HEWLETT PACKARD

HP 70590A H69

TEST MODULE ADAPTER MANUAL

SERIAL NUMBERS

This manual applies directly to HP 70590A H69 Test Module Adapters with serial numbers prefixed 2708A and below.

FIRMWARE VERSIONS

This manual applies directly to HP 70590A H69 Test Module Adapters with firmware versions of 870309 and earlier.

Edition 1

1212 VALLEY HOUSE DRIVE, ROHNERT PARK, CALIFORNIA 94928-4999 U.S.A.

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CERTIFICATION

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

WARRANTY

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

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

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

LIMITATION OF WARRANTY

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

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

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

ASSISTANCE

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

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

SAFETY SYMBOLS

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

Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.

Indicates dangerous voltages are present. Be extremely careful.

CAUTION

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

WARNING

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

GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

CONTENTS

GENERAL INFORMATION

Safety

Before operating this instrument, read the safety markings on the instrument and the safety instructions in the manuals.

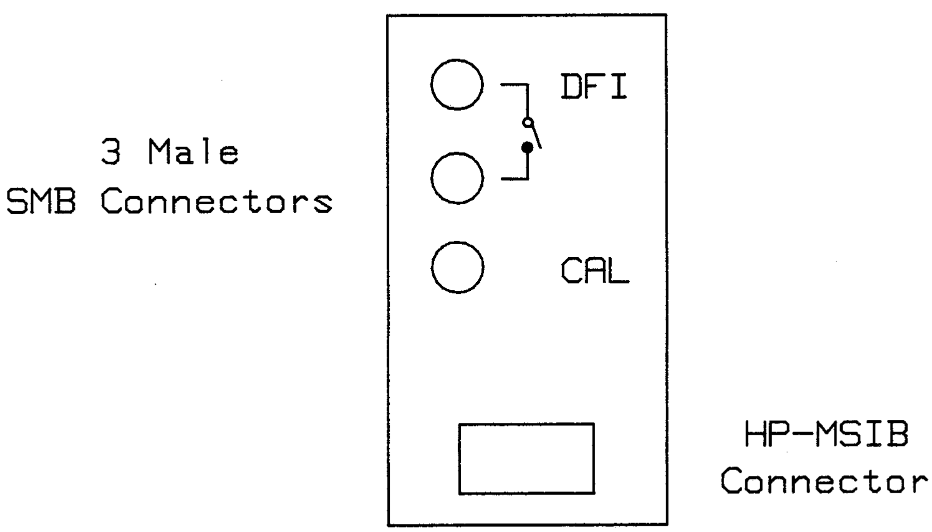
The instrument is manufactured and tested to international safety standards. However, to prevent instrument damage and ensure your personal safety, all cautions and warnings must be heeded.

Refer to the summary of safety information in the front of the manual.

Description of the HP 70590A TMA

The HP 70590A option H69 TMA (Test Module Adapter) is the MATE version of the 71000 series spectrum analyzers. It consists of an additional 1/8 size module to perform the TMA function. The TMA function translates CIIL (control intermediate interface language) into the HP 71000 series spectrum analyzer native code. A discrete indicator and a calibration switch signal is available at the rear panel of the HP 70590A H69 TMA.

Rear Panel



Compatibility

The HP 70590A option H69 TMA (firmware version 870309) is compatible with the following HP 71201A system.

- HP 70900A Local Oscillator (LO) (firmware version 861015 or later)
- HP 70902A IF Section (RES BW 10 Hz - 300 KHz)
- HP 70903A IF Section (RES BW 100 KHz - 3 MHz)
- HP 70905A/B RF Section (Range 50 KHz - 22 GHz)
- HP 70906A RF Section (Range 50 KHz - 26.5 GHz)
- HP 70600A Preselector Section (Range 0 - 22 GHz)
- HP 70310A Frequency Reference Module (FR)

The HP 70590A option H69 TMA (firmware version 871217) is compatible with the following HP 70000 modules.

- HP 70900A Local Oscillator (LO) (firmware version 861015 or later)
- HP 70902A IF Section (RES BW 10 Hz - 300 KHz)
- HP 70903A IF Section (RES BW 100 KHz - 3 MHz)
- HP 70904A RF Section (Range 100 Hz - 2.9 GHz)
- HP 70905A/B RF Section (Range 50 KHz - 22 GHz)
- HP 70906A RF Section (Range 50 KHz - 26.5 GHz)
- HP 70906B RF Section (Range 50 KHz - 22 GHz)
- HP 70907A External Mixer Interface (EMIM)
- HP 70908A Preselected Microwave Front End (YTFMD)
- HP 70600A Preselector Section (Range 0 - 22 GHz)
- HP 79601A Preselector Section (Range 0 - 26.5 GHz)
- HP 70310A Frequency Reference Module (FR)

NOTE

The firmware revision appears on the instrument display at power-on.

INSTALLATION

HP-MSIB Addressing

The HP 70590A option H69 TMA must be assigned to a column address equal to, or lower than the column address of the HP 70900A Local Oscillator module. The HP 70590A option H69 TMA must be assigned to a row address of 0. To do this, the local oscillator module must be reassigned to row address 1. The local oscillator module's slave elements may also need to be incremented as shown in the following procedure.

1. Set the instrument LINE switch to ON.
2. Press the **[DISPLAY]** hardkey.
3. Press the address map softkey in the Display menu.
4. Use the front-panel knob to scroll over to the local oscillator module (HP 70900A) column.
5. Note the row addresses and the column address of the local oscillator module and its slave elements in the Address Matrix. If the row address immediately above the local oscillator module is unassigned, then only the local oscillator module will require a row address change to incorporate the HP 70590A option H69 TMA (the local oscillator module's slave elements can remain at their current row addresses). If there is an unassigned row address between two local oscillator module slave elements, then the elements below the unassigned row address will require row address changes.
6. Set the instrument LINE switch to OFF.
7. Remove the rear-panel inter-module cables.
8. Swing the mainframe front door down. Note that the door will not open unless the LINE switch is OFF.
9. Loosen the local oscillator module latch using an 8 mm hex-ball driver.
10. Slide the local oscillator module forward, out of the mainframe.
11. Increment the local oscillator module's row address switch by one.
12. Set the local oscillator module's HP-IB switch to OFF.
13. Repeat steps 9 through 11 for the local oscillator module's slave elements if necessary.

14. Ensure that the HP-IB switch of the HP 70590A option H69 TMA is set to ON, its row address switch is set to 0, and its column address switch is set to that of the local oscillator module.

15. Slide the modules into the mainframe.

16. Tighten the module latches using an 8 mm hex-ball driver.

17. Connect the rear-panel inter-module cables. Note that the HP 70590A option H69 TMA does not require rear-panel inter-module connections.

18. Repeat steps 1 through 4 ensuring that all elements are configured properly.

INPUT/OUTPUT CHARACTERISTICS

Characteristics provide useful information by giving functional, but non-warranted, performance parameters.

Outputs

Calibration switch signal

Sink 3.2 milliamps at 0.4 volts

Sources 3.2 milliamps at 1.5 volts

Sources 200 microamps at 2.4 volts

The calibration switch will operate upon issuance of the following CIIL (control intermediate interface language) commands:

CNF

IST

CH 16 through 19

Input/Output

Discrete fault indicator (DFI)

Maximum current carrying capability 100 milliamps

The DFI is implemented as a normally closed relay whose coil is connected across the HP 70590A option H69 TMA power supply. The contacts will open when power is applied and will close when power is removed from the system, the power supply shuts itself down, or the HP-MSIB loop is broken.

VERIFICATION

To perform the System Operation Verification, the HP 70590A option H69 TMA must be bypassed or removed from the system.

To bypass the HP 70590A option H69 TMA, connect a remote computer to the system, then type the following program line.

```
OUTPUT 718;"GAL;"
```

If the HP 70590A option H69 TMA is removed from the system, the local oscillator module's row address switch must be set to 0 and its HP-IB switch must be set to ON. (The slave module row addresses do not need to change.)

The spectrum analyzer System Operation Verification software can then be run in the normal way.

TROUBLESHOOTING

Front Panel Operation

Check the HP-MSIB Address Matrix to ensure that the system is configured properly. Refer to the procedure under **HP-MSIB Addressing** in the **INSTALLATION** section.

Instrument Self-Test

At power-on, the HP 70590A option H69 TMA and spectrum analyzer run built-in tests. Upon issuance of the CNF or IST commands, more complete tests are executed. Refer to the CNF and IST descriptions under **Language Reference**, in this manual, for a list of the tests executed.

Error Indicators

The HP 70590A option H69 TMA error light turns on if the spectrum analyzer has an error present, an incorrect syntax is encountered, or if the HP 70590A option H69 TMA self-test failed.

Error Codes

The errors must be queried remotely via the STA command which requests the current operation status. Refer to the description of the STA command under **Language Reference**, in this manual, for a list of error codes.

PROGRAMMING

Adding the HP 70590A option H69 TMA to an HP Modular Spectrum Analyzer allows operation of the spectrum analyzer using either CIIL or its native language command set. Detailed information on the native language commands can be found in the HP 70000 Modular Spectrum Analyzer Programming Manual. The CIIL operation codes are described in this manual. They are followed by several ATLAS/CIIL examples. Finally, there is a list of all of the ATLAS nouns and noun modifiers (that are implemented) with their CIIL equivalent.

The measurement system will hereafter be referred to as the ASA. The ASA contains two separate parsers: one for CIIL and one for the native mode. The language selected at power up will be CIIL.

The ASA does not provide any switching capability. The user must provide any switching necessary to connect the analyzer to the UUT.

The ASA operates as both a STIM device (for signal conditioning purposes) and a SENSOR device for measurements.

The ASA reads into variables all of the NOUN MODIFIERS and marks a flag for each modifier that is encountered (an RST function performs an instrument preset and clears all modifier flags). From the collection of flags and the ATLAS NOUN, an inference will be made as to exactly which measurement the user is attempting to make. ATLAS examples (and their CIIL implications) are provided to illustrate what measurements will be done and which NOUN MODIFIERS trigger which actions.

At the end of each measurement, the ASA is left with the sweep enabled—to facilitate ASA integration—until RST occurs.

Compatibility with Native Operation

After receiving a GAL command, the analyzer will respond to all commands in the native mode. Any pending setup information will be programmed into the ASA before the completion of the GAL command.

In the native mode, the CIIL command will switch from native mode to CIIL mode—this is the only way to return to CIIL mode. CIIL will be defined as a dummy command in the CIIL mode and will not generate a syntax error.

NOTE

1. When the PROGRAM MESSAGE method is used to switch between languages, there will be no change in the POWER UP language state.
2. Device Clear, Group Execute Trigger, Serial Poll, and other device dependent ATN TRUE commands will function as defined by the language that is active. A Device Clear will NOT cause the language mode to be changed.

Calibration

The ASA is calibrated by providing a suitable signal at the selected input and specifying :CH16 through :CH19 (for inputs 0-3). This calibrates the insertion loss differences of the resolution bandwidth filters, their frequency offsets, step gain offsets, etc. The calibration will remain in effect until another calibration is performed. In addition, path loss correction may be performed by sending the setup string:

```
FNC CAL POWR :CHnn
SET FREQ ⟨value⟩ SET PRDF ⟨value⟩
. .
SET FREQ ⟨value⟩ SET PRDF ⟨value⟩
⟨cr/lf⟩
```

Up to 20 points may be supplied. The PRDF values are correction factors to be added to the measurements. This correction will remain effective until the next RST command. For further information, refer to the AMPCOR command in the ASA command reference manual.

NOTE

The frequency/amplitude pairs MUST be sent in ascending frequency order—lowest frequency first.

Allowable CIIL Operation Codes

The ASA reponds to the CIIL operation codes listed below:

CLS CNF FNC FTH GAL INX IST OPN RST SET SRN SRX STA

Language Reference

Unless otherwise stated, all ⟨mchar⟩ and ⟨noun-mod⟩ will have one ⟨value⟩ associated with them.

CLS :CHOO

This command closes the sensor connection. When REFO has been sent as part of the setup, this command will trigger the programming of the ASA. (The ASA is being used as a signal conditioner in this case.) Otherwise, this command causes no action. The CLS command will also put the analyzer in continuous sweep mode (again REFO must be sent as part of the setup string).

CNF The following tests are executed by this command.

NOTE

This command assumes a 300 MHz, -10 dBm signal is present at the ASA's input port.

TMA tests:

ROM Checksums
Non-destructive RAM test
Internal I/O bus check

System tests:

MSIB Slave Addressing Order
Signal Path Integrity
ROM Checksums
Non-destructive RAM test
Video Processor
100 MHz Reference
300 MHz Reference
Fractional N Synthesizer
Idler Phase-lock Loop
Frequency Control Board Adjust
Tune DAC
Decade Span Attenuator
Binary Span Attenuator
Sweep DAC
Correction DAC
YTO Limits

The following tests are uncalibrated:

Input attenuator
Step gain(s)
Resolution Bandwidths: 3 dB points, center frequency, amplitude switching
Calibration Attenuator(s)
Log Amplifier(s)

Display tests (if present):

HP-MSIB interface
Test switch position
ROM checksums
Non-destructive RAM test
8041 peripheral processor
Pixel RAM
Bit-slice processor
Peripheral to bit-slice interface
Dot generator
Character ROM checksum

The ASA will be left in its instrument preset state.

FNC **⟨noun⟩** **⟨mchar⟩** :CHOO

This command signifies the beginning of an instrument setup string. The noun and mchar are saved for later use in determining which measurement algorithm is to be initiated. Validation of the ⟨noun⟩ or ⟨mchar⟩ is performed and an error message is sent if an invalid item is found. Except as noted below, all ⟨noun⟩s and ⟨mchar⟩s are treated the same. This is done to facilitate the instruments use as a signal conditioning module.

NOTE

Setups are cumulative and are only reset by a RST command. The FNC op-code is followed by an arbitrary number of SET, SRN, and/or SRX op-codes. The purpose of the FNC op-code and its collection of SET, SRN, and SRX op-codes is to indicate which ⟨noun-modifier⟩s are to affect changes in the module state in transitioning from the current state to the next state. Those ⟨noun-mod⟩s not included in the FNC setup are to remain as defined in the current state of the module.

ILS and TACAN measurements imply a time domain setup and the use of a Fourier transform. Unless specifically overridden in the SET commands, the default conditions are:

ILS	SWPT=200ms	RESB=1kHz	
TACAN	SWPT=200ms	RESB=1kHz	
VOR	XSAM=15	RESB=1kHz	FRQW=30 kHz

An ⟨mchar⟩ of "NOPD" or "NOAD" will place the ASA in sample detection mode.

The noun CAL is used to transfer path-loss correction data. Refer to the FREQ and PRDF descriptions.

FTH ⟨mchar⟩

After the data has been gathered, this command is used to fetch various characteristics of the data. A syntax error is generated if a ⟨mchar⟩ is requested that is not specified in this document.

If the channel number is greater than 19 when the FTH is executed, it assumes that a user defined function (downloaded into the analyzer at test station initialization) is to be executed. The function is executed before the ⟨mchar⟩ is evaluated and the channel is then reset to zero (so that the function will only be executed once).

Case 1: RESP>1 indicating that an entire data set is to be transferred. RESP indicates the number of data items to be sent to the computer.

⟨mchar⟩ ::=

POWR returns RESP items from trace A in dBm.

VOLT returns RESP items from trace A in volts.

SMPL returns RESP items from trace A in volts.

SPEC returns the sorted spectrum (by signal amplitude) to a response vector. PRDF and SGTH should be included in the setup string (the default values are 6 dB and 9 divisions below the reference level respectively). Output is frequency and amplitude (in that order) for each signal found—largest signal level first. In the event that the response list is greater than the number of signals found, the remaining elements will be filled with zeroes.

SIGS returns the sorted spectrum (by frequency) to a response vector. PRDF and SGTH should be included in the setup string (the default values are 6 dB and 9 divisions below the reference level respectively). Output is frequency and amplitude (in that order) for each signal found—lowest frequency first. In the event that the response list is greater than the number of signals found, the remaining elements will be filled with zeroes.

Case 2: RESP<=1 (or not specified) indicates that a single data item is being requested.

⟨mchar⟩ ::=

FREQ executes a peak search and returns marker frequency.

XPOW executes a peak search and returns marker amplitude in dBm.

XVLT executes a peak search and returns marker amplitude in volts.

VLPK executes a peak search and returns marker amplitude in volts.

FREF returns marker frequency.

POWR returns marker amplitude in dBm.

VOLT returns marker amplitude in volts.

NPOW and NVLT execute a marker minimum search and return marker amplitude.

AMFQ returns the frequency difference of the signal found by doing a peak search followed by a next peak function (normally this will find the largest sideband). Refer to the descriptions for PRDF and SGTH for their effect on what constitutes a signal response.

AMOD returns % modulation of the signal found by doing a peak search followed by a next peak function (normally this will find the amplitude of the largest sideband). Refer to the descriptions for PRDF and SGTH for their effect on what constitutes a signal response.

BAND returns the 3 dB bandwidth of the largest signal on screen.

CAMP is the same as XVLT.

CFRQ same as FREQ.

FMCP returns the 99% power bandwidth of the signal(s) on screen.

FRQW returns the frequency window at the power level specified by POWR in the setup string.

FSTA executes a signal search beginning with the start frequency and terminating with the first signal found meeting the search criteria (SGTH and PRDF). The marker is left at the peak of the signal found and the marker frequency is returned. The search direction is increasing frequency.

FSTE executes a signal search beginning at the marker frequency and terminating with the first signal found meeting the search criteria (SGTH and PRDF). The marker is left at the peak of the signal found and the marker frequency is returned. The search direction is increasing frequency.

FSTO executes a signal search beginning with the stop frequency and terminating with the first signal found meeting the search criteria (SGTH and PRDF). The marker is left at the peak of the signal found and the marker frequency is returned. The search direction is decreasing frequency.

MAMP finds the first sideband (in increasing frequency) relative to the carrier (the largest signal on screen) and returns the % modulation. Refer to the descriptions for PRDF and SGTH for their effect on what constitutes a signal response.

MODF finds the first sideband (in increasing frequency) relative to the carrier (the largest signal on screen) and returns the frequency difference between the carrier and the sideband.
NOAD returns the noise amplitude density of the data trace in units of volts/square root Hz.

NOAD returns the noise amplitude density of the data trace in units of volts/square root Hz.

NOPD returns the noise power density of the data trace in units of dBm/Hz.

PERM is the same as AMOD.

PERI returns the period of a signal (inverse of FREQ).

PRDF returns the value of the user defined variable U_TMP which may be loaded by a user defined function specified by :CHnn.

PREF executes a probability density function in amplitude and returns the amplitude having the greatest number of signal responses. This is a convenient way of determining where the noise floor is.

RMSV returns the RMS value of 800 data points of the data trace.

SBCF returns frequency for VOR subcarrier (approximately 9960 Hz).

SBCM returns % modulation of VOR subcarrier (approximately 30%).

The following measurements imply a time domain setup (refer to FNC):

AMMC returns the % modulation of the 15 Hz tacan signal.

AMMF returns the % modulation of the 135 Hz tacan signal.

AMSH returns the AM-shift of a tacan signal.

DDMD returns the difference in depth of modulation of ILS signals.

DMDS returns the frequency of the dominant modulating signal (ILS).

HMDF returns measured frequency of 150 Hz ILS signal.

LMDF returns measured frequency of 90 Hz ILS signal.

MMOD returns mean modulation of ILS signal.

GAL (Go to Alternate Language—available only in CIIL, not ATLAS.) Points all succeeding commands to the native code parser. This condition will remain in effect until the CIIL command is encountered.

INX ⟨mchar⟩

This command initiates the programming of the ASA to acquire the signal(s) of interest. INX as a minimum will always trigger a sweep (in the case of multiple INX FTH sequences). This command formats an output of the anticipated measurement time in seconds.

The noun-modifiers RESP and FREF do not require an INX to effect a change in the ASA. The next FTH will take into account their current value. This is done to facilitate data interrogation.

An INX command will force the analyzer into the single sweep mode of operation.

When in the XSAM mode of data collection (multiple sweeps in max-hold) successive INX commands will trigger one more sweep unless a FNC, SET, SRN, or SRX command has been received. Refer to the description for XSAM for the conditions which clear the accumulated data.

When in the SAMA mode of data collection (multiple sweeps averaged together), successive INX commands will average one more sweep of data unless a SET, SRN, or SRX command has been received which invalidates the collected data. Refer to the description for SAMA for details.

Validation of the ⟨mchar⟩ is performed and an error message is issued if an invalid ⟨mchar⟩ is received. Except as noted elsewhere, all ⟨mchar⟩s are treated the same by this command.

IST (Instrument Self Test—available only in CIIL, not ATLAS.) The following tests are executed by this command:

NOTE

This command assumes a 300 MHz, -10 dBm signal is present at the ASA's input port.

TMA tests:

ROM Checksums
Non-destructive RAM test
Internal I/O bus check

System tests:

MSIB Slave Addressing Order
Signal Path Integrity
ROM Checksums
Non-destructive RAM test
Video Processor
100 MHz Reference
300 MHz Reference
Fractional N Synthesizer
Idler Phase-lock Loop
Frequency Control Board Adjust
Tune DAC
Decade Span Attenuator
Binary Span Attenuator
Sweep DAC
Correction DAC
YTO Limits

The following tests are uncalibrated:

Input attenuator
Step gain(s)
Resolution Bandwidths: 3 dB points, center frequency, amplitude switching
Calibration Attenuator(s)
Log Amplifier(s)

A calibration is then performed and the following tests run again:

Input attenuator
Step gain(s)
Resolution Bandwidths: 3 dB points, center frequency, amplitude switching
Calibration Attenuator(s)
Log Amplifier(s)

Display tests (if present):

HP-MSIB interface
Test switch position
ROM checksums
Non-destructive RAM test
8041 peripheral processor
Pixel RAM
Bit-slice processor
Peripheral to bit-slice interface
Dot generator
Character ROM checksum

The ASA will be left in its instrument preset state.

OPN :CHOO
The ASA does not have the ability to isolate itself from the rest of the test station. However, to facilitate ASA integration, this command will set the analyzer to continuous sweep mode.

RST ⟨noun⟩ ⟨mchar⟩ :CHOO
The ASA will return to its instrument preset condition upon receiving this command and clear its service request mask. This command sets the initial conditions for all FNC commands to follow. The marker will be set to center screen. Validation of the ⟨noun⟩ or ⟨mchar⟩ is performed and an error message is issued if an invalid item is encountered. All ⟨noun⟩s and ⟨mchar⟩s are treated the same. This is done to facilitate the instruments use as a signal conditioning module.

SET, SRN, and SRX ⟨noun-modifier⟩ ⟨value⟩
These three commands are used to specify the setup conditions of the ASA for making a measurement. SRN and SRX set minimum and maximum values respectively while SET specifies a nominal value.

SRN expects to set the algebraicly lesser value and SRX expects to set the algebraicly larger value. Incorrect operation will result if the SRN value is greater than the SRX value.

SRN and SRX are relevant to the ⟨noun-modifier⟩ POWR, VOLT, and FREQ or FRQW; when used with other ⟨noun-modifier⟩s they are the equivalent to the SET command. The following equivalences are in effect:

SRX POWR is equivalent to SET XPOW
SRN POWR is equivalent to SET NPOW
SRX VOLT is equivalent to SET XVLT
SRN VOLT is equivalent to SET NVLT
SRX FRQW is equivalent to SET FSTO
SRN FRQW is equivalent to SET FSTA
SRX FREQ is equivalent to SET FSTO
SRN FREQ is equivalent to SET FSTA

Amplitude scaling is derived from the combination of NPOW and XPOW (for dBm readouts) and NVLT and XVLT (for voltage readouts). All measurements will be made in log mode.

The ⟨noun-modifier⟩s ATTN, FSTE, RESB, SWPT, SMPW, VBAN can be set automatically or to specific values. The automatic selection mode is enabled by sending the ⟨value⟩ AUTO in place of a numeric ⟨value⟩. The automatic selection mode is disabled by sending a numeric ⟨value⟩.

All ⟨noun-modifier⟩s expecting numeric values will default to zero if the value field is not present.

Specifying a ⟨noun-modifier⟩ not contained in this document will result in a syntax error.

⟨noun-modifier⟩ ::=

ATTN sets the RF-attenuator to the specified value (0-70 dB in 10 dB steps). The ⟨value⟩ AUTO will maintain the RF-attenuator setting such that a signal at the reference level will be less than or equal to -10 dBm at the input mixer.

CAMP is the same as VOLT.

CFRQ is the same as FREQ.

XPOW / XVLT is used to set the reference level of the ASA.

POWR sets the marker amplitude at the specified POWR when making FRQW measurements at a specific power level.

FSTA specifies start frequency.

FSTO specifies stop frequency.

FREQ specifies center frequency.

NOTE

FREQ specifies the frequency for an amplitude correction value (which would be used to correct for test ASA path loss) for the CAL noun.

FRQW specifies frequency span.

FSTE sets center frequency step size (for step keys) and steps the center frequency up one step. The ⟨value⟩ AUTO sets the step size to one tenth the span.

FREF sets the marker frequency.

FRES sets the final span for an auto zoom operation.

MAXT sets maximum delay until trigger.

PRDF sets the signal peak recognition criterion—used in SPEC. This is the power difference that a response must exhibit in order to be classified as a signal. The default value is 6 dB. This parameter affects the following measurments: AMFQ, AMOD, FSTA, FSTE, FSTO, MAMP, MODF, PERM, AMMC, AMMF, AMSH, DDMD, DMDS, HMDF, LMDF, MMOD, SBCF, SBCM.

NOTE

PRDF specifies the amplitude correction value (which is to be added to the measurement result to correct for test ASA path loss) for the CAL noun.

PREF sets the display line.

SGTH sets the signal threshold—used for SPEC measurements. A signal must exceed this threshold by PRDF in order to be classified as a signal response. The default value is nine divisions below the reference level. This parameter affects the following measurements: AMFQ, AMOD, FSTA, FSTE, FSTO, MAMP, MODF, PERM, AMMC, AMMF, AMSH, DDMD, DMDS, HMDF, LMDF, MMOD, SBCF, SBCM.

REFO enables the signal conditioning mode of operation. It is assumed that the video output will be digitized by a high speed ADC. This is required in order to use the ASA as a signal conditioning (or stimulus) device. This mnemonic causes the ASA to be setup when the CLS command is received.

RESB sets the resolution bandwidth filter (1/3 sequence). The ⟨value⟩ AUTO sets the resolution bandwidth as a function of frequency span.

RESP specifies the number of items to be returned as measurement data.

SWPT sets the sweep time of the ASA. The ⟨value⟩ AUTO sets the sweep time as a function of frequency span, resolution bandwidth, and video bandwidth.

SMPW sets the sweep time of the ASA (zero span waveforms). This mnemonic is provided as a convenience to the ATLAS user. Its function is identical to SWPT including the ⟨value⟩ AUTO.

TRLV sets the trigger level for video trigger.

TRSC sets trigger source: INT EXT LINE VID.

VBAN sets the video bandwidth of the ASA (1, 3, 10 sequence). The ⟨value⟩ AUTO sets the video bandwidth as a function of resolution bandwidth.

SAMN selects negative-peak detector and can specify the number of sweeps to be taken. Value field is optional.

SAMP selects positive-peak detector and can specify the number of sweeps to be taken. Value field is optional.

SMPL selects the sample detector and can specify the number of sweeps to be taken. Value field is optional.

SMPP selects the detector to the normal (negative peak and positive peak) mode of operation and can specify the number of sweeps to be taken. Value field is optional.

SAMA selects the sample detector and specifies the number of sweeps to be averaged together. This mode is reset by selecting any of SAMN, SAMP, SMPL, or SMPP with a ⟨value⟩ <=1 (or ⟨value⟩ not specified). The accumulated data will be cleared if a state change in the ASA invalidates the measurement data. This occurs when any of the following are SET: NPOW, XPOW, NVLT, XVLT, FSTA, FRQW, FSTO, FSTE, FREQ, FRES, ATTN, SMPP, XSAM, SAMN, SAMP, RESB, SMPL, SAMA, SWPT, VBAN, NOAD, NOPD.

XSAM sets max-hold and can specify the number of sweeps to be taken. Value field is optional. This mode is reset by selecting any of SAMN, SAMP, SMPL, or SMPP with a ⟨value⟩ <=1 (or ⟨value⟩ not specified). The accumulated data will be cleared if a state change in the ASA invalidates the measurement data. This occurs when any of the following are SET: NPOW, XPOW, NVLT, XVLT, FSTA, FRQW, FSTO, FSTE, FREQ, FRES, ATTN, SMPP, XSAM, SAMN, SAMP, RESB, SMPL, SAMA, SWPT, VBAN, NOAD, NOPD.
This mode is suspended during autozoom operations—specifying FRES.

NOTE

Any ⟨noun-modifier⟩ used in the setup string can be interrogated by sending the ⟨noun-modifier⟩ followed by a question mark (?). If the channel number is greater than 19 when the setup is activated (CLS and REFO or INX), it is assumed that a user defined function (downloaded into the analyzer at test station initialization) is to be executed. The function is the last item in the setup to be done and the channel will then be reset to zero (so that the function will only be executed once).
Function naming convention:

CH20: USERA
CH21: USERB
.
.
.
CH45: USERZ
CH46: USERAA
.
.
.
CH71: USERAZ
CH72: USERBA
.
.
.
CH97: USERBZ
CH98: USERCA
CH99: USERCB

Channels 0-3 specify the input port to be used (if multiple ports are available).

Channels 4-7 select input ports 0-3 and enable currently stored pathloss data to be applied to the measurments. Once enabled this correction will continue until the next RST is received.

Channels 8-11 select input ports 0-3 and perform a preselector peak function as part of the measurement (if a tunable preselector is available on the input selected).

Channels 12-15 select input ports 0-3, enable currently stored pathloss data, and perform the preselector peak function.

Channels 16-19 select input ports 0-3 and perform the internal calibration procedure (takes approximately 2-3 minutes). The appropriate calibration signal must be present at the selected input.

STA Requests the current operation status. Normal return is ⟨sp⟩ ⟨crlf⟩.

Error messages:
F05ASA (MOD) Measurement Timeout
F07ASA (MOD) CIIL/HPIB Syntax Error
F07ASA (MOD) HARDWARE Error
F07ASA (MOD) INVALID RESPONSE LENGTH
F07ASA (MOD) INVALID MEASUREMENT CHARACTERISTIC
F07ASA (MOD) UNRECOGNIZED MEASUREMENT CHARACTERISTIC
F07ASA (MOD) CNF/IST Error: HHHH {,N . . ., N} {,M}

The digits in the error message have the following definition:

The hex digits (H) represent the results of tests run by the TMA on the TMA. (A word is 16 bits. Bit 0 is the least significant bit). The error codes reported by the ASA tests (5 possible) are appended as decimal numbers (N). If a display is present and reports an error, its error code is appended to the end of the message as a decimal number (M). For further information of ASA error codes, refer to the HP 70900A Local Oscillator Installation and Verification Manual. In all cases a zero means test passed.

Word 1 TMA tests

bit 0: ROM (msb) checksum error
bit 1: ROM (lsb) checksum error
bit 2: RAM (msb) checksum error
bit 3: RAM (lsb) checksum error
bit 4: MSIB I/O fail
bit 5: Timer fail
bit 6: Configuration error - no LO module found
bit 15: Processor fail

Measurement Modes

The ASA is intended to be used with both multiple action ATLAS verbs (such as MEASURE) and with single action verbs (such as INITIATE and FETCH). The ASA is specifically set up to gather data and be able to return multiple measurements through a series of FETCH commands. Therefore, INITIATE will always (as a minimum) trigger another sweep and FETCH will perform data reduction on the gathered data allowing the return of several parameters from the same INITIATE. This interaction between FETCH and INITIATE allows the MONITOR statement to function correctly.

It is expected that the measurement throughput will be better using single action verbs because it is possible to avoid multiple setups to accomplish related measurements.

Atlas / CIIL Examples

```
Syntax:        { }  select one of list
               [ ]  encloses optional items
                |   separates alternative selections
```

The following examples are illustrative only; they are not inclusive.

To measure POWER:

```
ATLAS:   MEASURE, (POWER), ⟨noun⟩,

  {  VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
     VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
     VOLTAGE MAX ⟨value⟩ V |
     VOLTAGE ⟨value⟩ V |
     POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
     POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
     POWER MAX ⟨value⟩ DBM |
     POWER ⟨value⟩ DBM }
  ,  FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  [,  FREQ-RESOLUTION ⟨value⟩ HZ ]
  [,  ATTEN ⟨value⟩ DB ]                [, SWEEP-TIME ⟨value⟩ SEC]
  [,  RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [,  { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
        [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [,  TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ POWR :CHOO
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
```

```
[ SET SWPT ⟨value⟩ ]
[ SET RESB ⟨value⟩ ]
[ SET VBAN ⟨value⟩ ]
[ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
     SAMA ⟨value⟩ } ]
[ SET TRSC { EXT | INT } ]

  CLS :CHOO  ⟨cr/lf⟩
  INX POWR  ⟨cr/lf⟩
```

response: { ⟨value⟩ | ⟨error message text⟩ } ⟨cr/lf⟩

```
  FTH POWR  ⟨cr/lf⟩
```

response: { ⟨value⟩ | ⟨error message text⟩ } ⟨cr/lf⟩

```
[ OPN :CHOO  ⟨cr/lf⟩ ]
  RST ⟨noun⟩ POWR :CHOO  ⟨cr/lf⟩
```

To measure VOLTAGE:

```
ATLAS:   MEASURE, ( { VOLTAGE | CAR-AMPL } ), ⟨noun⟩,

  { { VOLTAGE | CAR-AMPL } RANGE ⟨value⟩ V TO ⟨value⟩ V |
    { VOLTAGE | CAR-AMPL } MIN ⟨value⟩ V,
    { VOLTAGE | CAR-AMPL } MAX ⟨value⟩ V |
    { VOLTAGE | CAR-AMPL } ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }

  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ

  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                 [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ { VOLT | CAMP } :CHOO
       { SRN { VOLT | CAMP } ⟨value⟩ SRX { VOLT | CAMP } ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET { VOLT | CAMP } ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }

         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩

       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
       [ SET SWPT ⟨value⟩ ]
       [ SET RESB ⟨value⟩ ]
       [ SET VBAN ⟨value⟩ ]
       [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
```

```
        SAMA ⟨value⟩ } |
    [ SET TRSC { EXT | INT } ]

      CLS :CHOO ⟨cr/lf⟩
      INX { VOLT | CAMP }  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

      FTH { VOLT | CAMP }  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩
    [ OPN :CHOO  ⟨cr/lf⟩ ]
      RST ⟨noun⟩ { VOLT | CAMP } :CHOO  ⟨cr/lf⟩
```

To measure FREQUENCY:

```
ATLAS:   MEASURE, ( { FREQ | CAR-FREQ } ), ⟨noun⟩,

  { {FREQ | CAR-FREQ} ⟨value⟩ HZ,
    FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ |
    {FREQ | CAR-FREQ} MIN ⟨value⟩ HZ,
    {FREQ | CAR-FREQ} MAX ⟨value⟩ HZ |
    {FREQ | CAR-FREQ} RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ }

  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }

  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                   [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
      [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ { FREQ | CFRQ } :CHOO
       { SET { FREQ | CFRQ } ⟨value⟩
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
         SRN { FREQ | CFRQ } ⟨value⟩ SRX { FREQ | CFRQ } ⟨value⟩ }
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
```

```
    [ SET SWPT ⟨value⟩ ]
    [ SET RESB ⟨value⟩ ]
    [ SET VBAN ⟨value⟩ ]
    [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
        SAMA ⟨value⟩ } ]
    [ SET TRSC { EXT | INT } ]

      CLS :CHOO ⟨cr/lf⟩
      INX { FREQ | CFRQ }  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

      FTH { FREQ | CFRQ }  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩
    [ OPN :CHOO  ⟨cr/lf⟩ ]
      RST ⟨noun⟩ { FREQ | CFRQ } :CHOO  ⟨cr/lf⟩
```

To measure BANDWIDTH:

```
ATLAS:   MEASURE, (BANDWIDTH), ⟨noun⟩,

  { BANDWIDTH ⟨value⟩ HZ |
    BANDWIDTH MIN ⟨value⟩ HZ, BANDWIDTH MAX ⟨value⟩ HZ |
    BANDWIDTH RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ } ,

  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }

  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ

  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                 [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ BAND :CHOO
     [ { SET BAND ⟨value⟩ |
         SRN BAND ⟨value⟩ SRX BAND ⟨value⟩ } ]
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
```

```
        [ SET SWPT ⟨value⟩ ]
        [ SET RESB ⟨value⟩ ]
        [ SET VBAN ⟨value⟩ ]
        [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
            SAMA ⟨value⟩ } ]
        [ SET TRSC { EXT | INT } ]

          CLS :CHOO  ⟨cr/lf⟩
          INX BAND  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

          FTH BAND  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩
        [ OPN :CHOO  ⟨cr/lf⟩ ]
          RST ⟨noun⟩ BAND :CHOO  ⟨cr/lf⟩
```

To measure SPECTRUM:

```
ATLAS:    MEASURE, (SPECTRUM), ⟨noun⟩,
    RESP ⟨list⟩ ⟨list range⟩,
  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }
  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  [, POWER-DIFF ⟨value⟩ DBM ]
  [, SIGNAL-THRESHOLD ⟨value⟩ DBM ]
  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ SPEC :CHOO
         SET RESP ⟨value⟩
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET PRDF ⟨value⟩ ]
       [ SET SGTH ⟨value⟩ ]
       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
       [ SET SWPT ⟨value⟩ ]
       [ SET RESB ⟨value⟩ ]
       [ SET VBAN ⟨value⟩ ]
```

```
        [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
            SAMA ⟨value⟩ } ]
        [ SET TRSC { EXT | INT } ]
          CLS :CHOO  ⟨cr/lf⟩
          INX SPEC  ⟨cr/lf⟩
response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩
          FTH SPEC  ⟨cr/lf⟩
response:  { ⟨error message text⟩ |
           ⟨freq 1 value⟩ ⟨amp 1 value⟩
           ⟨freq 2 value⟩ ⟨amp 2 value⟩
           .
           .
           .
           ⟨freq N value⟩ ⟨amp N value⟩  ⟨cr/lf⟩
Note: N=RESP/2

        [ OPN :CHOO  ⟨cr/lf⟩ ]
          RST ⟨noun⟩ SPEC :CHOO  ⟨cr/lf⟩
```

To measure SAMPLE, POWER or VOLTAGE and return multiple values:

```
ATLAS:    MEASURE, ( { SAMPLE | POWER | VOLTAGE } ), ⟨noun⟩,
    RESP ⟨list⟩ ⟨list range⟩,
  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }
  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
      [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ { SMPL | POWR | VOLT } :CHOO
         SET RESP ⟨value⟩
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
       [ SET SWPT ⟨value⟩ ]
       [ SET RESB ⟨value⟩ ]
       [ SET VBAN ⟨value⟩ ]
       [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
            SAMA ⟨value⟩ } ]
       [ SET TRSC { EXT | INT } ]
```

```
        CLS :CHOO  ⟨cr/lf⟩
        INX { SMPL | POWR | VOLT }  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

        FTH { SMPL | POWR | VOLT }  ⟨cr/lf⟩

response:  { ⟨error message text⟩ |
         ⟨amp 1 value⟩
         ⟨amp 2 value⟩
         .
         .
         .
         ⟨amp N value⟩  ⟨cr/lf⟩
Note: N=RESP

       [ OPN :CHOO  ⟨cr/lf⟩ ]
        RST ⟨noun⟩ { SMPL | POWR | VOLT } :CHOO  ⟨cr/lf⟩
```

To measure MOD-FREQ:

```
ATLAS:    MEASURE, (MOD-FREQ), ⟨noun⟩,

  { MOD-FREQ ⟨value⟩ HZ |
    MOD-FREQ MIN ⟨value⟩ HZ, MOD-FREQ MAX ⟨value⟩ HZ |
    MOD-FREQ RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ } ,
  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }
  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  [, POWER-DIFF ⟨value⟩ DBM ]
  [, SIGNAL-THRESHOLD ⟨value⟩ DBM ]
  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ] ,
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ MODF :CHOO
       { SET MODF ⟨value⟩ |
         SRN MODF ⟨value⟩ SRX MODF ⟨value⟩ }
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET PRDF ⟨value⟩ ]
       [ SET SGTH ⟨value⟩ ]
       [ SET FRES ⟨value⟩ ]
```

```
[ SET ATTN ⟨value⟩ ]
[ SET SWPT ⟨value⟩ ]
[ SET RESB ⟨value⟩ ]
[ SET VBAN ⟨value⟩ ]
[ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
    SAMA ⟨value⟩ } ]
[ SET TRSC { EXT | INT } ]

  CLS :CHOO  ⟨cr/lf⟩
  INX MODF  ⟨cr/lf⟩
```

response: { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

```
  FTH MODF  ⟨cr/lf⟩
```

response: { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

```
[ OPN :CHOO  ⟨cr/lf⟩ ]
  RST ⟨noun⟩ MODF :CHOO  ⟨cr/lf⟩
```

To measure MOD-AMPL:

```
ATLAS:    MEASURE, (MOD-AMPL), ⟨noun⟩,

  { MOD-AMPL ⟨value⟩ PC |
    MOD-AMPL MIN ⟨value⟩ PC, MOD-AMPL MAX ⟨value⟩ PC |
    MOD-AMPL RANGE ⟨value⟩ PC TO ⟨value⟩ PC } ,
  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }
  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  [, POWER-DIFF ⟨value⟩ DBM]
  [, SIGNAL-THRESHOLD ⟨value⟩ DBM]
  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                 [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ MAMP :CHOO
       { SET MAMP ⟨value⟩ |
         SRN MAMP ⟨value⟩ SRX MAMP ⟨value⟩ }
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET PRDF ⟨value⟩ ]
       [ SET SGTH ⟨value⟩ ]
       [ SET FRES ⟨value⟩ ]
```

```
[ SET ATTN ⟨value⟩ ]
[ SET SWPT ⟨value⟩ ]
[ SET RESB ⟨value⟩ ]
[ SET VBAN ⟨value⟩ ]
[ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
    SAMA ⟨value⟩ } ]
[ SET TRSC { EXT | INT } ]

  CLS :CHOO  ⟨cr/lf⟩
  INX MAMP  ⟨cr/lf⟩
```

response: { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

```
  FTH MAMP  ⟨cr/lf⟩
```

response: { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

```
[ OPN :CHOO  ⟨cr/lf⟩ ]
  RST ⟨noun⟩ MAMP :CHOO  ⟨cr/lf⟩
```

To measure AM-SHIFT:

```
ATLAS:    MEASURE, (AM-SHIFT), TACAN,

  { AM-SHIFT ⟨value⟩ DEG |
    AM-SHIFT MIN ⟨value⟩ DEG, AM-SHIFT MAX ⟨value⟩ DEG |
    AM-SHIFT RANGE ⟨value⟩ DEG TO ⟨value⟩ DEG } ,

  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }
  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  [, FREQ-RESOLUTION ⟨value⟩ HZ ]
  [, ATTEN ⟨value⟩ DB ]                [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC TAC AMSH :CHOO
       { SET AMSH ⟨value⟩ |
         SRN AMSH ⟨value⟩ SRX AMSH ⟨value⟩ }
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
       [ SET FRES ⟨value⟩ ]
       [ SET ATTN ⟨value⟩ ]
       [ SET SWPT ⟨value⟩ ]
       [ SET RESB ⟨value⟩ ]
```

```
    [ SET VBAN ⟨value⟩ ]
    [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
         SAMA ⟨value⟩ } ]
    [ SET TRSC { EXT | INT } ]

      CLS :CHOO  ⟨cr/lf⟩
      INX AMSH  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

      FTH AMSH  ⟨cr/lf⟩

response:  { ⟨value⟩ |⟨error message text⟩ } ⟨cr/lf⟩

    [ OPN :CHOO  ⟨cr/lf⟩ ]
      RST TAC AMSH :CHOO  ⟨cr/lf⟩
```

To setup as a signal conditioner (receiver) feeding another measurement device:

```
ATLAS:   SETUP, ⟨noun⟩, { FREQ | POWER | VOLTAGE } ,

  { VOLTAGE RANGE ⟨value⟩ V TO ⟨value⟩ V |
    VOLTAGE MIN ⟨value⟩ V, VOLTAGE MAX ⟨value⟩ V |
    VOLTAGE MAX ⟨value⟩ V  |
    VOLTAGE ⟨value⟩ V |
    POWER RANGE ⟨value⟩ DBM TO ⟨value⟩ DBM |
    POWER MIN ⟨value⟩ DBM, POWER MAX ⟨value⟩ DBM |
    POWER MAX ⟨value⟩ DBM |
    POWER ⟨value⟩ DBM }

  , FREQ-WINDOW RANGE ⟨value⟩ HZ TO ⟨value⟩ HZ
  , REF-OUT

  [, ATTEN ⟨value⟩ DB ]                 [, SWEEP-TIME ⟨value⟩ SEC]
  [, RESOLUTION-BANDWIDTH ⟨value⟩ HZ ] [, VIDEO-BANDWIDTH ⟨value⟩ HZ ]
  [, { { MAX-SAMPLE | POS-SAMPLE | NEG-SAMPLE | SAMPLE | SAMPLE-PP }
       [ ⟨value⟩ ] | SAMPLE-AVG ⟨value⟩ } ]
  [, TRIG-SOURCE { EXT | INT } ]
  ⟨ connection field ⟩ $

CIIL:  FNC ⟨noun⟩ MODF :CHOO
       { SRN VOLT ⟨value⟩ SRX VOLT ⟨value⟩ |
         SET NVLT ⟨value⟩ SET XVLT ⟨value⟩ |
         SET XVLT ⟨value⟩ |
         SET VOLT ⟨value⟩ |
         SRN POWR ⟨value⟩ SRX POWR ⟨value⟩ |
         SET NPOW ⟨value⟩ SET XPOW ⟨value⟩ |
         SET XPOW ⟨value⟩ |
         SET POWR ⟨value⟩ }
         SRN FRQW ⟨value⟩ SRX FRQW ⟨value⟩
         SET REFO
       [ SET ATTN ⟨value⟩ ]
       [ SET SWPT ⟨value⟩ ]
       [ SET RESB ⟨value⟩ ]
       [ SET VBAN ⟨value⟩ ]
       [ SET { { XSAM | SAMP | SAMN | SMPL | SMPP } [ ⟨value⟩ ] |
            SAMA ⟨value⟩ } |
       [ SET TRSC { EXT | INT } ]
```

```
  CLS :CHOO ⟨cr/lf⟩

[ OPN :CHOO  ⟨cr/lf⟩ ]
  RST ⟨noun⟩ { FREQ | POWR | VOLT } :CHOO  ⟨cr/lf⟩
```

To setup amplitude/frequency calibration data for accuracy enhancement of the measurement device (path loss correction):

```
ATLAS:    SETUP, CALIBRATION , POWER ,

    FREQUENCY ⟨value⟩,  POWER-DIFF ⟨value⟩,
       .
       .        (up to twenty pairs of calibration data may be sent)
       .

    FREQUENCY ⟨value⟩,  POWER-DIFF ⟨value⟩
    $

CIIL:    FNC CAL POWR :CHOO
           SET FREQ ⟨value⟩ SET PRDF ⟨value⟩
              .
              .
              .

           SET FREQ ⟨value⟩ SET PRDF ⟨value⟩
           ⟨cr/lf⟩
```

NOTE: the frequency/amplitude pairs MUST be sent in ascending frequency order--lowest frequency first.

An alternative form (for convenience of the ATLAS programmer)

```
FNC CAL POWR :CHOO
  SET FREQ ⟨value⟩ ⟨value⟩ ⟨value⟩ .. ⟨value⟩ ⟨value⟩
  SET PRDF ⟨value⟩ ⟨value⟩ ⟨value⟩ .. ⟨value⟩ ⟨value⟩
  ⟨cr/lf⟩
```

NOTE: In this case, the arrays will be matched in order on a one to one basis. An equal number of values must be received for FREQ and PRDF. The data must be in ascending frequency order--lowest frequency first.

IMPLEMENTED NOUNS AND NOUN-MODIFIERS

ATLAS NOUNS	CIIL
AC SIGNAL	ACS
AM SIGNAL	AMS
calibration	CAL
DME	DME
DOPPLER	DOP
FM SIGNAL	FMS
IFF	IFF
ILS	ILS
PAM (Pulsed Amplitude Modulation)	PAM
PM SIGNAL	PMS
PULSED AC SIGNAL	PAC
PULSED AC TRAIN	PAT
RANDOM NOISE	RDN
SUP CAR SIGNAL	SCS
TACAN	TAC
VOR	VOR
WAVEFORM	WAV

ATLAS NOUN MODIFIERS	CIIL	⟨value⟩ UNITS
am-freq	AMFQ	HZ
AM-SHIFT	AMSH	DEG
AMP-MOD	AMOD	PC
AMPL-MOD-C	AMMC	PC
AMPL-MOD-F	AMMF	PC
ATTEN	ATTN	DB
BANDWIDTH	BAND	HZ
CAR-AMPL	CAMP	V
CAR-FREQ	CFRQ	HZ
DDM	DDMD	ratio
DOMINANT-MOD-SIG	DMDS	HZ
FREQ	FREQ	HZ
FM-COMP	FMCP	HZ
freq-ref	FREF	HZ
freq-resolution	FRES	HZ

freq-start	FSTA	HZ
freq-step	FSTE	HZ
freq-stop	FSTO	HZ
FREQ-WINDOW	FRQW	HZ
HI-MOD-FREQ	HMDF	HZ
LO-MOD-FREQ	LMDF	HZ
max-power	XPOW	DBM
max-sample	XSAM	integer
MAX-TIME	MAXT	SEC
max-voltage	XVLT	V
MEAN-MOD	MMOD	PC
min-power	NPOW	DBM
min-voltage	NVLT	V
MOD-AMPL	MAMP	V
MOD-FREQ	MODF	HZ
neg-sample	SAMN	integer
NOISE-AMPL-DENS	NOAD	V/sqrt(HZ)
NOISE-PWR-DENS	NOPD	DBM/HZ
percent-mod	PERM	PC
PERIOD	PERI	SEC
pos-sample	SAMP	integer
POWER	POWR	DBM
POWER-DIFF	PRDF	DB
POWER-REF	PREF	DBM
ref-out	REFO	no value field
resolution-bandwidth	RESB	HZ
RESP	RESP	integer
RMS-VOLT	RMSV	V
SAMPLE	SMPL	integer
sample-avg	SAMA	integer
sample-pp	SMPP	integer
SAMPLE-WIDTH	SMPW	SEC
signal-threshold	SGTH	DBM
signal-search	SIGS	DBM
spectrum	SPEC	DBM
SUB-CAR-FREQ	SBCF	HZ
SUB-CAR-MOD	SBCM	PC
sweep-time	SWPT	SEC
trig-level	TRLV	V
trig-source	TRSC	literal string
video-bandwidth	VBAN	HZ

VOLTAGE	VOLT V
VOLTAGE-P	VLPK V