# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Addressing</td>
<td>1</td>
</tr>
<tr>
<td>Syntax Rules</td>
<td>3</td>
</tr>
<tr>
<td>Commands by Functional Group</td>
<td>4</td>
</tr>
<tr>
<td>Power-On/Reset States</td>
<td>6</td>
</tr>
<tr>
<td>Command Summary</td>
<td>7</td>
</tr>
<tr>
<td>HP-IB Command Summary</td>
<td>20</td>
</tr>
<tr>
<td>Module Diagrams</td>
<td>21</td>
</tr>
<tr>
<td>Error Messages</td>
<td>27</td>
</tr>
<tr>
<td>Commonly Used Commands</td>
<td>Back Cover</td>
</tr>
</tbody>
</table>
Module Addressing

Before sending a plug-in module command, you must specify an address to designate which module will receive the command and, if applicable, which relay or channel will respond to the command. The address is of the form esnn, where e is the mainframe or extender number (0 = mainframe, 1 - 7 = extenders), s is the slot number (0 - 9), and nn is the relay or channel number.

Commands That Address a Slot (es00)

Commands such as CTYPE and CRESET apply to a module as a whole and do not reference a particular relay or channel. Commands of this type contain a slot# or slot_list parameter in their syntax statement. When using this type of command, you specify only the e and s digits and set the nn digits to 00. For commands using a slot# parameter you can specify only one slot per command. For example, to direct the CTYPE command to the module in mainframe slot 100, send:

```
OUTPUT 709; "CTYPE 0100"
```

For convenience, when using a slot in the mainframe, you can omit the e digit. For example, the following program statement also directs the CTYPE command to the module in mainframe slot 100:

```
OUTPUT 709; "CTYFE 100"
```

For commands using a slot_list parameter, you can specify a single slot (es00), multiple slots (es00,es00, ... ), sequential slots (es00-es00), groups of sequential slots (es00-es00, es00-es00), or any combination of slots and groups. For example, to direct the CRESET command to the plug-in modules in slots 100, 300, 400, 500, and 700 of the mainframe, and slot 800 of extender 1, send:

```
OUTPUT 709; "CRESET 100,300-500,700,1800"
```

Commands That Address a Relay or Channel (esnn)

Commands such as CLOSE and OPEN apply to individual relays or channels on a plug-in module. Commands of this type contain a relay#, relay_list, ch#, ch_list, or connector# parameter in their syntax statement. When using one of these commands, you specify the complete four digit address (you can omit the first digit when addressing a module in the mainframe). Refer to the appropriate plug-in module manual for a particular module’s relay or channel numbers.

For commands using a relay# or ch# parameter, you can specify only one relay or channel per command. For example, to query the state of channel 12 on the module in mainframe slot 200, send:

```
OUTPUT 709; "CLOSE? 212"
```
Module Addressing (cont)

For commands using a relay__list or ch__list parameter, you can specify singles (esnn), multiples (esnn, esnn, ...), sequentials (esnn-esnn), groups of sequentials (esnn-esnn, esnn-esnn), or any combination of these. For example, to close channels 2 through 5 on the module in mainframe slot 100 and channels 1 and 3 on the module in mainframe slot 200, send:

OUTPUT 709; "CLOSE 102-105,201,203"

Commands Requiring a Predefined Address

Commands that are specifically for the HP 34520 Multimeter or the HP 34522 Digital I/O Module do not specify an address in their command statements. These commands do not have any kind of slot, relay, channel, or connector parameter in their command syntax. Before sending a command to one of these modules, send the USE command to designate which module (use device) will receive commands. After designating a use device, all subsequent digital I/O or multimeter commands are sent to that slot. The use device is remembered by the mainframe and remains active until another USE command is executed or power is cycled.

Whenever power is applied to the mainframe, it searches its slots and the extender slots for installed multimeter modules. If it finds only one multimeter module, it designates that module as the use device. If it finds more than one multimeter module, it designates the one in the lowest numbered slot as the use device. If no multimeter module is found at power-on, the mainframe does not designate a use device. The power-on use device remains in effect until you change it by executing the USE command.

You can use the optional control panel to specify a different use device than that specified by the controller (over the HP-IB). If you do this, commands sent from the optional control panel go to the device that was specified from the control panel and commands sent from the controller go to the device specified by the controller. This is useful when an operator is interactively controlling one of the use devices from the control panel.

Designating a Multimeter Module

When designating a multimeter module as the use device, you specify the e and s digits and set the nn digits to 00. A multimeter module occupies two slots and is always addressed using the lowest of the two slot numbers. For example, to designate the multimeter in slots 800 and 900 of the mainframe, send:

OUTPUT 709; "USE 800"

Designating a Digital I/O Module

When designating a digital I/O module as the use device, you specify the e and s digits and specify one of four ports with the nn digits (nn = 00, 10, 20, or 30). For example, to select port 10 on the digital I/O module in slot 700 of the mainframe, send:

OUTPUT 709; "USE 710"
Syntax Rules

- Command keywords may be entered in upper or lower case.

- Parameters may be entered in upper case, lower case, or as a numeric variable for some commands. Numeric parameters may be in either integer, floating-point, or exponential format. Numbers in floating-point format are rounded to the nearest integer if the command requires an integer.

- Command keywords and parameters must be separated by either a space or a comma. Extra commas or spaces are ignored.

- Command parameters enclosed in square brackets (e.g., [slot_list]) are optional and may be omitted when executing the command. Parameters which are not enclosed in square brackets are required parameters and must be specified each time (e.g., relay_list).

- The carriage return (cr), line feed (lf), semicolon (;), or EOI sent concurrent with the last character indicate the end of message (command termination) to the HP 3235. The “Enter” key signals the end of a command entered from the control panel keyboard.

- To regain control of the HP-IB bus and the system controller immediately after sending a command, suppress the cr, lf, or both when sending a command. For HP Series 200/300 computers, use the following format to regain use of your controller:

  OUTPUT 709; "TEST;"

In the above program line, the first semicolon indicates the end of the command to the HP 3235 and the second semicolon suppresses the carriage return and line feed.

When using other controllers, use a formatted I/O statement to suppress the line feed or carriage return/line feed. For example, the HP Series 80 controllers use the following format to suppress the cr lf:

  OUTPUT 709 USING ";#K","TEST;"

In the above program line, the # image specifier suppresses the cr lf. The K image specifier suppresses trailing or leading spaces and outputs the command in free-field format. The semicolon following the TEST command indicates the end of the command to the HP 3235 and must be present when you suppress the cr lf.

- Multiple commands separated by semicolons (;) may be used in one command statement. For example:

  OUTPUT 709; "CLOSE 202; OPEN 202"
# Commands by Functional Group

## Mainframe Commands

<table>
<thead>
<tr>
<th>HP Common Instrument Capabilities</th>
<th>AND</th>
<th>ATN</th>
<th>BINAND</th>
<th>BINCMP</th>
<th>BINEOR</th>
<th>BINIOR</th>
<th>BIT</th>
<th>COS</th>
<th>DIM</th>
<th>DIV</th>
<th>EXOR</th>
<th>EXP</th>
<th>FILL</th>
<th>FILLBIN</th>
<th>INTEGER</th>
<th>LET</th>
<th>LGT</th>
<th>LOG</th>
<th>MOD</th>
<th>NOT</th>
<th>OR</th>
<th>REAL</th>
<th>SHIFT</th>
<th>SIN</th>
<th>SIZE?</th>
<th>SQR</th>
<th>LIST</th>
<th>PAUSE</th>
<th>PAUSED?</th>
<th>RETURN</th>
<th>RUN</th>
<th>STEP</th>
<th>SUB</th>
<th>SUBEND</th>
<th>WHILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLR</td>
<td>DISP</td>
<td>DISP?</td>
<td>ECHO</td>
<td>ECHO?</td>
<td>KEYS</td>
<td>KEYS?</td>
<td>MON</td>
<td>PONSQR</td>
<td>MON</td>
<td>Variable Storage/Output</td>
<td>MON</td>
<td>VREAD</td>
<td>User-Defined</td>
<td>Key Commands</td>
<td>DefKey</td>
<td>DefKey?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAT</td>
<td>COMPRESS</td>
<td>DELSUB</td>
<td>MEM</td>
<td>MEM</td>
<td>MEMAVAL?</td>
<td>PURGE</td>
<td>SCRATCH</td>
<td>Math Commands/Operators</td>
<td>Cat</td>
<td>COMPRESS</td>
<td>CONT</td>
<td>DELSUB</td>
<td>END IF</td>
<td>END WHILE</td>
<td>FOR...NEXT</td>
<td>IF...THEN</td>
<td>Limit Testing</td>
<td>LIMIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help System</td>
<td>HELP</td>
<td>Subroutines</td>
<td>ABORT</td>
<td>CALL</td>
<td>COMPRESS</td>
<td>CONT</td>
<td>DELSUB</td>
<td>END IF</td>
<td>END WHILE</td>
<td>FOR...NEXT</td>
<td>IF...THEN</td>
<td>TRIGBUF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>USE</td>
<td>USE?</td>
<td>Trigger Bus</td>
<td>AUTOOB</td>
<td>BOUT</td>
<td>DRIVEBPn</td>
<td>DRIVEETBn</td>
<td>DRIVEEXT</td>
<td>DRIVEETBn</td>
<td>TDBRIVE</td>
<td>TBn?</td>
<td>TRIGBUF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Timing/Synchronization**
- SERIAL
- SETTLE
- SET TIME
- TIME
- WAIT
- WAITFOR

**Timer Commands**
- DISABLE INTR
- ENABLE INTR
- PULSE
- READ COUNT
- SET CLKSRC
- SET COUNT
- SET OUTPUT
- SQWAVE

**Backplane Commands**
- CRESET
- CTYPER?
- EXTEND?
- ID?
- RESET
- RST

**Interrupt/Error Handling**
- DISABLE ERROR
- DISABLE INTR
- DISABLE INTR SYS
- ENABLE ERROR
- ENABLE INTR
- ENABLE INTR SYS
- INTR?
- OFF
- ON
Plug-In Module Commands

Switching Modules
ALLOW
CLOSE
CLOSE?
CONNECT
DISCONN
MON
OPEN
PROHIBIT
PROHIBIT?
SELECT
TRIGBUF

Power Fail/
Fixture Commands
FIXTURE?
PFCLOSE
PFCLOSE?
PFOPEN
PFSAME

Multimeter
ACAL
ACBAND
ACBAND?
ARANGE
ARANGE?

AUXERR?
AZERO
AZERO?
CAL
CALEN?
CALNUM?
CALSTR
CALSTR?
DELAY
DELAY?
DIAG
FIXEDZ
FIXEDZ?
FSOURCE
FSOURCE?
FUNC
FUNC?
LFREQ
LFREQ?
LINE?
NPLC
NPLC?
NRDGS
NRDGS?
OCOMP
OCOMP?

RANGE
RANGE?
READ
TBUF
TBUF?
TERM
TERM?
TIMER
TIMER?
TRIG
TRIG?
USE
VMCMPLT
VMCMPLT?

Digital I/O
CLEAR EVENT
CLEAR EVENTERR
CLOSE
CLOSE?
DISABLE ERROR
DISABLE EVENT
DISABLE EVENTERR
DISABLE INTR

EDGE
ENABLE ERROR
ENABLE EVENT
ENABLE EVENTERR
ENABLE INTR
HSDONE?
HSTIME
HSTYPE
LSENSE
OPEN
PULLUP
RBIT
READ
READBLK
RFLG
RLEVENT
RSEVENT
RSEVERR
SELECT
SRTRIG
TBDRIVE
USE
WBIT
WCTRL
WRITE
WRITEBLK
XFERMODE
XFERWIDTH

Breadboard
ALLOW
BBREAD
BBWRITE
CLOSE
CLOSE?
OPEN
PROHIBIT
PROHIBIT?
TRIGBUF

Scanning
CHCLOSED
MEAS
PSCAN
SADV
SCAN
STRIG
VERIFY
## Power-On/Reset States

<table>
<thead>
<tr>
<th>Item</th>
<th>State</th>
<th>Item</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACBAND</td>
<td>Slow mode</td>
<td>LSENSE</td>
<td>HIGH</td>
</tr>
<tr>
<td>ARANGE</td>
<td>ON</td>
<td>NPLC</td>
<td>10 Power Line Cycles</td>
</tr>
<tr>
<td>AUTOTB</td>
<td>ON</td>
<td>NRDGS</td>
<td>AUTO</td>
</tr>
<tr>
<td>AZERO</td>
<td>ON</td>
<td>OCOMP</td>
<td>OFF</td>
</tr>
<tr>
<td>BEEP</td>
<td>ON</td>
<td>OFORMAT</td>
<td>ASCII</td>
</tr>
<tr>
<td>BLOCKOUT</td>
<td>OFF</td>
<td>OUTBUF</td>
<td>OFF</td>
</tr>
<tr>
<td>CHCLOSED</td>
<td>OFF</td>
<td>PONSQR</td>
<td>Most recent value</td>
</tr>
<tr>
<td>DELAY</td>
<td>Automatic</td>
<td></td>
<td>stored in continuous</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>memory</td>
</tr>
<tr>
<td>DISP</td>
<td>ON</td>
<td>PULLUP</td>
<td>ENABLE (totem-pole)</td>
</tr>
<tr>
<td>DRIVEBPn</td>
<td>OFF</td>
<td>RANGE</td>
<td>AUTO</td>
</tr>
<tr>
<td>DRIVEETBn</td>
<td>OFF</td>
<td>SADV</td>
<td>AUTO (or SCAN)</td>
</tr>
<tr>
<td>DRIVEEXT</td>
<td>OFF</td>
<td>SERIAL</td>
<td>ON</td>
</tr>
<tr>
<td>DRIVETBn</td>
<td>OFF</td>
<td>SET CLKSRC</td>
<td>65535</td>
</tr>
<tr>
<td>DSP</td>
<td>ON</td>
<td>SET COUNT</td>
<td>OFF</td>
</tr>
<tr>
<td>EDGE</td>
<td>LH</td>
<td>SET OUTPUT</td>
<td>0.0</td>
</tr>
<tr>
<td>END</td>
<td>OFF</td>
<td>SET TIME</td>
<td>INT</td>
</tr>
<tr>
<td>FIXEDZ</td>
<td>OFF</td>
<td>SRTRIG</td>
<td>AUTO (or SCAN)</td>
</tr>
<tr>
<td>FSOURCE</td>
<td>ACV</td>
<td>STRIG</td>
<td>OFF</td>
</tr>
<tr>
<td>FUNC</td>
<td>DCV</td>
<td>TBUFF</td>
<td>FRONT</td>
</tr>
<tr>
<td>HP-IB Address</td>
<td>Not Changed</td>
<td>TERM</td>
<td>1 second</td>
</tr>
<tr>
<td>HSTIME</td>
<td>2E-6</td>
<td>TIMER</td>
<td>AUTO</td>
</tr>
<tr>
<td>HSTYPE</td>
<td>NONE</td>
<td>TRIG</td>
<td>OFF</td>
</tr>
<tr>
<td>INBUF</td>
<td>OFF</td>
<td>VMCMPLT</td>
<td>LIVE</td>
</tr>
<tr>
<td>KEYS</td>
<td>OFF</td>
<td>XFERMODE</td>
<td>Four 8-bit ports</td>
</tr>
<tr>
<td>LFREQ</td>
<td>Multimeter Switch Setting</td>
<td>XFERWIDTH</td>
<td></td>
</tr>
<tr>
<td>LOCK</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Command Summary

In the following command summary, command keywords are shown in upper case print and parameter names are in italics. Optional parameters are enclosed in square brackets ([ ] ). Unless otherwise noted, the default values for optional parameters are shown in bold print.

**ABORT**
Halt execution of any RUN subroutine and returns control to the system controller or control panel.

**ABS (argument)**
Returns the absolute value of the specified argument.

*argument*: Number or numeric expression.

**ACAL [type]**
Performs autocalibration (autocal) routines on the HP 34520 Multimeter in the current USE slot.

*type*: ALL (1), AC (2), OHMS (3).

**ACBAND [frequency]**
Selects the slow or fast AC measurement mode for the HP 34520 Multimeter in the current USE slot.

*frequency*: < 400 = slow mode, ≥ 400 = fast mode.

**ACBAND?**
Returns "100" if the HP 34520 Multimeter's slow AC measurement mode (ACBAND command) is selected or "1E + 0" if the fast AC measurement mode is selected.

**ADDR?**
Returns the HP-IB address of the HP 3235. Valid addresses are 0 through 30. Factory Setting = 09.

**ALLOW [combination,] relay_list**

**ALLOW ALL**
Allows closures of prohibited relays, channels, or bits.

*combination*: ANYOF, TWOOF, ALLOF.

*relay_list*: List of relay, channel, or bit numbers ("esnn").

*ALL*: Execute ALLOW ALL to cancel all prohibited closures.

**argument AND argument**
Returns a "0" or "1" based upon the logical AND of the specified arguments.

*argument*: Number or numeric expression.

**ARANGE [control]**
Enables or disables the autorange function on the HP 34520 Multimeter in the current USE slot.

*control*: OFF (0), ON (1).

**ARANGE?**
Returns "OFF" if the HP 34520 Multimeter's autorange function is disabled (ARANGE OFF) or "ON" if the autorange function is enabled (ARANGE ON).

**ATN (argument)**
Returns the value of the angle (in radians) which has a tangent equal to the argument.

*argument*: Number or numeric expression.

**AUTOTB mode**
Enables or disables automatic trigger bus connections between the mainframe and extenders.

*mode*: OFF, ON.

**AUXERR?**
Returns the weighted sum of all bits set in the HP 34520 Multimeter's auxiliary error register and clears the bits.

<table>
<thead>
<tr>
<th>Decimal Value</th>
<th>Bit Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>Isolation Error.</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Slave processor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>self-test failure</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Isolation self-test failure.</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>Integrator convergence error.</td>
</tr>
<tr>
<td>16</td>
<td>4</td>
<td>Front-end zero-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>measurement error</td>
</tr>
<tr>
<td>32</td>
<td>5</td>
<td>Current source, gain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>selection input divider</td>
</tr>
<tr>
<td>64</td>
<td>6</td>
<td>Amps self-test failure.</td>
</tr>
<tr>
<td>128</td>
<td>7</td>
<td>AC amplifier's DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>offset test failure.</td>
</tr>
<tr>
<td>256</td>
<td>8</td>
<td>AC flatness check.</td>
</tr>
<tr>
<td>512</td>
<td>9</td>
<td>Ohms precharge failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>during autocal.</td>
</tr>
<tr>
<td>1024</td>
<td>10</td>
<td>Backplane interface check</td>
</tr>
<tr>
<td>2048</td>
<td>11</td>
<td>Outguard ROM Checksum.</td>
</tr>
<tr>
<td>4096</td>
<td>12</td>
<td>Outguard reset failure.</td>
</tr>
<tr>
<td>8192</td>
<td>13</td>
<td>Trigger bus and hardware</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trigger failure.</td>
</tr>
<tr>
<td>16384</td>
<td>14</td>
<td>Calibration RAM failure.</td>
</tr>
</tbody>
</table>
AZERO [control]
Enables or disables the autozero function on the HP 34520 Multimeter in the current USE slot.

control: OFF (0), ON (1), ONCE (2).

AZERO?
Returns “OFF” if the HP 34520 Multimeter’s autozero function is disabled (AZERO OFF/ONCE) or “ON” if the autozero function is enabled (AZERO ON).

BBREAD slot#, register#
Returns the decimal equivalent of the specified register on the HP 34523 Breadboard Module.

slot#: Slot number (‘0’ - ‘6’).
register#: Register number between 0 and 31.

BBWRITE slot#, register#, value
Writes a decimal value to the specified register on the HP 34523 Breadboard Module.

slot#: Slot number (‘0’ - ‘6’).
register#: Register number between 0 and 31.
value: Two’s complement integer in the range -32768 to +32767.

BEEP [mode]
Controls the HP 3235’s beeper.

mode: OFF, ON, ONCE.

BINAND (argument, argument)
Returns the value of the bit-by-bit logical AND of the specified arguments.

argument: Number or numeric expression in the range -32768 to +32767.

BINCMP (argument)
Returns the binary complement of the specified argument.

argument: Number or numeric expression in the range -32768 to +32767.

BINEOR (argument, argument)
Returns the value of the bit-by-bit logical Exclusive-OR of the specified arguments.

argument: Number or numeric expression in the range -32768 to +32767.

BINIOR (argument, argument)
Returns the value of the bit-by-bit logical Inclusive-OR of the specified arguments.

argument: Number or numeric expression in the range -32768 to +32767.

BIT (argument, bit_position)
Returns a “0” or “1” representing the logic value of the specified bit of the argument.

argument: Number or numeric expression in the range -32768 to +32767.
bit_position: Bit position in the range 0 (lsb) to 15 (msb).

BLOCKOUT mode
Enables or disables the binary output mode.

mode: OFF, ON.

BPOUT bus [frame?]
Designates which backplane trigger bus signal, in the specified frame, sources a signal into the switching network for that frame.

bus: A “0” specifies backplane trigger bus 0 and “1” specifies backplane trigger bus 1.
frame?: Specifies mainframe (0 = default) or extenders (1 - 7).

CAL
Service-related command for the HP 34520 Multimeter. Refer to the HP 3235 Service Manual for details.

CALEN?
Service-related command for the HP 34520 Multimeter. Refer to the HP 3235 Service Manual for details.

CALL sub_name
Executes the named subroutine and waits for completion before executing other commands.

sub_name: Mainframe subroutine name.

CALNUM?
Returns “-9999”.

CALSTR
Service-related command for the HP 34520 Multimeter. Refer to the HP 3235 Service Manual for details.

CALSTR?
Service-related command for the HP 34520 Multimeter. Refer to the HP 3235 Service Manual for details.

CAT
Returns a catalog list of all user-defined arrays, variables, subroutines, and stored states.

CHCLOSED port
Specifies the source for the channel closed signal used with scanning. The specified source outputs a high-to-low pulse when the relays have closed and settled during a MEAS, PSCAN, SCAN, or VERIFY command.

port: EXT, TB0, TB1, OFF.

CLEAR EVENT bit#
Clears a single stored event bit on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.

CLEAR EVENTERR bit#
Clears event error detection on a single event bit on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.

CLOSE relay_list
Switching Modules: closes the specified relays or channels. HP 34522 Digital I/O: clears the specified bits (logic “0”).

relay_list: List of relay, channel, or bit numbers (“esdn”).
CLOSE? relay#
Switching Modules: returns the state of the specified relay or channel. 0 = Open, 1 = Closed.
HP 34522 Digital I/O: returns the state of the specified bit.
0 = Set, 1 = Cleared.

relay#: Single relay, channel, or bit number ("esn").

CLR
Device clear.

CLROUT
Clears the data in the HF-1B output buffer.

COMPRESS sub_name
Removes the text of the specified subroutine from mainframe memory. This saves space in mainframe memory but eliminates the ability to list or step the subroutine.

sub_name: Mainframe subroutine name.

CONNECT [ONLY.] connector#, connector# or CONNECT [ONLY.] ch#, ABu
HP 34506 Coaxial Matrix Module: connects the specified row to the specified column.
32-Channel Multiplexer Modules: closes the required relays to make connection between the specified channel and analog bus.

ONLY: Ensures that all relays on the module are open before making the connection.
connector#: Row or column number on the Coaxial Matrix.
ch#: Single channel number ("esn").
ABu: Analog bus 0, 1, 2 or 3. Can also specify a backplane relay number ("es90").

CONT
Continues execution of a paused or stepped subroutine executed with the RUN command.

COS (argument)
Returns the cosine of the angle (in radians) represented by the argument.

argument: Number or numeric expression in the range ±2.98156645429204 E + 8.

CRESET slot_list
Places the plug-in modules in the specified slots to their reset states.

slot_list: List of slot numbers ("es00").

CTYPE slot#
See the CTYPE? Command.

CTYPE? slot#
Returns an abbreviated model number of the plug-in module in the specified slot. Abbreviation: CTYPE.

---

<table>
<thead>
<tr>
<th>Data Returned</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No module installed in slot.</td>
</tr>
<tr>
<td>1</td>
<td>HP 34501 Armature Relay Mux.</td>
</tr>
<tr>
<td>2</td>
<td>HP 34502 Reed Relay Mux.</td>
</tr>
<tr>
<td>3</td>
<td>HP 34503 GP Relay Mux.</td>
</tr>
<tr>
<td>4</td>
<td>HP 34504 Coaxial Mux.</td>
</tr>
<tr>
<td>5</td>
<td>HP 34505 RF Mux.</td>
</tr>
<tr>
<td>6</td>
<td>HP 34506 Coaxial Matrix.</td>
</tr>
<tr>
<td>7</td>
<td>HP 34507 Mercury Relay Mux.</td>
</tr>
<tr>
<td>20</td>
<td>HP 34520 Multimeter Module.</td>
</tr>
<tr>
<td>22</td>
<td>HP 34522 Digital I/O Module.</td>
</tr>
<tr>
<td>48-63</td>
<td>HP 34523 Breadboard Module.</td>
</tr>
<tr>
<td>99</td>
<td>HP 34560 System Expansion Card.</td>
</tr>
</tbody>
</table>

slot#: Slot number ("es00").

DEFKEY key, string or
DEFKEY DEFAULT
Assigns a user-defined string to the specified number, shifted letter, or shifted punctuation key for use from the control panel. All user-defined key definitions are stored in continuous memory.

key: Any control panel number key (0-9), shifted letter key (A-Z), or shifted punctuation key (?!, <, >, ., etc.).
string: String to be assigned to key. Number keys may be redefined up to 80 characters and shifted letter/punctuation keys may be redefined up to 10 characters.

DEFAULT: Returns all shifted letter and punctuation keys to their original HP definition. This parameter has no effect on the number keys.

DEFKEY? key
Returns the contents of a user-defined key.

key: Any control panel number key (0-9), shifted letter key (A-Z), or shifted punctuation key (?!, <, >, ., etc.).

DELAY [time]
Specifies the time interval inserted before a measurement on the HP 34520 Multimeter in the current USE slot.

time: 0 to 2100 seconds. Default = automatically determined by function, range, resolution, and AC bandwidth.

DELAY?
Returns the present delay time, in seconds, for the HP 34520 Multimeter in the current USE slot.

DELSUB sub_name
Deletes the specified subroutine from mainframe memory.

sub_name: Mainframe subroutine name.

DIAG
Service-related command for the HP 34520 Multimeter. Refer to the HP 3235 Service Manual for details.

DIM array_name(max_index)[array_name(max_index)...]
Reserves mainframe memory space to store real arrays.

array_name: Mainframe array name.
max_index: Maximum index of the array (range = 0 through 32767).
DISABLE ERROR

DISABLES the plug-in module in the current USE slot from generating an HP error when a plug-in module error occurs.

DISABLE EVENT bit#

Disables event detection on a single event bit on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.

DISABLE EVENTERR bit#

Disables event error detection on a single event bit on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.

DISABLE INTR [TIMER#]

Disables internal (mainframe) interrupts from the plug-in module in the current USE slot or from the specified timer channel.

TIMER#: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).

DISABLE INTR SYS

Disables interrupts from the plug-in modules.

DISCONN connector, connector#

or

DISCONN ch#, ABn

HP 34506 Coaxial Matrix Module: disconnects the specified row from the specified column.
32-Channel Multiplexer: disconnects all relays required to connect the specified channel from the analog bus.

connector#: Row or column number on the Coaxial Matrix.
ch#: Single channel number ("s0nn").
ABn#: Analog bus 0, 1, 2 or 3. Can also specify a backplane relay number ("s99n").

DISP mode

or

DISP [MSG] message

Enables or disables the control panel display. This command can also display a string, the contents of a variable, a number, or a numeric expression. Abbreviation: DSP.

mode: ON, OFF.
MSG: Indicates to the HP 3235 that a message is to be displayed.
message: Quoted string of characters to be displayed.

DISP?

Returns a quoted string containing the contents of the control panel display. Abbreviation: DSP?.

numerator DIV denominator

Returns the integer portion of a division.

numerator: Number or numeric expression.
denominator: Number or numeric expression NOT equal to zero.

DRIVEBPn source [frame#]

Selects the source to drive the trigger bus in the specified mainframe or extender with AUTOIB OFF.

n: Specifies trigger bus 0 or trigger bus 1.
source: OFF, ETB0, ETB1, EXTIN, TIER0, TIER1, LOW, HIGH.
frame#: Specifies the mainframe (0 = default) or an extender (1-7).

DRIVEETBn source [frame#]

Specifies the frame and source in that frame to drive the extender trigger bus between frames with AUTOIB OFF.

n: Specifies trigger bus 0 or trigger bus 1.
source: OFF, BP, ETB0, ETB1, EXTIN, TIER0, TIER1, LOW, HIGH.
frame#: Specifies the mainframe (0 = default) or an extender (1-7).

DRIVEEXT source

Selects the source to drive the External Trigger Out BNC connector on the mainframe.

source: OFF, TBI0, TBI1, EXTIN, TIER0, TIER1, LOW, HIGH.

DRIVETBn source

Selects the source (other than a plug-in module) to drive the specified trigger bus in all frames from the mainframe with AUTOIB ON.

n: Specifies trigger bus 0 or trigger bus 1.
source: OFF, EXTIN, TIER0, TIER1, LOW, HIGH, TRG.

DSP mode

or

DSP [MSG] message

See the DISP Command.

DSP?

See the DISP? Command.

DTEST [slot_list]

Performs a "data test" on the plug-in modules in the specified slots. Abbreviation: DTST.

slot_list: List of slot numbers ("s000"). Default = all slots.

DTST [slot_list]

See the DTEST Command.

ECHO string

Tests communication between the HP 3235 and the system controller.

string: Quoted string of characters.

EDGE bit#, transition

Specifies which edge (rising or falling) is detected for event interrupts on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.
transition: LH (rising edge), HL (falling edge).
ENABLE ERROR

Enables the plug-in module in the current USE slot to generate an HP 3235 error state.

ENABLE EVENT bit#

Enables a single event bit for event detection on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.

ENABLE EVENTERR bit#

Enables event error detection on a single event bit on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Event bit number in the range 0 to 7.

ENABLE INTR [TIMER]+

Enables internal (mainframe) interrupts from the plug-in module in the current USE slot or from the specified timer channel.

TIMER#: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).

ENABLE INTR SYS

Enables the HP 3235 to acknowledge interrupts from the plug-in modules.

END control

Enables or disables the HP-IB End or Identify (EOI) function.

control: OFF, ON, ALWAYS.

END IF

Last statement of an IF...THEN loop.

END WHILE

Last statement of a WHILE loop.

ERR?

Returns the error code of the most recent error, deletes that error code from the error register, and clears the error bit in the status register when all errors are read.

ERRSTR?

Returns the error code and string of the most recent error, deletes that error from the error register, and clears the error bit in the status register when all errors are read.

argument EXOR argument

Returns a “0” or “1” based upon the logical Exclusive-OR of the specified arguments.

argument: Number or numeric expression.

EXP (argument)

Raises base e (2.718281828) to the power of the argument.

argument: Number or numeric expression.

EXTEND?

Returns seven integers indicating the frame addresses of any extenders connected to the mainframe. Each of the seven integers is either a "0" or a specific extender number (1 - 7).

variable

FETCH expression [string]

Returns the value of the specified variables, expressions, or displays a quoted string.

variable: Mainframe variable name.

expression: Number or numeric expression (enclosed in parentheses).

string: Quoted ASCII string to be displayed on control panel.

FILL array_name, list

Places the specified values into a previously dimensioned mainframe array.

array_name: Mainframe array name.

list: Any list of numbers, channels, relays, slots, etc.

FILLBIN array_name, block_data

Places the specified binary values into a previously dimensioned mainframe array.

array_name: Mainframe array name.

block_data: A block in IEEE-728 Block A format.

FIXEDZ [control]

Enables or disables the fixed input resistance function for DC voltage measurements on the HP 34520 Multimeter in the current USE slot.

control: OFF (0), ON (1).

FIXEDZ?

Returns “OFF” if the HP 34520 Multimeter’s fixed resistance function is disabled (FIXEDZ OFF) or “ON” if the fixed resistance function is enabled (FIXEDZ ON).

FIXTURE?

Returns the status of the mainframe quick interconnect fixture. 0 = Open, 1 = Closed.

FOR counter = initial_value TO final_value [STEP step_size] program segment

NEXT counter

Defines a loop which is repeated until a loop counter passes a specified value within an HP 3235 subroutine.

counter: Variable name which acts as the loop counter.

initial_value: Number or numeric expression which is the beginning value of the loop counter.

final_value: Number or numeric expression which is the ending value of the loop counter.

step_size: Number or numeric expression which specifies the amount the loop counter is incremented for each pass through the loop. Negative values decrement the loop counter.

FSOURCE [source]

Configures the HP 34520 Multimeter to accept either AC voltage, AC+DC voltage, AC current, or AC+DC current as the input signal for frequency or period measurements.

source: ACV (2), ACDCV (3), ACI (7), ACDCI (8).

FSOURCE?

Returns a string representing the present frequency source on the HP 34520 Multimeter in the current USE slot (see FSOURCE).
FTEST • LCL

FTEST [slot_list]
Performs a fixture self-test on a group of plug-in modules or the entire HP 3235 system. Abbreviation: FTST.
-slot_list: List of slot numbers ("es00"). Default = all slots.

FTEST SYS [test]
Performs a fixture self-test of the system. Abbreviation: FTST SYS.

-test: 0, 1

FTEST [slot_list]
See the FTEST Command.

FTEST SYS [test]
See the FTEST SYS Command.

FUNC [function, [max_input], [%resolution]]
Selects measurement type (AC volts, DC current, etc.), range, and resolution for the HP 34520 Multimeter in the current USE slot.

-function: DCV (1), ACV (2), ACDCV (3), OHM (4), OHMF (5), DCl (6), ACI (7), ACDCI (8), FREQ (9), PER (10).
-max_input: For Voltage: AUTO 0 - 300.
For AC Current: AUTO 0 - 1.
For DC Current: AUTO 0 - 1.5.
For Ohms: AUTO 0 - 3E9.
-%resolution: percentage of max_input (default set by the NPLC command).

FUNC?
Returns a string representing the present function of the HP 34520 Multimeter in the current USE slot (see FUNC).

-HHELP
[HELP]
[TOPIC]
[command]
[parameter]
Help Function.

HELP: Responds with: "HELP is available for the following topics: SWITCHING, DMM, DIGIO, SYSTEM, HP/IB, SUBS, and MATH".

TOPIc: Same response as HELP HELP.
-topic: Lists all commands related to a specific topic.
-command: Type HELP command for help on a specific command.
-parameter: Type HELP parameter for help on a specific parameter.

HSDONE?
Returns a number indicating the status of the present HP 34522 Digital I/O output handshake type. 0 = handshake in progress, 1 = handshake complete.

HSTIME seconds
Sets the handshake delay time for the HP 34522 Digital I/O Module in the current USE slot.

seconds: Handshake time in the range 2E-6 to 15E-3 seconds.

HSTYPE mode
Selects the handshake type used for data transfers on the HP 34522 Digital I/O Module in the current USE slot.

-mode: NONE, FULL1, FULL2, FULL3, PARTIAL, STROBE.

ID? [slot]
Returns "HP3235" or the plug-in module number and name:
"00000 Empty Slot"
"34501 Armature Relay Multiplexer"
"34502 Reed Relay Multiplexer"
"34503 General Purpose Relay"
"34504 Switched-Shield Coaxial Multiplexer"
"34505 RF Multiplexer"
"34506 Switched-Shield Coaxial Matrix"
"34507 Mercury-Wetted Multiplexer"
"34520 Multimeter"
"34522 Digital I/O"
"34523 Breadboard"
"34560 Expansion Card"

-slot: Slot number ("es00"). Default = entire system.

IDN?
Returns the manufacturer's name (HEWLETT PACKARD), the model number (3235), the serial number (always 0), and the firmware revision date (of the form: "yyyy").

IF expression THEN
program segment
[ELSE]
[program segment]
END IF
Provides conditional branching within an HP 3235 subroutine.

-expression: Number or numeric expression.

INBUF mode
Enables or disables the HP 3235 input buffer.

-mode: OFF, ON.

INTEGER name [(max_index)] [,name [(max_index)], ...]
Reserves mainframe memory space to store integer variables or arrays.

-name: Mainframe variable or array name.
max_index: Maximum index of the array (range = 0 through 32767).

INTR?
Returns the address of the most recent slot ("es00") to interrupt and be serviced. If no interrupt has been serviced since power-on or a reset, "-1" is returned.

KEYS mode
Enables the HP 3235 to send messages, entered from the control panel, to the system controller.

-mode: ON, OFF.

LCL
See the LOCAL Command.
[LET] variable = expression
Assign values to numeric variables. The keyword LET is optional.

variable: Mainframe variable name.
expression: Number or numeric expression.

Lfreq [value]
Temporarily changes the HP 34520 Multimeter's A/D converter
line frequency reference. When power is cycled or when the
multimeter is reset, the reference frequency returns to that
selected by the line frequency selector switch on the multimeter.

value: 50, 60 (Hz).

Lfreq?
Returns the value of the line reference frequency ("50" or
"60" Hz) being used by the HP 34520 Multimeter's A/D
converter.

LGT (argument)
Returns the logarithm (base 10) of the argument.

argument: Number or numeric expression greater than zero.

LIMIT test_value, lower_limit, upper_limit
Tests a single value (number or variable) or an array to
determine if the value is between the specified lower and upper
limits.

test_value: Value to be tested against lower and upper limits.
lower_limit: Lower limit number, numeric expression, or array.
upper_limit: Upper limit number, numeric expression, or array.

LINE?
Returns the setting of the line frequency switch ("50") or
"60") of the HP 34520 Multimeter in the current USE slot.

LIST sub_name
Lists the specified subroutine to the system controller or control
panel display.

sub_name: Mainframe subroutine name.

LOCAL
Returns the HP 3235 to the local mode and enables the control
panel Local key. Abbreviation: LCL.

LOCK mode
Enables or disables the HP 3235 control panel keyboard.

mode: OFF, ON.

LOG (argument)
Returns the natural logarithm (base e) of the specified argument.

argument: Number or numeric expression greater than zero.

Lsense line, sense
Specifies the logic sense, positive or negative true, for the data
lines and handshake lines (CTL and FLG) of the HP 34522
Digital I/O Module.

line: DATA, CTL, FLG.
sense: HIGH, LOW.

MEAS [function] [ABr.,] [FAST.] ch_list
Scans a channel list using the HP 34520 Multimeter in the current
USE slot for the measurement.

function: DCV, ACV, ACDCV, DCI, ACI, ACDCI, OHM,
OMF, FREQ, PER.
ABr.: Analog bus 0, 1, 2, or 3. Default = AB0.
FAST: Use front terminals of HP 34520 Multimeter.
ch_list: List of channels ("esrn").

OFF

MEM variable
array_name { (start_index) }
Specifies a variable or array to store data from commands which
return numeric results. This command cannot store ASCII
(strings) results.

OFF: Returns the memory output mode to normal operation
(results go to output buffer).
variable: Mainframe variable name.
array_name: Mainframe array name.
start_index: Starting location of the array (range = 0 through
32767, Default = 0).

MENAVAIL?
Returns the size (in bytes) of the largest volatile and continuous
memory blocks available within HP 3235 memory.

numerator MOD denominator
Returns the remainder portion of a division.

numerator: Number or numeric expression.
denominator: Number or numeric expression NOT equal to zero.

HPiB ch#

MON ALL
STATE, slot#
STATE ALL
OFF
Displays (on the control panel) command keywords entered over
the HP-IB, results from a scan, or the state of one or all plug-in
modules.

HPiB: Displays command keywords, with parameters, as the HP
3235 receives them from the system controller and executes
them.
ch#: Single channel number ("esrn").
ALL: Displays multimeter readings from each channel during a
MEAS or VERIFY scanning sequence.
STATE, slot#: Displays the state of the plug-in module in the
specified slot ("esrn").
STATE ALL: Displays the state of the most recent plug-in
module to be modified by a command.
OFF: Disables the monitor mode.

NOT argument
Returns a "0" or "1" based upon the logical complement of the
specified argument.

argument: Number or numeric expression.
NPLC • PROHIBIT?

NPLC:  \[\text{power\_line\_cycles}\]
Designates the minimum integration time for the HP 34520 Multimeter's A/D converter.

\textit{power\_line\_cycles: 0 - 0.0005, 0.005, 0.1, 1, 10, 100.}

NPLC?
Returns the present number of power line cycles (PLCs) of integration time used by the HP 34520 Multimeter's A/D converter (see NPLC).

NRDGS: \textit{[count \{event\} ]}
Specifies the number of readings per trigger and the event (sample event) which initiates each reading on the HP 34520 Multimeter in the current USE slot.

\textit{count: 1 - 32767,}
\textit{event: AUTO (1), EXT (2), TIMER (6), TB0 (7), TB1 (8), EXTBAR (9).}

NRDGS?
Returns two values indicating the number of readings per trigger and the sample event for the HP 34520 Multimeter in the current USE slot (see NRDGS).

OCOMP: \textit{[control]}
Enables or disables the offset compensated ohms function for the HP 34520 Multimeter in the current USE slot.

\textit{control: OFF (0), ON (1).}

OCOMP?
Returns "OFF" if the HP 34520 Multimeter's offset compensation function is disabled (OCOMP OFF) or "ON" if the offset compensation function is enabled (OCOMP ON).

OFF event
Prevents the action of a service subroutine when an enabled event interrupt occurs or when the count on the specified timer channel reaches zero.

\textit{event: INTR, TIMER0, TIMER1.}

OFORMAT: \textit{format}
Designates the output format (ASCII or Binary) for HP 3235 commands that generate data.

\textit{format: ASCII, BINARY.}

ON event CALL sub\_name
Executes the named subroutine when an enabled event interrupt occurs or when the count on the specified timer channel reaches zero.

\textit{event: INTR, TIMER0, TIMER1.}
\textit{sub\_name: Mainframe subroutine name.}

OPEN: \textit{relay\_list}
Switching Modules: opens the specified relays or channels. HP 34522 Digital I/O: sets the specified bits (logic "1").

\textit{relay\_list: List of relay, channel, or bit numbers ("esnn").}

OUTBUF \textit{mode}
Enables or disables the HP 3235 output buffer. Output buffer capacity is 2048 bytes.

\textit{mode: OFF, ON.}

PAUSE
Pauses the most recent subroutine executed with the RUN command.

PAUSED?
Returns "1" if the current subroutine is paused or "0" if the subroutine is running (or finished running). Only subroutines executed with the RUN command can be paused.

PFCLOSE: \textit{relay\_list}
Closes the specified relays when power fails. Valid for: HP 34501 Armature Relay Mux.

\textit{relay\_list: List of relay or channel numbers ("esnn").}

PFCLOSE? \textit{relay#}
Returns one of three numbers indicating the programmed power fail state. Valid for: HP 34501 Armature Relay Mux, HP 34504 Coaxial Mux, HP 34506 Coaxial Matrix.

\textit{0 = Relay Open (PFOPEN command).}
\textit{1 = Relay Closed (PCLOSE command).}
\textit{2 = Relay Same (PFSAME command).}

\textit{relay#: Single relay or channel number ("esnn").}

PFOPEN: \textit{relay\_list}
Opens the specified relays or channels when power fails. Valid for: HP 34501 Armature Relay Mux, HP 34504 Coaxial Mux, HP 34506 Coaxial Matrix.

\textit{relay\_list: List of relay or channel numbers ("esnn").}

PFSAME: \textit{relay\_list}
Leaves the designated relays or channels in the same state when power fails. Valid for: HP 34501 Armature Relay Mux, HP 34504 Coaxial Mux, HP 34506 Coaxial Matrix.

\textit{relay\_list: List of relay or channel numbers ("esnn").}

PNSRQ \textit{mode}
Enables or disables assertion of the HP-IB SRQ line at power-on.

\textit{mode: ON, OFF. Default = most recent value stored in continuous memory. Factory setting = OFF.}

PROHIBIT: \textit{[combination] \{relay\_list\}}
Prevents closures of the specified plug-in module relays, channels, or bits.

\textit{combination: ANYOF, TWOOF, ALLOF.}
\textit{relay\_list: List of relay, channel, or bit numbers ("esnn").}

PROHIBIT?
Returns a list of all prohibited relays and relay combinations (see PROHIBIT command).
PSCAN [ABn, [ABn,] FAST,] ch_list
Connects channel pairs to the specified analog buses for measurement by an external instrument.

ABn: Analog buses 0, 1, 2, or 3. Default = no analog bus connection.
FAST: Closes all backplane relays required to make connection to the specified analog bus before the scan starts (useful only for HP 34502 and HP 34597).
ch_list: List of channel numbers ("esun").

PULLUP mode
Configures the HP 34522 Digital I/O Module (current USE port) for either totem-pole or open-collector output ports.

mode: ENABLE (totem-pole), DISABLE (open-collector).

PULSE TIMERa, width
Outputs a low-to-high pulse from the specified timer channel.

TIMERa: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).
width: 0.625E-6 - 0.083918 seconds or 1 - 65535 clock pulses (one clock pulse = 1.25 μs).

PURGE name
Deletes the specified stored state (SSTATE command) from HP 3235 memory.

name: Mainframe stored state name.

RANGE [max_input, % resolution]
Selects measurement range or the autorange mode for the HP 34520 Multimeter in the current USE slot.

max_input:
For Voltage: AUTO or 0 - 300.
For AC Current: AUTO or 0 - 1.
For DC Current: AUTO or 0 - 1.5.
For Ohms: AUTO or 0 - 3E9.

% resolution: percentage of max_input (default set by the NPLC command).

RANGE?
Returns the present measurement range for the HP 34520 Multimeter in the current USE slot. If AUTO (autorange) is selected, "-1" is returned.

RBIT bit# Returns the logic value ("0" or "1") of a single bit on the HP 34522 Digital I/O Module in the current USE slot.

bit#: Numbered 0-7 for 8-bit ports, 0-15 for 16-bit ports, and 0-31 for 32-bit ports.

READ (multimeter)
Transfers each reading made using a hardware trigger from the HP 34520 Multimeter to the HP-IB output buffer or to a memory location.

READ (digital I/O)
Reads a single word from the HP 34522 Digital I/O port selected by the USE command.

READBLK array_name [length]
Reads a series (a block) of words from the HP 34522 Digital I/O Module in current USE slot and stores them into a mainframe integer array.

array_name: Mainframe array name.
length: Number of words to be read from port. Default = entire array.

READ COUNT TIMERa
Reads the current counter value on the specified timer channel.

TIMERa: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).

READY?
Returns "1" when the HP 3235 is ready to execute a new command. Most useful with INBUF ON.

REAL name [max_index] [name [max_index], ...]
Reserves mainframe memory space to store real variables or arrays.

name: Mainframe variable or array name.
max_index: Maximum index of the array (range = 0 through 32767).

RESET [slot_list]
Resets the entire HP 3235 system or places the specified plug-in modules in their reset states. Abbreviation: RST.

slot_list: List of slot numbers ("es00"). Default = entire system.

RETURN
Returns program execution from a subroutine to the program line following the CALL statement. For subroutines executed with the RUN command, this command terminates execution of the subroutine.

REV?
Returns the HP 3235 firmware revision date code in the form "yyww", where "yy" is the year minus 1960, and "ww" is the week of the year.

RFLG
Returns the logic state of the FLG (flag input) handshake line on the HP 34522 Digital I/O port specified in the USE command. This command is useful only with HSTYPE NONE.

RLEVEL
Returns the decimal equivalent of the "live" bit pattern of the eight event bits on the HP 34522 Digital I/O Module.

RMT
Executes a soft local lockout which disables the control panel Local key while in remote.

ROTATE (argument, bit displacement)
Returns an integer obtained by rotating the argument a specified number of positions with bit wraparound.

argument: Number or numeric expression in the range -32768 to +32767.
bit_displacement: Specifies the number of positions the bits are rotated. Positive values rotate the argument toward the LSB and negative values rotate the argument toward the MSB.
RQS • SET COUNT

RQS unmask_ value
Sets bits in the RQS mask register to determine which conditions assert the SRQ line and status bit.

unmask_ value:

<table>
<thead>
<tr>
<th>Bit Number</th>
<th>Decimal Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Data Available</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Not Used</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>User Service Request</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Local</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Ready</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Error</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>SRQ Sent.</td>
</tr>
<tr>
<td>7-8</td>
<td></td>
<td>Not Used.</td>
</tr>
<tr>
<td>9</td>
<td>512</td>
<td>Backplane Event</td>
</tr>
<tr>
<td>10</td>
<td>1024</td>
<td>Device-Under-Test Limit Failure</td>
</tr>
<tr>
<td>11</td>
<td>2048</td>
<td>Fixture Open</td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
<td>Interrupt on TIMER 0</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
<td>Interrupt on TIMER 1</td>
</tr>
<tr>
<td>14-15</td>
<td></td>
<td>Not Used.</td>
</tr>
</tbody>
</table>

RQS?
Returns the numeric sum of all conditions which are enabled for SRQ interrupts by the RQS command.

RSEVENT
Performs a non-destructive read of the event bits on the HP 34522 Digital I/O Module and returns the decimal equivalent of the bits which have detected events.

RSEVERR
Performs a non-destructive read of the event error register on the HP 34522 Digital I/O Module and returns the decimal equivalent of the bits in the register.

RST [slot_list]
See the RESET Command.

RSTATE name [slot_list]
Recalls the state of the HP 3235 or the specified plug-in modules as set by the SSTATE (store state) command.

name: Mainframe storec state name.
slot_list: List of slot numbers ("es00"). Default = store entire instrument state.

RUN sub_name
Executes the named sub-routine in parallel with other commands.

sub_name: Mainframe subroutine name.

SADV [source]
Specifies the scan advance signal for scanning using MEAS, PSCAN, SCAN, and VERIFY.

source: AUTO or SCAN, EXTIN, TB0, TBI, HOLD, SGL.

SCAN [ABn.] [FAST,] ch_list
Connects a channel list to the specified analog bus for measurement by an external instrument.

ABn: Analog buses 0, 1, 2, or 3. Default -- no analog bus connection.
FAST: Closes all backplane relays required to make connection to the specified analog bus before the scan starts (useful only for HP 34502 and HP 34507).
ch_list: List of channel numbers ("es00").

SCRATCH [CONT]
deletes (scratches) all user-defined arrays, variables, subroutines, and stored states from HP 3235 volatile and continuous memory.

CONT: If CONT is used, the contents of continuous memory are deleted. If not used, only the contents of volatile memory are deleted.

SELECT ch_list
Switching Modules: opens all channels in the associated bank, waits for the relays to settle, and then closes the specified channels.
HP 34522 Digital I/O: sets ("1") all bits on the current USE port and then clears ("0") the specified bits.

ch_list: List of channel numbers ("es00").

SER?
Returns "0000A00000"

SERIAL mode
Enables or disables serial command execution.

mode: ON, OFF.

SET block_data
Instructs the HP 3235 to accept a block of binary data, from the system controller, specifying the HP 3235's internal hardware setup state (use SET? to load state into controller).

block_data: Block of data in IEEE-728 Block A format.

SET?
Dumps the complete instrument state, in IEEE-728 Block A format, to the system controller (use SET to restore the state).

SET CLKSRC TIMERn, source
Sets the clock source for the specified timer channel.

TIMERn: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).
source: INT, BP, ETBO, ETBI, EXTIN.

SET COUNT TIMERn, value
Sets the counter value for the specified timer channel. The count is decremented from the specified value when clock pulses are received. The first clock pulse that occurs after the counter reaches 0 reloads the counter with the given value.

TIMERn: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).
value: 0 - 65535.
SET OUTPUT TIMERn, mode
Enables or disables outputs from the specified timer channel. Disabled timer channel outputs go to 0V.

TIMERn: Specifies timer channel 0 (TIMER0) or timer channel 1 (TIMER1).
mode: ON, OFF.

SET TIME seconds
Sets the HP 3235 internal clock in number of seconds since midnight. The time is stored in volatile memory and is lost when power is removed.

seconds: Seconds since midnight in the range 0 through 86399.9 (resolution = 0.01 seconds).

SETTLE
Ensures that all relays or channels have settled from a previous command before processing another command. Useful only with SERIAL OFF.

SHIFT (argument, bit displacement)
Returns an integer obtained by shifting the argument a specified number of positions without bit wraparound.

argument: Number or numeric expression in the range -32768 to +32767.
bit displacement: Specifies the number of positions the bits are shifted. Positive values shift the argument toward the LSB and negative values shift the argument toward the MSB.

SIN (argument)
Returns the sine of the angle (in radians) represented by the argument.

argument: Number or numeric expression in the range \( \pm 2.98156826 \times 10^8 \).

SIZE? array_name
Returns the number of elements in the specified array.

array_name: Mainframe array name.

SQR (argument)
Returns the square root of the specified argument.

argument: Number or numeric expression greater than or equal to zero.

SQWAVE TIMERn, period
Outputs a continuous square wave from the specified timer channel.

TIMERn: Specifies time: channel 0 (TIMER0) or timer channel 1 (TIMER1).
period: 2.5E-6 - 0.16384124 seconds or 2 - 131070 clock pulses (one clock pulse = 1.25 \( \mu \)S). Clock pulses are rounded up to the next even number.

SRQ
Sets bit 6 in the HP 3235's status register and sets the HP-IB SRQ line true.

SRTRIG source
Specifies the second rank trigger source for buffered output transfers on the HP 34522 Digital I/O Module.

source: INT, EXT, EXTBAR, TB0, TB1, EVENT, LOW, HIGH.

SSTATE name [slot_list ], CONT
Stores the hardware state of the entire HP 3235 system or the plug-in modules in the specified slots. The state may be stored in volatile or continuous memory.

name: Mainframe stored state name.
slot_list: List of slot numbers ("es00").
CONT: If the CONT parameter is used, the state is stored in continuous memory. If not used, the state is stored in volatile memory.

STA?
Returns the system status word which is the weighted sum of all bits set in the status register.

<table>
<thead>
<tr>
<th>Bit Number</th>
<th>Decimal Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Data Available.</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Not Used.</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>User Service Request.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Local.</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Ready.</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Error.</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>SRQ Sent.</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td>Backplane Event</td>
</tr>
<tr>
<td>8</td>
<td>256</td>
<td>Interrupt.</td>
</tr>
<tr>
<td>9</td>
<td>512</td>
<td>Device-Under-Test Limit</td>
</tr>
<tr>
<td>10</td>
<td>1024</td>
<td>Failure.</td>
</tr>
<tr>
<td>11</td>
<td>2048</td>
<td>Fixture Open.</td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
<td>Interrupt on TIMER 0.</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
<td>Interrupt on TIMER 1.</td>
</tr>
<tr>
<td>14-15</td>
<td></td>
<td>Not Used.</td>
</tr>
</tbody>
</table>

STB?
Returns the system status byte which is the weighted sum of the lower eight bits in the status register.

<table>
<thead>
<tr>
<th>Bit Number</th>
<th>Decimal Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Data Available.</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Not Used.</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>User Service Request.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Local.</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Ready.</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Error.</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>SRQ Sent.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Not Used.</td>
</tr>
</tbody>
</table>

STEP [sub_name]
Steps through the specified subroutine, line by line, to verify its operation.

sub_name: Mainframe subroutine name. Default = most recent subroutine to be stepped or paused.

STRIG [source]
Specifies the scan trigger signal for scanning with MEAS, PSCAN, SCAN, and VERIFY.

source: AUTO or SCAN, EXTIN, TB0, TB1, HOLD, SGL.
SUB • VMCMPLT?

SUB sub_name
Instructs the HP 3235 tc store all subsequent commands, until the SUBEND command, in the named subroutine.

sub_name: Mainframe subroutine name.

SUBEND
Identifies where the subroutine ends and also terminates the subroutine entry. All commands between SUB and SUBEND become part of the subroutine.

TBDRI
TBDRI source
Specifies the source to drive one of the mainframe or extender trigger busses from the HP 34522 Digital I/O Module.

TBDRI: Specifies trigger bus 0 (TB0) or trigger bus 1 (TB1).
source: OFF, SRTRIG, SRACK, EXT, EXTBAR, EVENT, LOW, HIGH.

TBDRI? [frame]
Returns the logic level (“0” or “1”) of the backplane trigger bus in the specified frame.

n: Specifies trigger bus 0 or trigger bus 1.
frame: Specifies the mainframe (0 = default) or an extender (1 - 7).

TBUFF [control]
Enables or disables hardware trigger buffering on the HP 34520 Multimeter in the current USE slot.

control: OFF (0), ON (1).

TBUFF?
Returns “OFF” if the HP 34520 Multimeter’s trigger buffering function is disabled (TBUFF OFF) or “ON” if the trigger buffering function is enabled (TBUFF ON).

TERM [source]
Selects the input source for non-scanning measurements using the HP 34520 Multimeter in the current USE slot.

source: OPEN (0), FRONT (1), AB0 (90), AB1 (91), AB2 (92), AB3 (93).

TERM?
Returns a string representing the selected multimeter input terminals (see TERM).

TEST [slot_list]
Performs an unfixed test on a group of plug-in modules. Abbreviation: TST.

slot_list: List of slot numbers (“es00”). Default = all slots.

TIME
Returns the current HP 3235 clock reading in number seconds since midnight.

TIME time
Defines the timer interval for the TIMER event in the NRDGS command on the HP 34520 Multimeter. The time interval is inserted between successive measurements.

time: 690E-6 to 2100 seconds (in 1 µS intervals). Default = 1 (second).

TIMER?
Returns the present timer interval, in seconds, for the NRDGS timer event on the HP 34520 Multimeter in the current USE slot.

TRG
Pulses the backplane trigger bus (high-to-low) specified in the DRIVETRa TRG command.

TRG [event]
Specifies the sample event which initiates a measurement using the HP 34520 Multimeter in the current USE slot.

event: AUTO (1), EXT (2), SGL (3), HOLD (4), TB0 (7), TB1 (8), EXTBAR (9).

TRIG?
Returns a string representing the trigger event for the HP 34520 Multimeter in the current USE slot (see TRIG).

TRIGBUF buffer, mode
Controls the bidirectional trigger bus buffers on the HP 34504 Coaxial MUX, the HP 34506 Coaxial Matrix, and the HP 34523 Breadboard.

buffer: Trigger bus buffer number (“es00” or “es01”).
mode: IN, OUT, OFF.

TST [slot_list]
See the TEST Command.

USE device#
Selects the plug-in module to receive subsequent commands.

device: Device number (“esnn”).

USE?
Returns the address (“esnn”) of the present use device set at power-on or by the USE command (returns “-1” if no multimeter is installed at power-on).

VERIFY [function, ABn, FAST, low_array, high_array, ch_list]
Scans a channel list using the HP 34520 Multimeter and performs a pass/fail limit comparison on each reading.

function: DCV, ACV, ACDCV, DCI, ACI, ACDCI, OHM, OHMF, FREQ, PER.
ABn: Analog bus 0, 1, 2, or 3. Default = AB0. Can also specify Multimeter front terminals (FRONT).
FAST: Closes all backplane relays required to make connection to the specified analog bus before the scan starts (useful only for HP 34502 and HP 34507).
low_array: Lower limit array name.
high_array: Upper limit array name.
ch_list: List of channel numbers (“esnn”).

VMCMPLT [mode]
Controls destination of the voltmeter complete signal on the HP 34520 Multimeter in the current USE slot.

mode: OFF (0), TB0 (1), TB1 (2), FRONT (3).

VMCMPLT?
Returns a string representing the voltmeter complete destination on the HP 34520 Multimeter in the current USE slot (see VMCMPLT).
variable
VREAD expression array_name
   Returns the value of the specified variables, expressions, or arrays.

   variable: Mainframe variable name.
   expression: Number or numeric expression.
   array_name: Mainframe array name.

WAIT seconds
   Waits the specified number of seconds before continuing.

   seconds: 0 - 21,474,836.

WAITFOR source [timeout_value]
   Waits until a trigger is received from the specified source or until a timeout value (in seconds) is reached.

   source: EXTN, TB0, TB1.
   timeout_value: 0 - 32767.00 seconds (Default = 0, no timeout limit).

WBIT bit#, value
   Writes a logic “0” or “1” to a single bit on the HP 34522 Digital I/O Module in the current USE slot.

   bit#: Numbered 0-7 for 8-bit ports, 0-15 for 16-bit ports, and 0-31 for 32-bit ports.
   value: 0, 1.

WCTL value
   Writes “0” or “1” to the CTL (control output) handshake line on the HP 34522 Digital I/O port specified in the USE command. This command is useful only with HSTYPE NONE.

   value: 0, 1.

WHILE expression
   program segment
END WHILE
   Defines a loop which is repeated as long as the numeric expression is true within an HP 3235 subroutine.

   expression: Number or numeric expression.

WRITE [data2,] data1
   Writes a single word to the HP 34522 Digital I/O port selected by the USE command.

   data2: Upper 16-bit word for 32-bit transfers.
   data1: Lower 8- or 16-bit word.

WRITEBLK array_name [length]
   Writes a series (a block) of words from a mainframe integer array to the HP 34522 Digital I/O port selected by the USE command.

   array_name: Mainframe array name.
   length: Number of words to write to the port. Default = entire array.

XFERMODE mode
   Configures the output ports of the HP 34522 Digital I/O Module for “live” or “buffered” transfers.

   mode: LIVE, BUFFERED.

XFERWIDTH width
   Defines the port size (in bits) for input and output transfers on the HP 34522 Digital I/O Module in the current USE slot.

   width: 8, 16, 32.
HP-IB Command Summary

ABORTIO 7 (IFC)
Clears the HP 3235's interface circuitry.

CLEAR (DCL or SDC)
Clears the HP 3235 preparing it to receive a command (same as the CLR command).

LOCAL (GTL)
Removes the HP 3235 from the remote state and enables the control panel keyboard (provided that the keyboard is not disabled with the LOCK command).

REMOTE
Sets the HP-IB REN line true.

SPOLL (Serial Poll)
Returns a number representing the bits in the status register (status byte). The number returned is the weighted sum of all set bits.

<table>
<thead>
<tr>
<th>Bit Number</th>
<th>Decimal Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Data Available.</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Not Used.</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>User Service Request.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Local.</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Ready.</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Error.</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>SRQ Sent.</td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>Not Used.</td>
</tr>
</tbody>
</table>

TRIGGER (GET)
If the DRIVETB or command is set for TRG, then the HP-IB TRIGGER command pulses the specified backplane trigger bus.
Module Diagrams (cont)

16 INDEPENDENT RELAYS

RELAY Ø1

RELAY Ø2

RELAY Ø3

RELAY 16

TERMINAL BLOCK

HP3235 MAINFRAME OR EXTENDER SYSTEM SIDE

NON-ISOLATION JUMPER

CHASSIS GND

NOTES: NO = NORMALLY OPEN CONTACT
       NC = NORMALLY CLOSED CONTACT
       COM = COMMON CONTACT

F. 3.1

HP 34503
GP Relay Module
Module Diagrams (cont)

HP 34504
Coaxial Mux Module
Module Diagrams (cont)

BNC CONNECTOR

SMB CONNECTOR

HP 34505
RF Mux Module
Module Diagrams (cont)

HP 34522

I/O Ports

HIGH-POWER LINES

PORT 00
I/O 00
CTL 00
FLG 00

HIGH-POWER LINES

PORT 10
I/O 10
CTL 10
FLG 10

PORT 20
I/O 20
CTL 20
FLG 20

PORT 30
I/O 30
CTL 30
FLG 30

TRIG BUS 0
TRIG BUS 1
INT STATUS
SYNC
ERROR
ERROR
EXT TRIG
EXT TRIG

CONTROL LINES

EVENT INTERRUPT CIRCUITRY

MAINFRAME/EXTENDER SYSTEM SIDE

NON-ISOLATION JUMPER

F.8.1

HP 34522
Digital I/O Module
### Error Messages

<table>
<thead>
<tr>
<th>Syntax</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR 01 &quot;INCOMPLETE COMMAND&quot;</td>
<td>ERROR 81 &quot;COMMAND TIMEOUT&quot;</td>
</tr>
<tr>
<td>ERROR 02 &quot;SYNTAX&quot;</td>
<td>ERROR 82 &quot;BUSY TOO LONG&quot;</td>
</tr>
<tr>
<td>ERROR 03 &quot;CANNOT RE-TYPE A VARIABLE&quot;</td>
<td>ERROR 83 &quot;BP ERROR FROM SLOT&quot;</td>
</tr>
<tr>
<td>ERROR 04 &quot;ERROR IN #A BLOCK&quot;</td>
<td>ERROR 84 &quot;UNEXPECTED INTR&quot;</td>
</tr>
<tr>
<td>ERROR 05 &quot;ARRAY SIZE OR TYPE MISMATCH&quot;</td>
<td>ERROR 85 &quot;SYSTEM TRIG TOO FAST&quot;</td>
</tr>
<tr>
<td>ERROR 06 &quot;COMMAND TOO LONG&quot;</td>
<td>ERROR 86 &quot;PROHIBITED SWITCH&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subroutines</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR 21 &quot;NOT ALLOWED IN SUB&quot;</td>
<td>ERROR 91 &quot;SYSTEMERROR&quot;</td>
</tr>
<tr>
<td>ERROR 22 &quot;ALLOWED ONLY IN SUB&quot;</td>
<td>ERROR 92 &quot;BUS ERROR&quot;</td>
</tr>
<tr>
<td>ERROR 23 &quot;NEXT WITHOUT FOR&quot;</td>
<td>ERROR 93 &quot;SYSTEM TRAP&quot;</td>
</tr>
<tr>
<td>ERROR 24 &quot;NEXT VARIABLE NOT SAME AS FOR VARIABLE&quot;</td>
<td>ERROR 94 &quot;MATH ERROR&quot;</td>
</tr>
<tr>
<td>ERROR 25 &quot;EXPECTED NEXT&quot;</td>
<td>ERROR 95 &quot;CPU EXCEPTION&quot;</td>
</tr>
<tr>
<td>ERROR 26 &quot;ELSE OR END IF WITHOUT IF&quot;</td>
<td>ERROR 101 &quot;ILLEGAL TRIGGERING SETUP&quot;</td>
</tr>
<tr>
<td>ERROR 27 &quot;EXPECTED END IF&quot;</td>
<td>ERROR 102 &quot;MM TRIG TOO FAST&quot;</td>
</tr>
<tr>
<td>ERROR 28 &quot;END WHILE WITHOUT WHILE&quot;</td>
<td>ERROR 103 &quot;ERROR - MM HARDWARE&quot;</td>
</tr>
<tr>
<td>ERROR 29 &quot;EXPECTED END WHILE&quot;</td>
<td>ERROR 104 &quot;ERROR - MM HARDWARE&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Memory</th>
<th>Cal Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR 41 &quot;OUT OF MEMORY&quot;</td>
<td>ERROR 111 &quot;PERIOD CAL ILLEGAL&quot;</td>
</tr>
<tr>
<td>ERROR 42 &quot;TOO MANY NESTED CALLS&quot;</td>
<td>ERROR 112 &quot;EXT OHMS CAL ILLEGAL&quot;</td>
</tr>
<tr>
<td>ERROR 43 &quot;TOO MANY NESTED STRUCTURES&quot;</td>
<td>ERROR 113 &quot;AC OFFSET CAL ILLEGAL&quot;</td>
</tr>
<tr>
<td>ERROR 51 &quot;SUB WAS DELETED&quot;</td>
<td>ERROR 114 &quot;CAL SWITCH NOT ENABLED&quot;</td>
</tr>
<tr>
<td>ERROR 52 &quot;NO ACTIVE SUB&quot;</td>
<td>ERROR 115 &quot;CAL SWITCH ENABLED&quot;</td>
</tr>
<tr>
<td>ERROR 53 &quot;SUB NOT PAUSED&quot;</td>
<td>ERROR 116 &quot;CAL INPUT OUT OF RANGE&quot;</td>
</tr>
<tr>
<td>ERROR 54 &quot;SUB IS RUNNING&quot;</td>
<td>ERROR 121 &quot;AC OFFSET ACAL FAIL&quot;</td>
</tr>
<tr>
<td>ERROR 55 &quot;CANNOT DELSUB AN ACTIVE SUB&quot;</td>
<td>ERROR 122 &quot;AC FLATNESS ACAL FAIL&quot;</td>
</tr>
<tr>
<td>ERROR 56 &quot;STATE WAS PURGED&quot;</td>
<td>ERROR 123 &quot;OHMS PRECHARGE ACAL FAIL&quot;</td>
</tr>
<tr>
<td>ERROR 57 &quot;STATE DOES NOT MATCH&quot;</td>
<td>ERROR 124 &quot;EXT OHMS ACAL FAIL&quot;</td>
</tr>
<tr>
<td>ERROR 58 &quot;SUB WAS COMPRESSED&quot;</td>
<td>ERROR 131 &quot;CAL MEMORY LOST&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subroutine Execution/Stored States</th>
<th>Cal Hardware Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR 61 &quot;OUT OF RANGE&quot;</td>
<td>ERROR 132 &quot;AUTO CAL MEMORY LOST&quot;</td>
</tr>
<tr>
<td>ERROR 62 &quot;EMPTY SLOT&quot;</td>
<td>— ACALUNIT required&quot;</td>
</tr>
<tr>
<td>ERROR 63 &quot;NO SUCH EXTENDER&quot;</td>
<td>ERROR 133 &quot;BAD CHECKSUM ON&quot;</td>
</tr>
<tr>
<td>ERROR 64 &quot;WROG CARD TYPE&quot;</td>
<td>ERROR 134 &quot;MM Hardware Error&quot;</td>
</tr>
<tr>
<td>ERROR 65 &quot;COMMAND INCOMPATIBLE WITH SETUP&quot;</td>
<td>ERROR 135 &quot;MM timeout&quot;</td>
</tr>
<tr>
<td>ERROR 66 &quot;SUBSCRIPT OUT OF BOUNDS&quot;</td>
<td>ERROR 151 &quot;INTERRUPT OVERRUN&quot;</td>
</tr>
<tr>
<td>ERROR 67 &quot;ARRAY TOO SMALL&quot;</td>
<td>ERROR 180 &quot;ERROR - MM HARDWARE&quot;</td>
</tr>
<tr>
<td>ERROR 68 &quot;ON BLOCK NOT FOUND&quot;</td>
<td>ERROR 181 &quot;ERROR - MM HARDWARE&quot;</td>
</tr>
<tr>
<td>ERROR 69 &quot;MUST BE IN LOCAL&quot;</td>
<td>ERROR 182 &quot;ERROR - MM HARDWARE&quot;</td>
</tr>
<tr>
<td>ERROR 70 &quot;SETTINGS CONFLICT&quot;</td>
<td>ERROR 183 &quot;ERROR - MM HARDWARE&quot;</td>
</tr>
</tbody>
</table>
Error Messages (cont)

Self-Test

ERROR 201 "PON TEST"
ERROR 202 "DTACK FAIL"
ERROR 203 "CARD ID FAIL"
ERROR 204 "CARD BUSY (D7) STUCK HIGH"
ERROR 205 "CARD BUSY (D7) STUCK LOW"
ERROR 206 "BUSY TOO SHORT"
ERROR 207 "BUSY TOO LONG"
ERROR 208 "RE-TRIG BUSY TIME FAIL"
ERROR 209 "BP/BUSY STUCK LOW"
ERROR 210 "RELAY READBACK FAIL"
ERROR 211 "TRIGGER BUS FAIL"

ERROR 221 "MM SELF TEST"
ERROR 222 "DIG SELF TEST"
ERROR 223 "RELAY OPEN"
ERROR 224 "RELAY SHORTED"
ERROR 225 "TRIGBUF FAIL"