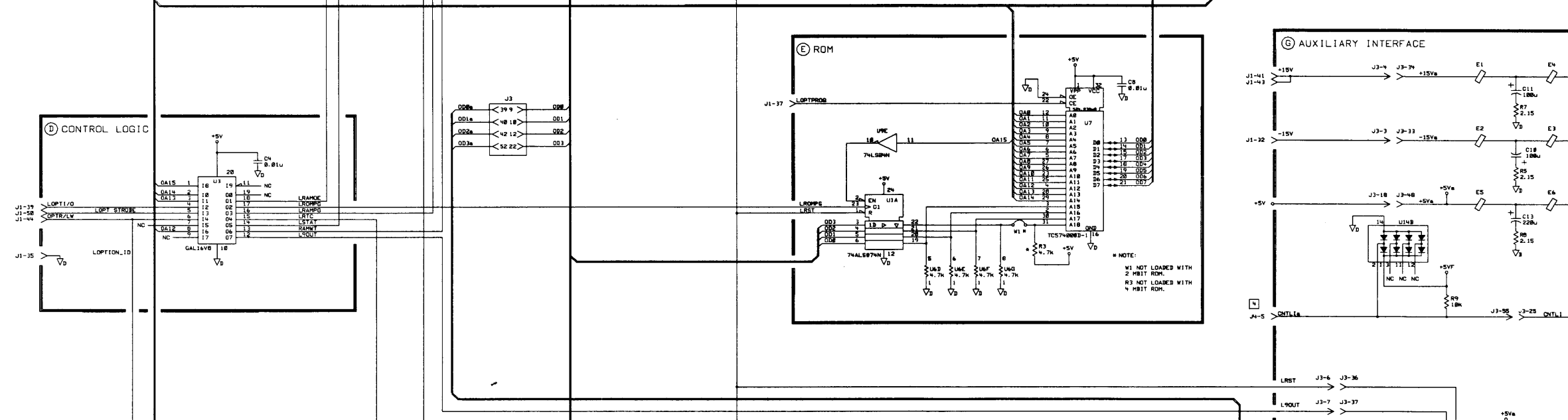
PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VDD	A	A
2	VDD	A	A
3	VDD	A	A
4	VDD	A	A
5	VDD	A	A
6	VDD	A	A
7	VDD	A	A
8	VDD	A	A
9	VDD	A	A
10	VDD	A	A
11	VDD	A	A
12	VDD	A	A
13	VDD	A	A
14	VDD	A	A
15	VDD	A	A
16	VDD	A	A
17	VDD	A	A
18	VDD	A	A
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20	VDD	A	A
21	VDD	A	A
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23	VDD	A	A
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25	VDD	A	A
26	VDD	A	A
27	VDD	A	A
28	VDD	A	A
29	VDD	A	A
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33	VDD	A	A
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37	VDD	A	A
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43	VDD	A	A
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45	VDD	A	A
46	VDD	A	A
47	VDD	A	A
48	VDD	A	A
49	VDD	A	A
50	VDD	A	A
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52	VDD	A	A
53	VDD	A	A
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57	VDD	A	A
58	VDD	A	A
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60	VDD	A	A
61	VDD	A	A
62	VDD	A	A
63	VDD	A	A
64	VDD	A	A
65	VDD	A	A
66	VDD	A	A
67	VDD	A	A
68	VDD	A	A
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87	VDD	A	A
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89	VDD	A	A
90	VDD	A	A
91	VDD	A	A
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94	VDD	A	A
95	VDD	A	A
96	VDD	A	A
97	VDD	A	A
98	VDD	A	A
99	VDD	A	A
100	VDD	A	A

J2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VDD	A	A
2	VDD	A	A
3	VDD	A	A
4	VDD	A	A
5	VDD	A	A
6	VDD	A	A
7	VDD	A	A
8	VDD	A	A
9	VDD	A	A
10	VDD	A	A
11	VDD	A	A
12	VDD	A	A
13	VDD	A	A
14	VDD	A	A
15	VDD	A	A
16	VDD	A	A
17	VDD	A	A
18	VDD	A	A
19	VDD	A	A
20	VDD	A	A
21	VDD	A	A
22	VDD	A	A
23	VDD	A	A
24	VDD	A	A
25	VDD	A	A
26	VDD	A	A
27	VDD	A	A
28	VDD	A	A
29	VDD	A	A
30	VDD	A	A
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32	VDD	A	A
33	VDD	A	A
34	VDD	A	A
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36	VDD	A	A
37	VDD	A	A
38	VDD	A	A
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47	VDD	A	A
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55	VDD	A	A
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62	VDD	A	A
63	VDD	A	A
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65	VDD	A	A
66	VDD	A	A
67	VDD	A	A
68	VDD	A	A
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72	VDD	A	A
73	VDD	A	A
74	VDD	A	A
75	VDD	A	A
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94	VDD	A	A
95	VDD	A	A
96	VDD	A	A
97	VDD	A	A
98	VDD	A	A
99	VDD	A	A
100	VDD	A	A

J3

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VDD	A	A
2	VDD	A	A
3	VDD	A	A
4	VDD	A	A
5	VDD	A	A
6	VDD	A	A
7	VDD	A	A
8	VDD	A	A
9	VDD	A	A
10	VDD	A	A
11	VDD	A	A
12	VDD	A	A
13	VDD	A	A
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18	VDD	A	A
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21	VDD	A	A
22	VDD	A	A
23	VDD	A	A
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26	VDD	A	A
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29	VDD	A	A
30	VDD	A	A
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78	VDD	A	A
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85	VDD	A	A
86	VDD	A	A
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88	VDD	A	A
89	VDD	A	A
90	VDD	A	A
91	VDD	A	A
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93	VDD	A	A
94	VDD	A	A
95	VDD	A	A
96	VDD	A	A
97	VDD	A	A
98	VDD	A	A
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100	VDD	A	A



J4

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VDD	A	A
2	VDD	A	A
3	VDD	A	A
4	VDD	A	A
5	VDD	A	A
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7	VDD	A	A
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9	VDD	A	A
10	VDD	A	A
11	VDD	A	A
12	VDD	A	A
13	VDD	A	A
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15	VDD	A	A
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23	VDD	A	A
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25	VDD	A	A
26	VDD	A	A
27	VDD	A	A
28	VDD	A	A
29	VDD	A	A
30	VDD	A	A
31	VDD	A	A
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34	VDD	A	A
35	VDD	A	A
36	VDD	A	A
37	VDD	A	A
38	VDD	A	A
39	VDD	A	A
40	VDD	A	A
41	VDD	A	A
42	VDD	A	A
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93	VDD	A	A
94	VDD	A	A
95	VDD	A	A
96	VDD	A	A
97	VDD	A	A
98	VDD	A	A
99	VDD	A	A
100	VDD	A	A

NOTES:

- REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
- UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω), CAPACITANCE IN MICROFARADS (μF), INDUCTANCE IN MICROHENRIES (μH)
- MNEMONIC TABLE

MNEMONIC	DESCRIPTION
J4	DELETE J4 FROM 05420-60014

UNUSED PACKAGES

# **Component-Level Information Packet for 85620-60008**

## **Mass Memory Assembly**



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

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HP Part Number **85620-60008**  
AI 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-OD	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

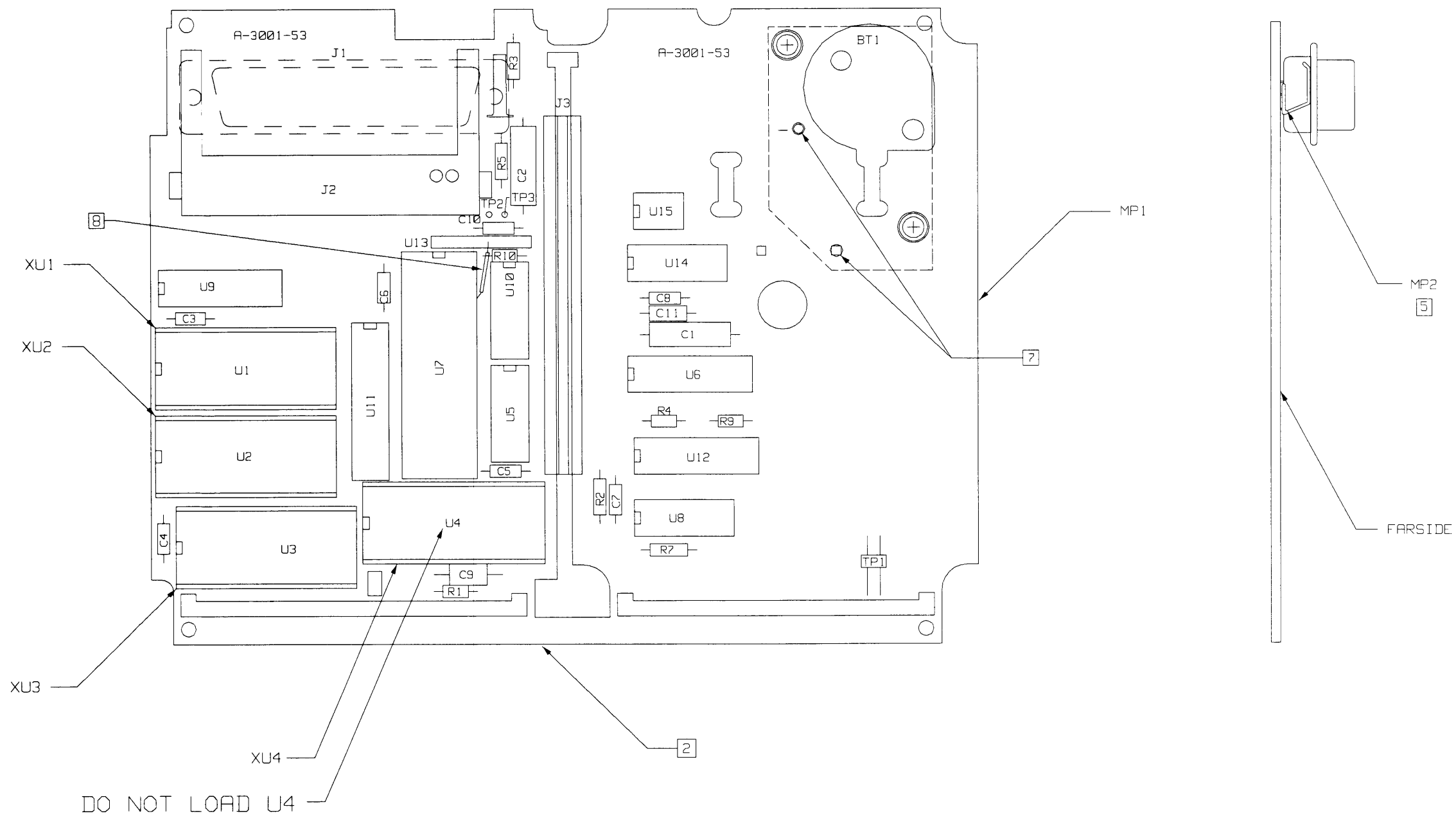
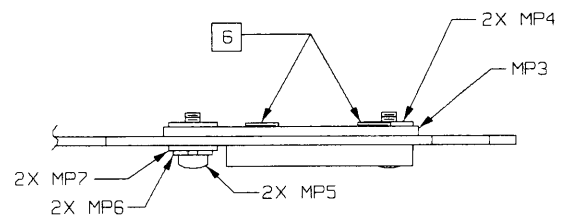
CLIP 85620-90034 1

HP Part Number 85620-60008  
AI 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 I-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
			<b>HP 85620A ACCESSORIES PARTS LIST</b>		
	0950-1964	1	MEMORY CARD, SRAM	10421	RBCO32IE00
	1420-0383	1	MEMORY CARD BATTERY	08709	CR2016



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.

DO NOT LOAD U4

SEE 85620-60008 MATERIAL LIST

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OTHERS EXCEPT AS AUTHORIZED BY HP.

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



# **Component-Level Information Packet for 85620-60018**

## **Mass Memory**



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

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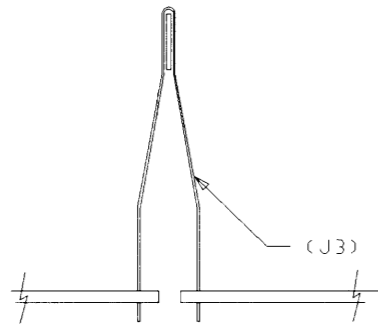
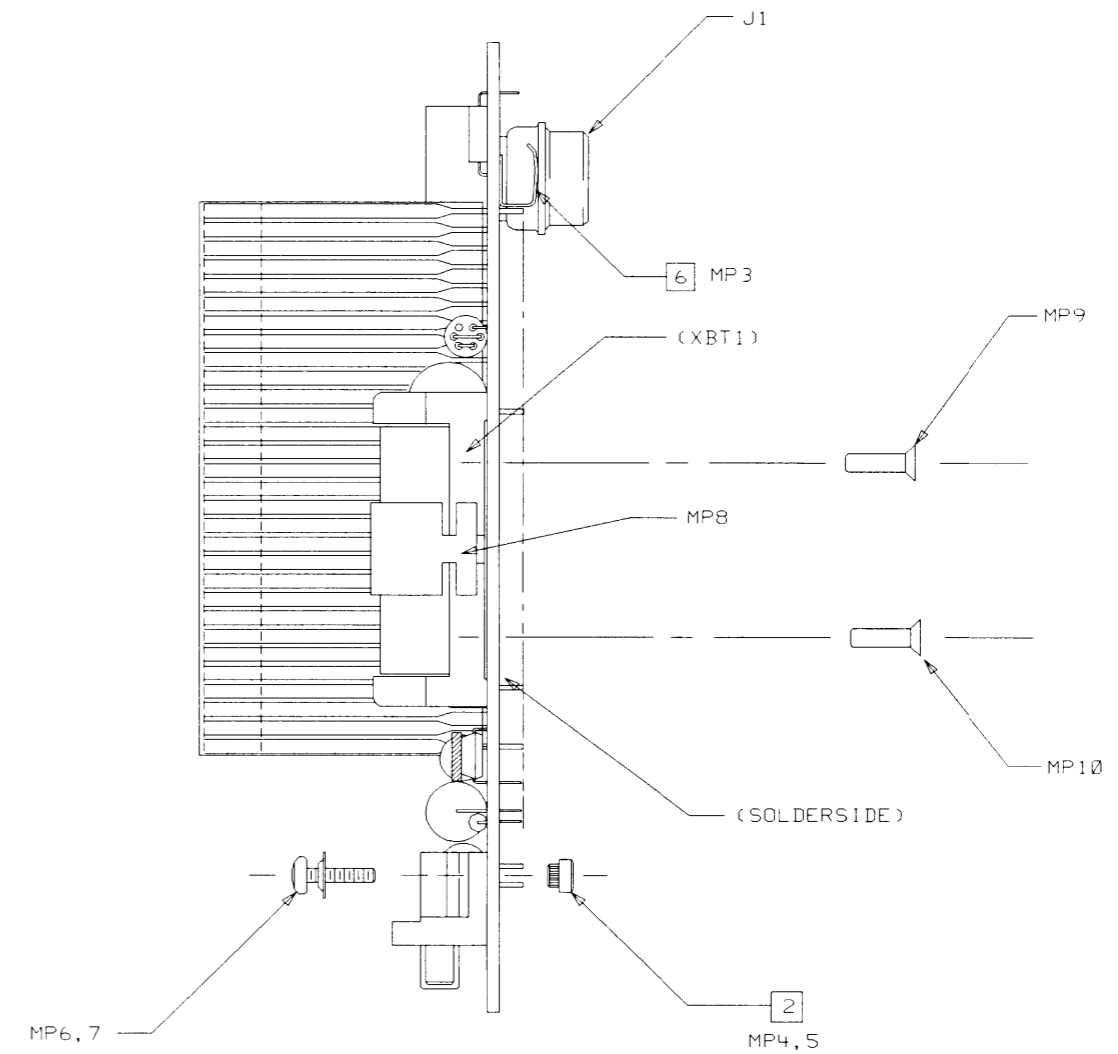
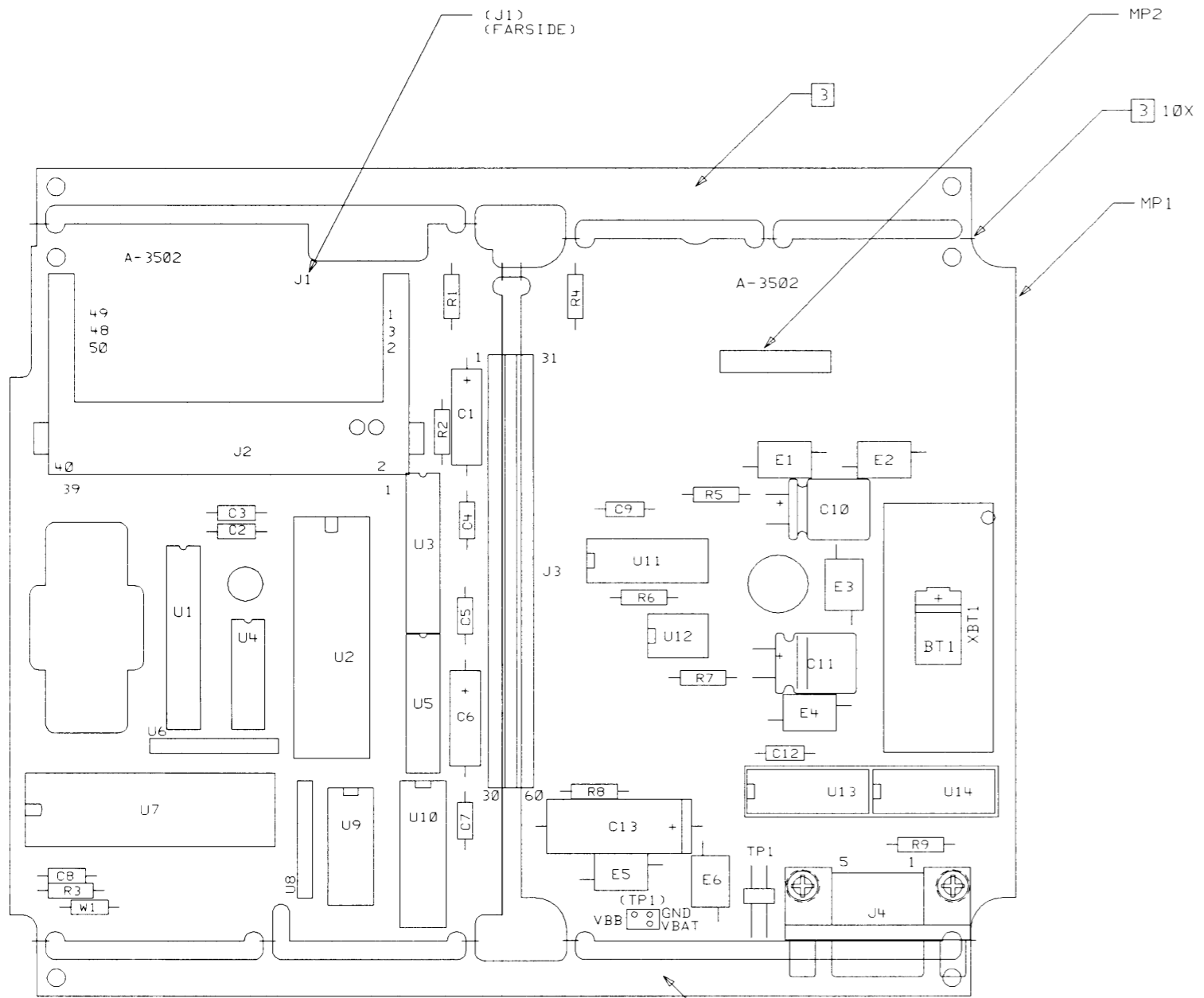
HP Part Number **85620-60018**

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

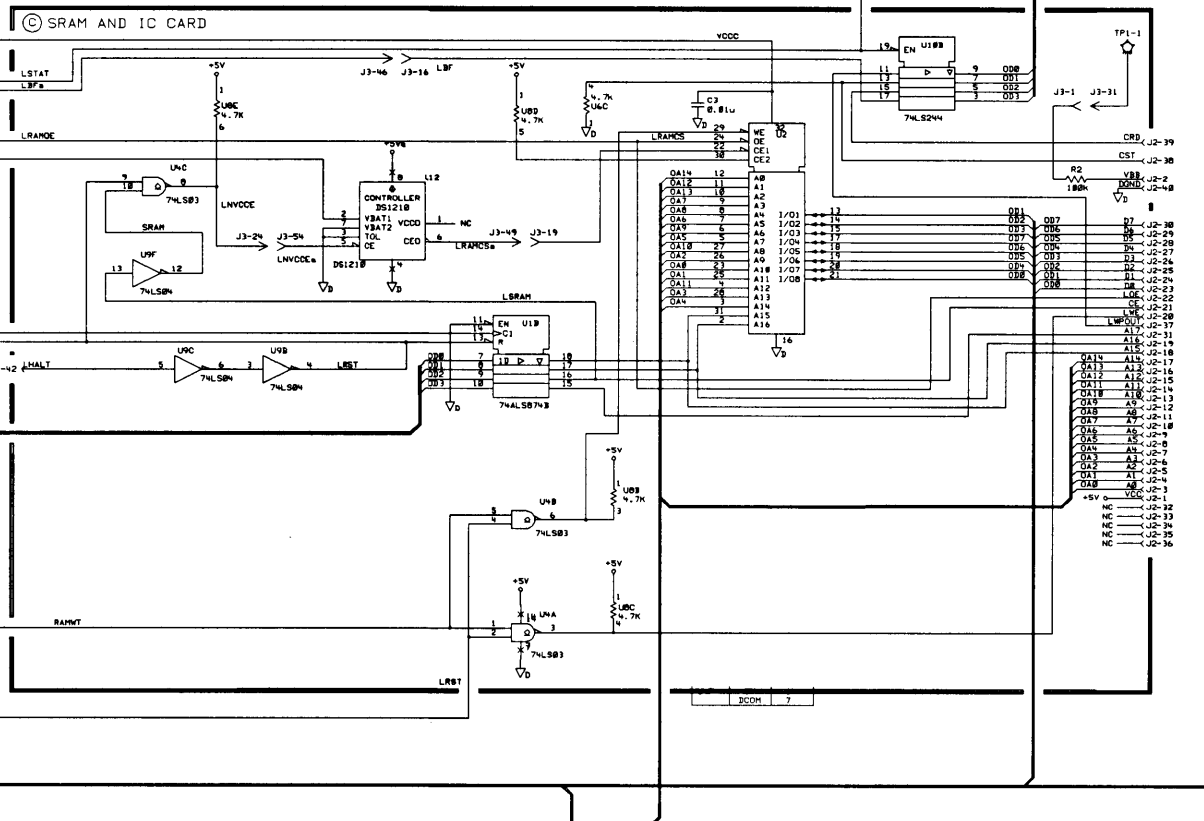
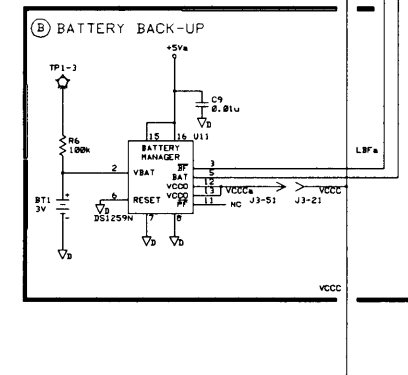
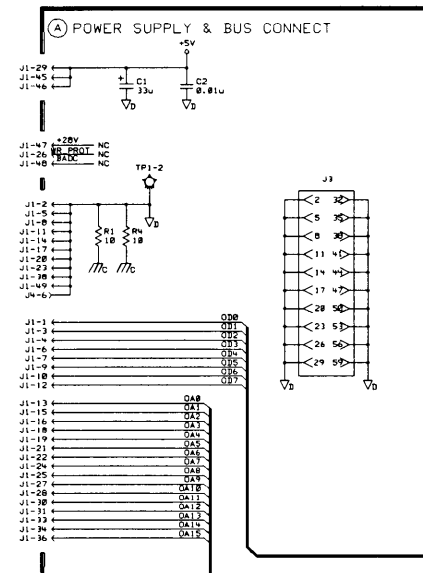
HP Part Number **85620-60018**  
Mass Memory (continued)

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



- NOTES: UNLESS OTHERWISE SPECIFIED
1. DIMENSIONS ARE IN INCHES.
  2. INSTALL MP4 AND MP5 FROM FAR SIDE 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, (FAR SIDE).

SEE MATERIAL LIST 85620-60018



J1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
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2	VSS	A	A
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