HP 8751A Network Analyzer
HP-IB Programming Manual
Contents

1. General Information

2. Programming Basics
   Preparing for HP-IB Control ......................................... 2-1
   Required Equipment .................................................. 2-1
   Optional Equipment .................................................. 2-1
   Powering Up the System ............................................. 2-2
   Measurement Programming ........................................... 2-4
   Basic Programming Examples ....................................... 2-6
   Setting Up a Measurement ........................................... 2-6
   Performing a Measurement Calibration .............................. 2-8
      Calibration Kits .................................................. 2-8
      Frequency Response Calibration .................................. 2-9
      1-Port Reflection Calibration .................................... 2-11
   Data Transfer from the HP 8751A to a Computer .................. 2-13
      Using Markers to Obtain Trace Data at Specific Points ....... 2-13
      Trace Transfer .................................................. 2-15
      Data Format ..................................................... 2-15
      Data Levels ..................................................... 2-16
      Data Transfer Using ASCII Transfer Format (Form 4) ......... 2-18
      Data Transfer using IEEE 64-bit Floating Point Format (Form 3) 2-20
   Application Example ................................................ 2-22
   Advanced Programming Examples .................................... 2-24
      Using List Frequency Mode ...................................... 2-24
      Using Limit Lines to Perform Limit Testing .................... 2-27
      Storing and Recalling Instrument Status ....................... 2-29
      Coordinating disk storage ...................................... 2-29
      Reading Calibration Data ....................................... 2-31
   Miscellaneous Programming Examples ............................... 2-34
      Controlling Peripherals ......................................... 2-34
      Transferring disk data files .................................... 2-36
      Status Reporting ................................................ 2-38

3. HP-IB Programming Reference
   Notation ........................................................................ 3-1
   Query Commands ..................................................... 3-2
   Suffix .......................................................................... 3-3
   Code Naming Conventions ........................................... 3-3
   Reference ....................................................................... 3-4
   AB ............................................................................. 3-4
   ABODCALI ................................................................... 3-4
   ACTLHFRE ................................................................... 3-4
CLESP 
3-10
CLETRIP 
3-10
COLO(CH1D|CH1M|CH2D|CH2M|GRAT|TEXT|WARN) 
3-10
COLOIBT 
3-10
COLOR value 
3-10
CONM{ON|OFF} 
3-10
CONPCP value [F] 
3-10
CONPCS value [F] 
3-11
CONPLP value [H] 
3-11
CONPLS value [H] 
3-11
CONPDISP{ON|OFF} 
3-11
CONT 
3-11
CONV parameter 
3-11
CONVIDS 
3-11
CONVOFF 
3-11
CONVYREF 
3-12
CONVYTRA 
3-12
CONVZREF 
3-12
CONVZTRA 
3-12
COPA 
3-12
COPT{ON|OFF} 
3-12
CORR{ON|OFF} 
3-12
COUC{ON|OFF} 
3-12
CWFREQ value [suffix] 
3-12
DATI 
3-13
DAYMYEAR 
3-13
DCBUS value 
3-13
DCCOR{ON|OFF} 
3-13
DEFC 
3-12
DEFS value 
3-13
DELA 
3-13
DELO 
3-13
DELR{1-8} 
3-13
DELRFIXM 
3-14
DESTOFF 
3-14
DESTON 
3-14
DFLT 
3-14
DISA parameter 
3-14
DISAALLB 
3-14
DISAALLI 
3-14
DISABASS 
3-14
DISAHIBB 
3-14
DISL{1|2} 
3-15
DISLIST 
3-15
DISMCTSP 
3-15
DISMMD 
3-15
DISMNUM 
3-15
DISMSTEP 
3-15
DISMSTSP 
3-15
DISMUL 
3-15
DISP parameter 
3-15
<table>
<thead>
<tr>
<th>Command</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISPDATA</td>
<td>3-16</td>
</tr>
<tr>
<td>DISPDATM</td>
<td>3-16</td>
</tr>
<tr>
<td>DISPDDM</td>
<td>3-16</td>
</tr>
<tr>
<td>DISPDMM</td>
<td>3-16</td>
</tr>
<tr>
<td>DISPMMM</td>
<td>3-16</td>
</tr>
<tr>
<td>DISPMM</td>
<td>3-16</td>
</tr>
<tr>
<td>DIPMEMO</td>
<td>3-16</td>
</tr>
<tr>
<td>DONE</td>
<td>3-16</td>
</tr>
<tr>
<td>DUAC{ON</td>
<td>OFF}</td>
</tr>
<tr>
<td>EDITDONE</td>
<td>3-16</td>
</tr>
<tr>
<td>EDITLIML</td>
<td>3-16</td>
</tr>
<tr>
<td>EDITLIS1</td>
<td>3-17</td>
</tr>
<tr>
<td>EDITLIS2</td>
<td>3-17</td>
</tr>
<tr>
<td>EDITLIST</td>
<td>3-17</td>
</tr>
<tr>
<td>ELED value [s]</td>
<td>3-17</td>
</tr>
<tr>
<td>ESB?</td>
<td>3-17</td>
</tr>
<tr>
<td>ESNB value</td>
<td>3-17</td>
</tr>
<tr>
<td>EXEDCALI</td>
<td>3-17</td>
</tr>
<tr>
<td>EXET</td>
<td>3-17</td>
</tr>
<tr>
<td>EXPP</td>
<td>3-17</td>
</tr>
<tr>
<td>EXTRLOCK?</td>
<td>3-17</td>
</tr>
<tr>
<td>EXTT parameter</td>
<td>3-18</td>
</tr>
<tr>
<td>EXTT OFF</td>
<td>3-18</td>
</tr>
<tr>
<td>EXTTON</td>
<td>3-18</td>
</tr>
<tr>
<td>EXTTPOIN</td>
<td>3-18</td>
</tr>
<tr>
<td>FBUS value</td>
<td>3-18</td>
</tr>
<tr>
<td>FIRLANOR</td>
<td>3-18</td>
</tr>
<tr>
<td>FIRLAPE</td>
<td>3-18</td>
</tr>
<tr>
<td>FIRLPNOR</td>
<td>3-18</td>
</tr>
<tr>
<td>FIRLPOPE</td>
<td>3-19</td>
</tr>
<tr>
<td>FIRR?</td>
<td>3-19</td>
</tr>
<tr>
<td>FMT parameter</td>
<td>3-19</td>
</tr>
<tr>
<td>FNDAUTO</td>
<td>3-19</td>
</tr>
<tr>
<td>FNDMANU</td>
<td>3-19</td>
</tr>
<tr>
<td>FNDVALU value</td>
<td>3-19</td>
</tr>
<tr>
<td>FNVNORM</td>
<td>3-19</td>
</tr>
<tr>
<td>FNVOPEN</td>
<td>3-19</td>
</tr>
<tr>
<td>FREO</td>
<td>3-19</td>
</tr>
<tr>
<td>FORM2</td>
<td>3-20</td>
</tr>
<tr>
<td>FORM3</td>
<td>3-20</td>
</tr>
<tr>
<td>FORM4</td>
<td>3-20</td>
</tr>
<tr>
<td>FORM5</td>
<td>3-20</td>
</tr>
<tr>
<td>FULP</td>
<td>3-20</td>
</tr>
<tr>
<td>FWDI</td>
<td>3-20</td>
</tr>
<tr>
<td>FWDM</td>
<td>3-20</td>
</tr>
<tr>
<td>FWDT</td>
<td>3-20</td>
</tr>
<tr>
<td>GRODAPER value [pct]</td>
<td>3-20</td>
</tr>
<tr>
<td>HOLD</td>
<td>3-20</td>
</tr>
<tr>
<td>IFBW value [suffix]</td>
<td>3-21</td>
</tr>
<tr>
<td>IFBW AUTO</td>
<td>3-21</td>
</tr>
<tr>
<td>IFRAUTO</td>
<td>3-21</td>
</tr>
<tr>
<td>IFRC?</td>
<td>3-21</td>
</tr>
<tr>
<td>IFRX1</td>
<td>3-21</td>
</tr>
<tr>
<td>Command</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------</td>
</tr>
<tr>
<td>IFRX1X8</td>
<td>3-21</td>
</tr>
<tr>
<td>IFRX64</td>
<td>3-21</td>
</tr>
<tr>
<td>IFRX8X1</td>
<td>3-21</td>
</tr>
<tr>
<td>IMAG</td>
<td>3-21</td>
</tr>
<tr>
<td>INID</td>
<td>3-22</td>
</tr>
<tr>
<td>INP8IO</td>
<td>3-22</td>
</tr>
<tr>
<td>INPUCALC{01-12} value</td>
<td>3-22</td>
</tr>
<tr>
<td>INPUCALK value</td>
<td>3-22</td>
</tr>
<tr>
<td>INPUDATA value</td>
<td>3-22</td>
</tr>
<tr>
<td>INPUFORM value</td>
<td>3-22</td>
</tr>
<tr>
<td>INPURAW{1-4} value</td>
<td>3-22</td>
</tr>
<tr>
<td>INPUUFORM value</td>
<td>3-22</td>
</tr>
<tr>
<td>INTE value</td>
<td>3-23</td>
</tr>
<tr>
<td>INVSCCHAR</td>
<td>3-23</td>
</tr>
<tr>
<td>ISOD</td>
<td>3-23</td>
</tr>
<tr>
<td>ISOL</td>
<td>3-23</td>
</tr>
<tr>
<td>KEY value</td>
<td>3-23</td>
</tr>
<tr>
<td>KITD</td>
<td>3-23</td>
</tr>
<tr>
<td>LABEFWD{M</td>
<td>T} string</td>
</tr>
<tr>
<td>LABERES{I</td>
<td>P} string</td>
</tr>
<tr>
<td>LABEREV{M</td>
<td>T} string</td>
</tr>
<tr>
<td>LABES11{A</td>
<td>B</td>
</tr>
<tr>
<td>LABES22{A</td>
<td>B</td>
</tr>
<tr>
<td>LABK string</td>
<td>3-24</td>
</tr>
<tr>
<td>LABS string</td>
<td>3-24</td>
</tr>
<tr>
<td>LEFL</td>
<td>3-24</td>
</tr>
<tr>
<td>LEFU</td>
<td>3-24</td>
</tr>
<tr>
<td>LIMCLEL</td>
<td>3-24</td>
</tr>
<tr>
<td>LIMD value [suffix]</td>
<td>3-25</td>
</tr>
<tr>
<td>LIMEDONE</td>
<td>3-25</td>
</tr>
<tr>
<td>LIMIAMPO value [suffix]</td>
<td>3-25</td>
</tr>
<tr>
<td>LIMILINE{ON</td>
<td>OFF}</td>
</tr>
<tr>
<td>LIMIMAOF</td>
<td>3-25</td>
</tr>
<tr>
<td>LIMISTIO value [suffix]</td>
<td>3-26</td>
</tr>
<tr>
<td>LIMITEST{ON</td>
<td>OFF}</td>
</tr>
<tr>
<td>LIML value [suffix]</td>
<td>3-26</td>
</tr>
<tr>
<td>LIMM value [suffix]</td>
<td>3-26</td>
</tr>
<tr>
<td>LIMS value [suffix]</td>
<td>3-27</td>
</tr>
<tr>
<td>LIMSADD</td>
<td>3-27</td>
</tr>
<tr>
<td>LIMSDEL</td>
<td>3-27</td>
</tr>
<tr>
<td>LIMSDON</td>
<td>3-27</td>
</tr>
<tr>
<td>LIMSEDI value</td>
<td>3-27</td>
</tr>
<tr>
<td>LIMU value [suffix]</td>
<td>3-27</td>
</tr>
<tr>
<td>LINFREQ</td>
<td>3-28</td>
</tr>
<tr>
<td>LINM</td>
<td>3-28</td>
</tr>
<tr>
<td>LINT{DATA</td>
<td>MEMO} value</td>
</tr>
<tr>
<td>LISDFBASE</td>
<td>3-28</td>
</tr>
<tr>
<td>LISOBASE</td>
<td>3-28</td>
</tr>
<tr>
<td>LISFREQ</td>
<td>3-28</td>
</tr>
<tr>
<td>LISSLIS1</td>
<td>3-28</td>
</tr>
<tr>
<td>LISSLIS2</td>
<td>3-28</td>
</tr>
</tbody>
</table>
LISV .......................................................... 3-28
LOGFREQ ................................................... 3-29
LOGM ........................................................ 3-29
LOGMD ....................................................... 3-29
LOGMP ....................................................... 3-29
MANTRIG ..................................................... 3-29
MARK{1-8} value [suffix] .................................. 3-29
MARKBUCK value ............................................ 3-29
MARKCENT .................................................. 3-29
MARKCONT ................................................... 3-30
MARKCOUP ................................................... 3-30
MARKDELA ................................................... 3-30
MARKDISC .................................................... 3-30
MARKFAUV value [suffix] .................................. 3-30
MARKFSTI value [suffix] ................................... 3-30
MARKFVAL value [suffix] ................................... 3-30
MARK{ON|OFF} ................................................. 3-31
MARKMIDD ................................................... 3-31
MARKODATA .................................................. 3-31
MARKOFF ..................................................... 3-31
MARKOMEMO .................................................. 3-31
MARKPEAD .................................................... 3-31
MARKREF ..................................................... 3-31
MARKSPAN .................................................... 3-31
MARK{STAR|STOP} ......................................... 3-32
MARKSTIM .................................................... 3-32
MARKTIME{ON|OFF} ....................................... 3-32
MARKUNCO .................................................... 3-32
MARKZERO .................................................... 3-32
MEAS parameter .............................................. 3-32
MEASA ........................................................ 3-32
MEASB ........................................................ 3-32
MEASR ........................................................ 3-32
MEASTAT{ON|OFF} ........................................... 3-33
MIXLPNOR ..................................................... 3-33
MIXLPTES ..................................................... 3-33
MODII ........................................................ 3-33
MONDYEAR ..................................................... 3-33
NEXP .......................................................... 3-33
NUMG value .................................................. 3-33
OFSD value [s] .............................................. 3-33
OFSL value .................................................. 3-34
OFSZ value [ohm] .......................................... 3-34
OMII .......................................................... 3-34
OPEP .......................................................... 3-34
OSE value ..................................................... 3-34
OSR ............................................................ 3-34
OUT{8|10} value .............................................. 3-34
OUTPCALC{01|12}? ......................................... 3-34
OUTPCALK? .................................................... 3-34
OUTPDATA? .................................................... 3-35
OUTPDATA? value ........................................... 3-35
OUTPERRO? .................................................. 3-35
OUTPFAIP? .................................................... 3-35
OUTPFBUS? .................................................... 3-35
OUTPFORM? .................................................... 3-35
OUTPFORMP? value ......................................... 3-35
OUTPFORM? .................................................... 3-35
OUTPINP8IO? ................................................. 3-35
OUTPIFORM? .................................................... 3-35
OUTPIRTMEM? ................................................ 3-36
OUTPITMEM? .................................................... 3-36
OUTPLIMF? ..................................................... 3-36
OUTPLIML? ..................................................... 3-36
OUTPLIMM? ..................................................... 3-36
OUTPMARK? ..................................................... 3-36
OUTPMEMO? ..................................................... 3-36
OUTPMEMOP? value .......................................... 3-36
OUTPMSTA? ..................................................... 3-36
OUTPMWID? ..................................................... 3-36
OUTPRAW{1-4}? .............................................. 3-37
OUTPREAD? ..................................................... 3-37
OUTPRTMEM? .................................................. 3-37
OUTPSTIM? ..................................................... 3-37
OUTPTESS? value ............................................ 3-37
OUTPTTTL? ..................................................... 3-37
OUTPTMEM? ..................................................... 3-37
OUTPTMEMP? value ......................................... 3-37
OUTPUFORM? .................................................. 3-37
PARS{ON|OFF} ............................................... 3-37
PEADX value [suffix] ...................................... 3-38
PEADY value [suffix] ...................................... 3-38
PHAO value [deg] .......................................... 3-38
PHAS .......................................................... 3-38
PLOALL ........................................................ 3-38
PLOC parameter ............................................. 3-39
PLOGRAT ...................................................... 3-39
PLOONLY ....................................................... 3-39
PLOS{FAST|SLOW} .......................................... 3-39
PLOT ........................................................... 3-39
POIN value ................................................... 3-39
POLA ............................................................ 3-39
POLM parameter ............................................. 3-39
POLMLIN ....................................................... 3-39
POLMLOG ....................................................... 3-40
POLMRI ........................................................ 3-40
PORE{ON|OFF} ............................................... 3-40
PORT1 value [s] ............................................. 3-40
PORT2 value [s] ............................................. 3-40
PORTA value [s] ............................................. 3-40
PORTB value [s] ............................................. 3-40
PORTR value [s] ............................................. 3-40

Contents-7
POWD AUTO
POWD MAN
POWD VALU value 3-41
POWE value [dBm] 3-41
POWLANOR 3-41
POWL AOPE 3-41
POWS 3-41
PREP 3-41
PRES 3-41
PRINALL 3-41
PRIC 3-42
PRIFIXE 3-42
PRICVARI 3-42
PRIS 3-42
P SOFT{ON|OFF} 3-42
PURG string 3-42
QUAD parameter 3-42
RAID 3-42
RAID SOL 3-42
RAIRESP 3-43
REAL 3-43
RECC 3-43
RECCOFF 3-43
RECCON 3-43
RECD string 3-43
REFD 3-43
REFL 3-43
REPP value 3-43
REFV value [suffiz] 3-44
RESAVD string 3-44
RESC 3-44
RESD 3-44
RESPDONE 3-44
REST 3-44
REVI 3-45
REVM 3-45
REVT 3-45
RFOPNORM 3-45
RFOPEN 3-45
RIGL 3-45
RIGU 3-45
RSCO 3-45
S11 3-45
S12 3-45
S21 3-46
S22 3-46
SADD 3-46
SAV1 3-46
SAV2 3-46
SAVC 3-46
SAVCA{ON|OFF} 3-46

Contents-8
SAVDALL string .......................................................... 3-46
SAVDA{ON|OFF} ......................................................... 3-46
SAVDDAT string .......................................................... 3-47
SAVDST string .......................................................... 3-47
SAVEUSEK ................................................................. 3-47
SAVMA{ON|OFF} ......................................................... 3-47
SAVR{ON|OFF} ............................................................. 3-47
SAVT{ON|OFF} ............................................................. 3-47
SAVTMA{ON|OFF} ......................................................... 3-47
SAVUA{ON|OFF} ............................................................ 3-47
SCAC ................................................................. 3-48
SCAFDATA ............................................................... 3-48
SCAFMEMO ............................................................... 3-48
SCAL value [suffix] ...................................................... 3-48
SCAPFULL ................................................................. 3-48
SCAPGL ................................................................. 3-48
SCAPGU ................................................................. 3-48
SCAU ................................................................. 3-49
SDEL ................................................................. 3-49
SDON ................................................................. 3-49
SEAL ................................................................. 3-49
SEALMAX ............................................................... 3-49
SEALMIN ............................................................... 3-49
SEAM parameter ....................................................... 3-49
SEAMEAN ............................................................... 3-49
SEAMAX ............................................................... 3-49
SEAMIN ............................................................... 3-49
SEAOFF ............................................................... 3-50
SEAPEAK ............................................................... 3-50
SEAR ............................................................... 3-50
SEASTOR ............................................................... 3-50
SEATARG value [suffix] .............................................. 3-50
SEDI value .............................................................. 3-50
SELC parameter ....................................................... 3-51
SELCPCS ............................................................... 3-51
SELCCPLS .............................................................. 3-51
SELCCSCP .............................................................. 3-51
SELCCSLP .............................................................. 3-51
SELCLPCS .............................................................. 3-51
SELCLPLS .............................................................. 3-51
SELCLSCP .............................................................. 3-51
SELCLSLP .............................................................. 3-51
SELD ................................................................. 3-51
SETCDATE year,month,day ............................................. 3-52
SETCTIME hour, min, sec ............................................. 3-52
SETZ value [ohm] ..................................................... 3-52
SING ................................................................. 3-52
SMIC ................................................................. 3-52
SMIM parameter ....................................................... 3-52
SMIMGB ............................................................... 3-52
SMIMLIN ............................................................... 3-53

Contents-9
SMIMLOG 3-53
SMIMRI 3-53
SMIMRX 3-53
SMOOAPER value [pct] 3-53
SMOO{ON|OFF} 3-53
SOUCOFF 3-53
SOUCON 3-53
SPAN value [suffix] 3-53
SPECFWDM $A\{B,C[D,E,F,G]\}[][][] 3-54$
SPECFWDT $A\{B,C[D,E,F,G]\}[][][] 3-54$
SPECRESI $A\{B,C,D,E,F,G\}[][][] 3-54$
SPECRESP $A\{B,C,D,E,F,G\}[][][] 3-54$
SPECREVM $A\{B,C,D,E,F,G\}[][][] 3-54$
SPECREV T $A\{B,C,D,E,F,G\}[][][] 3-54$
SPECSE1A $A\{B,C,D,E,F,G\}[][][] 3-55$
SPECSE1B $A\{B,C,D,E,F,G\}[][][] 3-55$
SPECSE1C $A\{B,C,D,E,F,G\}[][][] 3-55$
SPECSE22A $A\{B,C,D,E,F,G\}[][][] 3-55$
SPECSE22B $A\{B,C,D,E,F,G\}[][][] 3-55$
SPECSE22C $A\{B,C,D,E,F,G\}[][][] 3-55$
SPLD{ON|OFF} 3-56
STAN{A-G} 3-56
STAR value [suffix] 3-56
STDD 3-56
STDT parameter 3-56
STDTARBI 3-56
STDTDELA 3-56
STDTLOAD 3-56
STDTOPEN 3-57
STDTSHOR 3-57
STEODAUT 3-57
STEODMAN 3-57
STEODVAL value 3-57
STEONORM 3-57
STEOPEN 3-57
STOP value [suffix] 3-57
STPSIZE value [suffix] 3-57
SVCO 3-58
SWET value [s] 3-58
SWETAUTO 3-58
SWPT parameter 3-58
SWR 3-58
TERI value [ohm] 3-58
TESC 3-58
TESS? 3-58
TEST value 3-58
TINT value 3-59
TITL string 3-59
TRACK{ON|OFF} 3-59
TRAD 3-59
TRAN 3-59
VELOFACT value ........................................ 3-59
WIDSIN ............................................. 3-59
WIDSOUT ............................................ 3-59
WIDT{ON|OFF} ........................................ 3-60
WIDV value [suffiz] .................................. 3-60
*CLS ................................................. 3-60
*ESE value ......................................... 3-60
*ESR? .............................................. 3-60
*IDN? ............................................... 3-60
*OPC ............................................... 3-60
*PCB value ......................................... 3-61
*RST ............................................... 3-61
*SRE value ......................................... 3-61
*STB? .............................................. 3-61
*TRG ............................................... 3-61
*TST? .............................................. 3-61
*WAI ............................................... 3-61

A. HP-IB Commands Summary
Active Channel Block ................................... A-1
Response Function Block ............................... A-1

[MEAS] Key ........................................... A-1
Input Port Menu ..................................... A-1
S-Parameter Menu .................................... A-1
Conversion Menu ..................................... A-2

[FORMAT] Key ........................................ A-2
Format Menu ......................................... A-2
Format More Menu ................................... A-2

[SCALE REF] Key ..................................... A-2
Scale Reference Menu ................................ A-2
Electrical Delay Menu ................................. A-3

[DISPLAY] Key ......................................... A-3
Display Menu ........................................ A-3
Display More Menu .................................. A-3
Display Allocation Menu ............................. A-3
Trace Math Menu .................................... A-3
Conjugate Matching Menu ............................ A-3
Select Circuit Menu ................................ A-4
Adjust Display Menu ................................ A-4
Modify Colors Menu ................................ A-4
Color Adjust Menu .................................. A-4

[AVG] Key ............................................ A-5
Average Menu ....................................... A-5
IF Bandwidth Menu .................................. A-5

[CAL] Key .............................................. A-5
Correction Menu .................................... A-5
Select Cal Kit Menu ................................. A-5
Calibrate More Menu ................................ A-5
Reference Plane Menu ............................... A-5
DC Correction Menu ................................ A-6
Calibration Menu .................................... A-6
<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Cal Menu</td>
<td>A-6</td>
</tr>
<tr>
<td>Response and Isolation Cal Menu</td>
<td>A-6</td>
</tr>
<tr>
<td>S11 and S22 1-Port Cal Menus</td>
<td>A-6</td>
</tr>
<tr>
<td>Full 2-Port Cal Menus</td>
<td>A-6</td>
</tr>
<tr>
<td>One-Path 2-Port Cal Menus</td>
<td>A-7</td>
</tr>
<tr>
<td>Modify Cal Kit Menu</td>
<td>A-7</td>
</tr>
<tr>
<td>Define Standard Menus</td>
<td>A-8</td>
</tr>
<tr>
<td>Specify Offset Menu</td>
<td>A-8</td>
</tr>
<tr>
<td>Specify Class Menus</td>
<td>A-8</td>
</tr>
<tr>
<td>Label Class Menus</td>
<td>A-9</td>
</tr>
<tr>
<td><strong>MKR</strong> Key</td>
<td>A-9</td>
</tr>
<tr>
<td>Marker Menu</td>
<td>A-9</td>
</tr>
<tr>
<td>Active Marker Menu</td>
<td>A-9</td>
</tr>
<tr>
<td>Clear Marker Menu</td>
<td>A-9</td>
</tr>
<tr>
<td>Delta Marker Mode Menu</td>
<td>A-9</td>
</tr>
<tr>
<td>Delta Marker Menu</td>
<td>A-9</td>
</tr>
<tr>
<td>Fixed Marker Menu</td>
<td>A-10</td>
</tr>
<tr>
<td>Marker Mode Menu</td>
<td>A-10</td>
</tr>
<tr>
<td>Polar Marker Menu</td>
<td>A-10</td>
</tr>
<tr>
<td>Smith Marker Menu</td>
<td>A-10</td>
</tr>
<tr>
<td><strong>MKR FCTN</strong> Key</td>
<td>A-10</td>
</tr>
<tr>
<td>Marker Function Menu</td>
<td>A-10</td>
</tr>
<tr>
<td>Search Range Menu</td>
<td>A-10</td>
</tr>
<tr>
<td>Marker Search Menu</td>
<td>A-11</td>
</tr>
<tr>
<td>Target Menu</td>
<td>A-11</td>
</tr>
<tr>
<td>Marker Search More Menu</td>
<td>A-11</td>
</tr>
<tr>
<td>Width Menu</td>
<td>A-11</td>
</tr>
<tr>
<td><strong>ATTEN</strong> Key</td>
<td>A-11</td>
</tr>
<tr>
<td>Stimulus Function Block</td>
<td>A-12</td>
</tr>
<tr>
<td><strong>MENU</strong> Key</td>
<td>A-12</td>
</tr>
<tr>
<td>Stimulus Menu</td>
<td>A-12</td>
</tr>
<tr>
<td>Power Menu</td>
<td>A-12</td>
</tr>
<tr>
<td>Sweep Time Menu</td>
<td>A-12</td>
</tr>
<tr>
<td>Trigger Menu</td>
<td>A-12</td>
</tr>
<tr>
<td>Sweep Type Menu</td>
<td>A-12</td>
</tr>
<tr>
<td>List Sweep Menu</td>
<td>A-13</td>
</tr>
<tr>
<td>Edit List Menu</td>
<td>A-13</td>
</tr>
<tr>
<td>Edit Segment Menu</td>
<td>A-13</td>
</tr>
<tr>
<td>Edit Segment More Menu</td>
<td>A-13</td>
</tr>
<tr>
<td>Clear List Menu</td>
<td>A-13</td>
</tr>
<tr>
<td>Instrument State Function Block</td>
<td>A-14</td>
</tr>
<tr>
<td><strong>SYSTEM</strong> Key</td>
<td>A-14</td>
</tr>
<tr>
<td>Real Time Clock Menu</td>
<td>A-14</td>
</tr>
<tr>
<td>Limits Menu</td>
<td>A-14</td>
</tr>
<tr>
<td>Edit Limits Menu</td>
<td>A-14</td>
</tr>
<tr>
<td>Edit Segment Menu</td>
<td>A-14</td>
</tr>
<tr>
<td>Clear List Menu</td>
<td>A-14</td>
</tr>
<tr>
<td>Offset Limit Menu</td>
<td>A-14</td>
</tr>
<tr>
<td><strong>LOCAL</strong> Key</td>
<td>A-15</td>
</tr>
<tr>
<td><strong>PRESET</strong> Key</td>
<td>A-15</td>
</tr>
<tr>
<td><strong>COPY</strong> Key</td>
<td>A-15</td>
</tr>
</tbody>
</table>
Copy Menu .................................................. A-15
Print/Plot Setup Menu .................................. A-15
Select Quadrant Menu .................................. A-15
Define Plot Menu ......................................... A-15
Scale Plot Menu ........................................... A-16
Copy More Menu ........................................... A-16
Copy Cal Kit Menu ....................................... A-16
Copy Standard Number Menu ......................... A-16
Copy List Sweep Menu ................................... A-16
Copy Limit Test Menu ................................... A-16
Screen Menu .............................................. A-16
(SAVE) and (RECALL) Keys ............................... A-17
Save Menu ................................................ A-17
Define Save Menu ...................................... A-17
Define Save Date Menu ................................ A-17
Disk Menu ............................................... A-17
Recall Menu ............................................. A-17
Service Function ........................................ A-17
Commands Which Don’t Have Equivalent Softkey Labels A-19
IEEE 488.2 Common Commands ......................... A-20

B. Status Reporting

C. Key Codes

D. Calibration Types and Standard Classes, and Calibration Arrays

Messages:
ERROR MESSAGES IN ALPHABETICAL ORDER ......... Messages-1
ERROR MESSAGES IN NUMERICAL ORDER .......... Messages-14
Figures

2-1. HP-IB Connections in a Typical Setup ........................................ 2-2
2-2. Typical Measurement Sequence .................................................. 2-4
2-3. Sample Program: Setting Up a Measurement ................................. 2-6
2-4. Sample Program: Frequency Response Calibration .......................... 2-9
2-5. 1-port Reflection Calibration ...................................................... 2-12
2-6. Sample Program: Using Markers to Obtain Trace Data at Specific Points 2-13
2-7. Form 2 Data Transfer Format ...................................................... 2-15
2-8. Form 3 Data Transfer Format ...................................................... 2-15
2-9. Data Processing Chain .............................................................. 2-17
2-10. Sample Program: Data Transfer using ASCII Transfer Format (Form 4) 2-18
2-11. Sample Program: Data Transfer using IEEE 64-bit Floating Point Format (Form 3) .................................................. 2-21
2-12. Sample Program: Application Example (Bandpass Filter Test) .......... 2-23
2-14. Sample Program: Setting up Limit Lines ..................................... 2-28
2-15. Sample Program: Storing Instrument States .................................. 2-29
2-16. Reading calibration data ............................................................. 2-32
2-17. Sample Program: Controlling Peripherals .................................... 2-35
2-18. Sample Program: Transferring Disk Data Files ............................. 2-37
2-19. Sample Program: Generating Interrupts ...................................... 2-39
B-1. Status Reporting Structure ....................................................... B-1
C-1. Key Codes ................................................................................. C-1

Tables

2-1. Units as a Function of Display Format .......................................... 2-14
3-1. HP-IB Code Naming Convention .................................................. 3-3
B-1. Status Bit Definitions of the Status Byte (STB) ............................. B-2
B-2. Status Bit Definitions of the Event Status Register (ESR) ............. B-3
B-3. Status Bit Definitions of the Event Status Register B (ESB) .......... B-4
B-4. Status Bit Definitions of the Operational Status Register (OSR) .... B-4
D-1. Calibration Types and Standard Classes ...................................... D-1
D-2. Calibration Array ....................................................................... D-2
General Information

This manual is an introduction to remote operation of the HP 8751A Network Analyzer using an HP 9000 series 200 or 300 computer. It is a tutorial introduction, using BASIC programming examples. The following is a brief description of each chapter and appendix.

Chapter 2 describes programming basics and provides example programs.
Chapter 3 lists HP-IB commands in alphabetic order.

Appendix A summarizes HP-IB commands according to the softkey labels.
Appendix B describes the status byte register and the other registers of the HP 8751A.
Appendix C provides the codes of the front panel keys for using the KEY HP-IB command.
Appendix D describes the calibration types and the standard classes, and the calibration coefficients.

Error Messages lists error messages with explanations.

The reader should become familiar with the operation of the HP 8751A before controlling it over HP-IB. This manual is not intended to teach BASIC programming or to discuss HP-IB theory; refer to the following documents which are better suited to these tasks.

- For more information concerning the operation of the HP 8751A, refer to the following:
  
  HP 8751A User's Guide
  HP 8751A Reference Manual

- For more information concerning BASIC, refer to the manual set for the BASIC revision being used:
  
  BASIC Programming Techniques
  BASIC Language Reference

- For more information concerning HP-IB, refer to the following:
  
  BASIC Interfacing Techniques
  Tutorial Description of the Hewlett-Packard Interface Bus
  Condensed Description of the Hewlett-Packard Interface Bus
Programming Basics

This chapter describes programming basics and provides example programs.

Preparing for HP-IB Control

To run the examples in this chapter, the following equipment is required:

Required Equipment
1. HP 8751A Network Analyzer
2. HP 9000 Series 200 or 300 computer with enough memory to hold BASIC, needed binaries (refer to “Powering Up the System”), and at least 64 kilobytes of program space.
   A disk drive is required to load BASIC, if no internal disk drive is available.
3. BASIC 3.0 or higher operating system.
4. HP 10833A/B/C/D HP-IB cables to interconnect the computer, the HP 8751A, and any peripherals.

Optional Equipment
1. HP 87511A S-parameter Test Set
2. HP 85032B 50 Ω type-N calibration kit
3. HP 11857D Cable Kit
4. Accessory kit
5. Device under test (DUT)
6. Cables to connect DUT
7. Printer
Powering Up the System

1. Set up the HP 8751A as shown in Figure 2-1.
   Connect the HP 8751A to the computer with an HP-IB cable.

   ![Figure 2-1. HP-IB Connections in a Typical Setup](image)

2. Turn on the computer and load the BASIC operating system.
   Load the following BASIC binary extensions:
   HPIB, GRAPH, IO, KBD, and ERR.
   Depending on the disk drive, a binary such as CS80 may be required.

3. Turn the HP 8751A ON.
   To verify the HP 8751A's address, press **LOCAL** and select **SET ADDRESSES**
   ADDRESS: 8751. If the address has been changed from the default value (17), return it to 17 while performing the examples in this document by pressing **1 7 11** and the presetting the HP 8751A.
   Make sure the HP 8751A is in the **ADDRESSABLE ONLY** mode, as indicated under the **LOCAL** key. This is the only mode in which the HP 8751A will accept HP-IB commands.

4. On the computer, type the following:
   ```plaintext
   OUTPUT 717;"PRES" [Return] (or [EXECUTE])
   ```
   This will preset the HP 8751A. If preset does not occur, there is a problem. First check all HP-IB addresses and connections: most HP-IB problems are caused by an incorrect address and bad or loose HP-IB cables.
| Note | Only the HP 9000 Model 226 and 236 computers have an **EXECUTE** key. The Model 216 has an **EXEC** key with the same function. All other computers use the **Return** key as both execute and enter. The notation **Return** is used in this document. |
Measurement Programming

This section describes how to organize the commands into a measurement sequence. Figure 2-2 shows a typical measurement sequence.

![Measurement Sequence Diagram]

Figure 2-2. Typical Measurement Sequence

- Setting up the HP 8751A

Define the measurement by setting all of the basic measurement parameters. These include all the stimulus parameters: sweep type, span, sweep time, number of points, and RF power level. They also include the parameter to be measured, and both IF averaging and IF bandwidth. These parameters define the way data is gathered and processed within the instrument, and to change one requires that a new sweep be triggered.

There are other parameters that can be set within the HP 8751A that do not affect data gathering directly, such as smoothing, trace scaling or trace math. These functions are classed as post-processing functions: they can be changed with the HP 8751A in the hold mode, and the data will correctly reflect the current state.

The save/recall registers provide a rapid way of setting up an entire instrument state.

- Calibrating

Measurement calibration is normally performed once the HP 8751A state has been defined. Measurement calibration is not required to make a measurement, but it does improve measurement accuracy.

There are several ways to calibrate the HP 8751A as follows:

- The simplest is to stop the program and have the operator perform the calibration from the front panel.

2-4 Programming Basics
Alternatively, the computer can be used to guide the operator through the calibration, as
discussed in “Frequency Response Calibration” and “1-Port Reflection Calibration”.

The last option is to transfer calibration data from a previous calibration back into the
instrument, as discussed in “Reading Calibration Data”.

Connecting device under test

Have the operator connect and adjust the device. The computer can be used to speed the
adjustment process by setting up such functions as limit testing, bandwidth searches, and
trace statistics. All adjustments take place at this stage so that there is no danger of taking
data from the device while it is being adjusted.

Taking data

With the device connected and adjusted, measure its frequency response, and store the data
in the HP 8751A so that there is a valid trace to analyze.

The single sweep command SING is designed to ensure a valid sweep. All stimulus changes
are completed before the sweep is started, and the HP-IB hold state is not released until the
formatted trace is displayed. When the sweep is complete, the HP 8751A is put into the
hold mode, storing the data inside the HP 8751A.

The number of groups commands NUMGn is designed to work the same as single sweep,
except that it triggers n sweeps. This is useful, for example, in making a measurement with
an averaging factor of n. Both single sweep and number of groups restart averaging.

Post-processing

With valid data to operate on, the post-processing functions can be used. Referring ahead
to Figure 2-9, any function that affects the data after the error correction stage can be used.
The most useful functions are trace statistics, marker searches, and electrical delay offset.
If a 2-port calibration is active, then any of the four S-parameters can be viewed without
taking a new sweep.

Transferring data

Lastly, read the results out of the HP 8751A. All the data output commands are designed to
ensure that the data transmitted reflects the current state of the HP 8751A:

OUTPUTDATA, OUTPRAWn, OUTPFORM, etc. will not transmit data until all formatting functions
have been completed.

OUTPLIML, OUTPLIMM, and OUTPLIMF will not transmit data until the limit test has
occurred, if turned ON.

OUTPMARK will activate a marker if one is not already selected, and it will make sure that
any current marker searches have completed before transmitting data.

OUTPMSTA makes sure that statistics have been calculated for the current trace before
transmitting data. If statistics is not turned on, it will turn statistics on to update the
current values, and then turn it OFF.

OUTPMWID makes sure that a bandwidth search has been executed for the current trace
before transmitting data. If bandwidth search is not turned on, it will turn the search on
to update the current values, and then turn it OFF.

Data transfer is discussed further in “Data Transfer from the HP 8751A to a Computer”.
Basic Programming Examples

Setting Up a Measurement

In general, the procedure for setting up measurements on the HP 8751A via HP-IB follows the same sequence as if the setup was performed manually. There is no required order, as long as the desired frequency range, number of points and power level are set prior to performing the calibration.

By interrogating the HP 8751A to determine the actual values of the start, the stop, or the center frequencies, or the frequency span, the computer can keep track of the actual frequencies.

This example illustrates how a basic measurement can be set up on the HP 8751A. The program will first select the desired parameter, the measurement format, and then the frequency range.

This example sets up a measurement of transmission log magnitude on channel 1. When prompted for the center frequency and the frequency span, enter any value in Hz from 1.0E+5 (for the S-parameter Test Set) to 5.0E+8. These will be entered into the HP 8751A, and the frequencies will be displayed.

```
10 !
20 ! Setting Up a Measurement
30 !
40 H8751=717
50 ABORT 7
60 CLEAR H8751
70 !
80 OUTPUT H8751;"PRES"
90 OUTPUT H8751;"CHAN1;S21;LOGM"
100 INPUT "Enter center frequency (Hz)",F_cent
110 INPUT "Enter frequency span (Hz)",F_span
120 OUTPUT H8751;"CENT ";F_cent
130 .OUTPUT H8751;"SPAN ";F_span
140 !
150 OUTPUT H8751;"CENT?"
160 ENTER H8751;F_cent
170 OUTPUT H8751;"SPAN?"
180 ENTER H8751;F_span
190 PRINT "Center frequency: ",F_centr;"Hz"
200 PRINT "Frequency span: ",F_spanr;"Hz"
210 END
```

Figure 2-3. Sample Program: Setting Up a Measurement

Line 40 Assigns HP 8751A HP-IB address.

Lines 50 and 60 Prepares for HP-IB control.

Line 80 Presets the HP 8751A.
Line 90 Makes channel 1 the active channel, and measures the transmission parameter, $S_{21}$, displaying its magnitude in dB.

Lines 100 and 110 Inputs the center frequency and the frequency span.

Lines 120 and 130 Sets the center frequency and the frequency span to the HP 8751A.

Lines 150 through 180 Queries the center frequency and the frequency span.

Lines 190 and 200 Shows the current center frequency and the frequency span.
Performing a Measurement Calibration

This section will demonstrate how to coordinate a measurement calibration over HP-IB. The HP-IB program follows the key strokes required to calibrate from the front panel: there is a command for every step.

The general keystrokes sequence is to select the calibration, measure the calibration standards, and then declare the calibration done. The actual sequence depends on the calibration kit and changes slightly for 2-port calibrations, which are divided into three calibration sub-sequences.

Calibration Kits

The calibration kit tells the HP 8751A what standards to expect at each step of the calibration. The set of standards associated with a given calibration is termed a class. Refer to Appendix D for the relation between the calibration types and the standard classes.

For example, measuring the SHORT during a 1-port calibration is one calibration step. All of the SHORTs that can be used for this calibration step make up the class, which is called class S11B. For the 7 mm calibration kits, class S11B has only one standard in it. For type-N calibration kits, class S11B has two standards in it: male and female SHORTs.

When doing a 1-port calibration in 7 mm over HP-IB, sending CLASS11B will automatically measure the SHORT. In type-N, sending CLASS11B brings up the menu with the male and female SHORT options. To select a standard, use STANA or STANB. The STAN command is appended with the letters A through G, corresponding to the standards list under softkeys 1 through 7, softkey 1 being the topmost softkey.

Each full 2-port calibration is divided into three sub-sequences: transmission, reflection, and isolation. Each sub-sequence is treated like a calibration in its own right; each must be opened, have all the standards measured, and then be declared done. The opening and closing statements for the transmission sub-sequence are TRAN and TRAD. The opening and closing statements for the reflection sub-sequence are REFL and REFD. The opening and closing statements for isolation are ISOL and ISOD.
Frequency Response Calibration

The following program does a response calibration using a THRU calibration device. This program simplifies the calibration for the operator by giving explicit directions on the computer's display.

```
10    !
20    ! Frequency Response Calibration
30    !
40    Hp8751=717
50    ABORT 7
60    CLEAR Hp8751
70    !
80    OUTPUT Hp8751;"PRES"
90    OUTPUT Hp8751;"CHAN1; S21; LOGM"
100   INPUT "Enter center frequency (Hz)",F_centr
110   INPUT "Enter frequency span (Hz)",F_spanr
120   OUTPUT Hp8751;"CENT ";F_centr
130   OUTPUT Hp8751;"SPAN ";F_spanr
140   !
150   OUTPUT Hp8751;"HOLD"
160   OUTPUT Hp8751;"CALKN50"
170   OUTPUT Hp8751;"CALIRESP"
180   INPUT "Connect THRU, then press [Return].",Dum$
190   OUTPUT Hp8751;"CLES"
200   OUTPUT Hp8751;"STANC"
210   REPEAT
220       OUTPUT Hp8751;"ESB?"
230       ENTER Hp8751;Stat
240       UNTIL BIT(Stat,0)
250    !
260   OUTPUT Hp8751;"RESPDONE"
270   OUTPUT Hp8751;"*OPC?"
280   ENTER Hp8751;Dum
290   OUTPUT Hp8751;"CONT"
300   DISP "Response cal completed."
310   END
```

**Figure 2-4. Sample Program: Frequency Response Calibration**

Line 150  Sets the trigger to the hold mode.
Line 160  Selects the 50 Ω type-N calibration kit.
Line 170  Opens the calibration by calling the response calibration.
Line 180  Asks for a THRU, and waits for the operator to connect it.
Line 190  Clears all registers.
Line 200  Selects and measures the THRU. There is more than one standard in this calibration, so we must identify the specific standard within this calibration. The THRU is the third softkey selection from the
top in the menu, so use the STANC command to select THRU as the standard.

Lines 210 through 240  Waits for the standard to be measured. This is indicated by bit 0 of event status register B.

Lines 260 through 280  Affirms the completion of the calibration, and waits for calculation completion.

Line 290  Sets the trigger to the continuous mode.
1-Port Reflection Calibration

The following program does a 1-port calibration using the 50 Ω type-N calibration kit. The program assumes that the port being calibrated is a 50 Ω, type-N female test port. This program simplifies the calibration for the operator by giving explicit directions on the computer display.

10 !
20 ! 1-port Reflection Calibration
30 !
40 Hp8751=717
50 ABORT 7
60 CLEAR Hp8751
70 !
80 OUTPUT Hp8751:"PRES"
90 OUTPUT Hp8751:"CHAN1; S21; LOGM"
100 INPUT "Enter center frequency (Hz)";F_cent
110 INPUT "Enter frequency span (Hz)";F_span
120 OUTPUT Hp8751:"CENT ";F_cent
130 OUTPUT Hp8751:"SPAN ";F_span
140 !
150 OUTPUT Hp8751:"HOLD"
160 OUTPUT Hp8751:"CALKN50"
170 OUTPUT Hp8751:"CALIS111"
180 !
190 INPUT "Connect OPEN at port 1, then press [Return].";Dummy
200 OUTPUT Hp8751:"CLASS11A"
210 OUTPUT Hp8751:"CLES"
220 OUTPUT Hp8751:"STANB"
230 GOSUB Op_end
240 OUTPUT Hp8751:"DONE"
250 !
260 INPUT "Connect SHORT at port 1, then press [Return].";Dummy
270 OUTPUT Hp8751:"CLASS11B"
280 OUTPUT Hp8751:"CLES"
290 OUTPUT Hp8751:"STANB"
300 GOSUB Op_end
310 OUTPUT Hp8751:"DONE"
320 !
330 INPUT "Connect LOAD at port 1, then press [Return].";Dummy
340 OUTPUT Hp8751:"CLES"
350 OUTPUT Hp8751:"CLASS11C"
360 GOSUB Op_end
370 !
380 OUTPUT Hp8751:"SAV1"
390 OUTPUT Hp8751:"*OPC?"
400 ENTER Hp8751;Dummy
410 OUTPUT Hp8751:"CONT"
420 DISP "1-port cal completed."
430 STOP
440 !
450 Op_end:
460    REPEAT
470         OUTPUT Hp8751:"ESB?"
480         ENTER Hp8751:Stat
490         UNTIL BIT(Stat,0)
500     RETURN
510     END

Figure 2-5. 1-port Reflection Calibration

Line 170  Opens the calibration by calling the S11 1-port calibration.
Line 200  Selects the OPEN standard.
Line 210  Clears all the registers.
Line 220  Selects the female OPEN standard, and starts measuring the
          standard.
Line 230  Waits until the measurement ends.
Line 240  Completes the OPEN standard measurement.
Line 270  Selects the SHORT standard.
Line 290  Selects the female SHORT standard, and starts measuring the
          standard.
Line 310  Completes the SHORT standard measurement.
Line 350  Selects the LOAD standard, and starts measuring the standard.
Line 380  Saves the calibration.
Line 410  Sets the trigger to the continuous mode.
Line 450 through 500  Waits until the operation complete bit of the event status register is
                      set to 0.
Data Transfer from the HP 8751A to a Computer

Trace information can be read out of the HP 8751A in several ways. Data can be read off the trace selectively using the markers, or the entire trace can be read out.

Using Markers to Obtain Trace Data at Specific Points

If only specific information such as a single point off the trace or the result of a marker search is needed, the marker output command can be used to read the information.

Marker data is read out with the command OUTPMARK. This command causes the HP 8751A to transmit three numbers: marker value 1, marker value 2, and marker stimulus value. Refer to Table 2-1 for all the different possibilities for values one and two.

```plaintext
10 !
20 ! Using Markers to Obtain trace data at specific points
30 !
40 Hp8751=717
50 ABORT 7
60 CLEAR Hp8751
70 !
80 OUTPUT Hp8751;"PRES"
90 OUTPUT Hp8751;"CHAN1; S21; LOGM"
100 INPUT "Enter center frequency (Hz)",F_cent
110 INPUT "Enter frequency span (Hz)",F_span
120 OUTPUT Hp8751;"CENT ";F_cent
130 OUTPUT Hp8751;"SPAN ";F Span
140 !
150 OUTPUT Hp8751;"CLRS"
160 OUTPUT Hp8751;"SING"
170 REPEAT
180 OUTPUT Hp8751;"ESB?"
190 ENTER Hp8751;Stat
200 UNTIL BIT(Stat,0)
210 !
220 OUTPUT Hp8751;"AUTO"
230 OUTPUT Hp8751;"MARK1"
240 OUTPUT Hp8751;"SEAMIN"
250 OUTPUT Hp8751;"OUTPMARK?"
260 ENTER Hp8751;Val1,Val2,Stim
270 PRINT "Min val:",Val1;"dB"
280 PRINT "Stimulus:",Stim;"Hz"
290 END
```

Figure 2-6. Sample Program: Using Markers to Obtain Trace Data at Specific Points

Lines 150 through 200 Collects one sweep of data, and wait for completion.
Line 220 Brings the trace data in view on the HP 8751A's display.
Line 230 Activates marker 1.
Has the HP 8751A search for the trace minimum
Outputs the marker values at that point.
Reads marker value 1, marker value 2, and the stimulus value.

Table 2-1. Units as a Function of Display Format

| Display Format | Marker Mode | OUTPMARK value 1, value 2 | OUTPFORM value 1, value 2 | Marker Readout
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOG MAG</td>
<td></td>
<td>dB, 2</td>
<td>dB, 2</td>
<td>dB, 2</td>
</tr>
<tr>
<td>PHASE</td>
<td></td>
<td>degrees, 2</td>
<td>degrees, 2</td>
<td>degrees, 2</td>
</tr>
<tr>
<td>DELAY</td>
<td></td>
<td>seconds, 2</td>
<td>seconds, 2</td>
<td>seconds, 2</td>
</tr>
<tr>
<td>SMITH</td>
<td>LIN MKR</td>
<td>lin mag, degrees</td>
<td>real, imag</td>
<td>lin mag, degrees</td>
</tr>
<tr>
<td>CHART</td>
<td>LOG MKR</td>
<td>dB, degrees</td>
<td>real, imag</td>
<td>dB, degrees</td>
</tr>
<tr>
<td></td>
<td>Re/Im</td>
<td>real, imag</td>
<td>real, imag</td>
<td>real, imag</td>
</tr>
<tr>
<td></td>
<td>R + jX</td>
<td>real, imag ohms</td>
<td>real, imag</td>
<td>real, imag ohms</td>
</tr>
<tr>
<td></td>
<td>G + jB</td>
<td>real, imag Siemens</td>
<td>real, imag</td>
<td>real, imag Siemens</td>
</tr>
<tr>
<td>POLAR</td>
<td>LIN MKR</td>
<td>lin mag, degrees</td>
<td>real, imag</td>
<td>lin mag, degrees</td>
</tr>
<tr>
<td></td>
<td>LOG MKR</td>
<td>dB, degrees</td>
<td>real, imag</td>
<td>dB, degrees</td>
</tr>
<tr>
<td></td>
<td>Re/Im</td>
<td>real, imag</td>
<td>real, imag</td>
<td>real, imag</td>
</tr>
<tr>
<td>LIN MAG</td>
<td></td>
<td>lin mag, 2</td>
<td>lin mag, 2</td>
<td>lin mag, 2</td>
</tr>
<tr>
<td>REAL</td>
<td></td>
<td>real, 2</td>
<td>real, 2</td>
<td>real, 2</td>
</tr>
<tr>
<td>SWR</td>
<td></td>
<td>SWR, 2</td>
<td>SWR, 2</td>
<td>SWR, 2</td>
</tr>
</tbody>
</table>

1 The marker readout values are the marker values displayed in the upper left hand corner of the display. They also correspond to the value and aux value associated with the fixed marker.

2 Value not significant in this form, but is included in data transfers.
Trace Transfer

Getting trace data out of the HP 8751A with a 200/300 series computer can be broken down into three steps:

1. Setting up the receive array.
2. Telling the HP 8751A to transmit the data.
3. Accepting the transferred data.

Data inside the HP 8751A is always stored in pairs, to accommodate real/imaginary values, for each data point. Therefore, the receiving array has to be two elements wide, and as deep as the number of points. This memory space for this array must be declared before any data is to be transferred from the HP 8751A to the computer.

Data Format. The HP 8751A can transmit data over HP-IB in four different formats. The type of format affects what kind of data array is declared (real or integer), since the format determines what type of data is transferred.

- Form 2

IEEE 32-bit floating point format. In this mode, each number takes 4 bytes. This means that a 201 point transfer takes 1608 bytes. Figure 2-7 shows the data transfer format of Form 2.

![Diagram of Form 2 Data Transfer Format](image)

- Form 3

IEEE 64-bit floating point format. In this mode, each number takes 8 bytes. This means that a 201-point transfer takes 3216 bytes. Data is stored internally in the 200/300 series computer with the IEEE 64-bit floating point format, eliminating the need for any reformatting by the computer. Figure 2-8 shows the data transfer format of Form 3.

![Diagram of Form 3 Data Transfer Format](image)
Form 4

ASCII data transfer format. In this mode, each number is sent as a 24 character string, each character being a digit, sign, or decimal point. Since there are two numbers per point, a 201-point transfer in Form 4 takes 9648 bytes.

Form 5

MS-DOS® personal computer format. This mode is a modification of IEEE 32-bit floating point format with the byte order reversed. Form 5 also has a four byte header which must be read in so that data order is maintained. In this mode, an MS-DOS® PC can store data internally without reformatting it.

Data Levels. Different levels of data can be read out of the HP 8751A (Refer to Figure 2-9).

Raw data

The basic measurement data, reflecting the stimulus parameters, IF averaging, and IF bandwidth. If a full 2-port measurement calibration is ON, there are four raw arrays kept: one for each raw S-parameter. The data is read out with the commands OUTPRIN{1-4}?.

Normally, only raw 1 is available, and it holds the current parameter. If a 2-port calibration is ON the four arrays to S11, S21, S12, and S22 respectively. This data is in real/imaginary pairs.

Error corrected data

This is the raw data with error correction applied. The array is for the currently measured parameter, and is in real/imaginary pairs. The error corrected data is read out with OUTPDATA? or OUTPDATAP?. OUTPMEM? or OUTPMEMOP? reads the trace memory if available, which is also error corrected. Neither raw nor error corrected data reflect such post-processing functions as electrical delay offset, or trace math.

Unformatted data

This is the array of the complex number pairs which will be converted into a scalar number in the next stage. The unformatted data is read out with OUTPUFORM?.

Formatted data

This is the array of data being displayed. It reflects all post-processing functions such as electrical delay, and the units of the array read out depends on the current display format. Refer to Table 2-1 for various units as a function of display format. The formatted data is read out with OUTPFORM?, OUTPRFORM?, OUTPFORMP?, OUTPTMEM?, OUTPRTMEM?, OUTPTMEMP?, OUTPIFORM?, OUTPIRFORM?, OUTPITMEM? or OUTPIRTMEM?.

Calibration coefficients

The results of a calibration are arrays of calibration coefficients which are used in the error correction routines. Each array corresponds to a specific error term in the error model. The calibration coefficients are read out with OUTPCALC{0112}?.

Formatted data is generally the most useful, being the same information seen on the display. However, if the post-processing is not necessary, as may be the case with smoothing, error corrected data is more desirable. Error corrected data also gives you the opportunity to load the data into the instrument and apply post-processing at a later time.

2-16 Programming Basics
Figure 2-9. Data Processing Chain
Data Transfer Using ASCII Transfer Format (Form 4). When Form 4 is used, each number is sent as a 24 character string, each character being a digit, or decimal point. Since there are two numbers per point, a 201-point transfer in Form 4 takes 9648 bytes.

```plaintext
10 !
20 ! Data Transfer using ASCII Transfer Format
30 !
40 OPTION BASE 1
50 Hp8751=717
60 ABORT 7
70 CLEAR Hp8751
80 !
90 OUTPUT Hp8751;"PRES"
100 OUTPUT Hp8751;"CHAN1; S21; LOGM"
110 INPUT "Enter center frequency (Hz)"; F_cent
120 INPUT "Enter frequency span (Hz)"; F_span
130 OUTPUT Hp8751;"CENT "; F_cent
140 OUTPUT Hp8751;"SPAN "; F_span
150 !
160 OUTPUT Hp8751;"CLES"
170 OUTPUT Hp8751;"SING"
180 REPEAT
190 OUTPUT Hp8751;"ESB?"
200 ENTER Hp8751;Stat
210 UNTIL BIT(Stat,0)
220 !
230 OUTPUT Hp8751;"POIN?"
240 ENTER Hp8751;Nop
250 ALLOCATE Dat(Nop), Stim(Nop)
260 OUTPUT Hp8751;"FORM4"
270 !
280 OUTPUT Hp8751;"OUTPRFORM?"
290 ENTER Hp8751;Dat(*)
300 !
310 OUTPUT Hp8751;"OUTPSTIM?"
320 ENTER Hp8751;Stim(*)
330 !
340 FOR I=1 TO Nop
350 PRINT Stim(I);"Hz", Dat(I);"dB"
360 NEXT I
370 DEALLOCATE Dat(*), Stim(*)
380 END
```

Figure 2-10. Sample Program: Data Transfer using ASCII Transfer Format (Form 4)

Line 40 Specifies the default lower bound of arrays to 1.
Lines 230 and 240 Finds out how many points to expect.
Line 250 Create arrays to hold the trace data and the stimulus data.
<table>
<thead>
<tr>
<th>Line</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>260</td>
<td>Tells the HP 8751A to use the ASCII transfer format.</td>
</tr>
<tr>
<td>280</td>
<td>Requests the real part of the formatted trace data.</td>
</tr>
<tr>
<td>290</td>
<td>Transfers the data from the HP 8751A to the computer, and puts it in the receiving array.</td>
</tr>
<tr>
<td>310 and 320</td>
<td>Requests and transfers the stimulus data.</td>
</tr>
<tr>
<td>370</td>
<td>Deallocates memory space.</td>
</tr>
</tbody>
</table>
Data Transfer using IEEE 64-bit Floating Point Format (Form 3). To use Form 3, the computer is told to stop formatting the incoming data with the ENTER statement. This is done by defining an I/O path with formatting OFF. Form 3 also has an eight-byte header to deal with. The first two bytes are the ASCII characters "#6" that indicate that a fixed length block transfer follows, and the next 6 bytes form an integer containing number of bytes in the block to follow. The header must be read in so that data order is maintained.

10      !
20      ! Data Transfer using IEEE 64-bit Floating Point Format
30      !
40      OPTION BASE 1
50      Hp8751=717
60      ABORT 7
70      CLEAR Hp8751
80      !
90      OUTPUT Hp8751:"PRES"
100     OUTPUT Hp8751:"CHAN1; S21; LOGM"
110     INPUT "Enter center frequency (Hz)",F_cent
120     INPUT "Enter frequency span (Hz)",F_span
130     OUTPUT Hp8751:"CENT ";F_cent
140     OUTPUT Hp8751:"SPAN ";F_span
150     !
160     OUTPUT Hp8751:"CLES"
170     OUTPUT Hp8751:"SING"
180     REPEAT
190     OUTPUT Hp8751:"ESB?"
200     ENTER Hp8751;Stat
210     UNTIL BIT(Stat,0)
220     !
230     OUTPUT Hp8751:"POIN?"
240     ENTER Hp8751;Nop
250     ALLOCATE Dat(Nop),Stim(Nop)
260     OUTPUT Hp8751:"FORM3"
270     ASSIGN @Dt TO Hp8751;FORMAT OFF
280     !
290     OUTPUT Hp8751:"OUTPRFORM?"
300     ENTER @Dt USING ":,.8A";A$
310     ENTER @Dt;Dat(*)
320     ENTER @Dt USING ":,1A";B$
330     !
340     OUTPUT Hp8751:"OUTPSTIM?"
350     ENTER @Dt USING ":,.8A";A$
360     ENTER @Dt;Stim(*)
370     ENTER @Dt USING ":,1A";B$
380     !
390     ASSIGN @Dt TO *
400     FOR I=1 TO Nop
410     PRINT Stim(I);"Hz",Dat(I);"dB"
420     NEXT I
430     DEALLOCATE Dat(*),Stim(*)
Figure 2-11. Sample Program: Data Transfer using IEEE 64-bit Floating Point Format (Form 3)

Line 260                  Tells HP 8751A to output data using Form 3.
Line 270                  Defines a data I/O path with ASCII formatting OFF. The I/O path
                          points to the HP 8751A, and can be used to read or write data to
                          the HP 8751A, as long as that data is in binary rather than ASCII
                          format.
Line 300                  Enters the header.
Line 310                  Enters the data.
Line 320                  Enters the terminator.
Line 390                  Closes the I/O path.
Application Example

The following example is to measure the transmission parameter a bandpass filter and to get the typical parameters: -3 dB bandwidth, Center frequency, and Insertion loss.

10  !
20  ! Bandpass Filter Test
30  !
40  Hp8751=717
50  ABORT 7
60  CLEAR Hp8751
70  !
80  OUTPUT Hp8751:"PRES"
90  OUTPUT Hp8751:"CHAN1; S21; LOGM"
100 INPUT "Enter center frequency (Hz)",F_cent
110 INPUT "Enter frequency span (Hz)",F_span
120 OUTPUT Hp8751:"CENT ";F_cent
130 OUTPUT Hp8751:"SPAN ";F_span
140  !
150 OUTPUT Hp8751:"HOLD"
160 OUTPUT Hp8751:"CALKN50"
170 OUTPUT Hp8751:"CALIRESP"
180 INPUT "Connect THRU, then press [Return].",Dum$
190 OUTPUT Hp8751:"CLES"
200 OUTPUT Hp8751:"STANC"
210 GOSUB Op_end
220 OUTPUT Hp8751:"RESPDONE"
230 INPUT "Cal completed. Connect DUT, then press [Return].",Dum$
240  !
250 OUTPUT Hp8751:"CLES"
260 OUTPUT Hp8751:"SINC"
270 GOSUB Op_end
280  !
290 OUTPUT Hp8751:"MARK1"
300 OUTPUT Hp8751:"SEAMAX"
310 OUTPUT Hp8751:"OUTPMARK?"  
320 ENTER Hp8751;Loss,Val2,Stim
330  !
340 OUTPUT Hp8751:"DELR1"
350 OUTPUT Hp8751:"WIDV -3"
360 OUTPUT Hp8751:"WIDTON"
370 OUTPUT Hp8751:"OUTPWID?"
380 ENTER Hp8751;Bw,Cent,Q
390  
400 PRINT "-3 dB bandwidth:",Bw;"Hz"
410 PRINT "Center frequency:",Cent;"Hz"
420 PRINT "Insertion loss:",Loss;"dB"
430 STOP
440  
450 Op_end:  !
460    REPEAT
470    OUTPUT Hp8751;"ESB?"
480    ENTER Hp8751;Stat
490    UNTIL BIT(Stat,0)
500    RETURN
510    END

Figure 2-12. Sample Program: Application Example (Bandpass Filter Test)

Lines 80 through 130    Sets up measurement.
Lines 150 through 230    Does response calibration.
Lines 250 through 270    Takes one sweep of data.
Lines 290 through 320    Takes the insertion loss value using the marker search function.
Lines 340 through 380    Takes the \(-3\) dB bandwidth value and the center frequency value using the bandwidth search function.
Advanced Programming Examples

Using List Frequency Mode

The list frequency mode lets you select the specific points or frequency spacing between points at which measurements are to be made. Sampling specific points reduces the measurement time since additional time is not spent measuring device characteristics at unnecessary frequencies.

This example shows how to create a list frequency table and transmit it to the HP 8751A. The command sequence for entering a list frequency table imitates the key sequence followed when entering a table from the front panel: there is a command for every key press. Editing a segment is also the same as the key sequence, but the HP 8751A automatically reorders each edited segment in order of increasing start frequency.

This example takes advantage of the computer's capabilities to simplify creating and editing the table. The table is entered and completely edited before being transmitted to the HP 8751A. To simplify the programming task, options such as entering step size are not included.

```
10 !
20 ! Using List Frequency Mode
30 !
40 OPTION BASE 1
50 Hp8751=717
60 ABORT 7
70 CLEAR Hp8751
80 !
90 INPUT "Enter number of segments",Numb
100 ALLOCATE Table(Numb,3)
110 !
120 PRINTER IS 1
130 OUTPUT 2;CHR$(255)&"A"
140 PRINT USING "10A,10A,10A,20A";"Segment","Start(Hz)","Stop(Hz)","Number of Points"
150 !
160 FOR I=1 TO Numb
170 GOSUB Loadpoint
180 NEXT I
190 !
200 LOOP
210 INPUT "Do you want to edit? (Y/N)",An$
220 EXIT IF An$="N" OR An$="n"
230 INPUT "Enter segment number",I
240 GOSUB Loadpoint
250 END LOOP
260 !
270 OUTPUT Hp8751;"PRES"
280 OUTPUT Hp8751;"CHAN1; S21; LOGM"
290 !
300 OUTPUT Hp8751;"EDITLIST"
310 OUTPUT Hp8751;"CLEL"
```

2-24 Programming Basics
320 FOR I=1 TO Numb
330 OUTPUT Hp8751:"SADD"
340 OUTPUT Hp8751:"STAR ":Table(I,1)
350 OUTPUT Hp8751:"STOP ":Table(I,2)
360 OUTPUT Hp8751:"POIN ":Table(I,3)
370 OUTPUT Hp8751:"SDON"
380 NEXT I
390 OUTPUT Hp8751:"EDITDONE"
400 OUTPUT Hp8751:"LISFREQ"
410 OUTPUT Hp8751:"LISDOBASE"
420!
430 OUTPUT Hp8751:"CLES"
440 OUTPUT Hp8751:"SING"
450 REPEAT
460 OUTPUT Hp8751:"ESB?"
470 ENTER Hp8751;Stat
480 UNTIL BIT(Stat,0)
490 OUTPUT Hp8751:"AUTO"
500 STOP
510!
520 Loadpoint: !
530 INPUT "Enter start frequency (Hz)",Table(I,1)
540 INPUT "Enter stop frequency (Hz)",Table(I,2)
550 INPUT "Enter number of points",Table(I,3)
560 IF Table(I,3)=1 THEN Table(I,2)=Table(I,1)
570 PRINT TABXY(0,I+1);1:TAB(10);Table(I,1);TAB(20);Table(I,2);TAB(35);Table(I,3)
580 RETURN
590 END

Figure 2-13. Sample Program: Using List Frequency Mode

Line 90          Finds out how many segments to expect.
Line 100         Creates a table to hold the segments. Keeps start frequency, stop
                 frequency, and number of points.
Lines 120 through 140  Clears the screen and print the table header.
Lines 160 through 180  Reads in each segment.
Lines 200 through 250  Edits the table until editing is no longer needed.
Line 300         Activates the frequency list edit mode, and opens the list frequency
                 table for editing.
Line 310         Deletes any existing segments.
Lines 320 through 380  Enters the segment values.
Line 390         Closes the table.
Line 400         Turns on list frequency mode.
Line 410         Displays the trace for only the listed frequency ranges.
Lines 520 through 580  Enters in a segment.
Lines 530 through 550  Enters the segment values.
Line 560  Makes the stop frequency equal to the start frequency to avoid ambiguity, if only one point is in the segment.
Line 570  Prints the segment out.
Using Limit Lines to Perform Limit Testing

This example shows how to create a limit table and transmit it to the HP 8751A. The command sequence for entering a limit table imitates the key sequence followed when entering a table from the front panel: there is a command for every key press. Editing a limit is also the same as the key sequence, but remember that the HP 8751A automatically reorders the table in order of increasing start frequency.

This example takes advantage of the computer’s capabilities to simplify creating and editing the table. The table is entered and completely edited before being transmitted to the HP 8751A. To simplify the programming task, options such as entering offsets are not included.

10 !
20 ! Setting up Limit Lines
30 !

40 OPTION BASE 1
50 Hp8751=717
60 ABORT 7
70 CLEAR Hp8751
80 !
90 OUTPUT Hp8751;"PRES"
100 OUTPUT Hp8751;"CHAN1; S21; LOGM"
110 INPUT "Enter start frequency (Hz)",F_start
120 INPUT "Enter stop frequency (Hz)",F_stop
130 OUTPUT Hp8751;"STAR ";F_start
140 OUTPUT Hp8751;"STOP ";F_stop
150 !
160 INPUT "Enter number of limits",Numb
170 ALLOCATE Table(Numb,3)
180 !
190 PRINTER IS 1
200 OUTPUT 2;CHR$(255)&"K"
210 PRINT USING "10A,15A,15A,15A";"Segment","Stimulus(Hz)","Upper(dB)",
"Lower(dB)"
220 !
230 FOR I=1 TO Numb
240 GOSUB Loadlimit
250 NEXT I
260 !
270 LOOP
280 INPUT "Do you want to edit? (Y/N)",An$
290 EXIT IF An$="N" OR An$="n"
300 INPUT "Enter segment number",I
310 GOSUB Loadlimit
320 END LOOP
330 !
340 OUTPUT Hp8751;"EDITLIM"
350 OUTPUT Hp8751;"LIMCLEL"
360 FOR I=1 TO Numb
370 OUTPUT Hp8751;"LIMSADD"
380 OUTPUT Hp8751;"LIMS ";Table(I,1)
390 OUTPUT Hp8751:"LIMU ";Table(I,2)
400 OUTPUT Hp8751:"LIML ";Table(I,3)
410 OUTPUT Hp8751:"LIMSDON"
420 NEXT I
430 !
440 OUTPUT Hp8751:"LIMEDONE"
450 OUTPUT Hp8751:"LIMILINEON"
460 OUTPUT Hp8751:"LIMTESTON"
470 DEALLOCATE Table(*)
480 STOP
490 !
500 Loadlimit: !
510 INPUT "Enter stimulus value (Hz)",Table(I,1)
520 INPUT "Enter upper limit value (dB)",Table(I,2)
530 INPUT "Enter lower limit value (dB)",Table(I,3)
540 PRINTTABXY(0,1+1);I;TAB(11);Table(I,1);TAB(27);Table(I,2);TAB(42);
Table(I,3)
550 RETURN
560 END

Figure 2-14. Sample Program: Setting up Limit Lines

Line 160 Finds out how many limits to expect.
Line 170 Creates a table to hold the limits. It will contain the stimulus value (frequency), the upper limit value, and the lower limit value.
Lines 190 through 210 Clears the screen and prints the table header.
Lines 230 through 250 Reads in each segment.
Lines 270 through 320 Edits the table until editing is no longer needed.
Line 340 Begins editing the limit line table.
Line 350 Deletes any existing limits.
Lines 360 through 420 Enters the segment values.
Line 440 Closes the table.
Line 450 Displays the limits.
Line 460 Activates the limit testing.
Lines 500 through 550 Enters a segment.
Storing and Recalling Instrument Status

This example demonstrates ways of storing and recalling entire instrument states over HP-IB.

Coordinating disk storage

This example shows how to save and recall the instrument status in the disk installed in the built-in disk drive.

10 !
20 ! Storing Instrument States
30 !
40 DIM Err$[50]
50 Hp8751=717
60 ABORT 7
70 CLEAR Hp8751
80 !
90 OUTPUT Hp8751:"PRES"
100 OUTPUT Hp8751:"CHAN1; S21; LOGM"
110 INPUT "Enter center frequency (Hz)";F_cent
120 INPUT "Enter frequency span (Hz)";F_span
130 OUTPUT Hp8751;"CENT ";F_cent
140 OUTPUT Hp8751;"SPAN ";F_span
150 !
160 INPUT "File name? (up to 8 char.);Name$"
170 OUTPUT Hp8751;"SAVDESTA """";Name$;"""
180 OUTPUT Hp8751;"*OPC?"
190 ENTER Hp8751;Dum
200 OUTPUT Hp8751;"OUTPERR0?"
210 ENTER Hp8751;Err,Err$
220 IF Err THEN
230 PRINT "Error occurred."
240 PRINT Err$
250 STOP
260 ELSE
270 INPUT "Save done. Press [Return] to recall.";Dum$
280 END IF
290 !
300 OUTPUT Hp8751;"PRES"
310 OUTPUT Hp8751;"RECD """";Name$;"_S"""
320 OUTPUT Hp8751;"*OPC?"
330 ENTER Hp8751;Dum
340 DISP "Done."
350 END

Figure 2-15. Sample Program: Storing Instrument States

Line 160 Gets the name of the file to create.
Line 170 Saves the instrument states and the calibration coefficients with the file name. The file name must be preceded and followed by double quotes.
quotation marks, and the only way to do that with an OUTPUT statement is to use two sets of quotation marks: "".

Lines 180 and 190  Waits for completion of the saving.
Lines 200 and 210  Examines whether an error occurred or not.
Lines 220 through 289  If an error is detected, prints the error number and the error message. If an error is not detected, prompts the user to continue the program.
Line 310  Adds the extension to the file name and recalls the file.
Reading Calibration Data

This example demonstrates how to read measurement calibration data out of the HP 8751A, and how to put it back into the HP 8751A.

The data used to perform measurement error correction is stored inside the HP 8751A in up to twelve calibration coefficient arrays. Each array is a specific error coefficient, and is stored and transmitted as an error corrected data array: each point is a real/imaginary pair, and the number of points in the array is the same as the number of points in the sweep. The four data format also apply to the transfer of calibration coefficient arrays. Appendix D specifies where the calibration coefficients are stored for different calibration types.

A computer can read out the error coefficients using the OUTPCALC{01-12} commands. Each calibration type uses only as many arrays as needed, starting with array 1. Therefore, it is necessary to know the type of calibration about to be read out: attempting to read an array not being used in the current calibration causes the "REQUESTED DATA NOT CURRENTLY AVAILABLE" warning.

A computer can also store calibration coefficients in the HP 8751A. To do this, declare the type of calibration data about to stored in the HP 8751A just as if you were about to perform that calibration. Then, instead of calling up different classes, transfer the calibration coefficients using the INTPCALC{01-12} commands. When all the coefficients are in the HP 8751A, activate the calibration by issuing the mnemonic SAVC, and have the HP 8751A take a sweep.

This example reads the response calibration coefficients into a very large array, from which they can be examined, modified, stored, or put back into the HP 8751A.

```
10 !
20 ! Reading calibration data
30 !
40 OPTION BASE 1
50 DIM Head$(6)
60 Hp8751=717
70 ABORT 7
80 CLEAR Hp8751
90 !
100 INPUT "Connect THRU and press [Return] to do cal. ",Dum$
110 GOSUB Setup
120 GOSUB Cal
130 OUTPUT Hp8751;"SAVC"
140 OUTPUT Hp8751;"POIN?"
150 ENTER Hp8751;Nop
160 ALLOCATE Dat(Nop,2)
170 !
180 INPUT "Press [Return] to transmit cal data. ",Dum$
190 ASSIGN @Dt TO Hp8751;FORMAT OFF
200 OUTPUT Hp8751;"FORM3"
210 OUTPUT Hp8751;"OUTPCALCO1?"
220 ENTER @Dt USING ";#,8A";A$
230 ENTER @Dt;Dat(*)
240 ENTER @Dt USING ";#,1A";B$
250 INPUT "Transmit done. Disconnect THRU and press [Return]. ",Dum$
```

Programming Basics 2-31
260 !
270 GOSUB Setup
280 GOSUB Cal
290 OUTPUT Hp8751;"SAVC"
300 !
310 INPUT "Press [Return] to retransmit cal data.",Dum$
320 V$=VAL$(Nop*2+8)
330 Numv=LEN(V$)
340 Head$="000000"
350 FOR I=1 TO Numv
360 Head$[7-I,7-I]=V$[Numv-I+1,Numv-I+1]
370 NEXT I
380 !
390 OUTPUT Hp8751;"INPUCALCO1 ";
400 OUTPUT Hp8751;"#6"&Head$
410 OUTPUT @Dt;Dat(*),END
420 OUTPUT Hp8751;"SAVC"
430 !
440 ASSIGN @Dt TO *
450 DEALLOCATE Dat(*)
460 DISP "Retransmit completed. Connect DUT."
470 OUTPUT Hp8751;"CONT"
480 STOP
490 !
500 Setup: !
510 F_cent=7.0E+7
520 F_span=2.0E+5
530 OUTPUT Hp8751;"PRES"
540 OUTPUT Hp8751;"CHAN1; S21; LOGH"
550 OUTPUT Hp8751;"CENT ";F_cent
560 OUTPUT Hp8751;"SPAN ";F_span
570 OUTPUT Hp8751;"SING"
580 RETURN
590 !
600 Cal: !
610 OUTPUT Hp8751;"CALIRESP"
620 OUTPUT Hp8751;"CLES"
630 OUTPUT Hp8751;"STANC"
640 REPEAT
650 OUTPUT Hp8751;"ESB?"
660 ENTER Hp8751;Stat
670 UNTIL BIT(Stat,0)
680 WAIT .001
690 OUTPUT Hp8751;"RESPDONE"
700 RETURN
710 END

Figure 2-16. Reading calibration data

Line 50 Declares the dimension part of the file header.

2-32 Programming Basics
Line 110 Presets and sets up the HP 8751A, then holds the trigger.
Line 120 Performs the response calibration.
Line 130 Re-draws the trace with the calibration data.
Line 210 Requests outputting the calibration data.
Line 220 Enters the file header.
Line 230 Enters the calibration data.
Line 240 Enters the file terminator.
Line 280 Performs the calibration to set the correction ON.
Line 320 Calculates the number of bytes transferred, and represents it in the string format.
Line 330 Counts the number of characters in the string which contains the number of bytes transferred.
Line 340 Enters 0 to all the arrays of the header as the initial value.
Line 350 through 370 Places the number of bytes transferred to the header array digit by digit from the sixth array to the first array of the header.
Line 390 through 410 Transmits the file header and calibration data.
Miscellaneous Programming Examples

Controlling Peripherals

The purpose of this section is to demonstrate how to coordinate printers or plotters with the HP 8751A.

The HP 8751A has two operating modes with respect to HP-IB, as set under the LOCAL menu: System controller mode and Addressable only mode. The system controller mode is used when no controller is present. The addressable only mode is how the computer can control the HP 8751A and how the computer can pass active control to the HP 8751A so that the HP 8751A can plot or print.

Note that the HP 8751A assumes that the address of the computer is correctly stored in its HP-IB addresses menu under the ADDRESS: CONTROLLER entry. If this address is incorrect, control will not return to the computer.

If the HP 8751A is in Addressable only mode and receives a command telling it to plot or print, it sets bit 1 in the event status register to indicate that it needs control of the bus. If the computer then uses the HP-IB control command to pass control to the HP 8751A, the HP 8751A will take control of the bus, and access the peripheral. When the HP 8751A no longer needs control, it will pass it back to the computer.

Control should not be passed to the HP 8751A before it has set event status register bit 1, Request Active Control. If the HP 8751A receives control before the bit is set, control is passed immediately back.

While the HP 8751A has control, it is free to address devices to talk and listen as needed. The only functions denied it are the ability to assert the interface clear line (IFC), and remote line (REN). These are reserved for the system controller. As active controller, the HP 8751A can send messages to and read replies back from printers and plotters.

This example prints the display.

```
10 !
20 ! Controlling Peripherals
30 !
40 DIM Err$[50]
50 Hp8751=717
60 !
70 OUTPUT Hp8751;"*CLS"
80 OUTPUT Hp8751;"*ESE 2"
90 !
100 OUTPUT Hp8751;"PRINALL"
110 REPEAT
120 Stat=SPOLL(Hp8751)
130 UNTIL BIT(Stat,5)
140 !
150 PASS CONTROL Hp8751
160 DISP "Printing."
170 REPEAT
180 STATUS 7,6;HpiB
```

2-34 Programming Basics
190  UNTIL BIT(Hpib,6)
200  DISP "Done."
210  !
220  OUTPUT Hp8751:"OUTPERRO?"
230  ENTER Hp8751;Err,Err$
240  IF Err THEN DISP Err$
250  END

Figure 2-17. Sample Program: Controlling Peripherals

Line 70    Clears the status reporting system.
Line 80    Enables the Request Active Control bit in the event status register.
Line 100   Requests printing.
Lines 110 through 130  Waits until the HP 8751A requests control.
Line 150   Passes active control to the HP 8751A.
Line 170 through 190  Waits until the print is finished and the control is returned.
Line 220 through 240  If an error occurred, prints the error number and the error message.
Transferring disk data files

The built-in disk drive is often used to store data files in addition to instrument states. The file name is then appended with two characters to indicate what is in the file. "D" indicates the file contains the internal data array using the SAVE\DATA ONLY or the SAVDDAT command. Refer to "Saving and Recalling Instrument States and Data" in the Reference Manual for the file structure.

This example demonstrates how to recall a data file stored by the built-in disk drive into a computer using the disk drive connected to the computer.

Before running the program, store the data to the disk installed in the built-in disk drive, remove the disk, and put the disk in the disk drive connected to the computer.

```
10 !
20 ! Transferring Disk Data Files
30 !
40 OPTION BASE 1
50 INTEGER Nop
60 DIM Sw$(7)[8], Numseg(7)
"Tracemem",2
80 !
90 INPUT "File name (with extension)?", File$
100 ASSIGN @Path TO File$
110 ENTER @Path USING "6X,#"
120 Numdat=0
130 PRINT "Data contained:"
140 FOR I=1 TO 7
150 READ Dat$, Num
160 GOSUB Datasw
170 NEXT I
180 PRINT
190 ENTER @Path USING "4X,#"
200 !
210 INPUT "Press [Return] to read data.", Dum$
220 FOR J=1 TO Numdat
230 FOR I=1 TO Numseg(J)
240 PRINT Sw$(J);I
250 GOSUB Datasw
260 PRINT
270 NEXT I
280 PRINT
290 IF J>Numdat THEN INPUT "Press [Return] to read next data.", Dum$
300 NEXT J
310 ASSIGN @Path TO *
320 STOP
330 !
340 Datasw: !
350 ENTER @Path USING "B,#";Sw
360 IF Sw THEN
```
370 Numdat=Numdat+1
380 Sw$(Numdat)=Dat$
390 Numseg(Numdat)=Num
400 PRINT Sw$(Numdat)
410 END IF
420 RETURN
430 !
440 Dataset: !
450 ENTER @Path;Nop
460 ENTER @Path USING "4X,#"
470 FOR K=1 TO Nop
480 ENTER @Path;X,Y
490 PRINT Nop,X,Y
500 NEXT K
510 ENTER @Path USING "4X,#"
520 RETURN
530 END

Figure 2-18. Sample Program: Transferring Disk Data Files

Lines 50 and 60  Sets up the data of possible data groups.
Line 90         Gets the file name to load. The file name must be included the
                extension: "_.D".
Line 100        Defines an I/O path which points to the chosen file.
Line 110        Enters bytes of internal use only.
Line 120 through 170 Reads the data switches and examine the data contained.
Line 190        Enters bytes of internal use only.
Line 220 through 300 Enters a data group.
Line 230 through 270 Enters a data segment.
Line 310        Closes the I/O path.
Lines 340 through 420 Reads a data switch.
Lines 440 through 520 Enters a data segment.
Line 450        Enters the number of data bytes which follow.
Line 460        Enters bytes of internal use only.
Lines 470 through 500 Reads the data.
Line 510        Enters the bytes of internal use only.
Status Reporting

The HP 8751A has a status reporting mechanism that gives information about specific functions and events inside the HP 8751A. The status byte is an 8-bit register with each bit summarizing the state of one aspect of the HP 8751A. For example, the error queue summary bit will always be set if there are any errors in the queue. The value of the status byte can be read with the SPOLL statement. This command does not automatically put the HP 8751A into the remote mode, thus giving the operator access to the HP 8751A front panel functions. Reading the status byte does not affect its value. The sequencing bit can be set by the operator during execution of a test sequence.

The status byte also summarizes two event status registers and one operational status register that monitor specific conditions inside the HP 8751A. The status byte also has a bit that is set when the HP 8751A is issuing a service request over HP-IB, and a bit that is set when the HP 8751A has data to send out over HP-IB. Refer to Appendix B for a definition of the status registers.

The error queue holds up to 20 instrument errors and warnings in the order that they occurred. Each time the HP 8751A detects an error condition and displays a message on the CRT, it also puts the error in the error queue. If there are any errors in the queue, bit 3 of the status byte will be set. The errors can be read from the queue with the OUTPERR0? command, which causes the HP 8751A to transmit the error number and the error message of the oldest error in the queue.

It is also possible to generate interrupts using the status reporting mechanism. The status byte bits can be enabled to generate a service request (SRQ) when set. The computers can in turn be set up to generate an interrupt on the SRQ.

To be able to generate an SRQ, a bit in the status byte has to be enabled using *SRE n. A one in a bit position enables that bit in the status byte. Therefore, *SRE 8 enables an SRQ on bit 3, check error queue, since 8 equals 00001000 in binary representation. That means that whenever an error is put into the error queue and bit 3 gets set, and the SRQ line is asserted. The only way to clear the SRQ is to disable bit 3, re-enable bit 3, or read out all the errors from the queue.

A bit in the event status register can be enabled so that it is summarized by bit 5 of the status byte. If any bit is enabled in the event status register, bit 5 of the status byte will also be set. For example, *ESE 66 enables bits 1 and 6 of the event status register, since 66 equals 01000010 in binary representation. Therefore, whenever active control is requested or a front panel key is pressed, bit 5 of the status byte will be set. Similarly, ESNB n enables bits in event status register B so that they will be summarized by bit 2 in the status byte.

To generate an SRQ from an event status register, enable the desired event status register bit. Then enable the status byte to generate an SRQ. For instance, *ESE 32 and *SRE 32 enable the syntax error bit, so that when the syntax error bit is set, the summary bit in the status byte will be set, and it enables an SRQ on bit 5 of the status byte.

```
10   !
20   ! Generating Interrupts
30   !
40   HP8751=717
50   !
60   OUTPUT HP8751;"*CLS"
```

2-38 Programming Basics
70    OUTPUT Hp8751;"*ESE 32"
80    OUTPUT Hp8751;"*SRE 32"
90    !
100   ON INTR 7 GOSUB Err_report
110   ENABLE INTR 7;2
120   !
130   LOOP
140   END LOOP
150   STOP
160   !
170   Err_report:!
180   Stat=SPOLL(Hp8751)
190   OUTPUT Hp8751;"*ESR?"
200   ENTER Hp8751;Estat
210   PRINT "Syntax error detected."
220   !
230   OUTPUT Hp8751;"OUTPERR0?"
240   ENTER Hp8751;Err,Err$
250   PRINT Err,Err$
260   !
270   ENABLE INTR 7
280   RETURN
290   END

Figure 2-19. Sample Program: Generating Interrupts

Line 60    Clears the status reporting system.
Line 70    Enables bit 5 of the event status register.
Line 80    Enables bit 5 of the status byte so that an SRQ will generated on a syntax error.
Line 100   Tells the computer where to branch it gets the interrupt.
Line 110   Tells the computer to enable an interrupt from interface 7 (HP-IB) when value 2 (bit 1: SRQ bit) of the interrupt register is set. A branch to Err_report will disable the interrupt, so the return from Err_report re-enables it. If there is more than one instrument on the bus capable of generating an SRQ, it is necessary to use serial poll to determine which device has issued the SRQ. In this case, we assume the HP 8751A did it. A branch to Err_report will disable the interrupt, so the return from Err_report re-enable it.
Line 130 and 140  Does nothing loop.
Line 180   Clears the SRQ bit of the status byte.
Lines 190 and 200  Reads the register to clear the bit.
Lines 230 through 250  Instructs the HP 8751A to output the error number and the error message, and print them.
HP-IB Programming Reference

This chapter provides a reference for the HP-IB operation of the HP 8751A. Use this information as a reference to the syntax requirements and general function of the individual commands.

This chapter lists the commands in alphabetical order. Refer to Appendix A for a functional list of the commands.

Refer to the Reference Manual for the details of each function, or to the Service Manual for detail of the service related functions.

Notation

1. Upper case bold characters represent the program codes which must appear exactly as shown with no embedded spaces. Upperc and lower case characters are equivalent.

2. Characters enclosed in the {} brackets are qualifiers attached to the root mnemonic. There can be no spaces or symbols between the root mnemonic and its appendage.

For example:

{ON|OFF} shows that either ON or OFF can be attached to the root mnemonic.
CONM{ON|OFF} means CONMON or CONMOFF.

{1-4} shows that the numeral 1, 2, 3, or 4 can be attached to the root mnemonic.
DELR{1-4} means DELR1, DELR2, DELR3, or DELR4.

3. A constant or a pre-assigned simple or complex numeric or string variable transferred to the HP 8751A. There must be a space between it and the code.

4. Square brackets indicate that the enclosed information is optional.

5. Softkey or hardkey which has the same function.
“Query” indicates that the command can be queried. Refer to “Query Commands”.

A semicolon (;) is required as a separator for each program command except for the last command.

For example, either of the followings is acceptable.

```
OUTPUT Hp8751;'CHAN1; S11; LOGM;'
OUTPUT Hp8751;'CHAN1; S11; LOGM'
```

---

**Query Commands**

All instrument functions can be interrogated to find the current On/Off state or value.

For instrument state commands, append the question mark (?) character instead of {ON|OFF} to interrogate the state of the functions. The HP 8751A responds to the next controller ENTER operation with a “1” or a “0” to indicate On or Off, respectively.

For settable functions such as SCAL value, using SCAL? causes the HP 8751A to respond to the next controller ENTER operation by outputting the current function value then clearing the instrument entry area.

If a command that does not have a defined response is interrogated, the instrument outputs a zero.

- **Example 1**
  ```
  AB
  OUTPUT Hp8751;'AB?;'
  ENTER Hp8751;Reply
  PRINT "Input port is AB?",
  IF Reply then PRINT "Yes"
  IF NOT Reply the PRINT "No"
  ```

- **Example 2**
  ```
  ATTIA{0DB|20DB}
  OUTPUT Hp8751;'ATTIA?;'
  ENTER Hp8751;Reply$
  PRINT "Port A attenuator value is ";Reply$
  ```

- **Example 3**
  ```
  ADDRCONT value
  OUTPUT Hp8751;'ADDRCONT?;'
  ENTER Hp8751;Reply
  PRINT "Controller HP-IB address is ";Reply
  ```

---

3-2 HP-IB Programming Reference
Suffix

The following suffixes can be used as the units the of stimulus values:

Frequency: Hz (default), MHz
Power: dBm (default)
Attenuator: dB (default)
Log mag: dB (default)
Delay time: s (default)
Phase: deg (default)
Capacitance: F (default)
Inductance: H (default)
Impedance: ohm (default)

If no suffix is used, the HP 8751A assumes the default values for the instruction. Upper and lower case characters are equivalent.

Code Naming Conventions

The HP-IB Commands of HP 8751A are derived from their front panel key titles (where possible), according to the naming conventions below.

Some codes require appendages (on, off, 1, 2, etc.). Codes that have no front panel equivalent are HP-IB only commands, and use a similar convention based on the common name of the function. Where possible, HP 8751A codes are compatible with HP 8753 and HP 8510 codes.

<table>
<thead>
<tr>
<th>Convention</th>
<th>For HP-IB Code Use</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>One word</td>
<td>First four letters</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>KEY TITLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP-IB Code</td>
</tr>
<tr>
<td>Two words</td>
<td>First three letters of first word and first letter of second word</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two words in a group</td>
<td>First four letters of both</td>
<td></td>
</tr>
<tr>
<td>Three Words</td>
<td>First three letters of first word, first letter of second word, and first four letters of third word</td>
<td></td>
</tr>
</tbody>
</table>

Table 3-1. HP-IB Code Naming Convention
Reference

AB
Calculates and displays the complex ratio of input A to input B. (A/B under MEAS; Query)

ABODCALI
Aborts the dc detector's output voltage linearity calibration. (ABORT DC CAL under CAL)

ACTLHFRE
Sets the active L high frequency. (Under SERVICE MENU under SYSTEM; Query)

ACTLLFRE
Sets the active L low frequency. (Under SERVICE MENU under SYSTEM; Query)

ACTLNORM
Sets the active L normal. (Under SERVICE MENU under SYSTEM; Query)

ADDRCONT value
Sets the HP-IB address which the HP 8751A will use to communicate with an external controller. (ADDRESS CONTROLLER under LOCAL; Query)

value 0 to 30.

ADDRPLOT value
Sets the HP-IB address which the HP 8751A will use to communicate with the plotter. (ADDRESS PLOTTER under LOCAL; Query)

value 0 to 30.

ADDRPRIN value
Sets the HP-IB address which the HP 8751A will use to communicate with the printer. (ADDRESS PRINTER under LOCAL; Query)

value 0 to 30.
AR
Calculates and displays the complex ratio of input A to input R. (A/R under MEAS; Query)

ATTIA (0dB|20dB)
Sets the attenuator value at input A to 0 dB or 20 dB. (INPUT-A: 0dB or 20dB under ATTN; Query)

ATTIB (0dB|20dB)
Sets the attenuator value at input B to 0 dB or 20 dB. (INPUT-B: 0dB or 20dB under ATTN; Query)

ATTIR (0dB|20dB)
Sets the attenuator value at input R to 0 dB or 20 dB. (INPUT-R: 0dB or 20dB under ATTN; Query)

ATTP1 value [dB]
Sets the attenuator value at port 1 of an S-parameter test set used with the HP 8751A. (ATTENUATOR PORT 1; under MENU; Query)
value: 0 to 70 (dB), in 10 (dB) step.

ATTP2 value [dB]
Sets the attenuator value at port 2 of an S-parameter test set used with the HP 8751A. (ATTENUATOR PORT 2; under MENU; Query)
value: 0 to 70 (dB), in 10 (dB) step.

AUTO
Selects the scale/div value automatically to fit the trace data to the display. (AUTO SCALE under SCALE REF)

AVERFACT value
Sets the averaging factor. (AVERAGING FACTOR; under AVG; Query)
value: 1 to 999.
AVER{ON|OFF}
Sets the averaging function on or off for the active channel. (AVERAGING on off under (AVG)); (Query)

AVERREST
Resets and restarts averaging. (AVERAGING RESTART under (AVG))

BACI value
Sets the background intensity of the display as a percent of the white level. (BACKGROUND INTENSITY under (DISPLAY); Query)

value 0 to 100 (%).

BDC
Displays a dc voltage at input B. (BDC under (MEAS); Query)

BDCR
Calculates and displays the ratio of a dc voltage at input B to the reference signal at input R. (BDC/R under (MENU); Query)

BEEPDONE{ON|OFF}
Sets the operation completion beeper on or off. (BEEP DONE on off under (DISPLAY); Query)

BEEPFAIL{ON|OFF}
Sets the limit fail beeper on or off. (BEEP FAIL on off under (SYSTEM); Query)

BEEPWARN{ON|OFF}
Sets the warning beeper on or off. (BEEP WARN on off under (DISPLAY); Query)

BR
Calculates and displays the complex ratio of input B to input R. (B/R under (MENU); Query)
**C0 value**
Enters the constant term of the open circuit capacitor model value, \( C_0 \). (\( C_0 \) under \( \text{CAL} \))

*value*  
0 to 1000 \( (x \ 10^{-15} \text{ F}) \).

**C1 value**
Enters the constant term of the open circuit capacitor model value, \( C_1 \). (\( C_1 \) under \( \text{CAL} \))

*value*  
0 to 1000 \( (x \ 10^{-27} \text{ F/Hz}) \).

**C2 value**
Enters the constant term of the open circuit capacitor model value, \( C_2 \). (\( C_2 \) under \( \text{CAL} \))

*value*  
0 to 1000 \( (x \ 10^{-36} \text{ F/Hz}^2) \).

**CALCASS1**
Shows the tabular listing of the calibration kit class assignment. (\( \text{CLASS ASSIGNMENT} \) under \( \text{COPY} \))

**CAL1 parameter**
Selects the measurement calibration type. (Query)

*parameter*  
NONE, RESP, RAI, S111, S221, FUL2, or ONE2

**CALIFUL2**
Selects the full 2-port measurement calibration. (\( \text{FULL 2-PORT} \) under \( \text{CAL} \); Query)

**CALIONE2**
Selects the one-path 2-port measurement calibration. (\( \text{ONE-PATH 2-PORT} \) under \( \text{CAL} \); Query)

**CALIRAI**
Selects the response and isolation measurement calibration. (\( \text{RESPONSE & ISOL'N} \) under \( \text{CAL} \); Query)
CALIRESP
Selects the response measurement calibration. (RESPONSE under CAL; Query)

CALIS111
Selects the 1-port measurement calibration at port 1. (S11 1-PORT under CAL; Query)

CALIS221
Selects the 1-port measurement calibration at port 2. (S22 1-PORT under CAL; Query)

CALK parameter
Selects the calibration kit. (Query)

parameter APC7, N50, N75, or USED.

CALK7MM
Selects the 7 mm calibration kit. (CAL KIT: 7mm under CAL; Query)

CALKN50
Selects the 50 Ω type-N calibration kit. (N 50Ω under CAL; Query)

CALKN75
Selects the 75 Ω type-N calibration kit. (N 75Ω under CAL; Query)

CALKUSED
Selects a calibration kit model defined or modified by the user. (USER KIT under CAL; Query)

CALN
Selects using no calibration. (CALIBRATE: NONE under CAL; Query)

CALP
Calculates the parameters of the conjugate matching circuit. (CALCULATE PARAMETERS under DISPLAY)
CALS value
Provides the tabular listing of the standard setting. (STD NO.1 to STD NO.8 under COPY)
value 1 to 8.

CBRI value
Sets the color brightness in percent. (BRIGHTNESS under DISPLAY; Query)
value 0 to 100 (%).

CENT value [suffix]
Sets the center stimulus value. (CENTER, or CENTER under MENU; Query)
value 5 (Hz) to 500 (MHz), or
-50 (dBm) to +15 (dBm) (Power sweep only).
suffix Refer to “Suffix”.

CHAIRANG
Changes the IF range set channel (R to A to B). (Under SERVICE MENU under SYSTEM)

CHAN1
Selects channel 1 as the active measurement channel. (CH1; Query)

CHAN2
Selects channel 2 as the active measurement channel. (CH2; Query)

CLAD
Completes specifying the class. (CLASS DONE (SPE’D) under CAL)

CLASS11(A|B|C)
Selects port 1 (S11) one-port calibration standard class: S11A (open), S11B (short), or S11C (load). ([S11]: OPEN, SHORT, or LOAD under CAL)

CLASS22(A|B|C)
Selects port 2 (S22) one-port calibration standard class: S22A (open), S22B (short), or S22C (load). ([S22]: OPEN, SHORT, or LOAD under CAL)
CLEL
Clears the current frequency list. (CLEAR LIST YES) under [MENU]

CLEM{1-8}
Clears the marker. (marker 1 to marker 8) under [MKR]

CLES
Clears the status byte, the event status register, the event status register B, and the operational status register.

CLEPTRIP
Clears the power trip. (CLEAR POWER TRIP) under [MENU]

COLO{CH1D|CH1M|CH2D|CH2M|GRAT|TEXT|WARN}
Specifies the display element to change color: channel 1 data, channel 1 memory and limit lines, channel 2 data, channel 2 memory and limit lines, a text, or a warning message. (CH1 DATA, CH1 MEM LIMIT LN, CH2 DATA, CH2 MEM LIMIT LN, GRATICULE, TEXT, WARNING) under [DISPLAY]

COLOIBT
Specifies the display element to change color: the HP Instrument BASIC text. (IBASIC) under [DISPLAY] (Option 002 only)

COLOR value
Specifies the saturation percent of the specified display element. (COLOR under [DISPLAY]; Query)
value 0 to 100 (%).

CONM{ON|OFF}
Sets conjugate matching on or off. (CONJ MATCH ON OFF) under [DISPLAY]; Query

CONPCP value [F]
Displays or changes parameter value Cp for the selected conjugate matching circuit. (Cp under [DISPLAY]; Query)
value 1.0E-18 (F) to 1.0E+9 (F).
CONPCS value [F]
Displays or changes parameter value Cs for the selected conjugate matching circuit. (Cs under [DISPLAY]; Query)
value 1.0E-18 (F) to 1.0E+9 (F).

CONPLP value [H]
Displays or changes parameter value Lp for the selected conjugate matching circuit. (Lp under [DISPLAY]; Query)
value 1.0E-18 (H) to 1.0E+9 (H).

CONPLS value [H]
Displays or changes parameter value Ls for the selected conjugate matching circuit. (PARAMETER:Ls under [DISPLAY]; Query)
value 1.0E-18 (H) to 1.0E+9 (H).

CONPDISP{ON|OFF}
Displays or does not displays the conjugate matching parameters on the CRT. (CNJ.P DISP on off under [DISPLAY])

CONT
Continuous trigger. (CONTINUOUS under [MENU]; Query)

CONV parameter
Selects the conversion setting of the measured data, impedance or admittance. (Query)
parameter OFF, ZREF, ZTRA, YREF, YTRA, or ONEDS

CONV1DS
Expresses the data in inverse S-parameter values. (1/S under [MEAS]; Query)

CONVOFF
Turns off all parameter conversion operations. (OFF under [MEAS]; Query)
CONVYREF
Converts reflection data to its equivalent admittance values. \( Y: \text{Ref} \) under \text{MEAS}; Query)

CONVYTRA
Converts transmission data to its equivalent admittance values. \( Y: \text{Trans} \) under \text{MEAS}; Query)

CONVZREF
Converts reflection data to its equivalent impedance values. \( Z: \text{Ref} \) under \text{MEAS}; Query)

CONVZTRA
Converts transmission data to its equivalent impedance values. \( Z: \text{Trans} \) under \text{MEAS}; Query)

COPA
Aborts printing or plotting in progress. \( \text{COPY ABORT} \) under \text{COPY})

COPT\{ON\|OFF\}
Sets the time stamp function on or off. \( \text{COPY TIME} \) on\|off \) under \text{COPY}; Query)

CORR\{ON\|OFF\}
Sets the error correction function on or off. \( \text{CORRECTION} \) on\|off \) under \text{CAL}; Query)

COUC\{ON\|OFF\}
Sets the channel coupling of stimulus values on or off. \( \text{COUPLED CH} \) on\|off \) under \text{MENU}; Query)

CWFREQ value [suffix]
Sets the frequency for power sweep. \( \text{CWFREQ} \) under \text{MENU}; Query)

value \hspace{1cm} 5 (Hz) to 500 (MHz).
suffix \hspace{1cm} Hz or MHz.
DATI
Stores the active channel data to trace memory. (DATA → MEM under DISPLAY)

DAYMYEAR
Sets the displayed date mode to day/month/year order. (DayMonYear under SYSTEM; Query)

DCBUS value
Selects the DC bus. (Under SERVICE MENU under SYSTEM; Query)
value 0 to 20.

DCCOR{ON|OFF}
Sets the dc detector linearity correction on or off. (DC CORR on/off under CAL; Query)

DEFC
Returns all traces, lines, and text to the default colors. (DEFAULT COLORS under Display)

DEFS value
Defines the number of the calibration standard to be modified. (DEFINE STANDARD under CAL)
value 1 to 8.

DELA
Selects the Delay format for the current measurement. (DELAY under FORMAT; Query)

DELO
Sets the delta marker mode off. (Δ MODE OFF under MKR; Query)

DELR{1-8}
Selects the delta reference marker. (Δ REF = 1 to Δ REF = 8 under MKR; Query)
DELRFIXM
Sets the user-specified fixed reference marker. (AREF=A FIXED MKR under MKR; Query)

DESTOFF
Sets destructive testing off. (Under SERVICE MENU under SYSTEM; Query)

DESTON
Sets destructive testing on. (Under SERVICE MENU under SYSTEM; Query)

DFLT
Returns the plotting parameters to the default values. (DEFAULT SETUP under COPY)

DISA parameter
Selects the display allocation mode. (Query) (Option 002 only)
parameter ALLI, HIHB, or ALLB

DISAALLB
 Displays only the HP Instrument BASIC display on the HP 8751A's CRT. (ALL BASIC under DISPLAY; Query) (Option 002 only)

DISAALLI
 Displays only the measurement graticule on the HP 8751A's CRT. (ALL INSTRUMENT under DISPLAY; Query) (Option 002 only)

DISABASS
 Displays only the HP Instrument BASIC status on the HP 8751A's CRT. (BASIC STATUS under DISPLAY; Query) (Option 002 only)

DISAHIHB
 Displays the measurement graticule (top half) and the HP Instrument display (bottom half) on the HP 8751A's CRT. (HALF INSTR HALF BASIC under DISPLAY; Query) (Option 002 only)
DISL \{1|2\}
Selects the list sweep table 1 or 2 to be displayed and hard copied. (DISL1 or DISL2 under COPY)

DISLLIST
Displays the limit table on the display. (DISPLAY LIST under COPY)

DISMCTSP
Displays the list sweep stimulus range in the center and span format. (CTR & SPAN under COPY; Query)

DISMMMD
Selects the middle and delta format for the limit testing table. (MID & DLT under COPY; Query)

DISMNNUM
Displays the list sweep stimulus resolution in the number of points format. (NUMBER of POINTS under COPY; Query)

DISMSTEP
Displays the list sweep stimulus resolution in the step size format. (STEP SIZE under COPY; Query)

DISMSTSP
Displays the list sweep stimulus range in the start and stop format. (DISP MODE: ST & SP under COPY; Query)

DISMUL
Selects the upper and lower format for the limit testing table. (DISP MODE: UPR & LWR under COPY; Query)

DISP parameter
Selects the display trace type. (Query)

parameter DATA, MEMO, DATM, DDM, or DMM
DISPDATA
Displays a trace of the measured data. (DISPLAY: DATA under DISPLAY; Query)

DISPDATM
Displays traces of both the measured data and the memory data. (DATA and MEMORY under DISPLAY; Query)

DISPDDM
Displays the trace of the results of the measured data divided by the memory data. (DATA/MEM under DISPLAY; Query)

DISPDDMM
Displays the trace of the results of the measured data subtracted by the memory data. (DATA-MEM under DISPLAY; Query)

DISPMEMO
Displays a trace of the memory data. (MEMORY under DISPLAY; Query)

DONE
Completes the measurement of the selected standard class calibration. (DONE: OPENS, DONE: SHORTS, or DONE: LOADS under CAL)

DUAC{ON|OFF}
Selects the dual (ON) or single (OFF) channels display. (DUAL CHAN on off under DISPLAY; Query)

EDITDONE
Completes editing the frequency list for the list sweep. (LIST DONE under MENU)

EDITLIML
Beginning editing the limit line table. (EDIT LIMIT LINE under SYSTEM)
EDITLIS1
Selects list 1 for editing. **EDIT: LIST 1** under **MENU**; Query)

EDITLIS2
Selects list 2 for editing. **LIST 2** under **MENU**; Query)

EDITLIST
Begins editing the frequency list. **EDIT: LIST** under **MENU**)

ELED value [s]
Sets the electrical delay. **ELECTRICAL DELAY** under **SCALE REF**; Query)
value 
-10 (s) to 10 (s).

ESB?
Outputs the event status register B value.

ESNB value
Specifies the bits of event status register B.
value 
0 to 32767 (=2^15-1).

EXEDCALI
Executes the dc detector linearity calibration. **EXECUTE DC CAL** under **CAL**)

EXET
Executes the service test. (Under **SERVICE MENU** under **SYSTEM**)

EXPP
Selects the expanded phase format for the current measurement. **EXPANDED PHASE** under **FORMAT**; Query)
EXTRLOCK?
Outputs the state of the external reference (locked or unlocked). (Under SERVICE MENU under SYSTEM)

EXTT parameter
Selects the external trigger mode. (Query)
parameter OFF, ONSWEE, ONPOIN, or MAN.

EXTTOFF
Sets the internal measurement trigger mode (external trigger off). (TRIGGER: TRIG OFF under MENU; Query)

EXTTON
Sets the external measurement trigger mode on. When triggered, one measurement sweep is executed. (EXT: TRIG ON SWEEP under MENU; Query)

EXTTOPOIN
Sets the external measurement trigger mode on. When triggered, one point is measured.
(EXT: TRIG ON POINT under MENU; Query)

FBUS value
Selects the frequency bus. (Under SERVICE MENU under SYSTEM)
value 0 to 5.

FIIRLANOR
Sets first local ALC to normal. (Under SERVICE MENU under SYSTEM; Query)

FIIRLAOPENE
Sets first local ALC to open. (Under SERVICE MENU under SYSTEM; Query)

FIIRLPNNOR
Sets first local PLL to normal. (Under SERVICE MENU under SYSTEM; Query)
FIRLPOPE
Sets first local PLL to open. (Under SERVICE MENU under SYSTEM; Query)

FIRR?
Outputs the firmware revision. (Under SERVICE MENU under SYSTEM)

FMT parameter
Selects the display format. (Query)
parameter LOGM, PHAS, DELA, SMIC, POLA, LINM, SWR, REAL, IMAG, EXPP, INVSCHAR, LOGMP, or LOGMD

FNDAUTO
Sets FN DAC to auto. (Under SERVICE MENU under SYSTEM; Query)

FNDMANU
Sets FN DAC to manual. (Under SERVICE MENU under SYSTEM; Query)

FNDVALU value
Sets the FN DAC value. (Under SERVICE MENU under SYSTEM; Query)
value 0 to 255.

FNVNORM
Sets FN VCO to normal. (Under SERVICE MENU under SYSTEM; Query)

FNVOPEN
Sets FN VCO to open. (Under SERVICE MENU under SYSTEM; Query)

FREO
Erases the frequency annotation on the display. Preset to turn on. (FREQUENCY BLANK under DISPLAY; Query)
FORM2
Sets the IEEE 32-bit floating point format to transfer the trace data via HP-IB.

FORM3
Sets the IEEE 64-bit floating point format to transfer the trace data via HP-IB.

FORM4
Sets the ASCII transfer format to transfer the trace data via HP-IB.

FORM5
Sets the PC-DOS format to transfer the trace data via HP-IB.

FULP
Selects the full page plot. (FULL PAGE under COPY; Query)

FWDI
Selects forward isolation class for the calibration. (FWD ISOL N ISOL N STD under CAL)

FWDM
Selects forward match for the calibration. (FWD MATCH THRU under CAL)

FWDT
Selects forward transmission for the calibration. (FWD TRANS THRU under CAL)

GRODAPER value [pct]
Sets the group delay aperture. (GROUP DELAY APERTURE under AVG; Query)
value 1 to 200 (%).

HOLD
Holds the present measurement. (HOLD under MENU; Query)
**IFBW** value [suffix]
Sets the bandwidth value for IF bandwidth reduction. (IF BW under AVG; Query)

*value*  
2 (Hz), 20 (Hz), 200 (Hz), 1000 (Hz), or 4000 (Hz).

*suffix*  
Hz or MHz.

**IFBWAUTO**
Automatically selects the proper IF bandwidth for each measurement point. (IF BW AUTO under AVG; Query)

**IFRAUTO**
Sets the auto range mode for the IF range of the selected channel. (Under SERVICE MENU under SYSTEM; Query)

**IFRCH?**
Outputs the IF range set channel. (Under SERVICE MENU under SYSTEM)

**IFRX1**
Sets the X1 range for the IF range. (Under SERVICE MENU under SYSTEM; Query)

**IFRX1X8**
Sets X1, X8 range for the IF range. (Under SERVICE MENU under SYSTEM; Query)

**IFRX64**
Sets X64 range for the IF range. (Under SERVICE MENU under SYSTEM; Query)

**IFRX8X1**
Sets X8, X1 range for the IF range. (Under SERVICE MENU under SYSTEM; Query)

**IMAG**
Displays only the imaginary (reactive) portion of the measured data in Cartesian format. (IMAGINARY under FORMAT; Query)
INID
Initializes the disk in the built-in flexible disk drive. (INITIALIZE DISK under SAVE/RECALL)

INP810
Inputs data from the 4-bit parallel input port to the HP 8751A.

INPUCALC{01-12} value
Stores the measurement calibration error coefficient set real/imaginary pairs input via HP-IB into instrument memory. Refer to Appendix D for calibration array assignments.
value Complex number. (Data format: real, imaginary)

INPUCALK value
Retransmits the calibration kit data transmitted by the OUTPCALK? command.
value Block data. (Data format: HP 8751A internal format (714 bytes of binary data))

INPUDATA value
Inputs the error corrected data.
value Complex number. (Data format: real, imaginary)

INPUFORM value
Inputs formatted data.
value Complex number. (Data format: real, imaginary)

INPURAW{1-4} value
Inputs raw data.
value Complex number. (Data format: real, imaginary)

INPUUFORM value
Inputs unformatted data. This command is invalid, when MEMORY or DATA and MEMORY is selected as a trace.
value Complex number. (Data format: real, imaginary)
INTE value
Sets the display intensity as a percent of the brightest setting. (INTENSITY under DISPLAY; Query)

value 0 to 100 (%).

INVSCHAR
Displays an inverse Smith chart (admittance Smith chart) format. (INV SMITH CHART under FORMAT; Query)

ISOD
Completes the isolation part of the 2-port calibration. (ISOLATION DONE under CAL)

ISOL
 Begins the isolation part of the 2-port calibration. (ISOLATION under CAL)

KEY value
Sends the key code for a hardkey or a softkey on the front panel. This is equivalent to actually pressing a key. Refer to Appendix C for key codes.

value 0 to 49.

KITD
Ends the calibration kit modification process. (KIT DONE under CAL)

LABEFWD{M|T} string
Defines the label for forward match or forward transmission class during modifying the calibration kit. (FWD MATCH or LABEL: FWD TRANS under CAL)

string Up to ten characters long.

LABERES{I|P} string
 Defines the label for response and isolation, or response class when modifying the calibration kit. (RESPONSE & ISOLN or RESPONSE under CAL)

string Up to ten characters long.
LABEREV\{M|T\} \textit{string}
Defines the label for reverse match or reverse transmission class during modifying the calibration kit. (\textit{REV.MATCH} or \textit{REV.TRANSM} under \textit{CAL})
\textit{string} Up to ten characters long.

LABES11\{A|B|C\} \textit{string}
Defines the label for \textit{S11A} (opens), \textit{S11B} (shorts), or \textit{S11C} (loads) class when modifying the calibration kit. (\textit{LABEL: S11A, S11B, or S11C} under \textit{CAL})
\textit{string} Up to ten characters long.

LABES22\{A|B|C\} \textit{string}
Defines the label for \textit{S22A} (opens), \textit{S22B} (shorts), or \textit{S22C} (loads) class when modifying the calibration kit. (\textit{LABEL: S22A, S22B, or S22C} under \textit{CAL})
\textit{string} Up to ten characters long.

LABK \textit{string}
Defines the calibration kit label when modifying the calibration kit. (\textit{LABEL.KIT} under \textit{CAL})
\textit{string} Up to ten characters long.

LABS \textit{string}
Defines the calibration standard label when modifying the calibration kit. (\textit{LABEL.STD} under \textit{CAL})
\textit{string} Up to ten characters long.

LEFL
Sets the plot quadrant to left lower. (\textit{LEFT_LOWER} under \textit{COPY}; Query)

LEFU
Sets the plot quadrant to left upper. (\textit{LEFT_UPPER} under \textit{COPY}; Query)

LIMCLEL
Clears all of segments in the limit test. (\textit{CLEAR LIST YES} under \textit{SYSTEM})
**LIMD value [suffix]**

Sets the limits delta value from the specified middle value. (DELTA LIMITS under [SYSTEM]; Query)

- value 0 to 5.0E+5 (dB) (Log mag format),
- 0 to 5.0E+5 (deg) (Phase and Expanded phase formats),
- 0 to 5.0E+5 (s) (Delay format),
- 0 to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),
- 0 to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
- 0 to 5.0E+5 (SWR format).

**suffix** Refer to “Suffix”.

---

**LIMEDONE**

Completes editing the limit table. (DONE under [SYSTEM])

---

**LIMIAMPO value [suffix]**

Sets an amplitude offset value for limit testing. (AMPLITUDE OFFSET under [SYSTEM]; Query)

- value -5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),
- -5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase format),
- -5.0E+5 (s) to 5.0E+5 (s) (Delay format),
- -5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),
- -5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
- -5.0E+5 to 5.0E+5 (SWR format).

**suffix** Refer to “Suffix”.

---

**LIMILINE{ON|OFF}**

Sets limit lines on or off. (LIMIT LINE on off under [SYSTEM]; Query)

---

**LIMIMAOF**

Sets the active marker value to the amplitude offset for limit testing. (MARKER AMP. OFFSET under [SYSTEM])
LIMISTIO value [suffix]
Sets a stimulus offset value for limit testing. (STIMULUS OFFSET under SYSTEM; Query)

value
-500 (MHz) to 500 (MHz) (Frequency sweep), or
-50 (dBm) to 50 (dBm) (Power sweep).

suffix Refer to "Suffix".

LIMITTEST{ON|OFF}
Sets the limit testing on or off. (LIMIT TEST on/off under SYSTEM; Query)

LIML value [suffix]
Sets the lower limit value for a limit testing segment. (LOWER LIMIT under SYSTEM; Query)

value
-5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),
-5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),
-5.0E+5 (s) to 5.0E+5 (s) (Delay format),
-5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),
-5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
-5.0E+5 to 5.0E+5 (SWR format).

suffix Refer to "Suffix".

LIMM value [suffix]
Sets the middle value of delta limits. (MIDDLE VALUE under SYSTEM; Query)

value
-5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),
-5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),
-5.0E+5 (s) to 5.0E+5 (s) (Delay format),
-5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith Chart and Inv. Smith chart formats),
-5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
-5.0E+5 to 5.0E+5 (SWR format).

suffix Refer to "Suffix".
LIMS value [suffix]
Sets the starting stimulus value of a limit testing segment. \textit{(STIMULUS VALUE under SYSTEM; Query)}
value 5 (Hz) to 500 (MHz) (Frequency sweep), or
-50 (dBm) to 15 (dBm) (Power sweep).
suffix Refer to "Suffix".

LIMSADD
Adds a new segment to the end of the limit list. \textit{(ADD under SYSTEM)}

LIMSDEL
Deletes a limit testing segment. \textit{(DELETE under SYSTEM)}

LIMSDON
Completes editing the limit segments. \textit{(DONE under SYSTEM)}

LIMSEDI value
Opens the segment to define or modify the stimulus and limit values. \textit{(EDIT under SYSTEM; Query)}
value 1 to 18.

LIMU value [suffix]
Sets the upper limit value for a limit testing segment. \textit{(UPPER LIMIT under SYSTEM; Query)}
value -5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),
-5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),
-5.0E+5 (s) to 5.0E+5 (s) (Delay format),
-5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),
-5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
-5.0E+5 to 5.0E+5 (SWR format).
suffix Refer to "Suffix".
LINFREQ
Activates a linear frequency sweep. (LIN FREQ under \texttt{(MENU)}; Query)

LINM
Displays the linear magnitude format. (LIN M AG \texttt{(FORMAT)}; Query)

\texttt{LINT\{DATA\|MEMO\}} \textit{value}
Selects the line type of a trace for plotting. (LINE \texttt{TYPE DATA} or LINE \texttt{TYPE MEMORY} under \texttt{(COPY)})
\textit{value} 0 to 7.

LISDFBASE
Displays the measured data for the range between the minimum and maximum frequency set in the “Edit List Menu.” (LIST DISP FREQ BASE under \texttt{(MENU)}; Query)

LISDOBASE
Displays the measured data for only the frequency ranges set in the “Edit List Menu.” (ORDER BASE under \texttt{(MENU)}; Query)

LISFREQ
Activates the frequency list sweep mode. (LIST FREQ under \texttt{(MENU)}; Query)

LISLIS1
Activates LIST 1 for the list sweep. (Sweep BY: \texttt{LIST 1} under \texttt{(MENU)}; Query)

LISLIS2
Activates LIST 2 for the list sweep. (LIST 2 under \texttt{(MENU)}; Query)

LISV
Displays a tabular listing of all the stimulus values and their current measured values. (LIST VALUES under \texttt{(COPY)})
LOGFREQ
Activates log frequency sweep mode. (LOG FREQ under MENU; Query)

LOGM
Displays in log magnitude format. (LOG MAG under FORMAT; Query)

LOGMD
Displays the log magnitude trace and delay trace simultaneously. (LOG MAG & DELAY under FORMAT; Query)

LOGMP
Displays the log magnitude trace and phase trace simultaneously. (LOG MAG & PHASE under FORMAT; Query)

MANTRIG
Triggers measurement at one point. (MANUAL TRG ON POINT under MENU; Query)

MARK{1-8} value [suffix]
Selects the active marker, and moves it to the specified stimulus value. (MARKER 1 to MARKER 8 under MKR; Query)

value  5 (Hz) to 500 (MHz) (Frequency sweep), or
       -50 (dBm) to +15 (dBm) (Power sweep).

suffix  Refer to “Suffix”.

MARKBUCK value
Moves the active marker to specified data point number.

value  1 to “number of points”.

MARKCENT
Changes the stimulus center value to the active marker value. (MARKER - CENTER under MKR FCTN)
MARKCONT
Interpolates between measured points to allow the markers to be placed at any point on the trace. (CONTINUOUS under [MKR]; Query)

MARKCOUP
Couples the marker stimulus values for the two display channels. (MARKERS: COUPLED under [MKR]; Query)

MARKDELA
Enters the group delay at the active marker point of a fixed frequency aperture to the electrical delay to balance the phase of the DUT. (MARKER — DELAY under [SCALE REF])

MARKDISC
Places markers only on measured trace points determined by the stimulus settings. (MARKERS: DISCRETE under [MKR]; Query)

MARKFAUV value [suffix]
Sets the fixed marker auxiliary value offset. (FIXED MKR AUX VALUE under [MKR]; Query)

value
- $-5.0 \times 10^6$ (ohm) to $5.0 \times 10^6$ (ohm) (Smith chart and Inv. Smith chart formats), or
- $-5.0 \times 10^6$ (deg) to $5.0 \times 10^6$ (deg) (Polar format).

suffix
Refer to “Suffix”.

MARKFSTI value [suffix]
Sets the fixed marker stimulus value offset. (FIXED MKR STIMULUS under [MKR]; Query)

value
- $-5000$ (MHz) to $5000$ (MHz) (Frequency sweep), or
- $-99999$ (dBm) to $99999$ (dBm) (Power sweep).

suffix
Refer to “Suffix”.

MARKFVAL value [suffix]
Sets the fixed marker position value offset. (FIXED MKR VALUE under [MKR]; Query)

value
- $-5.0 \times 10^5$ (dB) to $5.0 \times 10^5$ (dB) (Log mag format),
- $-5.0 \times 10^5$ (deg) to $5.0 \times 10^5$ (deg) (Phase and Expanded phase formats),
- $-5.0 \times 10^5$ (s) to $5.0 \times 10^5$ (s) (Delay format),
- $-5.0 \times 10^5$ (ohm) to $5.0 \times 10^5$ (ohm) (Smith chart and Inv. Smith chart formats),

3-30 HP-IB Programming Reference
MARKSPAN

- 5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
- 5.0E+5 to 5.0E+5 (SWR format).

suffix Refer to “Suffix”.

MARKL{ON|OFF}
Displays (ON) or does not display (OFF) the list of stimulus values and response values of all markers. (MARK LIST on-off under MKR; Query)

MARKMIDD
Sets the middle value for the delta limit using to the active marker value. (MIDDLE VALUE under SYSTEM)

MARKODATA
Enables the marker to move on the measurement data trace. (MARKERS ON DATA under MKR; Query)

MARKOFF
 Turns off all the markers and the delta reference marker. (ALL-MKR OFF under MKR; Query)

MARKOMEMO
Enables the marker to move on the memory data trace. (MARKERS ON MEMO under MKR; Query)

MARKPEAD
Changes the differential stimulus value and the response value of the peak for searching the local max, min, and peak-to-peak. (MARKER PEAK DEF under MKR FTN)

MARKREF
Changes the reference value to the active marker’s response value, without changing the reference position. (MARKER REFERENCE under SCALE REF or MKR FTN)

MARKSPAN
Changes the start and stop values of the stimulus span to the active marker and the delta reference marker. (MARKER SPAN under MKR FTN)
MARK{START|STOP}
Changes the stimulus start or stop value to the active marker value. (MARKER → START, MARKER → STOP under MKR FCTN)

MARKSTIM
Sets the stimulus value of a segment to the active marker value. (MARKER → STIMULUS under SYSTEM)

MARKTIME{ON|OFF}
Sets the x-axis marker readout to the sweep time (ON), or cancels the setting (OFF). (MKR TIME on off under MKR; Query)

MARKUNCO
Allows the marker stimulus values to be controlled independently on each channel. (UNCOUpled under MKR; Query)

MARKZERO
Puts a fixed reference marker at the present active marker position, and makes the fixed marker stimulus and response values at that position equal to zero. (MKR ZERO under MKR)

MEAS parameter
Selects the parameters or inputs to be measured. (Query)

parameter AR, BR, AB, A, B, R, S11, S12, S21, S22, BDC, or BDCR.

MEASA
Measures the absolute power amplitude at input A. (A under MEAS; Query)

MEASB
Measures the absolute power amplitude at input B. (B under MEAS; Query)

MEASR
Measures the absolute power amplitude at input R. (R under MEAS; Query)
MEASTAT{ON|OFF}
Calculates and displays the mean, standard deviation, and peak-to-peak values among the search range (ON), or does not display them (OFF). (STATICS under MKR FCTN; Query)

MIXLPNOR
Sets the mixer local port to normal. (Under SERVICE MENU under SYSTEM; Query)

MIXLPTES
Sets the mixer local port to test. (Under SERVICE MENU under SYSTEM; Query)

MOD11
Leads to the modify calibration kit menu, where a calibration kit can be user-modified. (MODIFY under CAL)

MONDYEAR
Changes the displayed date to the "month:day:year" format. (DATE MODE: MonDayYear under SYSTEM; Query)

NEXP
Displays the next page of information in a tabular listing onto the display. (NEXT PAGE under COPY)

NUMG value
Triggers a user-specified number of sweeps, and returns to the hold mode. (NUMBER OF GROUPS under MENU)

value Greater than 0.

OFSD value [$]
Specifies the one-way electrical delay from the measurement (reference) plane to the standard. (OFFSET DELAY under CAL)

value −10 (s) to 10 (s).
**OFSL value**

Specifies energy loss, due to skin effect, along a one-way length of coaxial cable offset. (OFFSET-LOSS under CAL)

value 0 to 1.0E+19 (Ω/s).

**OFSZ value [ohm]**

Specifies the characteristic impedance of the coaxial cable offset. (OFFSET-Z0 under CAL)

value 0.1 (ohm) to 5.0E+6 (ohm).

**OMII**

Omits the correction for isolation of a 2-port calibration. (OMIT-ISOLATION under CAL)

**OPEP**

Lists the key parameters for both channel 1 and 2 on the display. (OPERATING PARAMETERS under COPY)

**OSE value**

Enables the operational status register.

value 0 to 32767.

**OSR?**

Outputs the operational status register value.

**OUT8IO value**

Outputs the data to the 8-bit parallel output port.

value 0 to 32767.

**OUTPCALC{01-12}?**

Outputs the active calibration set array of the active channel (Data format: real, imaginary). Refer to Appendix D for the calibration set array.

**OUTPCALK?**

Outputs the active calibration kit. (Data format: block data (714 bytes of binary data))
OUTPDATA?
Outputs the error corrected data (Data format: real, imaginary).

OUTPDATAP? value
Outputs the error corrected data at the specified point (Data format: real, imaginary).
value 1 to "number of points."

OUTPERRO?
Outputs the error message in the error queue (Data format: ASCII No., "string").

OUTPFAIP?
Outputs the detailed information of the limit test at the failed point (Data format: stimulus, result, upper limit, lower limit).

OUTPFBUS?
Outputs the FBUS data. (Under SERVICE MENU under SYSTEM)

OUTPFORM?
Outputs the formatted trace data (Data format: real, imaginary)

OUTPFORMP? value
Outputs the formatted trace data at the specified point (Data format: real, imaginary)
value 1 to "number of points."

OUTPIFORM?
Outputs the formatted data from the inactive channel (Data format: real, imaginary)

OUTPINP8IO?
Outputs the data entered from the 4-bit parallel input port.

OUTPIRFORM?
Outputs the real part of the formatted data from the inactive channel.
OUTPIRTMEM?
Outputs the real part of the trace memory data from the inactive channel.

OUTPITMEM?
Outputs the trace memory data from the inactive channel. (Data format: real, imaginary)

OUTPLIMF?
Outputs the limit test results only for the failed points. (Data format: stimulus, result (0 for fail, -1 for no test), upper limit, lower limit; Form 4)

OUTPLIML?
Outputs the limit test results for each point. (Data format: stimulus, result (1 for pass, 0 for fail, -1 for no test), upper limit, lower limit; Form 4)

OUTPLIMM?
Outputs the limit test result for the marker position. (Data format: stimulus, result (1 for pass, 0 for fail, -1 for no test), upper limit, lower limit)

OUTPMARK?
Outputs the active marker values. (Data format: marker value, marker aux. value, stimulus)

OUTPMEMO?
Outputs the memory data from the active channel. (Data format: real, imaginary)

OUTPMEMOP? value
Outputs the memory data from the active channel at a specified point. (Data format: real, imaginary)

value 1 to “number of points.”

OUTPMSTA?
Outputs the marker statistics. (Data format: mean, standard deviation, peak to peak)

OUTPMWID?
Outputs the results of the bandwidth search. (Data format: bandwidth, center, Q)
OUTPRAW{1-4}?  
Output the uncorrected data arrays for the active channel. (Data format: real, imaginary)

OUTPRFORM?  
Outputs the real part of the formatted data from the active channel.

OUTPRTMEM?  
Outputs the real part of the trace memory data from the active channel.

OUTPSTIM?  
Outputs the stimulus array data from the active channel.

OUTPTESS? value  
Outputs the specified test number's result. (Under SERVICE MENU under SYSTEM)  
value 0 to 85.

OUTPTITL?  
Outputs the display title for the active channel (less than 54 characters).

OUTPTMEM?  
Outputs the memory data from the active channel. (Data format: real, imaginary)

OUTPTMEMP? value  
Outputs the memory data from the active channel at a specified point. (Data format: real, imaginary)  
value 1 to “number of points.”

OUTPUFORM?  
Outputs the unformatted data from the active channel. (Data format: real, imaginary)

PARS{ON|OFF}  
Sets the partial search of the marker search function on or off. (PART SRCH on off under MKR FCTN; Query)
PEADX value [suffix]
Defines the differential stimulus value of the peak for searching for the local max, min, and peak-to-peak. (PEAK DEF: ΔX under [MKR FCTN]; Query)

*value* 
-5000 (MHz) to 5000 (MHz) (Frequency sweep), or
-500 (dBm) to 500 (dBm) (Power sweep).

*suffix* Refer to “Suffix”.

PEADY value [suffix]
Defines the differential response value of the peak for searching for the local max, min, and peak-to-peak. (ΔY under [MKR FCTN]; Query)

*value* 
-5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),
-5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),
-5.0E+5 (s) to 5.0E+5 (s) (Delay format),
-5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),
-5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
-5.0E+5 to 5.0E+5 (SWR format).

*suffix* Refer to “Suffix”.

PHAO value [deg]
Adds or subtracts a phase offset. (PHASE OFFSET under [SCALE REF]; Query)

*value* 
-360 (deg) to +360 (deg).

PHAS
Displays a Cartesian format of the phase portion of the data, measured in degrees. (PHASE under [FORMAT]; Query)

PLOALL
Selects plotting all the information displayed on the display except for the softkey. (PLOT: ALL under [COPY]; Query)
**POLMLIN**

**PLOC parameter**
Selects the plot elements. (Query)

*parameter* 
DONLY, DGRAT, or ALL.

**PLODGRAT**
Selects the measured data and memory data with the graticules for plotting.

(Data & Gratcl under COPY; Query)

**PLODONLY**
Selects the measured data and the memory data without the graticules for plotting.

(Data Only under COPY; Query)

**PLOS{FAST|SLOW}**
Sets the plotting speed to fast or slow. (Plot Speed under COPY)

**PLOT**
Plots the display to a graphics plotter. (Plot under COPY)

**POIN value**
Sets the number of the data points per sweep. (Number of Points under Menu; Query)

*value* 
2 to 801.

**POLA**
Displays in polar format. (Polar under Format; Query)

**POLM parameter**
Selects the polar marker. (Query)

*parameter* 
LOG, LIN, or RI.

**POLMLIN**
Displays the linear magnitude and the phase of the active polar marker. (Lin MkR under MkR; Query)
POLMLOG
Displays the logarithmic magnitude and the phase of the active polar marker. (LOG MKR under MKR; Query)

POLMRI
Displays a real and imaginary pair of the active polar marker. (Re/Im MKR under MKR; Query)

PORE{ON|OFF}
Sets the reference plane extension mode on or off. (EXTENSIONS on/off under CAL; Query)

PORT1 value [s]
Extends the reference plane for measurement of S11, S21, and S12. (EXTENSION PORT 1 under CAL; Query)
value -10 (s) to 10 (s).

PORT2 value [s]
Extends the reference plane for measurement of S22, S12, and S21. (EXTENSION PORT 1 under CAL; Query)
value -10 (s) to 10 (s).

PORTA value [s]
Adds electrical delay to the input A reference plan for any A input measurements including S-parameters. (EXTENSION INPUT A under CAL; Query)
value -10 (s) to 10 (s).

PORTB value [s]
Adds electrical delay to the input B reference plane for any B input measurements including S-parameters. (EXTENSION INPUT B under CAL; Query)
value -10 (s) to 10 (s).

PORTR value [s]
Adds electrical delay to extend the reference plane at input R to the end of cable. (EXTENSION INPUT R under CAL; Query)
value -10 (s) to 10 (s).
POWDAUTO
Sets the power DAC to auto. (Under SERVICE MENU under SYSTEM)

POWDMAN
Sets the power DAC to manual. (Under SERVICE MENU under SYSTEM)

POWDVALU value
Sets the power DAC value. (Under SERVICE MENU under SYSTEM)
value 0 to 4095.

POWE value [dBm]
Sets the source output level. (POWER under MENU; Query)
value -50 (dBm) to +15 (dBm).

POWLANOR
Sets the power level ALC to normal. (Under SERVICE MENU under SYSTEM)

POWLAOPE
Sets the power level ALC to open. (Under SERVICE MENU under SYSTEM)

POWS
Activates a power sweep mode. (POWER SWEEP under MENU; Query)

PREP
Displays the previous page of information in a tabular listing. (PREV PAGE under COPY)

PRES
Presets the state. (PRESET)

PRINALL
Copies the measurement display to the printer according to plotting options. (PRINT under COPY)
PRIC
Selects color printing. \texttt{COLOR} under \texttt{COPY}; Query)

PRICFIXE
Selects the default colors for printing a hard copy. \texttt{PRINT COLOR [FIXED]} under \texttt{COPY}; Query)

PRICVARI
Selects the colors as similar as possible to the display for printing a hard copy. \texttt{PRINT COLOR [VARIABLE]} under \texttt{COPY}; Query)

PRIS
Sets the print command to the default selection. \texttt{PRINT STANDARD} under \texttt{COPY}; Query)

PSOFT\{ON|OFF\}
Selects the plot softkey label option on or off.

PURG \texttt{string}
Removes a file saved on the disk in the built-in flexible disk drive. \texttt{PURGE FILE} under \texttt{SAVE}/\texttt{RECALL}

\texttt{string} File name. Up to 10 characters including the extension.

QUAD \texttt{parameter}
Selects the quadrant plot setting.

\texttt{parameter} LEFU, LEFL, RIGU, RIGL, or FULP.

RAID
Completes the response and isolation calibration. \texttt{DONE RESP ISOL'N CAL} under \texttt{CAL})

RAIIISOL
Selects the isolation class for the response and isolation calibration. \texttt{ISOL'N STD} under \texttt{CAL})
RAIRES

Selects the response class for the response and isolation calibration. (RESPONSE under CAL)

REAL

Displays only the real (resistive) portion of the measured data in Cartesian format. (REAL under FORMAT; Query)

RECC

Recalls the previously saved color set. (RECALL COLORS under DISPLAY)

RECCOFF

Sets the receiver correction off. (Under SERVICE MENU under SYSTEM; Query)

RECCON

Sets the receiver correction on. (Under SERVICE MENU under SYSTEM; Query)

RECD string

Loads the instrument states or data from the disk in the built-in flexible disk drive. (RECALL FILE under SAVE/RECALL)

string File name. Up to 10 characters including the extension.

REFD

Completes with the reflection part of the full 2-port calibration. (REFLECT'N DONE under CAL)

REFL

 Begins the reflection part of the full 2-port calibration. (REFLECT'N under CAL)

REFP value

Sets the position of the reference line on the graticule of a Cartesian format. (REFERENCE POSITION under SCALE REF; Query)

value 0 to 10 (Div).
REFV \textit{value [suffix]}

Changes the value of the reference line, moving the measurement trace correspondingly. ( \textit{REFERENCE VALUE} under \texttt{SCALE REF}; Query)

\begin{align*}
\text{value} & \quad -500 \text{ (dB)} \text{ to } 500 \text{ (dB) (Log mag format)}, \\
& \quad -5.0 \times 10^6 \text{ (deg)} \text{ to } 5.0 \times 10^6 \text{ (deg) (Phase or Expanded phase formats)}, \\
& \quad 0.5 \text{ (s)} \text{ to } 0.5 \text{ (s) (Delay format)}, \\
& \quad 1.0 \times 10^{-11} \text{ (Units)} \text{ to } 500 \text{ (Units) (Smith chart, Inv. Smith chart, or Polar formats)}, \\
& \quad -5.0 \times 10^6 \text{ (Units)} \text{ to } 5.0 \times 10^6 \text{ (Units) (Lin man, Real, or Imaginary formats)}, \\
& \text{ or} \\
& \quad -5.0 \times 10^6 \text{ to } 5.0 \times 10^6 \text{ (SWR format)}.
\end{align*}

\textit{suffix} \quad \text{Refer to "Suffix".}

RESAVD \textit{string}

Updates an already saved file on the disk in the built-in flexible disk drive. ( \texttt{RE-SAVE FILE} under \texttt{SAVE})

\textit{string} \quad \text{File name. Up to 10 characters including the extension.}

RESC

Resumes the last measurement calibration sequence. ( \texttt{RESUME CAL SEQUENCE} under \texttt{CAL})

RESD

Turns off the tabular listing and returns the measurement display to the screen. ( \texttt{RESTORE DISPLAY} under \texttt{COPY})

RESPDONE

Completes the response calibration. ( \texttt{DONE: RESPONSE} under \texttt{CAL})

REST

Aborts the sweep in progress, then restarts the measurement. ( \texttt{MEASURE RESTART} under \texttt{MENU})

3-44 HP-IB Programming Reference
REVI
Selects the reverse isolation class for the calibration. (REV ISOL'N ISOL'N STD under CAL)

REVM
Selects the reverse match class for the calibration. (REV MATCH THRU under CAL)

REV'T
Selects the reverse transmission class for the calibration. (REV TRAN. THRU under CAL)

RFOPNORM
Sets the RF OSC PLL to normal. (Under SERVICE MENU under SYSTEM; Query)

RFOPOPEN
Sets the RF OSC PLL to open. (Under SERVICE MENU under SYSTEM; Query)

RIGL
Draws a quarter-page plot in the lower right quadrant of the page. (RIGHT LOWER under COPY; Query)

RIGU
Draws a quarter-page plot in the upper right quadrant of the page. (RIGHT UPPER under COPY; Query)

RSCO
Resets the modified colors to the default colors. (RESET COLOR under DISPLAY)

S11
Selects the S-parameter test set for measurement of S11. (Ref1: FWD S11 (A/R) under MEAS; Query)

S12
Selects the S-parameter test set for measurement of S12. (Trans: REV S12 (A/R) under MEAS; Query)
REVI
Selects the reverse isolation class for the calibration. (REV: ISOL N' ISOL N' STD under CAL)

REVM
Selects the reverse match class for the calibration. (REV: MATCH THRU under CAL)

REVT
Selects the reverse transmission class for the calibration. (REV: TRANS. THRU under CAL)

RFOPNORM
Sets the RF OSC PLL to normal. (Under SERVICE MENU under SYSTEM; Query)

RFOPOPEN
Sets the RF OSC PLL to open. (Under SERVICE MENU under SYSTEM; Query)

RIGL
Draws a quarter-page plot in the lower right quadrant of the page. (RIGHT LOWER under COPY; Query)

RIGU
Draws a quarter-page plot in the upper right quadrant of the page. (RIGHT UPPER under COPY; Query)

RSCO
Resets the modified colors to the default colors. (RESET COLOR under DISPLAY)

S11
Selects the S-parameter test set for measurement of S11. (Ref: FWD S11 (A/R) under MEAS; Query)

S12
Selects the S-parameter test set for measurement of S12. (Trans: REV S12 (A/R) under MEAS; Query)
S21
Selects the S-parameter test set for measurement of S21. (Trans: FWD S21 (B/R) under MEAS; Query)

S22
Selects the S-parameter test set for measurement of S22. (Ref1: REV S22 (B/R) under MEAS; Query)

SADD
Adds a new segment to a list sweep. (ADD under MENU)

SAV1
Saves the 1-port calibration results. (DONE: 1-PORT CAL under CAL)

SAV2
Saves the 2-port calibration results. (DONE: 2-PORT CAL under CAL)

SAVC
Re-draws a trace using current error coefficient arrays.

SAVCA{ON|OFF}
Sets the calibration coefficients arrays to be saved or not. (CAL ARY on off under SAVE; Query)

SAVDALL string
Saves the instrument states, the data array, and the memory array to the disk in the built-in flexible disk drive. (SAVE ALL under SAVE)

string File name. Up to 8 characters.

SAVDA{ON|OFF}
Sets the data arrays to be saved (ON) or not (OFF). (DATA ARY on off under SAVE; Query)
**SAVDDAT string**

Saves the internal data arrays which is defined by the SAVRA{ON|OFF}, SAVCA{ON|OFF}, SAVDA{ON|OFF}, SAVMA{ON|OFF}, SAVUA{ON|OFF}, SAVTA{ON|OFF}, and SAVTMA{ON|OFF}. (SAVE DATA ONLY under SAVE)

*string*  File name. Up to 8 characters.

**SAVDSTA string**

Saves only the instrument states and the calibration coefficients to the disk in the built-in flexible disk drive. (SAVE STATE ONLY under SAVE)

*string*  File name. Up to 8 characters.

**SAVEUSEK**

Stores the user-modified or user-defined calibration kit into memory. (SAVE USER KIT under CAL)

**SAVMA{ON|OFF}**

Sets the memory arrays to be saved (ON) or not (OFF). (MEMORY ARY on off under SAVE; Query)

**SAVRA{ON|OFF}**

Sets the raw data arrays to be saved (ON) or not (OFF). (RAW ARY on off under SAVE; Query)

**SAVTA{ON|OFF}**

Sets the trace arrays to be saved (ON) or not (OFF). (TRACE ARY on off under SAVE; Query)

**SAVTMA{ON|OFF}**

Sets the memory trace arrays to be saved (ON) or not (OFF). (T.MEM ARY on off under SAVE; Query)

**SAVUA{ON|OFF}**

Sets the unformatted data arrays to be saved (ON) or not (OFF). (UNFORM ARY on off under SAVE; Query)
SCAC
Couples the data and memory trace to be scaled.  \( \text{SCALE} \cdot \text{SCALE} \cdot \text{SCALE} \cdot \text{COUPLE} \) under \text{SCALE REF}; Query)

SCAFDATA
Selects the data trace to be scaled.  \( \text{SCALE} \cdot \text{FOR} \cdot \text{DATA} \) under \text{SCALE REF}; Query)

SCAFMEMO
Selects the memory trace to be scaled.  \( \text{SCALE} \cdot \text{FOR} \cdot \text{MEMORY} \) under \text{SCALE REF}; Query)

\text{SCAL } value\ [\text{suffix}]
Changes the response value scale per division of the graticule.  \( \text{SCALE/DIV} \) under \text{SCALE REF}; Query)

value
0.001 (dB/div) to 500 (dB/div) (Log mag format),
0.01 (deg/div) to 500 (deg/div) (Phase format),
1.0E-11 (deg) to 10000 (deg) (Expanded phase format),
1.0E-14 (s/div) to 10 (s/div) (Delay format),
1.0E-11 (Units FS) to 10000 (Units FS) (Smith chart, Inv. Smith chart, and Polar format),
1.0E-11 (Units/div) to 10000 (Units/div) (Lin mag, Real, and Imaginary formats), or
1.0E-11 to 10000 (/div) (SWR format).

suffix
Refer to “Suffix”.

SCAPFULL
Selects the normal full size scale for plotting.  \( \text{SCALE: FULL} \) under \text{COPY})

SCAPGL
Fits the lower graticule to the user-defined P1 and P2.  \( \text{LOWER GRATICULE} \) under \text{COPY})

SCAPGU
Fits the upper graticule to the user-defined P1 and P2.  \( \text{UPPER GRATICULE} \) under \text{COPY})
SCAU
Uncouples the data and memory trace to be scaled. (D&[SCALE: [UNCouple]] under (SCALE REF; Query)

SDEL
Deletes a segment from the list sweep. (DELETE under (MENU)

SDON
Completes editing a segment of the list sweep. (SEGMENT DONE under (MENU)

SEAL
Searches the trace for the next occurrence of the target value to the left of the marker. (SEARCH LEFT under (MKR FCTN)

SEALMAX
Moves the active marker to the maximum peak point on the trace in the search range. (LOCAL MAX under (MKR FCTN; Query)

SEALMIN
Moves the active marker to the minimum peak point on the trace in the search range. (LOCAL MIN under (MKR FCTN; Query)

SEAM parameter
Selects the marker search function. (Query)
parameter OFF, MAX, MIN, TARG, MEAN, LMAX, LMIN, or PPEAK.

SEAMEAN
Moves the active marker to the mean point on the trace. (SEARCH : MEAN under (MKR FCTN; Query)

SEAMAX
Moves the active marker to the maximum point on the trace. (MAX under (MKR FCTN; Query)
SEAMIN
Moves the active marker to the minimum point on the trace. \( \text{MIN under MKR FCTN} \); Query)

SEAOFF
Turns off the marker search function. \( \text{SEARCH: OFF under MKR FCTN} \); Query)

SEAPPEAK
Moves the active marker and the delta reference marker to the maximum peak point and the minimum peak point on the trace in the search range. \( \text{PEAK-PEAK under MKR FCTN} \); Query)

SEAR
Searches the trace for the next occurrence of the target value to the right of the marker. \( \text{SEARCH: RIGHT under MKR FCTN} \)

SEARSTOR
Stores the search range, which is defined between the active marker and the delta reference marker. \( \text{SEARCH: RNG STORE under MKR FCTN} \)

SEATARG value [suffix]
Places the active marker at a specified target point on a trace. \( \text{TARG under MKR FCTN} \); Query)

\[
\begin{align*}
\text{value} & : -5.0E+5 \, \text{(dB) to 5.0E+5 \, (dB) (Log mag format)}, \\
& : -5.0E+5 \, \text{(deg) to 5.0E+5 \, (deg) (Phase and Expanded phase formats)}, \\
& : -5.0E+5 \, \text{(s) to 5.0E+5 \, (s) (Delay format)}, \\
& : -5.0E+5 \, \text{(ohm) to 5.0E+5 \, (ohm) (Smith chart and Inv. Smith chart formats)}, \\
& : -5.0E+5 \, \text{(Units) to 5.0E+5 \, (Units) (Polar, Lin mag, Real, and Imaginary format)}, \text{ or} \\
& : -5.0E+5 \, \text{to 5.0E+5 \, (SWR format)}. \\
\text{suffix} & : \text{Refer to "Suffix".}
\end{align*}
\]

SEDI value
Determines a segment of the list sweep to be modified. \( \text{SEGMENT under MENU} \); Query)

\[
\text{value} & : 1 \text{ to 31.}
\]
**SELECT parameter**

Selects the conjugate matching circuit type. (Query)

**parameter** LSLP, LSCP, CSLP, CSCP, LPLS, LPCS, CPLS, or CPCS

**SELCPCS**

Selects the “Cp-Cs” circuit for conjugate matching. (Cp-Cs under DISPLAY; Query)

**SELCCPLS**

Selects the “Cp-Ls” circuit for conjugate matching. (Cp-Ls under DISPLAY; Query)

**SELCCSCP**

Selects the “Cs-Cp” circuit for conjugate matching. (Cs-Cp under DISPLAY; Query)

**SELCCSLP**

Selects the “Cs-Lp” circuit for conjugate matching. (Cs-Lp under DISPLAY; Query)

**SELCLPCS**

Selects the “Lp-Cs” circuit for conjugate matching. (Lp-Cs under DISPLAY; Query)

**SELCLPLS**

Selects the “Lp-Ls” circuit for conjugate matching. (Lp-Ls under DISPLAY; Query)

**SELCLSCP**

Selects the “Ls-Cp” circuit for conjugate matching. (Ls-Cp under DISPLAY; Query)

**SELCLSLS**

Selects the “Ls-Lp” circuit for conjugate matching. (Ls-Lp under DISPLAY; Query)

**SELD**

Execute the self diagnostics. (Under SERVICE MENU under SYSTEM)
SETCDATE year,month,day
Changes date of the internal clock. (MONTH, DAY, and YEAR under SYSTEM; Query)

- **year**: 1901 to 2059.
- **month**: 1 to 12.
- **day**: 1 to 31.

SETCTIME hour,min,sec
Changes time of the internal clock. (HOUR, MIN, and SEC under SYSTEM; Query)

- **hour**: 0 to 23.
- **min**: 0 to 59.
- **sec**: 0 to 59.

SETZ value [ohm]
Sets the characteristic impedance used by the HP 8751A in calculating measured impedance with the Smith chart markers and conversion parameters. (SET ZO under CAL; Query)

- **value**: 0.1 (ohm) to 5.0E+6 (ohm).

SING
Makes a single measurement sweep, then sets the hold mode. (SINGLE under MENU)

SMIC
Displays a Smith chart format. (SMITH CHART under FORMAT; Query)

SMIM parameter
Selects the form for the Smith marker. (Query)

- **parameter**: LIN, LOG, RI, RX, or GB.

SMIMGB
Displays the complex admittance values of the active marker position on a Smith chart in rectangular form. (G+J E XR under MKR; Query)
SMILIN
Displays the linear magnitude value and the phase of the active marker position on a Smith chart. (LIN under MKR; Query)

SMIMLOG
Displays the logarithmic magnitude value and the phase of the active marker on a Smith chart. (LOG under MKR; Query)

SMIMRI
Displays the values of the active marker on a Smith chart as a real and imaginary pair. (Re/Im under MKR; Query)

SMIMRX
Displays the complex impedance values of the active marker on a Smith chart in rectangular form. (R+jX under MKR; Query)

SMOAPER value [pct]
Changes the value of the smoothing aperture as a percent of the span. (SMOOTHER APERTURE under AVG; Query)

value 0.05 (%) to 100 (%).

SMOO{ON|OFF}
Sets the smoothing function to on or off. (SMOOTHER on-off under AVG; Query)

SOUCOFF
Sets the source correction to off. (Under SERVICE MENU under SYSTEM; Query)

SOUCON
Sets the source correction to on. (Under SERVICE MENU under SYSTEM; Query)

SPAN value [suffix]
Sets the frequency span of a segment about a specified center frequency. (SPAN or SPAN under MENU; Query)

value 0 to 499.999995 MHz.

suffix Hz or MHz.
SPECFWDM \( A[B[C[D[E[F[G]]]]] \)
Enters the standard numbers for the forward match (THRU) calibration. (FWD.MATCH under CAL)
\( A, B, C, D, \quad 1 \) to 8.
\( E, F, G \)

SPECFWDT \( A[B[C[D[E[F[G]]]]] \)
Enters the standard numbers for the forward transmission (THRU) calibration. (FWD.TRAN under CAL)
\( A, B, C, D, \quad 1 \) to 8.
\( E, F, G \)

SPECRESI \( A[B[C[D[E[F[G]]]]] \)
Enters the standard numbers for the response and isolation calibration. (RESPONSE & ISOL'N under CAL)
\( A, B, C, D, \quad 1 \) to 8.
\( E, F, G \)

SPECRESP \( A[B[C[D[E[F[G]]]]] \)
Enters the standard numbers for the response calibration. (RESPONSE under CAL)
\( A, B, C, D, \quad 1 \) to 8.
\( E, F, G \)

SPECREVM \( A[B[C[D[E[F[G]]]]] \)
Enters the standard numbers for the reverse match (THRU) calibration. (REV.MATCH under CAL)
\( A, B, C, D, \quad 1 \) to 8.
\( E, F, G \)

SPECREVT \( A[B[C[D[E[F[G]]]]] \)
Enters the standard numbers for the reverse transmission (THRU) calibration. (REV.TRAN under CAL)
\( A, B, C, D, \quad 1 \) to 8.
\( E, F, G \)
**SPECS11A** \( A[I[C[I[D[I[E[I[F[I[G]]]]]]]]] \)

Enters the standard numbers for the first class required for an \( S_{11} \) 1-port calibration. (SPECIFY \( S_{11} \) under CAL)

\( A, B, C, D, \) 1 to 8,
\( E, F, G \)

**SPECS11B** \( A[I[C[I[D[I[E[I[F[I[G]]]]]]]]] \)

Enters the standard numbers for the second class required for an \( S_{11} \) 1-port calibration. (\( S_{11} \) under CAL)

\( A, B, C, D, \) 1 to 8,
\( E, F, G \)

**SPECS11C** \( A[I[C[I[D[I[E[I[F[I[G]]]]]]]]] \)

Enters the standard numbers for the third class required for an \( S_{11} \) 1-port calibration. (\( S_{11} \) under CAL)

\( A, B, C, D, \) 1 to 8,
\( E, F, G \)

**SPECS22A** \( A[I[C[I[D[I[E[I[F[I[G]]]]]]]]] \)

Enters the standard numbers for the first class required for an \( S_{22} \) 1-port calibration. (SPECIFY \( S_{22} \) under CAL)

\( A, B, C, D, \) 1 to 8,
\( E, F, G \)

**SPECS22B** \( A[I[C[I[D[I[E[I[F[I[G]]]]]]]]] \)

Enters the standard numbers for the second class required for an \( S_{22} \) 1-port calibration. (\( S_{22} \) under CAL)

\( A, B, C, D, \) 1 to 8,
\( E, F, G \)

**SPECS22C** \( A[I[C[I[D[I[E[I[F[I[G]]]]]]]]] \)

Enters the standard numbers for the third class required for an \( S_{22} \) 1-port calibration. (\( S_{22} \) under CAL)

\( A, B, C, D, \) 1 to 8,
\( E, F, G \)
SPLD{ON|OFF}
Sets the dual channel display mode: a full-screen single graticule display (OFF), or a split display with two half-screen graticules (ON). (SPLIT DISP on off; under (DISPLAY; Query)

STAN{A-G}
Measures the calibration standard in the current standard class. (OPEN, SHORT, THRU, LOAD, etc. under (CAL)

STAR value [suffix]
Defines the start frequency of the stimulus. (START; Query)
Sets the start frequency of a segment. (SEGMENT START under (MENU; Query)

value 5 (Hz) to 500 (MHz) (Frequency sweep), or
-50 (dBm) to 15 (dBm) (Power sweep).

suffix Refer to “Suffix”.

STD
Completes the current standard definition. (STD DONE (DEFINED) under (CAL)

STD T parameter
Selects the standard type. (Query)
parameter OPEN, SHOR, LOAD, DELA, or ARBI.

STDTARBI
Defines the standard type to LOAD with an arbitrary impedance. (ARBITRARY IMPEDANCE under (CAL; Query)

STDTDELA
Defines the standard type as transmission line of specified length. (DELAY/THRU under (CAL; Query)

STDTLOAD
Defines the standard type as LOAD (termination). (LOAD under (CAL; Query)
STDTOPEN
Defines the standard type as an OPEN. (OPEN under CAL; Query)

STDTSHOR
Defines the standard type as a SHORT. (SHORT under CAL; Query)

STEODAUT
Sets the step OSC DAC to auto. (Under SERVICE MENU under SYSTEM; Query)

STEODMAN
Sets the step OSC DAC to manual. (Under SERVICE MENU under SYSTEM; Query)

STEODVAL value
Sets the step OSC DAC value. (Under SERVICE MENU under SYSTEM; Query)

value
0 to 255.

STEONORM
Sets the step OSC DAC to normal. (Under SERVICE MENU under SYSTEM; Query)

STEOOPEN
Sets the step OSC DAC to open. (Under SERVICE MENU under SYSTEM; Query)

STOP value [suffix]
Defines the stop value of the stimulus. (STOP; Query)
Sets the stop frequency of a segment. (STOP under MENU; Query)

value
5 (Hz) to 500 (MHz).
-50 (dBm) to +15 (dBm).

suffix
Refer to “Suffix”.

STPSIZE value [suffix]
Specifies the frequency step for the list sweep. (STEP SIZE under MENU; Query)

value
0 to 499.999995 (MHz).

suffix
Hz or MHz.
SVCO
Saves the modified color set. (SAVE COLORS under DISPLAY)

SWET value [s]
Sets the sweep time manually. (SWEEP TIME under MENU; Query)
value 6.0E-4 (s) to 86400 (s).

SWETAUTO
Sets the sweep time automatically. (SWEEP TIME AUTO under MENU; Query)

SWPT parameter
Selects the sweep type. (Query)
parameter LINF, LOGF, LIST, or POWE

SWR
Selects the SWR display for the active channel. (SWR under FORMAT; Query)

TERI value [ohm]
Specifies the (arbitrary) impedance of the standard. (TERMINAL IMPEDANCE under CAL)
value 0 to 10000 (ohm).

TESC
Continues the test. (Under SERVICE MENU under SYSTEM)

TESS?
Outputs the test set identifier: 1 for an S-parameter test set, or 0 for none.

TEST value
Selects the test number. (Under SERVICE MENU under SYSTEM; Query)
value 0 to 85.
TINT value
Adjusts the hue of the chosen attribute. (TINT under DISPLAY; Query)
value 0 to 100.

TITL string
Sends the string to the title area on the display. (TITLE under DISPLAY; Query)
string up to 53 characters.

TRACK{ON|OFF}
Tracks the search at the specified target value with each new sweep. (TRACKING on-off under MKR FCTN; Query)

TRAD
Completes the transmission part of the full 2-port calibration. (TRANS DONE under CAL)

TRAN
Begins the transmission part of the full 2-port calibration. (TRANSMISSION under CAL)

VELOFACT value
Enters the velocity factor used by the HP 8751A to calculate the equivalent electrical length.
(VELOCITY FACTOR under CAL; Query)
value 0 to 10.

WIDSIN
Searches the cutoff point on the trace within the current cutoff points. (SEARCH IN under MKR FCTN)

WIDSOUT
Searches the cutoff point on the trace outside of the current cutoff points. (SEARCH OUT under MKR FCTN)
WIDT{ON|OFF}
Sets the bandwidth search feature (ON) or not (OFF). (WIDTHS on/off under MKR FCTN: Query)

WIDV value [suffix]
Sets the amplitude parameter that defines the start and stop points for a bandwidth search. (WIDTH VALUE under MKR FCTN: Query)

value
-5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),
-5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),
-5.0E+5 (s) to 5.0E+5 (s) (Delay format),
-5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),
-5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or
-5.0E+5 to 5.0E+5 (SWR format).

suffix Refer to “Suffix”.

*CLS
Clears the status byte register, the event register of the standard operation status register structure, and the standard event status register.

*ESE value
Sets the enable bits of the standard status register. (Query)

value 0 to 255 (decimal expression of enable bits of the operation status register).

*ESR?
Returns the contents of the standard event status register.

*IDN?
Returns the HP 8751A ID. (Data format: manufacturer, model, serial no., firmware rev.)

*OPC
Tells the HP 8751A to set bit 0 (OPeration Complete bit) in the standard event status register when it completes all pending operations. (Query)
*PCB value
Specifies the address of a controller that is temporarily passing control of the HP-IB to the HP 8751A. (Option 002 only)
value 0 to 30.

*RST
Resets the HP 8751A to its initial settings.

*SRE value
Sets the enable bits of the status byte register. (Query)
value 0 to 255 (decimal expression of enable bits of the status byte register).

*STB?
Reads the status byte by reading the master summary status bit.

*TRG
Triggers the HP 8751A when the trigger mode is set to the external trigger.

*TST?
Executes an internal self-test and returns the test result.

*WAI
Makes the HP 8751A wait until all previously sent commands are completed.
HP-IB Commands Summary

This appendix summarizes the HP-IB commands of the HP 8751A according to the softkey labels.

Active Channel Block

CHAN1  CHAN2
CH 1   CH 2

Response Function Block

**MEAS** Key

**Input Port Menu**

<table>
<thead>
<tr>
<th>Port</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>A/R</td>
</tr>
<tr>
<td>BR</td>
<td>B/R</td>
</tr>
<tr>
<td>AB</td>
<td>A/B</td>
</tr>
<tr>
<td>MEASA</td>
<td>A</td>
</tr>
<tr>
<td>MEASB</td>
<td>B</td>
</tr>
<tr>
<td>MEASR</td>
<td>R</td>
</tr>
</tbody>
</table>

**S-Parameter Menu**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>S11</td>
<td>Refl: FWD S11 (A/R)</td>
</tr>
<tr>
<td>S21</td>
<td>Trans: FWD S21 (B/R)</td>
</tr>
<tr>
<td>S12</td>
<td>Trans: REV S12 (A/R)</td>
</tr>
<tr>
<td>S22</td>
<td>Refl: REV S22 (B/R)</td>
</tr>
<tr>
<td>BDC</td>
<td>Bdc</td>
</tr>
<tr>
<td>BDCR</td>
<td>Bdc/R</td>
</tr>
</tbody>
</table>

**MEAS** parameter
Conversion Menu

CONVOFF  OFF
CONVZREF  Z: Ref1
CONVZTRA  Z: Trans
CONVYREF  Y: Ref1
CONVYTRA  Y: Trans
CONV1DS  1/S

(Format) Key

Format Menu

LOGM  LOG MAG
PHAS  PHASE
DELA  DELAY
SMIC  SMITH CHART
POLA  POLAR
LINM  LIN MAG
SWR  SWR

Format More Menu

REAL  REAL
IMAG  IMAGINARY
EXPP  EXPANDED PHASE
INVSMCHAR  INV SMITH CHART
LOGMP  LOG MAG & PHASE
LOGMD  LOG MAG & DELAY

FMT parameter

(Scale Ref) Key

Scale Reference Menu

AUTO  AUTO SCALE
SCAL value  SCALE/DIV
REFP value  REFERENCE POSITION
REFV value  REFERENCE VALUE
MARKREF  MARKER REFERENCE
SCAFDATA  SCALE FOR [DATA]
SCAFMEMO  SCALE FOR [MEMORY]

A-2 HP-IB Commands Summary
Electrical Delay Menu

MARKDELA
ELED value
PHAO value
CONPDISP{ON|OFF}

Display Menu

DUAC{ON|OFF}
SPLD{ON|OFF}
TITL string

Display More Menu

BEEPDONE{ON|OFF}
BEEPWARN{ON|OFF}
FREQ

Display Allocation Menu

DISAALLI
DISAHIHB
DISAALLB
DISA parameter

Trace Math Menu

DISPDATA
DISPMEMO
DISPDATM
DISPDDM
DISPDMM
DATI
DISP parameter

Conjugate Matching Menu

CONNM{ON|OFF}
CALP
CONPLS value

DISPLAY Key

D&M SCALE: [COUPLE]
D&M SCALE: [UNCouple]
MARKER -> DELAY
ELECTRICAL DELAY
PHASE OFFSET
CONJ:P DISP on off
DUAL CHAN on off
SPLIT DISP on off
TITLE
BEEP DONE on off
BEEP WARN on off
FREQUENCY BLANK
ALL INSTRUMENT
HALF INSTR HALF BASIC
ALL BASIC
DISPLAY: DATA
MEMORY
DATA and MEMORY
DATA/MEM
DATA—MEM
DATA -> MEM
CONJ MATCH on off
CALCULATE PARAMETERS
PARAMETER: Lb
<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONLP value</td>
<td>( L_p )</td>
</tr>
<tr>
<td>CONPCS value</td>
<td>( C_s )</td>
</tr>
<tr>
<td>CONPCP value</td>
<td>( C_p )</td>
</tr>
</tbody>
</table>

Select Circuit Menu

<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELCLSLP</td>
<td>( L_b - L_p )</td>
</tr>
<tr>
<td>SELCLSCP</td>
<td>( L_s - C_p )</td>
</tr>
<tr>
<td>SELCCSLP</td>
<td>( C_s - L_p )</td>
</tr>
<tr>
<td>SELCCSCP</td>
<td>( C_s - C_p )</td>
</tr>
<tr>
<td>SELCLPLS</td>
<td>( L_p - L_s )</td>
</tr>
<tr>
<td>SELCLPCS</td>
<td>( L_p - C_s )</td>
</tr>
<tr>
<td>SELCCPLS</td>
<td>( C_p - L_s )</td>
</tr>
<tr>
<td>SELCCPCS</td>
<td>( C_p - C_s )</td>
</tr>
</tbody>
</table>

SEL parameter

Adjust Display Menu

<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTE value</td>
<td>INTENSITY</td>
</tr>
<tr>
<td>BACI value</td>
<td>BACKGROUND INTENSITY</td>
</tr>
<tr>
<td>DEFC</td>
<td>DEFAULT COLORS</td>
</tr>
<tr>
<td>SVCO</td>
<td>SAVE COLORS</td>
</tr>
<tr>
<td>RECC</td>
<td>RECALL COLORS</td>
</tr>
</tbody>
</table>

Modify Colors Menu

<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOCH1D</td>
<td>CH1 DATA</td>
</tr>
<tr>
<td>COLOCH1M</td>
<td>CH1 MEM LIMIT LN</td>
</tr>
<tr>
<td>COLOCH2D</td>
<td>CH2 DATA</td>
</tr>
<tr>
<td>COLOCH2M</td>
<td>CH2 MEM LIMIT LN</td>
</tr>
<tr>
<td>COLOGRAT</td>
<td>GRATICULE</td>
</tr>
<tr>
<td>COLOWARN</td>
<td>WARNING</td>
</tr>
<tr>
<td>COLOTEXT</td>
<td>TEXT</td>
</tr>
<tr>
<td>COLOIBY</td>
<td></td>
</tr>
</tbody>
</table>

Color Adjust Menu

<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TINT value</td>
<td>TINT</td>
</tr>
<tr>
<td>CBRI value</td>
<td>BRIGHTNESS</td>
</tr>
<tr>
<td>COLOR value</td>
<td>COLOR</td>
</tr>
<tr>
<td>RSCO</td>
<td>RESET COLOR</td>
</tr>
</tbody>
</table>

A-4  HP-IB Commands Summary
### AVG Key

**Average Menu**

- **AVERREST**
- **AVERTFACT value**
- **AVER{ON|OFF}**
- **SMOQAPER value**
- **SMOO{ON|OFF}**
- **GRODAPER value**
- **IFBW value**

**IF Bandwidth Menu**

- **IFBW{AUTO}**

### CAL Key

**Correction Menu**

- **CORR{ON|OFF}**
- **RESC**

**Select Cal Kit Menu**

- **CALK7MM**
- **CALK550**
- **CALK75S**
- **CALKUSED**
- **MODI1**
- **SAVEUSEK**
- **CALK parameter**

**Calibrate More Menu**

- **VELOFACT value**
- **SETZ value**

**Reference Plane Menu**

- **PORE{ON|OFF}**
- **PORTR value**
- **PORTA value**
- **PORTB value**
- **PORT1 value**
- **PORT2 value**
DC Correction Menu

DCCOR{ON|OFF} DC CORR on off
EXEDCALI EXECUTE DC CAL
ABGDCALI ABORT DC CAL

Calibration Menu

CALN CALIBRATE: NONE
CALIRES CALI RESPONSE
CALIRAIN CALI RESPONSE & ISOL’N
CALIS111 S11 1-PORT
CALIS221 S22 1-PORT
CALIFUL2 FULL 2-PORT
CALIONE2 ONE-PATH 2-PORT
CALI parameter

Response Cal Menu

RESPDONE DONE: RESPONSE

Response and Isolation Cal Menu

RASRESP RESPONSE
RAISOL ISOL’N STD
RAID DONE RESPONSE ISOL’N CAL

S11 and S22 1-Port Cal Menus

CLASS11B SHORT
CLASS11C LOAD
CLASS22A [S22] : OPEN
CLASS22B SHORT
CLASS22C LOAD
SAV1 DONE: 1-PORT CAL
STAN{A-G} OPEN[M], OPEN[F], SHORT[M], SHORT[F], load1, load2, and so on.
DONE DONE: OPENS, DONE: SHORTS, or DONE: LOADS

Full 2-Port Cal Menus

REFL REFLECT’N
TRAN TRANSMISSION
ISOL ISOLATION
CLASS11B SHORT

A-6 HP-IB Commands Summary
CLASS11C LOAD
CLASS22A [S22] OPEN
CLASS22B SHORT
CLASS22C LOAD
REFD REFLECT'N DONE
FWDT FWD. TRANS. THRU
FWDM FWD. MATCH THRU
REVT REV. TRANS. THRU
REVM REV. MATCH THRU
STAN{A-G} OPEN[M], OPEN[F], SHORT[M], load1, load2, thru1, thru2, and so on.
TRAD TRANS. DONE
OMII OMIT ISOLATION
FWDI FWD. ISOL'N ISOL'N STD
REVI REV. ISOL'N ISOL'N STD
ISOD ISOLATION DONE
DONE DONE: OPENS, DONE: SHORTS, or DONE: LOADS

One-Path 2-Port Cal Menus
REFL REFLECT'N
TRAN TRANSMISSION
ISGL ISOLATION
CLASS11B SHORT
CLASS11C LOAD
REFD REFLECT'N DONE
FWDT FWD. TRANS. THRU
FWDM FWD. MATCH THRU
OMII OMIT ISOLATION
FWDI FWD. ISOL'N ISOL'N STD
STAN{A-G} open1, open2, short1, short2, load1, load2, thru1, thru2, and so on.
ISOD ISOLATION DONE
SAV2 DONE: 2-PORT CAL
DONE DONE: OPENS, DONE: SHORTS, or DONE: LOADS

Modify Cal Kit Menu
DEFS value DEFINE STANDARD
LABK string LABEL KIT

HP-IB Commands Summary A-7
Define Standard Menus

STDOPEN
STDTSHOR
STDTLOAD
STDDELAL
STDTARBI
C0 value
C1 value
C2 value
TERI value
LABS string
STDD
STDT parameter

Specify Offset Menu

OFSD parameter
OFSL parameter
OFSZ parameter

Specify Class Menus

SPECS11A
value, value, ...
SPECS11B
value, value, ...
SPECS11C
value, value, ...
SPECS22A
value, value, ...
SPECS22B
value, value, ...
SPECS22C
value, value, ...
SPECFWDT
value, value, ...
SPECREV
value, value, ...
SPECFWDM
value, value, ...
SPECREVM
value, value, ...
SPECRESP
value, value, ...

A-8 HP-IB Commands Summary
SPECRESI, value, value, ...
CLASS DONE (SPEED)

Label Class Menus
LABES11A
LABES11B
LABES11C
LABES22A
LABES22B
LABES22C
LABEFWD
LABEFWD
LABEREVT
LABEREVT
LABEREVT
LABEREVT
LABERESP
LABERESI

(MKR) Key

Marker Menu
MARKOFF
MARKDATA
MARKMEMO
MARKL{ON|OFF}
MARKZERO

Active Marker Menu
MARK{1-8} value

Clear Marker Menu
CLEM{1-8}

Delta Marker Mode Menu
DELRFIXM
DELC

Delta Marker Menu
DELR{1-8}

HP-IB Commands Summary A-9
Fixed Marker Menu

MARKFSTI value [FIXED MKR STIMULUS]
MARKFVAL value [FIXED MKR VALUE]
MARKFAUV value [FIXED MKR AUX VALUE]

Marker Mode Menu

MARKDISC [MARKERS: DISCRETE]
MARKCONT [CONTINUOUS]
MARKCoup [MARKERS: COUPLED]
MARKUNCO [UNCOUPL ED]
MARKTIME{ON|OFF} [MKR TIME on off]

Polar Marker Menu

POLMLIN [LIN MKR]
POLMLOG [LOG MKR]
POLMRI [Re/Im MKR]
POLM parameter

Smith Marker Menu

SMILIN [LIN MKR]
SMIMLOG [LOG MKR]
SMIMRI [Re/Im MKR]
SMIMRX [R+jX MKR]
SMIMGB [G+jB MKR]
SMIM parameter

(MKR FCTN) Key

Marker Function Menu

MARKSTART [MARKER -> START]
MARKSTOP [MARKER -> STOP]
MARKCENT [MARKER -> CENTER]
MARKSPAN [MARKER -> SPAN]
MARKREF [MARKER -> REFERENCE]
MEASTAT{ON|OFF} [STATISTICS]

Search Range Menu

SEARSTOR [SEARCH RNG STORE]
PARS{ON|OFF} [PART SRCH on off]
### Marker Search Menu

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEAOFF</td>
<td>SEARCH: OFF</td>
</tr>
<tr>
<td>SEAMAX</td>
<td>MAX</td>
</tr>
<tr>
<td>SEAMIN</td>
<td>MIN</td>
</tr>
<tr>
<td>SEATARG value</td>
<td>TARGET</td>
</tr>
<tr>
<td>TRACK{ON</td>
<td>OFF}</td>
</tr>
</tbody>
</table>

### Target Menu

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEATARG</td>
<td>TARGET</td>
</tr>
<tr>
<td>SEAL</td>
<td>SEARCH LEFT</td>
</tr>
<tr>
<td>SEAR</td>
<td>SEARCH RIGHT</td>
</tr>
</tbody>
</table>

### Marker Search More Menu

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEAMEAN</td>
<td>SEARCH: MEAN</td>
</tr>
<tr>
<td>SEALMAX</td>
<td>LOCAL MAX</td>
</tr>
<tr>
<td>SEALMIN</td>
<td>LOCAL MIN</td>
</tr>
<tr>
<td>SEAPPEAK</td>
<td>PEAK-PEAK</td>
</tr>
<tr>
<td>MARKPEAK</td>
<td>MARKER PEAK DEF</td>
</tr>
<tr>
<td>PEADX value</td>
<td>PEAK DEF: ΔX</td>
</tr>
<tr>
<td>PEADY value</td>
<td>ΔY</td>
</tr>
<tr>
<td>SEAM parameter</td>
<td>Width Menu:</td>
</tr>
<tr>
<td>WIDEV value</td>
<td>WIDTH VALUE</td>
</tr>
<tr>
<td>WIDSIN</td>
<td>SEARCH IN</td>
</tr>
<tr>
<td>WIDSOUT</td>
<td>SEARCH OUT</td>
</tr>
<tr>
<td>WIDT{ON</td>
<td>OFF}</td>
</tr>
</tbody>
</table>

### Key

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTIAODB</td>
<td>INPUT-A: 0dB</td>
</tr>
<tr>
<td>ATTIA20DB</td>
<td>20dB</td>
</tr>
<tr>
<td>ATTBODB</td>
<td>INPUT-B: 0dB</td>
</tr>
<tr>
<td>ATTIB20DB</td>
<td>20dB</td>
</tr>
<tr>
<td>ATTIRODB</td>
<td>INPUT-R: 0dB</td>
</tr>
<tr>
<td>ATTIR20DB</td>
<td>20dB</td>
</tr>
</tbody>
</table>
Stimulus Function Block

**STAR value**  START
**STOP value**  STOP
**CENT value**  CENTER
**SPAN value**  SPAN

**MENU** Key

**Stimulus Menu**

**POWE value**  POWER
**POIN value**  NUMBER OF POINTS
**REST**  MEASURE RESTART
**COUC{ON|OFF}**  COUPLED CH on/off
**CWFREQ value**  CW FREQ

**Power Menu**

**POWE value**  POWER
**CLEPTRIP**  CLEAR POWER TRIP
**ATTP1 value**  ATTENUATOR PORT 1
**ATTP2 value**  ATTENUATOR PORT 2

**Sweep Time Menu**

**SWET value**  SWEEP TIME
**SWETAUTO**  SWEEP TIME AUTO

**Trigger Menu**

**HOLD**  HOLD
**SING**  SINGLE
**NUMG**  NUMBER OF GROUPS
**CONT**  CONTINUOUS
**EXTTOFF**  TRIGGER: TRIG OFF
**EXTTON**  EXT. TRIG ON SWEEP
**EXTTPOIN**  EXT. TRIG ON POINT
**MANTRRIG**  MANUAL TRG ON POINT
**EXTT parameter**

**Sweep Type Menu**

**LINFREQ**  LIN FREQ
**LOGFREQ**  LOG FREQ
**LISTFREQ**  LIST FREQ [LIST 1] or LIST FREQ [LIST 2]
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWS</td>
<td>POWER SWEEP</td>
</tr>
<tr>
<td>LISDFBASE</td>
<td>LIST DISP. : FREQ BASE</td>
</tr>
<tr>
<td>LISDBASE</td>
<td>ORDER BASE</td>
</tr>
<tr>
<td>EDITLIST</td>
<td>EDIT LIST</td>
</tr>
<tr>
<td>SWPT parameter</td>
<td>List Sweep Menu</td>
</tr>
<tr>
<td>LISSLIS1</td>
<td>SWEEP by : LIST 1</td>
</tr>
<tr>
<td>LISSLIS2</td>
<td>LIST 2</td>
</tr>
<tr>
<td>Edit List Menu</td>
<td>EDITLIST1</td>
</tr>
<tr>
<td></td>
<td>EDIT : LIST 1</td>
</tr>
<tr>
<td></td>
<td>EDITLIST2</td>
</tr>
<tr>
<td></td>
<td>LIST 2</td>
</tr>
<tr>
<td>SEDI</td>
<td>SEGMENT</td>
</tr>
<tr>
<td>SDEL</td>
<td>DELETE</td>
</tr>
<tr>
<td>SADD</td>
<td>ADD</td>
</tr>
<tr>
<td>CLEL</td>
<td>CLEAR LIST</td>
</tr>
<tr>
<td>EDITDONE</td>
<td>LIST DONE</td>
</tr>
<tr>
<td>Edit Segment Menu</td>
<td>MARKSTAR</td>
</tr>
<tr>
<td></td>
<td>MKR -&gt; START</td>
</tr>
<tr>
<td></td>
<td>MARKSTOP</td>
</tr>
<tr>
<td></td>
<td>MKR -&gt; STOP</td>
</tr>
<tr>
<td>POINT</td>
<td>NUMBER of POINTS</td>
</tr>
<tr>
<td>STPSIZE</td>
<td>STEP SIZE</td>
</tr>
<tr>
<td>POWE</td>
<td>POWER</td>
</tr>
<tr>
<td>IFBW</td>
<td>IT BW</td>
</tr>
<tr>
<td>SDON</td>
<td>SEGMENT DONE</td>
</tr>
<tr>
<td>Edit Segment More Menu</td>
<td>STAR</td>
</tr>
<tr>
<td></td>
<td>SEGMENT: START</td>
</tr>
<tr>
<td></td>
<td>STOP</td>
</tr>
<tr>
<td>CENT</td>
<td>CENTER</td>
</tr>
<tr>
<td>SPAN</td>
<td>SPAN</td>
</tr>
<tr>
<td>Clear List Menu</td>
<td>CLEL</td>
</tr>
<tr>
<td></td>
<td>CLEAR LIST : YES</td>
</tr>
</tbody>
</table>
Instrument State Function Block

**Key**

Real Time Clock Menu

**SETTIME**

*hour, min, sec*  
*TIME HH:MM:SS*

**SETDATE**

*year, month, day*  
*DATE MM:DD:YY*

**MONDAYEAR**  
*DATE MODE: MonDayYear*

**DAYMYEAR**  
*DayMonYear*

Limits Menu

**LIMIT{ON|OFF}**  
*LIMIT LINE on off*

**LIMIT{ON|OFF}**  
*LIMIT TEST on off*

**BEEP{ON|OFF}**  
*BEEP FAIL on off*

**EDITLIML**  
*EDIT LIMIT LINE*

Edit Limits Menu

**LIMSEDI value**  
*EDIT*

**LIMSDEL**  
*DELETE*

**LIMSADD**  
*ADD*

**LIMEDONE**  
*DONE*

Edit Segment Menu

**LIMS value**  
*STIMULUS VALUE*

**MARKSTIM**  
*MARKER → STIMULUS*

**LIMU value**  
*UPPER LIMIT*

**LIML value**  
*LOWER LIMIT*

**LIMD value**  
*DELTA LIMITS*

**LIMM value**  
*MIDDLE VALUE*

**MARKMIDD**  
*MARKER → MIDDLE*

**LIMEDONE**  
*DONE*

Clear List Menu

**LIMCLEL**  
*CLEAR LIST YES*

Offset Limit Menu

**LIMISTIO value**  
*STIMULUS OFFSET*

**LIMIAmpO value**  
*AMPLITUDE OFFSET*
LOCAL Key
ADDRPLOT value
ADDRPRIN value
ADDRCONT value

PRESET Key
PRES

COPY Key

Copy Menu
PRINALL
PLOT
COPA
COPT{ON|OFF}

Print/Plot Setup Menu
PRIS
PRIC
PRICFIXE
PRICVARI
DFLT

Select Quadrant Menu
LEFU
LEFL
RIGU
RIGL
FULP
QUAD parameter

Define Plot Menu
PLOALL
PLGODRAGTY
PLODONL
LINTDATA
LINTMEMO
PLOFAST  PLOT SPEED [FAST]
PLOSSLOW  PLOT SPEED [SLOW]
PLOC parameter

Scale Plot Menu
SCAPFULL  SCALE: FULL
SCAPGU    UPPER GRATICULE
SCAPGL    LOWER GRATICULE

Copy More Menu
LISV     LIST VALUES
OPEP OPERATING PARAMETERS

Copy Cal Kit Menu
CALCASSI  CLASS ASSIGNMENT

Copy Standard Number Menu
CALS value  STD NO.1 to STD NO.8

Copy List Sweep Menu
DISL1  DISPLAY: LIST1
DISL2  LIST2
DISMSSTSP  DISP MODE: ST & SPAN
DISMNUM  NUMBER of POINTS
DISMSTEP  STEP SIZE

Copy Limit Test Menu
DISLLIST  DISPLAY LIST
DISMUL  DISP MODE: UPR & LWR
DISMMD  MID & DLT

Screen Menu
PRINALL  PRINT [STANDARD]
PLT  PLOT
COPA  COPY ABORT
COPT{ON|OFF} COPY TIME on off
NEXP  NEXT PAGE
PREP  PREV PAGE
RESD  RESTORE DISPLAY

A-16  HP-IB Commands Summary
SAVE and RECALL Keys

Save Menu
RESAVD string  RE-SAVE FILE

Define Save Menu
SAVDALL string  SAVE ALL
SAVDSTA string  SAVE STATE ONLY
SAVDDAT string  SAVE DATA ONLY

Define Save Date Menu
SAVRA{ON|OFF}  RAW ARY on off
SAVCA{ON|OFF}  CAL ARY on off
SAVDA{ON|OFF}  DATA ARY on off
SAVMA{ON|OFF}  MEMORY ARY on off
SAVUA{ON|OFF}  UNIFORM ARY on off
SAVT{ON|OFF}   TRACE ARY on off
SAVTMA{ON|OFF}  T.MEM ARY on off

Disk Menu
PURG string  PURGE FILE
INID  INITIALIZE DISK

Recall Menu
RECD string  RECALL FILE

Service Function

TEST value
EXET
TESC
DESTON
DESTOFF
SELD
FIRR?
RECCON
RECCOFF
SOUCON
SOUCOFF
DCBUS value
FBUS value
FNVNORM
FNVOOPEN
FNDAUTO
FNDMANU
FNDVALU value
STEDNORM
STEOOPEN
STEODAUT
STEODMAN
STEODVAL value
REOPNORM
REOOPEN
FIQLPNOR
FIQLPOPE
MIXLPNOR
MIXLPTES
POWDAUTO
POWDMANU
POWDVALU value
POWLANOR
POWLPE
ACTLNORM
ACTLHFRE
ACTLHFRE
FIQLNOR
FIQLPE
CHAIRANG
IFRCH?
IFRAUTO
IFRX1
IFRX8X1
IFRX1X8
IFRX64
OUTPFBUS?
OUTPTESS? value
EXTRLOCK?
Commands Which Don’t Have Equivalent Softkey Labels

INP8IO
OUT8IO value
OUTPINP8IO
MARKBUCK value
PSOFT{ON|OFF}
KEY value
INPUDATA value
INPUFORM value
INPUUFORM value
INPURAW1 value
INPURAW2 value
INPURAW3 value
INPURAW4 value

INPUCALC{01-12} value
INPUCALK value
FORM2
FORM3
FORM4
FORM5
OUTPCALC{01-12}? OUTPCALK?
OUTPSTIM?
OUTPDATA?
OUTPDATAP? value
OUTPERRO?
OUTPFORM?
OUTPFORMP? value
OUTPLMF?
OUTPFAIP?
OUTPLIML?
OUTPLIMM?
OUTPMARK?
OUTPMEM0?
OUTPMEMOP? value
OUTPMEM?
OUTPMEMP? value
OUTPIFORM?
OUTPITMEM?
OUTPRFORM?
OUTPRITMEM?
OUTPIFORM?
OUTPRIITMEM?
OUTPUFORM?
OUTPMSHA?
OUTPMWID?
OUTPRAW1?
OUTPRAW2?
OUTPRAW3?
OUTPRAW4?
OUTPTIIL?
ESB?
ESNB value
OSR?
OSE value
TESS?
CLES
SAVC

IEEE 488.2 Common Commands

*IDN?
*RST
*TST?
*OPC
*OPC?
*WAI
*CLS
*ESE value
*ESE?
*ESR?
*SRE value
*SRE?
*STB?
*TRG
*PCB value
Status Reporting

Figure B-1 shows the status reporting structure of the HP 8751A. Table B-1, Table B-2, Table B-3, and Table B-4 describe the status bits of each register.

Figure B-1. Status Reporting Structure
<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Check event status register B</td>
<td>One of the enabled bits in event status register B has been set.</td>
</tr>
<tr>
<td>4</td>
<td>Message in output queue</td>
<td>A command has prepared information to be output, but it has not been read yet.</td>
</tr>
<tr>
<td>5</td>
<td>Check event status register</td>
<td>One of the enabled bits in the event status register has been set.</td>
</tr>
<tr>
<td>6</td>
<td>Request service</td>
<td>One of the enabled status byte bits is causing an SRQ.</td>
</tr>
<tr>
<td>7</td>
<td>Operational status summary bit</td>
<td>One of the enabled bits in the operational status register has been set.</td>
</tr>
<tr>
<td>Bit</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>0</td>
<td>Operation complete</td>
<td>A command for which OPC has been enabled and completed an operation.</td>
</tr>
<tr>
<td>1</td>
<td>Request control</td>
<td>The HP 8751A has been commanded to perform an operation that requires control of a peripheral, and needs control of HP-IB.</td>
</tr>
</tbody>
</table>
| 2   | Query error                 | 1. The HP 8751A has been addressed to talk, but there is nothing in the output queue to transmit.  
2. Data in the Output Queue has been lost. |
| 3   | Device dependent error      | An error other than a command error, a query error, and an execution error has occurred. |
| 4   | Execution error             | 1. A program data element following a header exceeded its input range, or is inconsistent with the HP 8751A's capabilities.  
2. A valid program message could not be properly executed due to some instrument condition. |
| 5   | Command error               | 1. An IEEE 488.2 syntax error has been occurred. Possible violations include, a data element violated the HP 8751A listening formats or a data element type is unacceptable to the HP 8751A.  
2. A semantic error which indicates that an unrecognized header was received has occurred. Unrecognized headers include incorrect device-specific headers and incorrect or unimplemented IEEE 488.2 common commands.  
3. A Group Execute Trigger (GET) was entered into the Input Buffer of a program message. |
| 6   | User request                | The operator has pressed a front panel key or an optional keyboard key or turned the rotary knob. |
| 7   | Power on                    | A power on sequence has occurred since the last read of the register.       |
| 8   | Waiting for reverse GET     | A one-path 2-port calibration is active, and the instrument has stopped, waiting for the operator to connect the device for a reverse measurement. |
| 9   | Waiting for forward GET     | A one-path 2-port calibration is active, and the instrument has stopped, waiting for the operator to connect the device for a forward measurement. |
### Table B-3. Status Bit Definitions of the Event Status Register B (ESB)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Sweep or group complete</td>
<td>A single sweep or group has been completed since the last read of the register. Operates in conjunction with SING or NUMG.</td>
</tr>
<tr>
<td>1</td>
<td>Service routine waiting or done, or manual trigger waiting</td>
<td>1. An internal service routine has completed an operation, or is waiting for an operator response. 2. The HP 8751A has set the manual trigger on point mode and is waiting for a manual trigger.</td>
</tr>
<tr>
<td>2</td>
<td>Data entry complete</td>
<td>A terminator key has been pressed.</td>
</tr>
<tr>
<td>3</td>
<td>Limit failed, Ch 2</td>
<td>Limit test failed on channel 2.</td>
</tr>
<tr>
<td>4</td>
<td>Limit failed, Ch 1</td>
<td>Limit test failed on channel 1.</td>
</tr>
<tr>
<td>5</td>
<td>Search failed, Ch 2</td>
<td>A marker search was executed on channel 2, but the target value was not found.</td>
</tr>
<tr>
<td>6</td>
<td>Search failed, Ch 1</td>
<td>A marker search was executed on channel 1, but the target value was not found.</td>
</tr>
<tr>
<td>7</td>
<td>Point measurement complete¹</td>
<td>One point measurement of a sweep has completed.</td>
</tr>
</tbody>
</table>

¹ This bit is set only when the related bits of both the SRE and ESNB are enabled.

In the case of the manual trigger on point mode, HP 8751A accepts the next trigger while current measurement is in progress (up to the number of points). Use bit 1 and bit 7 correctly to synchronize measurement and external triggering. For example, 1) wait until bit 1 is set, 2) trigger, and 3) wait until bit 7 is set.

### Table B-4. Status Bit Definitions of the Operational Status Register (OSR)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Program running</td>
<td>An HP Instrument BASIC program is running.</td>
</tr>
</tbody>
</table>
Key Codes

Figure C-1 shows the codes of the front panel keys for using the KEY HP-IB command.

Figure C-1. Key Codes
Table D-1 lists which standard classes are required for each calibration type. Table D-2 specifies where the calibration coefficients are stored for different calibration types.

<table>
<thead>
<tr>
<th>Class</th>
<th>Response</th>
<th>Response and Isolation</th>
<th>$S_{11}$ 1-port</th>
<th>$S_{22}$ 1-port</th>
<th>One-path 2-port</th>
<th>Full 2-port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response and isolation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection:¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S11A (opens)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S11B (shorts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S11C (loads)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S22A (opens)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S22B (shorts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S22C (loads)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission:¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward match</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward thru</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse match</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse thru</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation:¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ These subheadings must be called when doing 2-port calibrations.
Table D-2. Calibration Array

<table>
<thead>
<tr>
<th>Array</th>
<th>Response$^1$</th>
<th>Response and Isolation$^1$</th>
<th>1-port$^1$</th>
<th>2-port$^{1,2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$E_R$ or $E_T$</td>
<td>$E_X (E_D)^3$</td>
<td>$E_D$</td>
<td>$E_{DF}$</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>$E_T (E_R)$</td>
<td>$E_S$</td>
<td>$E_{SF}$</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>$E_R$</td>
<td>$E_{RF}$</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>$E_{RF}$</td>
<td>$E_{XF}$</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>$E_{XF}$</td>
<td>$E_{LF}$</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>$E_{LF}$</td>
<td>$E_{TF}$</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>$E_{TF}$</td>
<td>$E_{DR}$</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>$E_{DR}$</td>
<td>$E_{SR}$</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>$E_{SR}$</td>
<td>$E_{RR}$</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>$E_{RR}$</td>
<td>$E_{XR}$</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td>$E_{XR}$</td>
<td>$E_{LR}$</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>$E_{LR}$</td>
<td>$E_{TR}$</td>
</tr>
</tbody>
</table>

1 Meaning of first subscript: $D$=directivity; $S$=source match; $X$=crosstalk; $L$=load match; $T$=transmission tracking.
   Meaning of second subscript: $F$=forward; $R$=reverse.
2 One port, 2-port cal duplicates arrays 1 to 6 in arrays 7 to 12.
3 Response and isolation corrects for crosstalk and transmission tracking in transmission measurements, and for directivity and reflection tracking in reflection measurements.
Error Messages

This section lists the error messages that may be displayed on the analyzer display or transmitted by the instrument over HP-IB. Each error message is accompanied by an explanation, and suggestions are provided to help in solving the problem. Where applicable, references are given to related sections of the Operation and Maintenance manuals.

When displayed, error messages are usually preceded with the word CAUTION: . That part of the error message has been omitted here for the sake of brevity. Some messages are for information only, and do not indicate an error condition. Two listings are provided: the first is in alphabetical order, and the second in numerical order.

In addition to error messages, instrument status is indicated by status notations in the left margin of the display. Examples are “*”, “msh”, and “P1”. Sometimes these appear in conjunction with error messages. A complete listing of status and notations and their meanings is provided in “Front and Rear Panel” in the Reference Manual.

ERROR MESSAGES IN ALPHABETICAL ORDER

159  +12V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

160  +15V(A) OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

157  +18V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

161  +22V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

162  +65V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

156  -12.6V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.
Severe error. Contact your nearest Hewlett-Packard office.

192  1st IF OFFSET OSC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

190  1st LOCAL AMP TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

186  1st LOCAL MIXER LOCAL PORT ALC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

149  A1 CPU EXT BUS TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

141  A1 ROM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

A40 HEAT SINK TOO HOT
The temperature sensors on the A4 post-regulator assembly have detected an over-temperature condition. Power off and cool down the instrument for approximately 10 minutes. If this message is displayed again, contact your nearest Hewlett-Packard office.

165  ACH +5V(A)/2 OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

173  ACH A/D LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

166  ACH A/D REF VOLTAGE OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

170  ACH RECEIVER FUNCTIONALLY POOR
Severe error. Contact your nearest Hewlett-Packard office.

176  ACH/RCH IF GAIN OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

6  ADDITIONAL STANDARD NEEDED
Error correction for the selected calibration class cannot be computed until all the necessary standards have been measured.
14 BACKUP DATA LOST
Data check-sum error on the battery backup memory has occurred. The battery is recharged for approximately 10 minutes after power on.

143 BACKUP RAM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

167 Bch -5.2V(A)/2 OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

174 Bch A/D LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

168 Bch A/D REF VOLTAGE OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

171 Bch RECEIVER FUNCTIONALLY POOR
Severe error. Contact your nearest Hewlett-Packard office.

177 Bch/Rch IF GAIN OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

-160 Block data error
Block data is improper.

-168 Block data not allowed
Block data is not allowed.

9 CALIBRATION ABORTED
The calibration in progress was terminated due to change of the active channel or stimulus parameters.

7 CALIBRATION REQUIRED
No valid calibration coefficients were found, when user attempted to turn calibration on. Refer to “Measurement Calibration” in the Reference Manual.

60 CAN'T CHANGE-ANOTHER CONTROLLER ON BUS
The analyzer cannot assume the mode of system controller until the active controller is removed from the bus or relinquishes the bus.
-148 Character data not allowed
Character data not allowed for this operation.

-144 Character data too long
Character data is too long (maximum length is 12 characters).

136 CONTINUOUS SWITCHING NOT ALLOWED
The current measurement requires the S-parameter test set to switch automatically between forward and reverse measurements (driving test port 1 and then test port 2). Refer to "Stimulus Function Block" in the Reference Manual.

-253 CORRUPT MEDIA
A legal program command could not be executed because of corrupt media; for example, bad disk or wrong format.

13 CURRENT PARAMETER NOT IN CAL SET
HP-IB only. Correction is not valid for the selected measurement parameter. Refer to "Measurement Calibration" in the Reference Manual.

-222 Data out of range
Numerical parameter of HP-IB command is out of the range defined.

-104 Data type error
Improper data type used (for example, string data was expected, but numeric data was received).

10 DC CALIBRATION ABORTED
Pressing the <DC CAL ABORT> softkey causes the analyzer to abort the DC detector linearity calibration in progress.

97 DC OVERLOAD ON INPUT A

96 DC OVERLOAD ON INPUT B

98 DC OVERLOAD ON INPUT R
The DC voltage at one of the three receiver inputs approaches a DC damage level. Refer to "Instrument Specifications" in the General Information section for the DC damage level.

-255 DIRECTORY FULL
A legal program command could not be executed because the media directory was full.
DRAM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

EEPROM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

EEPROM WRITE FAILED
Severe error. Contact your nearest Hewlett-Packard office.

EXCEEDED 7 STANDARDS PER CLASS
A maximum of seven standards can be defined for any class. Refer to “Measurement Calibration” in the Reference Manual.

EXTERNAL REFERENCE UNLOCKED
The frequency of the external reference signal input to the connector on the rear panel deviates from 10/N MHz, where N is an integer between 1 to 10, and phase lock can no longer be maintained. Refer to “Front and Rear Panel” in the Reference Manual for details about the signal.

FAN POWER OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

FDC CHIP TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

FILE NAME ERROR
A legal program command could not be executed because the file name on the device media was in error; for example, an attempt was made to copy to a duplicate file name.

FILE NAME NOT FOUND
A legal program command could not be executed because the file name on the device media was not found; for example, an attempt was made to read or copy a nonexistent file.

FN FREQ TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

FN PRETUNE-DAC/MONITOR FAILURE
Severe error. Contact your nearest Hewlett-Packard office.

FORMAT NOT VALID FOR MEASUREMENT
The conversion function except the 1/S mode is not valid for the Smith, Inverse Smith, and SWR formats.
FORMAT TYPE IS NOT SMITH

The conjugate matching function is only valid in the Smith chart format.

FPC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

-105 GET not allowed

GET is not allowed inside a program message.

GSP I/F TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

HPIB CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

INTR TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

-161 Invalid block data

Invalid block data was received (for example, END received before length satisfied).

-141 Invalid character data

Bad character data or unrecognized character data was received.

-121 Invalid character in number

Invalid character in numeric data.

-101 Invalid character

Invalid character was received.

INVALID FILE NAME

HP-IB only. The file name for the RECALL, PURGE, or RE-SAVE function must have a extension, "_A", "_D", or "_S". Refer to “Saving and Recalling Instrument States and Data” in the Reference Manual for more information.

-103 Invalid separator

The message unit separator (for example, ";", ",") is improper.

-151 Invalid string data

Invalid string data was received (for example, END received before close quote).
-131 Invalid suffix
Units are unrecognized, or the units are not appropriate.

152 KEY CHIP TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

66 LIST TABLE EMPTY OR INSUFFICIENT TABLE
The frequency list is empty. To implement list frequency mode, add segments to the list table.
Refer to “Stimulus Function Block” in the Reference Manual.

80 LOCAL MAX NOT FOUND
The maximum peak whose sharpness is defined by the peak define function cannot be found.

81 LOCAL MIN NOT FOUND
The minimum peak whose sharpness is defined by the peak define function cannot be found.

-250 MASS STORAGE ERROR
A mass storage error occurred. This error message should be used when the device cannot
detect the more specific errors described for errors -251 trough -259.

-254 MEDIA FULL
A legal program command could not be executed because the media was full; for example,
there is no room on the disk.

-258 MEDIA PROTECTED
A legal program command could not be executed because the media was protected; for
example, the write-protect tab on a disk was present.

-251 MISSING MASS STORAGE
A legal program command could not be executed because of missing mass storage; for
example, attempt to access an external disk drive by using Instrument BASIC.

-252 MISSING MEDIA
A legal program command could not be executed because of a missing media; for example, no
disk.

-109 Missing parameter
A command with improper number of parameters received.

178 MIXER LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.
8 NO CALIBRATION CURRENTLY IN PROGRESS
The **RESUME CAL SEQUENCE** softkey is not valid unless a calibration was already in progress. Start a new calibration. Refer to "Measurement Calibration" in the *Reference Manual*.

111 NO DATA TRACE DISPLAYED
The **SCALE FOR [DATA]** is selected while the data trace is not displayed.

76 NO DATA TRACE
The **MARKER ON [DATA]** is selected while the data trace is not displayed.

105 NO LEGAL FILES ON DISK
There are no files on the disk with extensions ",_A", ,_D", or ,_S". Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for more information.

82 NO MARKER DELTA - PEAK DEF NOT SET
The **MARKER - PEAK DEF** softkey requires that delta marker mode be turned on, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual*.

79 NO MARKER DELTA - RANGE NOT SET
The **SEARCH RNG STORE** softkey requires that delta marker mode be turned on, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual*.

78 NO MARKER DELTA - SPAN NOT SET
The **MARKER - SPAN** softkey requires that delta marker mode be turned on, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual*.

112 NO MEMORY TRACE DISPLAYED
The **SCALE FOR [MEMORY]** is selected while the memory trace is not displayed.

77 NO MEMORY TRACE
The **MARKER ON [MEMORY]** is selected while the memory trace is not displayed.

117 NO VALID Ach ABS MAG CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

118 NO VALID Bch ABS MAG CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.
NO VALID DC FULL SCALE CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID FN PRETUNE CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID HF PWR LIN CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID LF PWR LIN CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID MEMORY TRACE
If a memory trace is to be displayed or otherwise used, a data trace must first be stored to memory. Refer to "Response Function Block" in the Reference Manual.

NO VALID RATIO A/B CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID RATIO A/R CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID RATIO B/R CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID Rch ABS MAG CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID STEP OSC CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NOT AVAILABLE FOR THIS FORMAT
The DEM SCALE [COUPLED] softkey is not valid when the format is either LOG MAG & PHASE, or LOG MAG & DELAY.

NOT ENOUGH DATA
HP-IB only. The amount of data sent to the analyzer is less than that expected.

NOT VALID FOR PRESENT TEST SET
The calibration requested is inconsistent with the test set present. This message occurs in the following situations:
- A full 2-port calibration is requested with a test set other than an S-parameter test set.
- A one-path 2-port calibration is requested with an S-parameter test set (this procedure is typically used with a transmission/reflection test set).

-128 Numeric data not allowed
Numerical data not allowed for this operation.

-123 Numeric overflow
Numerical data value was too large (exponent magnitude >32k).

94 OVERLOAD ON INPUT A, POWER REDUCED

93 OVERLOAD ON INPUT B, POWER REDUCED

95 OVERLOAD ON INPUT R, POWER REDUCED

When the power level at one of the three receiver inputs exceeds a certain level greater than the maximum input level, the RF output power level is automatically reduced to minimum and the annotation “P.1” appears in the left margin of the display. Refer to “Stimulus Function Block” in the Reference Manual.

-108 Parameter not allowed
Too many parameters for the command received.

21 PLOT ABORTED
Pressing the COPY/ABORT softkey causes the analyzer to abort the plot in progress.

25 PLOTTER NOT READY-PINCH WHEELS UP
If user attempts to plot when plotter's pinch wheels are up, this message is displayed.

23 PLOTTER not on, not connected, wrong address
The plotter does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the plotter. Ensure that the plotter address recognized by the analyzer matches the HP-IB address set on the plotter itself. Refer to “Instrument State Function Block” in the Reference Manual for instruction on setting peripheral addresses.

180 POOR PRETUNE TRACKING
Severe error. Contact your nearest Hewlett-Packard office.

185 POWER LINEARITY TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.
POWER SHUT DOWN (ANALOG SYSTEM)
Severe error. Contact your nearest Hewlett-Packard office.

4 POWER SHUT DOWN (FDD, FRONT PANEL)
Severe error. Contact your nearest Hewlett-Packard office.

20 PRINT ABORTED
Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.

24 PRINT/ PLOT IN PROGRESS, ABORT WITH COPY ABORT
If a print or plot is in progress and a second print or plot is attempted, this message is displayed and the second attempt is ignored. To abort a print or plot in progress, press COPY ABORT.

22 PRINTER: not on, not connected, wrong address
The printer does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the HP-IB address set on the printer itself. Refer to “Instrument State Function Block” in the Reference Manual for instruction on setting peripheral addresses.

-112 Program mnemonic too long
Program mnemonic is too long (maximum length is 12 characters).

-430 Query DEADLOCKED
Input buffer and output buffer are full; cannot continue.

-400 Query error
Query is improper.

-410 Query INTERRUPTED
Query is followed by DAB or GET before the response was completed.

-440 Query UNTERMINATED after indefinite response
The query which requests arbitrary data response (*IDN? and *OPT? queries) is sent before usual queries in a program message. (for example, FREQ?; *IDN? was expected, but *IDN?; FREQ? is received.)

-420 Query UNTERMINATED
Addressed to talk, incomplete program message received.

Messages-11
145   RATE TIMER TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

163   Rch +5V(D)/2 OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

172   Rch A/D LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

164   Rch A/D REF VOLTAGE OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

169   Rch RECEIVER FUNCTIONALLY POOR
Severe error. Contact your nearest Hewlett-Packard office.

148   REALTIME CLOCK TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

REAR PANEL FAN STOPPED
The analyzer detected that the rear panel fan stopped and automatically shut the power
down.

103   RECALL ERROR: INSTR STATE PRESET
A serious error, for example corrupted data, is detected on recalling file, and this forced the
analyzer to be preset.

184   RF AMP FLATNESS TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

187   RF MIXER LOCAL PORT ALC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

193   RF OSC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

189   RF POWER LEVEL ALC(HF) TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

188   RF POWER LEVEL ALC(LF) TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

Messages-12
SAVE ERROR.

A serious error, for example physically damaged disk surface, is detected on saving file.

SOURCE ATTENUATOR OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

STEP OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

-150  String data error

String data is improper.

-158  String data not allowed

String data is not allowed.

-138  Suffix not allowed

A suffix is not allowed for this operation.

-102  Syntax error

Unrecognized command or data type was received.

-124  Too many digits

Numerical data length was too long (more than 255 digits received).

-350  Too many errors

Too many errors occurred in HP-IB commands.

TOO MANY SEGMENTS OR POINTS

Frequency list mode is limited to 31 segments or 801 points. Refer to “Stimulus Function Block” in the Reference Manual for more information.

TOO MANY SEGMENTS

The maximum number of segments for the limit line table is 18. Refer to “Instrument State Function Block” in the Reference Manual.

-223  Too much data

Either there is too much binary data to send to the analyzer when data transfer format is FORM 2, FORM 3 or FORM 5, or number of data is greater than the number of points.
TOO MUCH DATA
The number of data to be sent to the analyzer is greater than that expected.

Undefined header
Undefined header or an unrecognized command was received (operation not allowed).

VCO MISADJUSTED, RETRY THIS TEST
Severe error. Contact your nearest Hewlett-Packard office.

VRAM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

ERROR MESSAGES IN NUMERICAL ORDER

POWER SHUT DOWN (ANALOG SYSTEM)
Severe error. Contact your nearest Hewlett-Packard office.

A40 HEAT SINK TOO HOT
The temperature sensors on the A40 post-regulator assembly have detected an over-temperature condition. Power off and cool down the instrument for approximately 10 minutes. If this message is displayed again, contact your nearest Hewlett-Packard office.

REAR PANEL FAN STOPPED
The analyzer detected that the rear panel fan stopped and automatically shut the power down.

POWER SHUT DOWN (FDD, FRONT PANEL)
Severe error. Contact your nearest Hewlett-Packard office.

EXTERNAL REFERENCE UNLOCKED
The frequency of the external reference signal input to the connector on the rear panel deviates from $10/N$ MHz, where $N$ is an integer between 1 to 10, and phase lock can no longer be maintained. Refer to “Front and Rear Panel” in the Reference Manual for details about the signal.

ADDITIONAL STANDARDS NEEDED
Error correction for the selected calibration class cannot be computed until all the necessary standards have been measured.
7 CALIBRATION REQUIRED
No valid calibration coefficients were found, when user attempted to turn calibration on. Refer to “Measurement Calibration” in the Reference Manual.

8 NO CALIBRATION CURRENTLY IN PROGRESS
The RESUME CAL SEQUENCE softkey is not valid unless a calibration was already in progress. Start a new calibration. Refer to “Measurement Calibration” in the Reference Manual.

9 CALIBRATION ABORTED
The calibration in progress was terminated due to change of the active channel or stimulus parameters.

10 DC CALIBRATION ABORTED
Pressing the ABORT DC CAL softkey causes the analyzer to abort the DC detector linearity calibration in progress.

11 NOT VALID FOR PRESENT TEST SET
The calibration requested is inconsistent with the test set present. This message occurs in the following situations:
• A full 2-port calibration is requested with a test set other than an S-parameter test set.
• A one-path 2-port calibration is requested with an S-parameter test set (this procedure is typically used with a transmission/reflection test set).

12 EXCEEDED 7 STANDARDS PER CLASS
A maximum of seven standards can be defined for any class. Refer to “Measurement Calibration” in the Reference Manual.

13 CURRENT PARAMETER NOT IN CAL SET
HP-IB only. Correction is not valid for the selected measurement parameter. Refer to “Measurement Calibration” in the Reference Manual.

14 BACKUP DATA LOST
Data check-sum error on the battery backup memory has occurred. The battery is recharged for approximately 10 minutes after power on.

20 PRINT ABORTED
Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.

21 PLOT ABORTED
Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.
22 PRINT/R: not on, not connect, wrong address

The printer does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the HP-IB address set on the printer itself. Refer to “Instrument State Function Block” in the Reference Manual for instruction on setting peripheral addresses.

23 PLOTTER: not on, not connect, wrong address

The plotter does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the plotter. Ensure that the plotter address recognized by the analyzer matches the HP-IB address set on the plotter itself. Refer to “Instrument State Function Block” in the Reference Manual for instruction on setting peripheral addresses.

24 PRINT/PLOT IN PROGRESS, ABORT WITH COPY ABORT

If a print or plot is in progress and a second print or plot is attempted, this message is displayed and the second attempt is ignored. To abort a print or plot in progress, press COPY/ABORT.

25 PLOTTER NOT READY-PINCH WHEELS UP

If user attempts to plot when plotter's pinch wheels are up, this message is displayed.

30 NO VALID MEMORY TRACE

If a memory trace is to be displayed or otherwise used, a data trace must first be stored to memory. Refer to “Response Function Block” in the Reference Manual.

31 NOT AVAILABLE FOR THIS FORMAT

The D&M SCALE [(COUPLED)] softkey is not valid when the format is either LOG MAG & PHASE, or LOG MAG & DELAY.

32 FORMAT TYPE IS NOT SMITH

The conjugate matching function is only valid in the Smith chart format.

40 TOO MUCH DATA

The number of data to be sent to the analyzer is greater than that expected.

41 NOT ENOUGH DATA

HP-IB only. The amount of data sent to the analyzer is less than that expected.

50 TOO MANY SEGMENTS

The maximum number of segments for the limit line table is 18. Refer to “Instrument State Function Block” in the Reference Manual.

Messages-16
60  CAN'T CHANGE-ANOTHER CONTROLLER ON BUS

The analyzer cannot assume the mode of system controller until the active controller is removed from the bus or relinquishes the bus.

61  FORMAT NOT VALID FOR MEASUREMENT

The conversion function except the 1/S mode is not valid for the Smith, Inverse Smith, and SWR formats.

66  LIST TABLE EMPTY OR INSUFFICIENT TABLE

The frequency list is empty. To implement list frequency mode, add segments to the list table. Refer to "Stimulus Function Block" in the Reference Manual.

67  TOO MANY SEGMENTS OR POINTS

Frequency list mode is limited to 31 segments or 801 points. Refer to "Stimulus Function Block" in the Reference Manual for more information.

76  NO DATA TRACE

The [MARKER ON] [DATA] is selected while the data trace is not displayed.

77  NO MEMORY TRACE

The [MARKER ON] [MEMORY] is selected while the memory trace is not displayed.

78  NO MARKER DELTA - SPAN NOT SET

The [MARKER - SPAN] softkey requires that delta marker mode be turned on, with at least two markers displayed. Refer to "Using Markers" in the Reference Manual.

79  NO MARKER DELTA - RANGE NOT SET

The [SEARCH RNG] [STORE] softkey requires that delta marker mode be turned on, with at least two markers displayed. Refer to "Using Markers" in the Reference Manual.

80  LOCAL MAX NOT FOUND

The maximum peak whose sharpness is defined by the peak define function cannot be found.

81  LOCAL MIN NOT FOUND

The minimum peak whose sharpness is defined by the peak define function cannot be found.

82  NO MARKER DELTA - PEAK DEF NOT SET

The [MARKER - PEAK DEF] softkey requires that delta marker mode be turned on, with at least two markers displayed. Refer to "Using Markers" in the Reference Manual.
93 OVERLOAD ON INPUT B, POWER REDUCED
94 OVERLOAD ON INPUT A, POWER REDUCED
95 OVERLOAD ON INPUT R, POWER REDUCED
When the power level at one of the three receiver inputs exceeds a certain level greater than the maximum input level, the RF output power level is automatically reduced to minimum and the annotation "Pl" appears in the left margin of the display. Refer to "Stimulus Function Block" in the Reference Manual.
96 DC OVERLOAD ON INPUT B
97 DC OVERLOAD ON INPUT A
98 DC OVERLOAD ON INPUT R
The DC voltage at one of the three receiver inputs approaches a DC damage level. Refer to "Instrument Specifications" in the General Information section for the DC damage level.
102 SAVE ERROR
A serious error, for example physically damaged disk surface, is detected on saving file.
103 RECALL ERROR: INSTR STATE PRESET
A serious error, for example corrupted data, is detected on recalling file, and this forced the analyzer to be preset.
104 INVALID FILE NAME
HP-IB only. The file name for the RECALL, PURGE, or RE-SAVE function must have an extension, "_A", "_D", or "_S". Refer to "Saving and Recalling Instrument States and Data" in the Reference Manual for more information.
105 NO LEGAL FILES ON DISK
There are no files on the disk with extensions, "_A", "_D", or "_S". Refer to "Saving and Recalling Instrument States and Data" in the Reference Manual for more information.
111 NO DATA TRACE DISPLAYED
The SCALE FOR [DATA] is selected while the data trace is not displayed.
112 NO MEMORY TRACE DISPLAYED
The SCALE FOR [MEMORY] is selected while the memory trace is not displayed.
116 NO VALID R.ch ABS MAG CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

Messages-18
NO VALID Ach ABS MAG CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID Bch ABS MAG CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID RATIO A/R CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID RATIO B/R CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID RATIO A/B CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID DC FULL SCALE CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID HF PWR LIN CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID LF PWR LIN CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID FN PRETUNE CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

NO VALID STEP OSC CORRECTION CONSTANTS
Severe error. Contact your nearest Hewlett-Packard office.

CONTINUOUS SWITCHING NOT ALLOWED
The current measurement requires the S-parameter test set to switch automatically between forward and reverse measurements (driving test port 1 and, then test port 2). Refer to “Stimulus Function Block” in the Reference Manual.

A1 ROM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

DRAM TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.
143  BACKUP RAM TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

144  EEPROM TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

145  RATE TIMER TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

146  INTR TIMER TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

147  FPC TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

148  REALTIME CLOCK TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

149  A1 CPU EXT BUS TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

150  GSP I/F TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

151  VRAM TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

152  KEY CHIP TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

153  FDC CHIP TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

154  HPIB CHIP TEST FAILED
    Severe error. Contact your nearest Hewlett-Packard office.

155  -15V OUT OF SPEC
    Severe error. Contact your nearest Hewlett-Packard office.

Messages-20
-12.6V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

+18V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

PAN POWER OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

+12V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

+15V(A) OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

+22V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

+65V OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

Rch +5V(D)/2 OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

Rch A/D REF VOLTAGE OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

Ach +5V(A)/2 OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

Ach A/D REF VOLTAGE OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

Bch −5.2V(A)/2 OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

Bch A/D REF VOLTAGE OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.
169  Rch RECEIVER FUNCTIONALLY POOR
Severe error. Contact your nearest Hewlett-Packard office.

170  Ach RECEIVER FUNCTIONALLY POOR
Severe error. Contact your nearest Hewlett-Packard office.

171  Bch RECEIVER FUNCTIONALLY POOR
Severe error. Contact your nearest Hewlett-Packard office.

172  Rch A/D LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

173  Ach A/D LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

174  Bch A/D LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

175  SOURCE ATTENUATOR OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

176  Ach/Rch IF GAIN OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

177  Bch/Rch IF GAIN OUT OF SPEC
Severe error. Contact your nearest Hewlett-Packard office.

178  MIXER LINEARITY POOR
Severe error. Contact your nearest Hewlett-Packard office.

179  VCO MISADJUSTED, RETRY THIS TEST
Severe error. Contact your nearest Hewlett-Packard office.

180  POOR PRETUNE TRACKING
Severe error. Contact your nearest Hewlett-Packard office.

181  FN PRETUNE-DAC/MONITOR FAILURE
Severe error. Contact your nearest Hewlett-Packard office.
EEPROM WRITE FAILED
Severe error. Contact your nearest Hewlett-Packard office.

STEP OSC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

RF AMP FLATNESS TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

POWER LINEARITY TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

1st LOCAL MIXER LOCAL PORT ALC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

RF MIXER LOCAL PORT ALC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

RF POWER LEVEL ALC(LF) TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

RF POWER LEVEL ALC(HF) TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

1st LOCAL AMP TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

FN FREQ TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

1st IF OFFSET OSC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

RF OSC TEST FAILED
Severe error. Contact your nearest Hewlett-Packard office.

Query UTERMINATED after indefinite response
The query which requests arbitrary data response (*IDN? and *OPT? queries) is sent before usual queries in a program message. (for example, FREQ?; *IDN? was expected, but *IDN?;FREQ? is received.)
-430 Query DEADLOCKED
Input buffer and output buffer are full; cannot continue.

-420 Query UNTERMINATED
Addressed to talk, incomplete program message received.

-410 Query INTERRUPTED
Query is followed by DAB or GET before the response was completed.

-400 Query error
Query is improper.

-350 Too many errors
Too many errors occurred in HP-IB commands.

-258 MEDIA PROTECTED
A legal program command could not be executed because the media was protected; for example, the write-protect tab on a disk was present.

-257 FILE NAME ERROR
A legal program command could not be executed because the file name on the device media was in error; for example, an attempt was made to copy to a duplicate file name.

-256 FILE NAME NOT FOUND
A legal program command could not be executed because the file name on the device media was not found; for example, an attempt was made to read or copy a nonexistent file.

-255 DIRECTORY FULL
A legal program command could not be executed because the media directory was full.

-254 MEDIA FULL
A legal program command could not be executed because the media was full; for example, there is no room on the disk.

-253 CORRUPT MEDIA
A legal program command could not be executed because of corrupt media; for example, bad disk or wrong format.

-252 MISSING MEDIA
A legal program command could not be executed because of a missing media; for example, no disk.

Messages-24
-251  MISSING MASS STORAGE
A legal program command could not be executed because of missing mass storage; for example, attempt to access an external disk drive by using Instrument BASIC.

-250  MASS STORAGE ERROR
A mass storage error occurred. This error message should be used when the device cannot detect the more specific errors described for errors -251 through -259.

-223  Too much data
Either there is too much binary data to send to the analyzer when data transfer format is FORM 2, FORM 3 or FORM 5, or number of data is greater than the number of points.

-222  Data out of range
Numerical parameter of HP-IB command is out of the range defined.

-168  Block data not allowed
Block data is not allowed.

-161  Invalid block data
Invalid block data was received (for example, END received before length satisfied).

-160  Block data error
Block data is improper.

-158  String data not allowed
String data is not allowed.

-151  Invalid string data
Invalid string data was received (for example, END received before close quote).

-150  String data error
String data is improper.

-148  Character data not allowed
Character data not allowed for this operation.

-144  Character data too long
Character data is too long (maximum length is 12 characters).
-141 Invalid character data
Bad character data or unrecognized character data was received.

-138 Suffix not allowed
A suffix is not allowed for this operation.

-131 Invalid suffix
Units are unrecognized, or the units are not appropriate.

-128 Numeric data not allowed
Numerical data not allowed for this operation.

-124 Too many digits
Numerical data length was too long (more than 255 digits received).

-123 Numeric overflow
Numerical data value was too large (exponent magnitude >32k).

-121 Invalid character in number
Invalid character in numeric data.

-113 Undefined header
Undefined header or an unrecognized command was received (operation not allowed).

-112 Program mnemonic too long
Program mnemonic is too long (maximum length is 12 characters).

-109 Missing parameter
A command with improper number of parameters received.

-108 Parameter not allowed
Too many parameters for the command received.

-105 GET not allowed
GET is not allowed inside a program message.

-104 Data type error
Improper data type used (for example, string data was expected, but numeric data was received).
-103  Invalid separator

The message unit separator (for example, ";", ";") is improper.

-102  Syntax error

Unrecognized command or data type was received.

-101  Invalid character

Invalid character was received.