



3.X.X Firmware Manual for Ethernet/RS-232 Test Systems

(Warning: This manual does NOT apply to JFW USB products)

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1.1 OVERVIEW

Firmware 3.x.x is the latest generation of firmware for JFW test systems with Ethernet/RS-232 remote control. It does NOT apply to JFW's USB products. It is only for Ethernet/RS-232 test systems. It is written in a multi-threaded fashion that allows the test system to execute commands and interact with users in ways that were previously not available. Below is a list of features that are available for test systems running firmware 3.x.x.

- Ethernet and RS-232 interfaces configurable using the keypad /display or via remote connection.
- DHCP capable
 - By default test systems will attempt to obtain network interface information from a listening DHCP server.
- Multi-Threaded command process
 - Each user connection is handled in its own process.
 - Commands that execute over time (i.e. FADE, PAUSE) do not block other users' access to the test system.
- There can be up to 12 simultaneous Ethernet connections to the test system.
- The Ethernet, RS-232, and Manual interfaces can all be utilized simultaneously.
- The remote command set functionality has increased with the inclusion of command options.
- User configurable command line prompt.
- Remotely accessible help command with help files that show command syntax and examples.
- The ability to escape out of erroneous Pause, Fade, and Handover commands.
- Reboot command that allows remote resetting of a test system.
- Date feature that allows for time tracking with timestamp command option.
- MOTD feature that retains a message through power cycles including when and by whom the message was set.
- User comments can now be added to script files without interfering with script execution.
- Additional commands such as Block, Set Block, Name, Show Users, and Net.
- Command options such as Max dB (-M), Step Size (-S), Lock (-L), Block (-B), and Verbose (-V).

1.2 ETHERNET INTERFACE

The Ethernet, RS-232, and manual interfaces can all be utilized simultaneously. Previous firmware revisions required a slide switch to set the interface mode. That is no longer the case for firmware 3.x.x which is multi-threaded and allows all three interfaces to be used simultaneously without blocking other users from using the test system.

1.2.1 ETHERNET DESCRIPTION

One RJ-45 connector with 10Base-T interface provides a 10 Mbps Ethernet connection. The TCP port 3001 is used for a raw data connection in which plain text ASCII commands are used to interface with the test system. The packet MTU is 600bytes including TCP/IP preamble, header, data, and CRC. The firmware does not make any out bound TCP connections, and should be considered a listening device. UDP port 3002 is used for discovery of networked test systems.

1.2.2 ETHERNET SETUP

The network interface by default uses DHCP to attempt to obtain IP, net mask, and gateway IPv4 address. If it is successful, then the IP address will be displayed on display. If there is no DHCP server to issue dynamic network address then the network address can be set manually via the keypad/display or using NET remote command via the RS-232 port.

Note: If you update any network options without being physically cabled to a network, then you will need to connect the test system to the network and power cycle the test system for the changes to take effect.

1.2.3 SIMULTANEOUS USERS

Test systems ship from the factory with the number of network users set to a maximum of 4 users. Firmware 3.x.x can handle up to 12 network connections. Use the remote command NET with the USERS keyword to change the maximum number of allowed connections.

Change to 6 network connections: NET USERS=6<CR>
Change to 12 network connections: NET USERS=12<CR>

1.2.4 CONNECTION OPEN MESSAGE

After a network connection has been established, the test system will send out a two line opening message. The first line will include the model number and the second line will include the message of the day (MOTD).

Example message with no MOTD set: Connection Open 50PMA-035<CR><LF>
No MOTD has been set<CR><LF>

Example message w/ prompt (JFW>>): Connection Open 50PMA-035<CR><LF>
No MOTD has been set<CR><LF>

JFW>>

1.2.5 MAC ADDRESS

The MAC (Media Access Control) address or EHA (Ethernet Hardware Address) of the network interface can be obtained using the NET or IDN remote commands. This may be of use to network administrators wishing to issue a static IP to this test system through the DHCP configuration.

1.3 RS-232 INTERFACE

For serial control there is one RS-232 port available via the DE9 connector labeled “RS-232” port. The available baud rates are 2400, 9600, 19200, 38400, 57600, or 115200 Baud. Internally the RS-232 port is wired with a 5 wire configuration that can utilize hardware flow control (CTS/RTS). The current baud rate is shown on the front panel display.

1.3.1 NULL MODEM CABLE

Included with the system will be one “Null Modem” cable (JFW part #012-174). This cable is used to interface with the RS-232 Port. This cable is DE-9P to DE-9S and is the “Null Modem” type. The female connector will plug into the serial port on most PC’s, and the male connector will connect to the “RS-232 Port” on the rear panel of the test system.

1.3.2 RS-232 PORT SETTINGS

When sending commands to the unit, your computer’s RS-232 port settings must be configured as shown below. If your RS-232 port is not configured with these settings, then the test system will not receive and execute the commands sent. It will not send back an error message because communication was never established.

BAUD RATE	57600 (factory setting of test system)
FLOW CONTROL	off (factory setting of test system)
DATA LENGTH	8 bits
STOP BITS	1
PARITY	none

1.3.3 REMOTE CHECK SERIAL SETTINGS

The current serial settings of the test system can be checked via an Ethernet connection to the test system by sending the SERIAL remote command.

```
Send command:          SERIAL<CR><LF>

Response from test system:  RS-232 Interface<CR><LF>
                          Baud Rate: 57600<CR><LF>
                          Flow Control: OFF<CR><LF>
                          Data Bits: 8<CR><LF>
                          Stop Bits: 1<CR><LF>
                          Parity: NONE<CR><LF>
```

1.3.4 CONNECTION OPEN MESSAGE

There is no connection open message for a RS-232 connection. Only Ethernet connections have connection open messages.

1.4 MANUAL INTERFACE VIA KEYPAD/DISPLAY

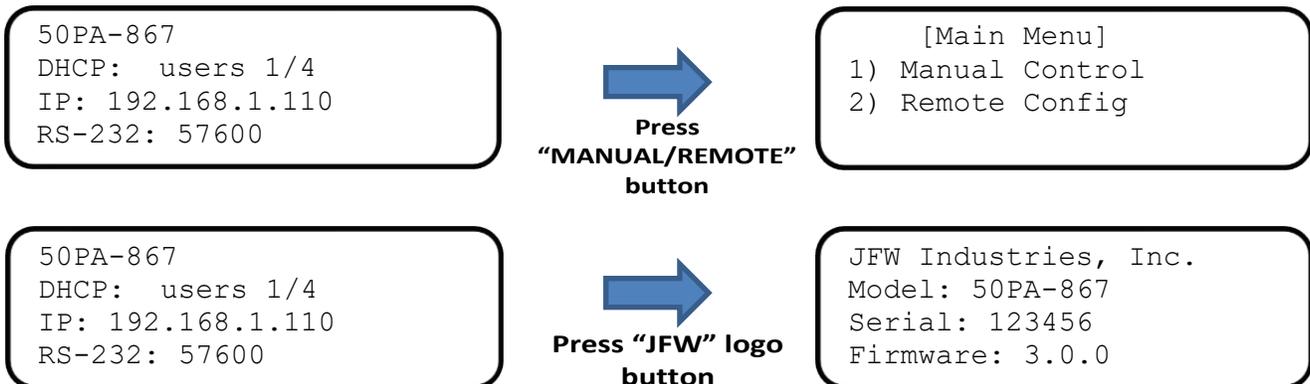
This section is for test system models that have a keypad/display for the manual control. The keypad/display works simultaneously with both RS-232 and network users. The manual control provides the following functionality:

- Set the network settings of the test system (i.e. IP address, Net mask, Gateway)
- Turn on DHCP network mode
- Change the baud rate of the test system
- Set/read attenuator settings
- Fade an attenuator over a specified time period
- Handover operation for two attenuators over a specified time period



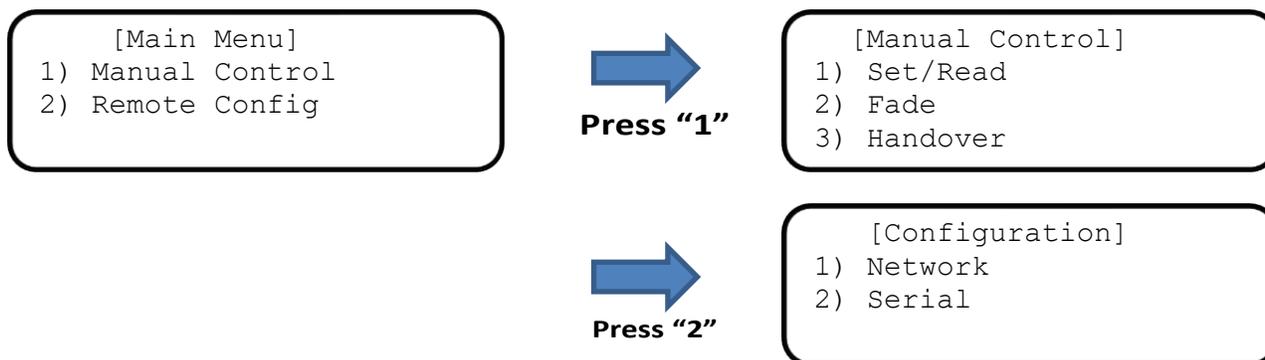
1.4.1 REMOTE STATUS MENU

The default menu shown at start-up is the remote status window. From this status window, the model number, number of connected Ethernet users, IP address, and RS-232 baud rate are shown. Whether or not the system has DHCP enabled, or has a fixed IP address is also shown. Systems are shipped with DHCP enabled. Press MANUAL/REMOTE to jump to manual mode MAIN MENU. Press the JFW logo in the top left of the keypad to see the serial number and firmware revision level.



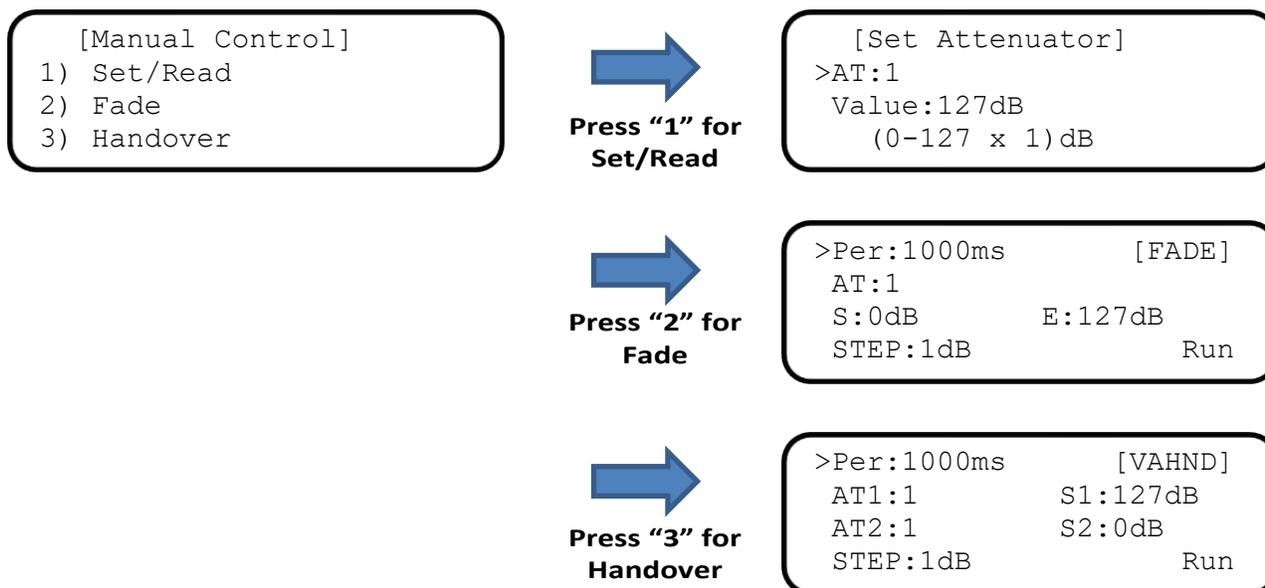
1.4.2 MAIN MENU

From the main menu, can choose to manually set/read RF component settings or manually set the network or serial settings. Press the BACK or MANUAL/REMOTE button to step back to previous menus.



1.4.3 MANUAL CONTROL MENU

The manual control menu allows you to set/read an attenuator, fade an attenuator, or perform a handover using two attenuators.



1.4.4 SET ATTENUATOR MENU

Use the up/down arrows to move the location of the ">" character. The ">" location indicates the active line for data entry. The up/down arrows are located just below the MANUAL/REMOTE button. To enter new settings use keys 0-9 or the +/- keys to increment. If you use the + key while on the attenuator line (i.e. AT line), the attenuation displayed will update for each attenuator address as you scroll up. Move the ">" down to the value line and you may change the attenuation setting for the displayed attenuator number with 0-9 keys or with +/- keys for scrolling.

AT: Used to enter the attenuator address.

Value: Used to enter the dB value.

Change attenuator address number when ">" on AT line

```
[Set Attenuator]
>AT:1
Value:127dB
(0-127 x 1)dB
```

Change dB value when ">" on VALUE line

```
[Set Attenuator]
AT:1
>Value:127dB
(0-127 x 1)dB
```

1.4.5 FADE ATTENUATOR MENU

The FADE menu allows you to fade an attenuator from a starting dB setting to an ending dB setting with a specified step time interval. Move the ">" down to RUN and press ENTER to begin the fade. While the fade is in progress you may stop at any time using CANCEL. The dB setting will be updated on the display as the attenuator is stepped.

PER: Use to set the time period between steps. Press "." to toggle units between milliseconds/seconds.

AT: Use to enter the attenuator address.

S: Use to enter the starting dB value.

E: Use to enter the ending dB value.

STEP: Use to enter the dB step size of each step.

RUN Use to start the fade.

How menu appears before you start the fade.

```
Per:1000ms [FADE]
AT:1
S:0dB E:127dB
STEP:1dB >Run
```

How menu appears while the fade is in progress.

```
Per:1000ms [RUNNING]
AT:1 at 1dB
S:0dB E:127dB
STEP:1dB >Cancel
```

1.4.6 HANDOVER ATTENUATOR MENU

The handover menu allows you to perform a handover test using two attenuators that step in opposite directions. The ending dB value for the first attenuator is the starting dB value of the second attenuator. The ending dB value for the second attenuator is the starting dB value of the first attenuator. Move the ">" down to RUN and press ENTER to begin the fade. While the handover is in progress you may stop at any time using CANCEL. The dB values will be updated on the display as the attenuators are stepped.

- PER:** Use to set the time period between steps. Press "." to toggle units between milliseconds/seconds.
- AT1:** Use to enter first attenuator's address.
- S1:** Use to enter first attenuator's starting dB value.
- AT2:** Use to enter second attenuator's address.
- S2:** Use to enter second attenuator's starting dB value.
- STEP:** Use to enter the dB step size of each step.
- RUN** Use to start the fade.

How menu appears before you start the handover.

```
Per:1000ms      [VAHND]
AT1:10          S1:127dB
AT2:11          S2:0dB
STEP:1dB       >Run
```

How menu appears while the handover is in progress.

```
Per:1000ms      [RUNNING]
AT1:10          S1:126dB
AT2:11          S2:1dB
STEP:1dB       >Cancel
```

1.4.7 NETWORK OPTIONS MENU

The manual network configuration allows you to select between running the Ethernet port in DHCP mode, in fixed IP address mode, or disabling the port. If you select DHCP mode, then the test system will obtain IP address, net mask, and gateway from the DHCP server. If you choose fixed IP mode, then you will manually enter an IP address, net mask, and gateway and then SAVE the settings. You must move the ">" to the text SAVE and press ENTER to save your settings.

Warning: If you update any network options w/o being physically cabled to a network, then you will need to power cycle the test system for the change to take effect.

```
[Configuration]
1) Network
2) Serial
```


Press "1"

```
[Network Options]
1) Use DHCP
2) Supply Fixed IP
3) Disable
```

Move ">" and manually enter your IP, NM, & GW numbers. Move ">" to SAVE and press ENTER.

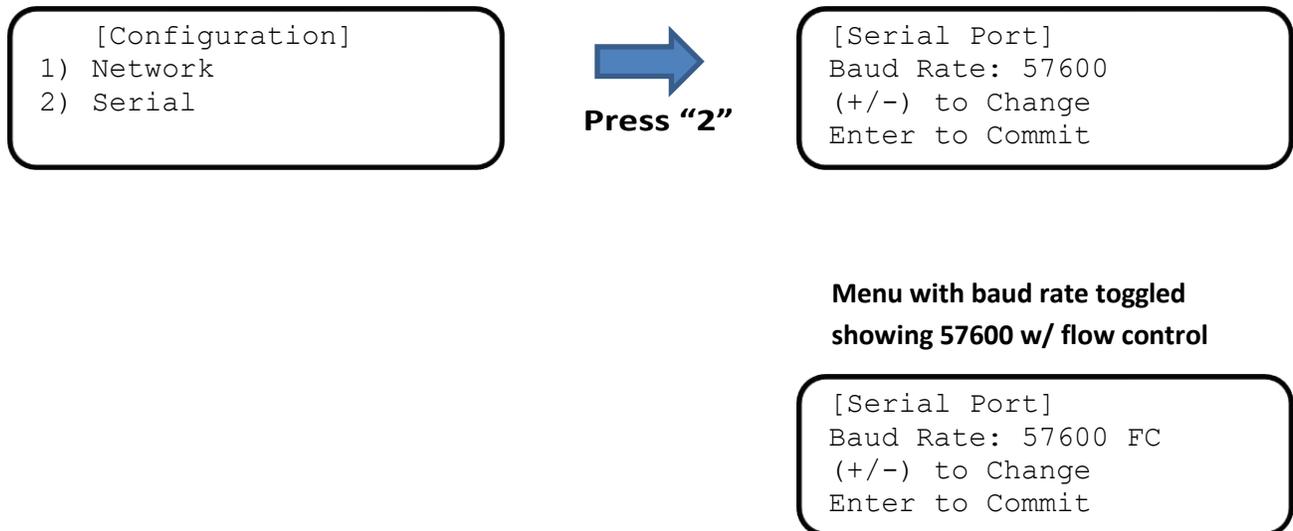
```
[Network Options]
1) Use DHCP
2) Supply Fixed IP
3) Disable
```


Press "2" for Fixed IP mode

```
[Network]          Save
>IP:192.168.1.130
NM:255.255.255.0
GW:192.168.1.1
```

1.4.8 SERIAL PORT MENU

The baud rate and flow control settings can be manually configured from the Serial Port menu. Use the +/- keys to scroll through all available settings. Press ENTER to commit a setting. If the text displayed is "57600", then the baud rate will be 57600 without flow control. If the text displayed is "57600 FC", then the baud rate will be 57600 with flow control. Test system are shipped with default settings: 57600 Baud, no flow control, 8 data bits, 1 stop bit, no parity.

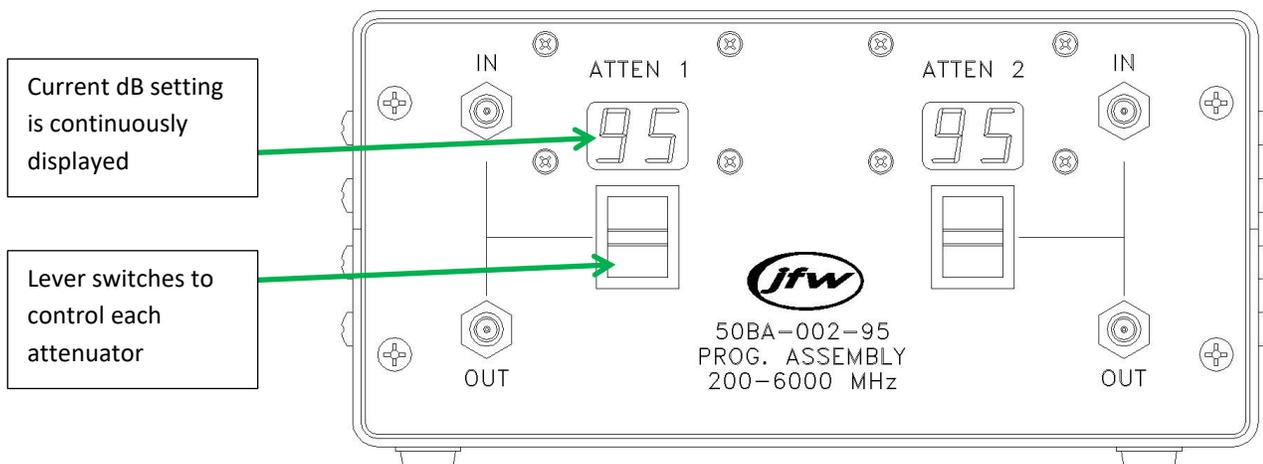


1.5 MANUAL INTERFACE VIA MOMENTARY LEVERS

This section is for test system models that have momentary lever switches for the manual control. The levers work simultaneously with both RS-232 and network users. The current dB setting of each attenuator is always displayed. It does not matter if the dB setting is changed manually or remotely, the dB change is instantly displayed on the front panel. This type of manual control provides the following functionality:

- Tap the lever up/down to step the attenuation.
- Hold the lever up/down to jog the attenuation.
- Multiple levers can be used simultaneously to perform manual handover tests.
- The 7-segment LED displays show the current dB setting for the attenuator at all times.
- Remotely executing test scripts can be visually verified by the constant updating of the 7-segment displays.
- If a remote user changes dB settings, you will see the changes on the 7-segment LED displays.
- Manual lever switches work concurrently with Ethernet users and RS-232 users (i.e. non-blocking controls).

When the lever switch is held up/down to jog the attenuation, the speed of the attenuation fade is dependent on the jog speed setting. Examples of the jog speed remote command can be found on page 33 of this manual. The jog speed can be set from 0-10. The factory setting is 5. If jog speed is set to zero, then all levers will be disabled. If disabled, the levers can only be re-activated using the remote jog command.



2.0 REMOTE COMMAND SET

Description:

Firmware 3.x.x is written in such a manner that the base code is used for all test systems (i.e. attenuator assemblies, switch assemblies, matrix switches). Test systems with only programmable attenuators will not have all of the switch and matrix commands enabled. As features in the base firmware are added, then all new test system will be programmed with the upgraded base firmware. As the base firmware is updated, this manual will be updated to reflect those changes. Changes to individual command features will be noted at the end of each command description with revision level and change made.

<u>Remote Command Sets</u>	<u>Page</u>	
2.1 System.....	13	Commands that deal with system features and system connectivity.
2.2 Security	41	Used to enable login password feature.
2.3 Attenuator.....	46	Used to control programmable attenuators in the test system.
2.4 Switch.....	84	Used to control RF switches in the test system.
2.5 Matrix Switch	94	Used for matrix switch models to control RF path states.
2.6 Legacy.....	102	List of legacy commands.

2.1 SYSTEM COMMANDS

All commands listed in this section are used for system features, or Ethernet and RS-232 connectivity.

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2.1.1 IDENTIFICATION COMMAND

Respond with system identification information.

Syntax:

IDN<CR>

Example:

Messages sent to the test system are in black and responses back to the user are in blue.

Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).

Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

IDN<CR>

Model: 50PA-505 by JFW INDUSTRIES, INC

Serial: 123456 Datecode: 1214

Firmware: 3.0.0

Network Interface: 00|90|C2|55|AA|55

Physical: CONNECTED Status: UP

Mode: DHCP Users: 1 of 4

IP: 192.168.1.105

NM: 255.255.255.0

GW: 192.168.1.3

RS-232: 57600 baud

Type "HELP" for a list of commands.

No MOTD has been set

Model number

Serial number

Firmware revision

MAC address

Connection status

Network information

IP address

Netmask

Gateway

Serial port baud rate

Message of the day

Command Revisions:

3.0.0 No revisions to this command

2.1.2 HELP COMMAND

Return a list of all available commands on the test system or return the help file of a specific command. The help files for individual commands show the command syntax with examples.

Syntax:

HELP<CR> Responds with list of all available commands.
 HELP COMMAND<CR> Responds with help file for the specific command listed.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
HELP SA<CR>           Respond with help file for SA command.
HELP RA<CR>           Respond with help file for RA command.
HELP NET<CR>          Respond with help file for NET command.
HELP<CR>
System
  IDN                 Send system identification tag
  HELP                Manual Pages
  IDENT               Identify User
  SERIAL              Show/Set Serial port settings
  NET                 Show/Set Network interface setting
...
Attenuator
  ATTEN              Define attenuator parameters
  SA                 Set attenuation value
  SAA                 Set all attenuators
  RA                 Read attenuator
  RAA                 Read all attenuators
...
Legacy
  SMA                (Legacy) Set multiple attenuators
  SAR                (Legacy) Set attenuation with response
```

Command Revisions:

3.0.0 No revisions to this command

NET IP=192.168.1.246<CR> NET<CR> Network Interface: 00 90 c2 dc 28 48 Physical: CONNECTED Status: UP Mode: FIXED Users: 1 of 4 IP: 192.168.1.246 NM: 255.255.255.0 GW: 192.168.1.3	Change to Fixed Address mode w/ new IP address Returns the current network settings Fixed Address shown as current network mode
NET USERS=6<CR> NET<CR> Network Interface: 00 90 c2 dc 28 48 Physical: CONNECTED Status: UP Mode: FIXED Users: 1 of 6 IP: 192.168.1.246 NM: 255.255.255.0 GW: 192.168.1.3	Number of network users changed to 6 Returns the current network settings Number of users shown as 6 maximum
NET NM=255.255.0.0<CR> NET GW=192.168.1.1<CR> NET<CR> Network Interface: 00 90 c2 dc 28 48 Physical: CONNECTED Status: UP Mode: FIXED Users: 1 of 6 IP: 192.168.1.246 NM: 255.255.0.0 GW: 192.168.1.1	Change netmask Change gateway Verify NM and GW changes
NET IP=192.168.1.111 NM=255.255.0.0 GW=192.168.1.3 USERS=5<CR> Network Interface: 00 90 c2 dc 28 48 Physical: CONNECTED Status: UP Mode: FIXED Users: 0 of 5 IP: 192.168.1.111 NM: 255.255.0.0 GW: 192.168.1.3	
NET DISABLE<CR>	Disable the network interface completely. The network interface can be re-enabled by using the NET command through the serial port or manually with the keypad and display.

Command Revisions:

- 3.0.0 No revisions to this command
- 3.2.4 The USERS keyword will no longer trigger a reboot.

2.1.5 CLOSE COMMAND

Close all other active network connections.

The only remaining network connection will be the user who sent the CLOSE command.

Syntax:

```
CLOSE<CR>
```

Notes:

- This command can be restricted by the administration with the RESTRICT command.

Example:

Messages sent to the test system are in black and responses back to the user are in blue.

Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).

Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
CLOSE<CR>
```

```
Closing 2 connections<CR><LF>
```

The network connections that are closed will receive the message:

```
This session has been closed by 3:USER3<CR><LF>
```

```
50PMA-082 Connection Closed<CR><LF>
```

Command Revisions:

3.0.0 No revisions to this command

2.1.6 DISCONNECT COMMAND

Disconnect the current network connection.

Syntax:

```
DIS<CR>
```

Example:

Messages sent to the test system are in black and responses back to the user are in blue.

Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).

Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
DIS<CR>  
50PA-505 Connection Closed<CR><LF>
```

Command Revisions:

3.0.0 No revisions to this command

2.1.7 REBOOT COMMAND

Reboot the test system.

Syntax:

```
REBOOT<CR>
```

Note:

- All lock settings will be reset.
- All block settings will be reset.
- System uptime is reset.
- This command can be restricted by the administrator with the RESTRICT command.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
REBOOT<CR>  
System Reboot called by [3:USER3]<CR><LF>  
Rebooting in 3 seconds<CR><LF>
```

Command Revisions:

3.0.0 No revisions to this command

2.1.8 DATE COMMAND

Set or show the time and date for the system.
No day light savings or leap year calculations are done.

Syntax:

DATE<CR>	Respond with the current date setting.
DATE MM/DD/YYYY hh:mm:ss<CR>	Set the date.

Note:

- This command can be restricted by the administrator with the RESTRICT command.

Example:

Messages sent to the test system are in black and responses back to the user are in blue.
Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

DATE<CR>	Show current date and time
17 MAR 2014 03:00:21<CR><LF>	Response

DATE 03/17/2014 15:30:00<CR>	Set to March 17, 2014 at 3:30PM
17 MAR 2014 15:30:00<CR><LF>	Response

Command Revisions:

3.0.0 No revisions to this command

2.1.9 UPTIME COMMAND

Description:

Returns the amount of time that has passed since the system was turned on.

Syntax:

```
UPTIME<CR>
```

Notes:

- UPTIME value is reset if the system losses power or is turned off.
- UPTIME value is reset if the reboot command is executed.

Example:

Messages sent to the test system are in black and responses back to the user are in blue.
Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
UPTIME<CR>
```

```
System uptime: 2 Days, 17 Hours, 53 Minutes, 48 Seconds<CR><LF>
```

Command Revisions:

3.0.0 No revisions to this command

2.1.10 MOTD COMMAND

Set or return a message of the day that is sent to each new network connection.

Syntax:

MOTD<CR>	Respond with the message of the day.
MOTD CLEAR<CR>	Clear the message of the day.
MOTD <i>string</i> <CR>	Set the message of the day.

Notes:

- The message can be up to size of the input buffer, 256 characters.
- The RESTRICT command can be used to restrict this command.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

MOTD<CR>	Show MOTD
No MOTD has been set<CR><LF>	
MOTD Calvin using attenuators #1, 2 today<CR><LF>	Set MOTD
MOTD<CR>	Show MOTD
CALVIN USING ATTENUATORS #1, 2 TODAY<CR><LF>	
MOTD CLEAR<CR>	Clear MOTD
No MOTD has been set<CR><LF>	

Command Revisions:

3.0.0 No revisions to this command

2.1.12 SHOW USERS COMMAND

Return a table listing all the current connections to the test system.

Syntax:

```
SHOW USERS<CR>
```

Notes:

- The ID column in the response is a unique number that identifies the connection.
- The NAME column is the connection name of each connection.
- The SERIAL keyword denotes the RS-232 interface.
- The MANUAL keyword denotes the keypad and display.
- The CONNECTION column shows the remote IP address or other interface keywords.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
SHOW USERS<CR>
ID  NAME                CONNECTION
1   MANUAL              MANUAL          Keypad and display
2   USER2              SERIAL          RS-232 port
3   USER3              192.168.1.160  Ethernet connection
4   USER4              192.168.1.175  Ethernet connection
```

Command Revisions:

3.0.0 No revisions to this command

2.1.14 PROMPT COMMAND

Return or set the session or default text (up to 30 characters) of the command prompt. The session prompt is the text that applies only to the connection that defined it. The default prompt is applied to all new connections as well as the connection that defined the new prompt. When setting the prompt take care to notice that the prompt will be the exact string that is typed, no additional characters will be added.

Syntax:

```
PROMPT -{options} string<CR>
```

Options:

-D	Default	Set the default command prompt for the test system
-J	JFW	Quick set prompt to be "JFW>> "
-M	Model #	Quick set prompt to be "ModelNumber>> "
-S	Serial #	Quick set prompt to be "SerialNumber>> "
-U	User	Quick set prompt to the connection name
-Q	Quiet	Suppress feedback to user

Keywords:

OFF	Clear session or default (-D) prompt.
RESET	Set session prompt to default prompt.

Notes:

- The prompt text can be up to 30 characters.
- The session prompt is only seen by the current connection.
- The default setting is used for every new network connection.
- The prompt is shown when all of the commands in the command buffer have completed execution.
- The session prompt is disabled in client mode even if it has been restricted.
- The default prompt is persistent through power cycles.
- The session prompt can be restricted by the administrator by the RESTRICT command.
- The default prompt can be restricted by the administrator by the RESTRICT command.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
PROMPT<CR>                                     Check the current prompt settings.
Default Prompt: "NOT SET"
Session Prompt: "NOT SET"
```

```
PROMPT LAB3>> <CR>                             Set session prompt to "LAB3>> "
Default Prompt: "JFW>> "
Session Prompt: "LAB3>> "
```

```
PROMPT -DJ<CR>                                   Quick set default prompt to -J option.
Default Prompt: "JFW>> "
Session Prompt: "JFW>> "
```

```
PROMPT -DJMS<CR>                                Quick set default with options -J, -M, -S.
Default Prompt: "JFW:50PA-599:123456>> "
Session Prompt: "JFW:50PA-599:123456>> "
```

```
PROMPT RESET<CR>  
Default Prompt: "JFW>> "  
Session Prompt: "JFW>> "
```

Reset session prompt to default prompt

```
PROMPT -D LAB4 <CR>  
Default Prompt: "LAB4 "  
Session Prompt: "LAB4 "
```

Set default prompt to "LAB4 "

```
PROMPT -DQ JFW>> <CR>
```

Set default prompt to "JFW>> " with no response

```
PROMPT -Q OFF<CR>
```

Clear the session prompt with no response

```
PROMPT -D OFF<CR>  
Default Prompt: "OFF"  
Session Prompt: "OFF"
```

Clear the default prompt

Command Revisions:

- 3.0.0 No revisions to this command
- 3.2.13 The CLEAR keyword was removed. The function of the CLEAR keyword was changed and the RESET keyword was added.

2.1.15 STORE COMMAND

Store the current settings of all the system devices into memory. The settings can be recalled using the recall command. Battery backed up memory (BBRAM) can be saved to an unlimited number of times. Flash memory can be saved up to 10,000 times maximum. Settings saved to flash will only be used if the test system is set to boot to BBRAM values and the battery fails.

Syntax:

STORE<CR> Stores current settings to BBRAM memory.
STORE FLASH<CR> Stores current settings to FLASH memory.

Notes:

- BBRAM can be saved to an unlimited number of times.
- Flash memory can be saved to 10,000 times maximum.
- See SWITCH command to choose BBRAM or FLASH as boot port values.
-
- See MATRIX command to choose BBRAM or FLASH as boot port values.
- See ATTEN command to choose BBRAM, FLASH, MAX or ZERO as boot dB values.
- The RESTRICT command can be used to restrict this command.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

Attenuator Assembly Example using BBRAM:

```
STORE<CR>
16 Attenuator settings stored in memory<CR><LF>
```

Switch Assembly Examples using FLASH:

```
STORE FLASH<CR>
4 Switches stored in FLASH<CR><LF>
```

Command Revisions:

3.0.0 No revisions to this command

2.1.16 RECALL COMMAND

Set all of the devices to their settings stored in memory. The user can select between settings stored in BBRAM or FLASH memory.

Syntax:

RECALL<CR> Recall settings from battery backed up memory.
RECALL FLASH<CR> Recall settings from flash memory.

Notes:

- This command respects all device locks (i.e. Locked/Blocked attenuators will not be changed).
- BBRAM can be saved to an unlimited number of times.
- Flash memory can be saved to 10,000 times maximum.

Example:

Messages sent to the test system are in black and responses back to the user are in blue.
Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RECALL<CR>  
Verifying stored data: SUCCESS<CR><LF>
```

```
RECALL FLASH<CR>  
Verifying stored data: SUCCESS<CR><LF>
```

Command Revisions:

3.0.0 No revisions to this command

2.1.17 PAUSE COMMAND

Suspend command execution from the user's command buffer for a set period of time. The time duration can be set from 1-9999 and include a postfix of 'M' milliseconds (default) or 'S' seconds.

Syntax:

PAUSE -{options} tM<CR> Syntax for milliseconds time duration
PAUSE -{options} tS<CR> Syntax for seconds time duration

Option:

-Q No response is given (best for use in scripts)

Notes:

- Use the escape command to terminate any erroneous command.
- This firmware is multi-threaded. The PAUSE command will not affect other users.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

PAUSE -Q 1500M<CR> Pause this connections command execution for 1500 milliseconds

PAUSE 150M<CR> Pause this connections command execution for 150 milliseconds
Pausing for 150MS
Pause complete

PAUSE 3S<CR> Pause this connections command execution for 3 seconds
Pause for 3S
Pause complete

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

Syntax Error<CR><LF> Formatting error
Invalid value entry: X<CR><LF> Value out of range

Command Revisions:

3.0.0 No revisions to this command

2.1.18 JOG SPEED COMMAND

The JOG speed command is only available in test system models that have manual control via momentary lever switches on the front panel. The JOG command changes the speed at which a device is changed when lever switches are held in their up or down positions. The jog speed range is 0-10. If the jog speed is set to zero, then all lever switches on the front panel will be disabled.

Syntax:

JS x<CR> Set the jog speed to value X.
JS<CR> Respond with the current jog speed setting.

Notes:

- If the jog speed is set to zero, then no manual control will be allowed using the lever switches.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

JS 5<CR> Manual Speed = 5/10<CR><LF>	Set the jog speed to 50%.
JS<CR> Manual Speed = 5/10<CR><LF>	Show the jog speed setting.
JS 7<CR> Manual Speed = 7/10<CR><LF>	Set the jog speed to 70%.
JS 0<CR> Manual Speed = OFF<CR><LF>	Set the jog speed to 0%, Disabling the lever switches.
JS<CR> Manual Speed = OFF<CR><LF>	Show the jog speed setting.

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

Command not found: X<CR><LF>	Formatting error
Invalid Jog Speed: X<CR><LF>	Value out of range

Command Revisions:

3.2.0 Command added to firmware.

2.1.19 ESCAPE COMMAND

The escape command will cause the test system to stop processing and clear the connections command buffer. This command is useful for breaking out of remote commands that process over a period of time. (i.e. PAUSE, FA).

Syntax:

ESCAPE<CR> The spelled out version of this command can be implemented into GUI applications.
 ^C<CR> The command can also be manually keyed if using a terminal program (i.e. CTRL+C ENTER).

Example:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

FA 1 0 127 6000S<CR>	User accidentally fades attenuator with 6000 seconds between steps
Fade Started<CR><LF>	(i.e. 100 minutes per step ☹)
ESCAPE<CR>	Escape command sent to stop the erroneous fade command.
Escaping, Clearing buffer<CR><LF>	

Notes:

- This command will not affect the buffered commands of other users (i.e. other connections to the test system).

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

Command not found: X<CR><LF>	Formatting error
------------------------------	------------------

Command Revisions:

3.0.0 No revisions to this command

2.1.20 STARTUP COMMAND

Setup a list of commands that are executed when the system first boots. The commands that can be used at system boot are listed in the Available Commands section below.

Syntax:

```
STARTUP KEYWORD<CR>
```

Keywords:

CLEAR	Clear the startup command list.
RUN	Execute the startup commands. Useful for testing.
ADD	Add a command to the startup execution list.
LIST	Show the list of commands issued at startup in order of execution.

Available Commands:

ATTN	(Legacy) Set channel attenuation	SB	Set attenuator block attenuation
BLOCK	Attenuator block assignment	SI	Set matrix input port to output port
CHAN	(Legacy) Set active channel	SO	Set matrix output port to input port
SA	Set attenuator attenuation	SP	Set path attenuation
SAA	Set all attenuators attenuation	SS	Set switch port
SAS	Set all switches to the same port		

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
STARTUP ADD BLOCK 1 ADD 1 3<CR> Add "BLOCK 1 ADD 1 3" to startup list
STARTUP ADD BLOCK 2 ADD 2 4<CR> Add "BLOCK 2 ADD 2 4" to startup list
STARTUP ADD SB 1 10, 2 20<CR> Add "SB 1 10, 2 20" to startup list
```

```
STARTUP LIST<CR>
[1] BLOCK 1 ADD 1 3<CR><LF> Response
[2] BLOCK 2 ADD 2 4<CR><LF>
[3] SB 1 10, 2 20<CR><LF>
```

```
STARTUP CLEAR<CR>
STARTUP CLEAR<CR><LF> Response
```

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF> Formatting error
```

Notes:

- 1) When using the ADD keyword the STARTUP LIST response is given.
- 2) Each command that is ADDED is limited to 64 characters.

Command Revisions:

3.2.0 Command added to firmware.

2.1.21 WIPE COMMAND

Clear all saved data and reset the system to factory defaults.

Syntax:

```
WIPE<CR>
```

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
WIPE<CR>  
System reset to factory defaults    Response  
Reboot required...
```

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>           Formatting error
```

Notes:

- 1) The RESTRICT command can be used to restrict this command.
- 2) Mechanically latching devices will need AUTOSAVE set back to true.
- 3) The STARTUP list is not cleared because some systems have factory STARTUP commands.
- 4) Use the STARTUP CLEAR command to clear the STARTUP list.

Command Revisions:

- 3.2.0 Command added to firmware.
- 3.2.13 The WIPE command no longer forces a reboot. This allows the user to change other parameters before rebooting.

2.1.22 READ DICTIONARY ENTRY COMMAND

Read dictionary entries.

The dictionary allows the users to write a list of information into flash memory. Each entry has a Name field and a Description field. The name field can be up to 24 characters. The description field can be up to 54 characters. Entries are shown in the order they were entered. Changing the Name or Description of an entry will not change its order. There is no mechanic for reordering dictionary entries. Once entered, an entry can only be modified or cleared.

Syntax:

```
RT -{options} argument<CR>
```

Options:

- I ID Show only the entry with ID matching the argument.
- N NAME Show only the entry with NAME matching the argument.
- D DESC Respond with only the description for all entries.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RT<CR>
ID  NAME                DESCRIPTION<CR><LF>
1   PATH-A              SWITCH 1 AND 2<CR><LF>
2   PATH-B              SWITCH 3 AND 4<CR><LF>
```

```
RT -I 1<CR>
ID  NAME                DESCRIPTION<CR><LF>
1   PATH-A              SWITCH 1 AND 2<CR><LF>
```

```
RT -DI 2<CR>           (read description only for ID #2 by referencing the ID #)
SWITCH 3 AND 4<CR><LF>
```

```
RT -DN path-a<CR>     (read description only for ID #2 by referencing the name)
SWITCH 3 AND 4<CR><LF>
```

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>      Formatting error
```

Notes:

- 1) No response is given if a match is not found.

Command Revisions:

3.2.6 Command added to firmware.

2.1.23 SET DICTIONARY ENTRY COMMAND

Create or modify a dictionary entry.

The dictionary allows the users to write a list of information into flash memory. Each entry has a name field and a description field. The name field can be up to 24 characters. The description field can be up to 54 characters. Entries are shown in the order they were entered. Once entered, an entry can be modified or cleared. Changing the Name or Description of an entry will not change its order. Deleting an entry will change the ID numbers for all entries that follow the deleted entry.

Syntax:

ST x y<CR>	Enter new entry with name x and description y.
ST x NAME=y DESC=z<CR>	Modify entry number x to name y and description z.
ST x NAME=y<CR>	Modify entry number x to name y.
ST x DESC=y<CR>	Modify entry number x to description y.

Keywords:

NAME	Select the name field
DESC	Select the description
CLEAR	Clear the entry or field
RESET	Clear all the entries

Notes:

- 1) Up to 254 entries or 4K of memory can be stored.
- 2) The Fields ID, NAME, DESC, are optional, but NAME or ID must be given.
- 3) If NAME or DESC is left blank the previous stored value will be used.
- 4) If an invalid ID is given for adding an entry, the ID will be ignored.
- 5) Double quotes are needed for any NAME or DESC that contains spaces.
- 6) The NAME field is unique. If the ID and NAME keywords are used then the NAME field will be modified for the Given ID. If only the NAME field is given the DESC field is modified for the entry matching the NAME.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

Append the new entry to the end of the dictionary

```
ST "IN1 to OUT1" -10.5dB
```

```
RT<CR>
```

```
ID  NAME                DESCRIPTION<CR><LF>
1   IN1 TO OUT1         -10.5DB<CR><LF>
```

```
ST "IN1 to OUT2" -8.0dB
```

```
RT<CR>
```

```
ID  NAME                DESCRIPTION<CR><LF>
1   IN1 TO OUT1         -10.5DB<CR><LF>
2   IN1 TO OUT2         -8.0DB<CR><LF>
```

```
ST "IN1 to OUT3" -9.2dB
RT<CR>
```

ID	NAME	DESCRIPTION<CR><LF>
1	IN1 TO OUT1	-10.5DB<CR><LF>
2	IN1 TO OUT2	-8.0DB<CR><LF>
3	IN1 TO OUT3	-9.2DB<CR><LF>

```
ST 1 DESC=-9.9dB<CR>
RT<CR>
```

ID	NAME	DESCRIPTION<CR><LF>
1	IN1 TO OUT1	-9.9DB<CR><LF>
2	IN1 TO OUT2	-8.0DB<CR><LF>
3	IN1 TO OUT3	-9.2DB<CR><LF>

```
ST 2 CLEAR<CR>
RT<CR>
```

(deletes ID #2)

ID	NAME	DESCRIPTION<CR><LF>
1	IN1 TO OUT1	-9.9DB<CR><LF>
2	IN1 TO OUT3	-9.2DB<CR><LF>

(what was ID #3 now becomes ID #2)

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

`Syntax Error<CR><LF>` Formatting error

Command Revisions:

3.2.6 Command added to firmware.

3.2.11 Entry name can no longer be blank.

2.1.24 READ CYCLE COUNT COMMAND

Show and set the number of times each device has changed state.

The cycle count of each device is tracked and can be displayed using the RCC command.

The Current count can be reset allowing the user to keep a current cycle count if a device has been replaced.

Syntax:

```
RCC<CR>                Show cycle count table
RCC SET ADDR# Value<CR> Set device counter at address to value
RCC SET ALL Value<CR>  Set all device counters to value
```

Table:

Device	Group and identifier of the device
Addr	Physical address of the device
Reset	The number of times the Current counter has been set
Current	The number of times the device has changed state between resets
Total	The total number of times the device has changed state

Notes:

- 1) The Address number NOT the device number is used to set the Current Count
- 2) The Reset counter is incremented every time the Current count is modified
- 3) The Reset and Total counters cannot be changed
- 4) This command requires administrator privileges

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.

Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).

Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RCC<CR>
```

```
Device Addr  Reset  Current  Total
SW 1     1       1      1557    2557
SW 2     3       1      1557    3122
SW 3     5       1      1557    5432
SW 4     7       1      1557    7123
```

```
RCC SET 3 500<CR>
```

```
Device Addr  Reset  Current  Total
SW 1     1       1      1557    2557
SW 2     3       2       500    3122
SW 3     5       1      1557    5432
SW 4     7       1      1557    7123
```

*Note: Switch 2 (Addr 3), not Switch 3 (Addr 5)

```
RCC SET ALL 0<CR>
```

```
Device Addr  Reset  Current  Total
SW 1     1       2       0      2557
SW 2     3       3       0      3122
SW 3     5       2       0      5432
SW 4     7       2       0      7123
```

2.2 SECURITY COMMANDS

The security system allows administrators to restrict access to some of the features of the test system. The security feature is not a replacement for firewalls or proxy services. By default the security system is disabled and all features are available to any user of the system. Connections made to the test system are given the GUEST security level.

If the system has not been configured to require a system password then the GUEST security level has all non-privileged access to the system.

If the system has been configured to require a system password all connections must execute the IDENT command with the system password to gain USER privileges. The GUEST security level will only have access to the HELP and IDENT commands.

By default there are no security restrictions to the test system. The ADMIN security level is required to setup restrictions or a system password. The ADMIN password can be found on the rear panel of the test system. If at any time the ADMIN password is lost please contact JFW (jfwengr@jfwindustries.com, sales@jfwindustries.com) for information on how to retrieve the ADMIN password.

User Security Levels:

GUEST Non-privileged access to the system.
 USER Non-privileged access to the system, with authentication.
 ADMIN All access privilege to the test system.

Notes:

- Connections gain USER or ADMIN privileges by using the IDENT command.
- Features are restricted using the RESTRICT command.

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2.2.1 IDENT COMMAND

The IDENT command is used to set or check the security level of a connection, or to set or clear the password of the test system. The connection must be at the ADMIN security level to set or clear the password, or to use the RESTRICT command.

ADMIN Password:

Each test system has a unique ADMIN password. The ADMIN password can be found on a label that is affixed to the rear panel of the test system.

Syntax:

IDENT<CR>	Respond with the access level of the connection.
IDENT x<CR>	Enter system password x to login and gain USER level access.
IDENT y<CR>	Enter ADMIN password y to login and gain ADMIN level access.
IDENT PASS z<CR>	Set password z as the system password (ADMIN only)
IDENT PASS CLEAR<CR>	Clear the system password (ADMIN only)

Notes:

- System passwords have a maximum length of 14 characters.
- The ADMIN password can be found on the rear panel of the test system.
- The ADMIN security level is required to set or clear the system password.
- If the ADMIN password is used to authenticate when the system password is set then the connection will gain the ADMIN security level.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

IDENT<CR>	Respond with your access level.
Access: GUEST Password: NOT SET	
IDENT x<CR>	Request ADMIN level access by sending ADMIN password.
Access: ADMIN Password: NOT SET	
IDENT PASS JFW<CR>	Set the system password to "JFW".
Access: ADMIN Password: JFW	Password is displayed for ADMIN level users.
IDENT PASS CLEAR<CR>	Clear the system password
Access: ADMIN Password: NOT SET	

(New connection gaining access using system password)

Connection Open 50PA-505

User Authentication Required

No MOTD has been set

Specifies that a system password has been set.

SA -R 1 3<CR>

User Authentication Required

Unauthorized user tries to set attenuator 1 and fails.

IDENT JFW<CR>

Access: USER

Password: SET

Unauthorized user enters system password.

Access level is upgraded to USER.

Password is not displayed at USER level.

SA -R 1 3<CR>

Atten #1 = 3dB

Attenuator can now be set with USER level access

Command Revisions:

3.0.0 No revisions to this command

2.2.2 RESTRICT COMMAND

Restrict certain features to require the ADMIN security level. Connections with the ADMIN security level can use all features even if the feature is listed as restricted.

Syntax:

RESTRICT<CR>	Respond with list of labels and restricted status.
RESTRICT LABEL<CR>	Set the label to be restricted.
RESTRICT !LABEL<CR>	Set the label to be unrestricted.

Label Descriptions:

ATTEN_LOCK	Restrict locking of attenuators.
ATTEN_AUTOSAVE	Restrict auto-saving dB setting to BBRAM after each set attenuator command.
ATTEN_STARTUP	Restrict changing the boot settings.
BLOCK	Restricting use of block command to create blocks.
SERIAL	Restrict access to modify the RS-232 port baud rate and hardware flow control.
CLOSE	Restrict access to remotely closing other network connections.
DATE	Restrict access to modify the system date and time.
MOTD	Restrict access to modify the system's message of the day.
MSG	Disable the MSG command.
NET	Restrict use of NET command.
DPPROMPT	Restrict access to modify the default prompt of the system.
SPROMPT	Restrict access to modify the session prompt of a connection.
REBOOT	Disable remote rebooting of the test system.
SAA	Disable the set all attenuator command.
STORE	Restrict access to modifying the stored default values of the battery backed up memory.

Notes:

- In order to use RESTRICT you must first gain ADMIN level access using the ADMIN password.
- The ADMIN password can be found on the rear panel of the test system.
- The label list is system dependent and will change depending on the devices in the system.
For example the ATTEN_LOCK restriction is only available on test systems with attenuators.

Example:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

RESTRICT<CR>		Respond with the list restrictions.
		Response with the restriction label and state.
	LABEL	RESTRICTED
	ATTEN_LOCK	NO
	ATTEN_AUTOSAVE	NO
	ATTEN_STARTUP	NO
	...	
	...	
	...	
	REBOOT	NO
	SAA	NO
	STORE	NO

RESTRICT MOTD<CR>

LABEL	RESTRICTED
ATTEN_LOCK	NO
ATTEN_AUTOSAVE	NO
ATTEN_STARTUP	NO
BLOCK	NO
SERIAL	NO
CLOSE	NO
DATE	NO
MOTD	YES
MSG	NO
NET	NO
DPROMPT	NO
SPROMPT	NO
REBOOT	NO
SAA	NO
STORE	NO

Restrict MOTD command.
Reply showing MOTD is restricted.

RESTRICT ATTEN_LOCK BLOCK !MOTD<CR>

LABEL	RESTRICTED
ATTEN_LOCK	YES
ATTEN_AUTOSAVE	NO
ATTEN_STARTUP	NO
BLOCK	YES
SERIAL	NO
CLOSE	NO
DATE	NO
MOTD	NO
MSG	NO
NET	NO
DPROMPT	NO
SPROMPT	NO
REBOOT	NO
SAA	NO
STORE	NO

Restrict the locking and blocking of attenuators.
Un-restrict the setting of the message of the day.

RESTRICT !ATTEN_LOCK<CR>

LABEL	RESTRICTED
ATTEN_LOCK	NO
ATTEN_AUTOSAVE	NO
ATTEN_STARTUP	NO
BLOCK	YES
SERIAL	NO
CLOSE	NO
DATE	NO
MOTD	NO
MSG	NO
NET	NO
DPROMPT	NO
SPROMPT	NO
REBOOT	NO
SAA	NO
STORE	NO

Enable attenuator locking feature.

Command Revisions:

3.0.0 No revisions to this command

2.3 ATTENUATOR COMMANDS

The commands listed in this section are used to control the programmable attenuators of the test system.

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2.3.1 ATTENUATOR ATTRIBUTE CONTROL

The ATTEN command is a multiple purpose command that is used to lock/unlock attenuators and set various attenuator attributes. The STARTUP keyword is used to set the boot state for the attenuators in the test system. The AUTOSAVE keyword is used to save attenuator attenuation settings to BBRAM after each set attenuator command is executed. The READ keyword is used to check the STARTUP or READ settings.

Option Syntax:

ATTEN -{options} x1<CR>	Set attributes for single attenuator.
ATTEN -{options} x1, x2 ..., x16<CR>	Set attributes for up to 16 attenuators.

Options:

-L Lock	Only allow the attenuator to be modified by the current connection.
-U Unlock	Remove the attenuator lock.
-F Force	Ignore current attenuator lock and relock to current connection.
-K Manual Lock	Ignore modification made by the keypad/display.
-R Respond	Notify the user of the new setting.

Keyword Syntax:

```
ATTEN STORE={BBRAM, FLASH}<CR>
ATTEN RECALL={BBRAM, FLASH}<CR>
ATTEN AUTOSAVE={TRUE or FALSE}<CR>
ATTEN STARTUP={FLASH, BBRAM, MAX, or ZERO}<CR>
ATTEN READ={STARTUP, AUTOSAVE, FLASH, or BBRAM}<CR>
```

Keyword Descriptions:

ALL	Lock or unlock ALL attenuators.
READ	Respond with current settings.
STORE	Save the current state of the attenuators to BBRAM or FLASH memory.
RECALL	Set the attenuators to values stored in BBRAM or FLASH memory.
STARTUP	Set the boot state for attenuators to BBRAM, FLASH, MAX or ZERO.
AUTOSAVE	Feature that automatically saves attenuator last to BBRAM at each set.

Notes:

- If an attenuator is locked other users are prevented from changing the state of the attenuator.
- If an attenuator is locked, the Force option can be used to steal the lock on the attenuator.
- If Manual Lock is set, then other remote users can still use the attenuator. Only the manual user is locked out.
- The manual interface can LOCK and STEAL locks if not locked out.
- Lock is denoted on the display for manual users by putting the character "L" before the attenuator address.
- Manual lock is denoted on the display for manual users by putting the character "M" before the attenuator address.
- When a user disconnects all the devices they have locked are automatically unlocked.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

ATTEN -L 1<CR>	Lock attenuator 1
ATTEN -RL 8<CR>	Lock attenuator 8 with response
Atten #2 Locked by YOU<CR><LF>	Response

ATTEN -L 2, 4<CR>	Lock attenuators 2, 4
ATTEN -K 1, 3<CR>	Lock out manual control for attenuators 1, 3
ATTEN -LK 5, 6<CR>	Lock and lockout manual control for attenuators 5, 6
ATTEN -U 1, 2<CR>	Remove all locks for attenuator 1, 2
ATTEN -UK 6<CR>	Remove manual lockout only for attenuator 6
ATTEN -L ALL<CR>	Lock all attenuators
ATTEN -FL 5, 6, 7<CR> Atten #1 Lock changed to 3:USER3<CR><LF>	Steal lock for attenuators 5, 6, 7 Response to original user
ATTEN -UF 5, 6, 7<CR> Atten #1 Unlocked by 4:USER4<CR><LF>	Force unlock attenuators 5, 6, 7 Response to original user
ATTEN STARTUP=BBRAM<CR>	Set test system boot to BBRAM.
ATTEN STARTUP=MAX<CR>	Set test system boot to maximum dB value.
ATTEN STARTUP=ZERO<CR>	Set test system boot to 0dB.
ATTEN AUTOSAVE=TRUE<CR>	Save to BBRAM after each SA command.
ATTEN READ=BBRAM<CR>	Responds w/ current BBRAM stored settings.
ATTEN READ=STARTUP<CR>	Responds w/ current boot state type.
ATTEN READ=AUTOSAVE<CR>	Responds w/ auto save option.
ATTEN STORE=BBRAM<CR>	Store the current state of the attenuators in BBRAM.
ATTEN STORE=FLASH<CR>	Store the current state of the attenuators in FLASH.
ATTEN RECALL=BBRAM<CR>	Set the attenuators to the state saved in BBRAM.
ATTEN RECALL=FLASH<CR>	Set the attenuators to the state saved in FLASH.

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Atten X does not exist<CR><LF>	Attenuator address out of range
Atten X In use by X:USER<CR><LF>	Attenuator executing command for another user
Atten X is locked by X:USER<CR><LF>	Attenuator locked by another user
Atten X is a member of Block X<CR><LF>	Attenuator is assigned to a block
Command not found<CR><LF>	Command does not apply to your test system model

Startup:

By default at startup the RF attenuators are set to the dB settings saved in battery backed up RAM (BBRAM). The BBRAM settings can be changed using the ATTEN STORE or the SA -S (i.e. Set Attenuator w/ Store option). If ATTEN AUTOSAVE is enabled then any command that changes attenuator dB values will also update the BBRAM setting for those attenuators.

The ATTEN STARTUP=FLASH command also provides the option to set the attenuators to the values stored in flash memory at startup. The flash memory has a 10,000 write limit and can take seconds to store the new values. Because of these limitations there are no options to update values stored in flash on the fly. See STORE=FLASH option of the ATTEN command, and the STORE FLASH command to update values stored in FLASH memory.

If memory corruption of the data stored in FLASH or BBRAM occurs then the factory default settings are used at startup.

Command Revisions:

- 3.0.0 No revisions to this command
- 3.2.0 Store Recall keywords added
- 3.2.0 More precise locking control

2.3.2 SET ATTENUATOR COMMAND

Set the attenuation for up to 16 attenuators.

Syntax:

SA <code>-{options}</code> <code>x1 y1</code> <CR>	Set single attenuator with address and dB value
SA <code>-{options}</code> <code>x1 Iy1, ..., x16 Dy16</code> <CR>	Increment/Decrement value modifier
SA <code>-{options}</code> <code>x1 y1, x2 y2, ..., x16 y16</code> <CR>	Set up to 16 attenuators w/ address and dB value
SA <code>-M{options}</code> <code>x1, x2, ..., x16</code> <CR>	Set a list of attenuators to their max dB value
SA <code>-V{options}</code> <code>y x1, x2, ..., x16</code> <CR>	Set a list of attenuators to the same dB value

Options:

<code>-M</code> Max dB	Set a list of attenuators to their maximum attenuation value.
<code>-V</code> Value	Set a list of attenuators to the same attenuation value.
<code>-R</code> Respond	Notify the user of the new setting.
<code>-S</code> Store	Store the new dB setting in battery backed up memory (BBRAM).
<code>-T</code> Timestamp	Include [HH:MM:SS] timestamp with response.

Notes:

- The expected parameter list changes with the `-M` and `-V` options.
- Increment/Decrement modifiers cannot be used with `-M` and `-V` options.
- The SA command has no user feedback unless using the `-R` or `-T` options.
- The settings stored in BBRAM using the `-S` option can be applied by using the RECALL command or at system startup.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

SA 2 10<CR>	Set attenuator 2 to 10dB
SA 5 63<CR>	Set attenuator 5 to 63dB
SA 1 10, 2 20, 3 30<CR>	Set attenuator 1 to 10db, 2 to 20dB, 3 to 30dB

(Increment/Decrement modifier)

SA 1 10, 2 I3, 3 D2<CR>	Set attenuator 1 to 10dB, increment attenuator 2 by 3dB, decrement attenuator 3 by 2dB
-------------------------	--

(Include the set to maximum option)

SA <code>-M</code> 1<CR>	Set attenuator 1 to maximum attenuation
SA <code>-M</code> 1, 3, 5<CR>	Set attenuators 1, 3, 5 to maximum attenuation

(Include the set list to same value option)

SA <code>-V</code> 42 2, 4, 6<CR>	Set attenuators 2, 4, 6 to 42dB
-----------------------------------	---------------------------------

(Include the respond option)

SA <code>-R</code> 3 16<CR>	Set attenuator #3 with response
Atten #3 = 16dB<CR><LF>	Response

(Include the store option)

```
SA -S 1 63<CR>
```

Set attenuator 1 to 63db and stores that individual dB value.
This stored dB value can be applied by the recall command.

(Include the timestamp option)

```
SA -T 1 10, 2 20, 3 30<CR>
[10:02:21] Atten #1 = 10dB<CR><LF>
[10:02:21] Atten #2 = 20dB<CR><LF>
[10:02:21] Atten #3 = 30dB<CR><LF>
```

Set attenuators 1, 2, 3 with timestamp response
Response

(Combination of options)

```
SA -RM 1, 3, 5<CR>
Atten #1 = 127dB<CR><LF>
Atten #3 = 127dB<CR><LF>
Atten #5 = 127dB<CR><LF>
```

Set attenuators 1, 3, 5 to maximum attenuation and respond
Response

```
SA -RV 42, 2, 4, 6<CR>
Atten #2 = 42dB<CR><LF>
Atten #4 = 42dB<CR><LF>
Atten #6 = 42dB<CR><LF>
```

Set attenuators 2, 4, 6 to 42dB
Response

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Atten X does not exist<CR><LF>
Invalid value entry: X<CR><LF>
Increment of Atten X above attenuator max
Decrement of Atten X below attenuator min
Atten X In use by X:USER<CR><LF>
Atten X is locked by X:USER<CR><LF>
Atten X is a member of Block X<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
Attenuator address out of range
Attenuation value out of range
Command failure because value out of range
Command failure because value out of range
Attenuator executing command from another user
Attenuator locked by another user
Attenuator is assigned to a block
Command does not apply to your test system model
```

Command Revisions:

```
3.0.0    Command added to firmware
3.3.18  Increment/Decrement feature added
```

2.3.3 READ ATTENUATOR COMMAND

Read the attenuation setting for up to 16 attenuators.

Additional attenuator information is available with the use of the command options.

Syntax:

RA -{options} x<CR>	Read dB setting for a single attenuator.
RA -{options} x1, x2, ..., x16<CR>	Read dB settings for up to 16 attenuators.

Options:

-M Max dB	Include maximum attenuation of the attenuator.
-S Step Size	Include dB step size of attenuator.
-L Locked	Include if attenuator is locked/unlocked.
-B Blocked	Include if attenuator is assigned to a block.
-V Verbose	Use verbose option in place of -MSLB combination.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.

Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).

Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

RA 1<CR>	Read attenuator 1
Atten #1 = 127dB<CR><LF>	Response

RA 1, 2, 3, 4<CR>	Read attenuators 1, 2, 3, 4
Atten #1 = 127dB<CR><LF>	Response
Atten #2 = 127dB<CR><LF>	
Atten #3 = 127dB<CR><LF>	
Atten #4 = 127dB<CR><LF>	

(Include the maximum attenuation information)

RA -M 1<CR>	Command
Atten #1 = 127dB, Max 127dB<CR><LF>	Response

(Include the dB step size information)

RA -S 1<CR>	Command
Atten #1 = 127dB, Step 1dB<CR><LF>	Response

(Include the lock state of attenuator)

RA -L 1<CR>	Command
Atten #1 = 127dB, Not Locked<CR><LF>	Response if attenuator is not locked
or	
Atten #1 = 127dB, Locked by 3:CALVIN<CR><LF>	Response if attenuator is locked

(Include the block state of attenuator)

RA -B 1<CR>	Command
Atten #1 = 127dB, Not Blocked<CR><LF>	Response if attenuator is not assigned to block
or	
Atten #1 = 127dB, Block 6<CR><LF>	Response if attenuator is assigned to block

(Include the verbose response)

```
RA -V 1, 3, 5<CR>
```

```
Atten #1 = 127dB, Max 127dB, Step 1dB, Not Locked, Block 6<CR><LF>
```

```
Atten #3 = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

```
Atten #5 = 127dB, Max 127dB, Step 1dB, Locked by 3:CALVIN, Not Blocked<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
```

```
Atten X does not exist<CR><LF>
```

```
Command not found<CR><LF>
```

Formatting error

Attenuator address out of range

Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command

2.3.4 SET ALL ATTENUATORS COMMAND

Set all attenuators to the same dB value.

Syntax:

SAA -{options} x<CR>	Set all attenuators to x dB
SAA -{options} start x<CR>	Set all attenuators from start on to x dB
SAA -{options} start stop x<CR>	Set all attenuators between start and stop to x dB
SAA -{options} start stop I/Dx<CR>	Increment/Decrement all attenuators between start and stop by xdB

Options:

-M Max dB	Set the attenuators to maximum attenuation.
-R Respond	Notify the user of the new setting.
-Q Quiet	Suppress feedback to user.
-T Timestamp	Include [HH:MM:SS] timestamp with response.

Notes:

- The expected parameter list changes with the -M option.
- The Increment/Decrement modifiers cannot be used with the -M option.
- This command will attempt to change the state of all attenuators in a system.
- Using this command should be avoided when more than one user is working with the test system.
- This command respects all (In Use, Locking, and Blocking) attenuator attributes.
- Attenuators in a block can only be modified with block commands.
- This command can be restricted by the administrator with the RESTRICT command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

SAA 10<CR> Attens #1-16 set to 10dB<CR><LF>	Set all attenuators in the system to 10dB Response
SAA I4<CR>	Increment all attenuators by 4dB
SAA -Q 10<CR>	Set all attenuators w/ quiet option (i.e. no response to user)
SAA 6 12<CR> Attens #6-16 set to 12dB<CR><LF>	Set all attenuators from 6 on to 12dB Response
SAA 2 6 15<CR> Attens #2-6 set to 15dB<CR><LF>	Set all attenuators between 2 and 6 to 15dB Response
SAA 2 6 D5<CR>	Decrement all attenuators between 2 and 6 by 5dB

(Include the set to maximum option)

SAA -M<CR> Attens #1-16 set to MAX dB<CR><LF>	Set all attenuators to maximum attenuation Response
SAA -M 6<CR> Attens #6-16 set to MAX dB<CR><LF>	Set all attenuators from 6 on to maximum attenuation Response
SAA -M 4 8<CR> Attens #4-8 set to MAX dB<CR><LF>	Set all attenuators between 4 and 8 to maximum attenuation Response

(Include the respond option)

SAA -R 2 10 15<CR> Atten #2 = 15dB<CR><LF> Atten #3 = 15dB<CR><LF> ... Atten #9 = 15dB<CR><LF> Atten #10 = 15dB<CR><LF> Attens #2-10 set to 15dB<CR><LF>	Set all attenuators between 2 and 10 to 15dB and respond Response
--	--

(Include the timestamp option)

SAA -RT 127<CR> [06:03:43] Atten #1 = 127dB [06:03:43] Atten #2 = 127dB [06:03:43] Atten #3 = 127dB ... [06:03:43] Atten #14 = 127dB [06:03:43] Atten #15 = 127dB [06:03:43] Atten #16 = 127dB Attens #1-16 set to 127dB	Set all attenuators to 127dB with time stamp response Response
--	---

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Invalid value entry: X<CR><LF>	Attenuation value out of range
Increment of Atten X above attenuator max	Attenuator skipped because value out of range
Decrement of Atten X below attenuator min	Attenuator skipped because value out of range
Atten X In use by X:USER<CR><LF>	Attenuator executing command from another user
Atten X is locked by X:USER<CR><LF>	Attenuator locked by another user
Atten X is a member of Block X<CR><LF>	Attenuator is assigned to a block
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

3.0.0	Command added to firmware
3.3.18	Increment/Decrement feature added

2.3.5 READ ALL ATTENUATORS COMMAND

Return the current attenuation value of all or a range of attenuators.

Syntax:

```
RAA -{options}<CR>           Read all attenuators
RAA -{options} start<CR>    Read all attenuators starting from attenuator start
RAA -{options} start stop<CR> Read all attenuators between start and stop
```

Options:

```
-C Checksum  Reply only with the checksum (Cyclic Redundancy Check) information.
-M Max dB    Include maximum attenuation of the attenuator.
-S Step size Include dB step size of attenuator.
-L Locked    Include if attenuator is locked/unlocked.
-B Blocked   Include if attenuator is assigned to a block.
-V Verbose   Use verbose option in place of -CMSLB combination.
```

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RAA<CR>           Read all attenuators
Checksum = 0x2b5a<CR><LF> Response
Atten #1 = 127dB<CR><LF>
Atten #2 = 127dB<CR><LF>
Atten #3 = 127dB<CR><LF>
...
Atten #16 = 127dB<CR><LF>
```

```
RAA 6<CR>        Read all attenuators starting from attenuator 6
Checksum = 0x2b5a<CR><LF> Response
Atten #6 = 127dB<CR><LF>
Atten #7 = 127dB<CR><LF>
Atten #8 = 127dB<CR><LF>
...
Atten #16 = 127dB<CR><LF>
```

```
RAA 3 8<CR>      Read all attenuators between 3 to 8
Checksum = 0x2b5a<CR><LF> Response
Atten #3 = 127dB<CR><LF>
Atten #4 = 127dB<CR><LF>
Atten #5 = 127dB<CR><LF>
Atten #6 = 127dB<CR><LF>
Atten #7 = 127dB<CR><LF>
Atten #8 = 127dB<CR><LF>
```

(Include the maximum attenuation information)

```

RAA -M<CR>
Checksum = 0x2b5a<CR><LF>
Atten #1 = 127dB, Max 127dB<CR><LF>
Atten #2 = 127dB, Max 127dB<CR><LF>
Atten #3 = 127dB, Max 127dB<CR><LF>
...
Atten #16 = 127dB, Max 127dB<CR><LF>

```

(Include the dB step size information)

```

RAA -S<CR>
Checksum = 0xe96e<CR><LF>
Atten #1 = 10dB, Step 1dB<CR><LF>
Atten #2 = 10dB, Step 1dB<CR><LF>
Atten #3 = 10dB, Step 1dB<CR><LF>
...
Atten #16 = 10dB, Step 1dB<CR><LF>

```

(Include the lock state of attenuator)

```

RAA -L<CR>
Checksum = 0xe96e<CR><LF>
Atten #1 = 10dB, Locked by 3:USER3<CR><LF>
Atten #2 = 10dB, Locked by 3:USER3<CR><LF>
Atten #3 = 10dB, Not Locked<CR><LF>
...
Atten #16 = 10dB, Not Locked<CR><LF>

```

(Include the block state of attenuator)

```

RAA -B<CR>
Checksum = 0xe96e<CR><LF>
Atten #1 = 10dB, Block 6<CR><LF>
Atten #2 = 10dB, Block 6<CR><LF>
Atten #3 = 10dB, Not Blocked<CR><LF>
...
Atten #16 = 10dB, Not Blocked<CR><LF>

```

(Include only the checksum information)

```

RAA -C<CR>
Checksum = 0x2b5a<CR><LF>

```

(Include the verbose response)

```

RAA -V 15<CR>
Checksum = 0xe96e<CR><LF>
Atten #15 = 10dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #16 = 10dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>

```

(Combination of options)

```
RAA -MSLB 7 12<CR>
```

```
Checksum = 0x2b5a<CR><LF>
```

```
Atten #7 = 127dB, Max 127dB, Step 1dB, Not Locked, Block 6<CR><LF>
```

```
Atten #8 = 127dB, Max 127dB, Step 1dB, Not Locked, Block 6<CR><LF>
```

```
Atten #9 = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

```
Atten #10 = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

```
Atten #11 = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

```
Atten #12 = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

```
RAA -LB<CR>
```

```
Checksum = 0x2b5a<CR><LF>
```

```
Atten #1 = 127dB, Not Locked, Not Blocked<CR><LF>
```

```
Atten #2 = 127dB, Not Locked, Not Blocked<CR><LF>
```

```
Atten #3 = 127dB, Not Locked, Not Blocked<CR><LF>
```

```
...
```

```
Atten #16 = 127dB, Not Locked, Not Blocked<CR><LF>
```

```
RAA -MS<CR>
```

```
Checksum = 0x2b5a<CR><LF>
```

```
Atten #1 = 127dB, Max 127dB, Step 1dB<CR><LF>
```

```
Atten #2 = 127dB, Max 127dB, Step 1dB<CR><LF>
```

```
Atten #3 = 127dB, Max 127dB, Step 1dB<CR><LF>
```

```
...
```

```
Atten #16 = 127dB, Max 127dB, Step 1dB<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
```

Formatting error

```
Command not found<CR><LF>
```

Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command

2.3.6 READ ALL ATTENUATORS EXTENDED COMMAND

Return the current attenuation value of all or a range of attenuators in table format.

Syntax:

- RAAE<CR> Read all attenuators
- RAAE start<CR> Read all attenuators starting from attenuator start
- RAAE start stop<CR> Read all attenuators between start and stop

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

(Response for 16 attenuator system)

```
RAAE<CR>
 0      1      2      3      4      5      6      7      8      9<CR><LF>
0      127    127    127    127    127    127    127    127    127<CR><LF>
10     127    127    127    127    127    127    127<CR><LF>
```

(Response for 48 attenuator system)

```
RAAE<CR>
 0      1      2      3      4      5      6      7      8      9<CR><LF>
0      127    127    127    127    127    127    127    127    127<CR><LF>
10     127    127    127    127    127    127    127    127    127<CR><LF>
20     127    127    127    127    127    127    127    127    127<CR><LF>
30     127    127    127    127    127    127    127    127    127<CR><LF>
40     127    127    127    127    127    127    127    127    127<CR><LF>
```

(Read all attenuators starting from attenuator 34)

```
RAAE 34<CR>
 0      1      2      3      4      5      6      7      8      9<CR><LF>
30      127    127    127    127    127    127    127    127<CR><LF>
40     127    127    127    127    127    127    127    127<CR><LF>
```

(Read all attenuators between 12 and 16)

```
RAAE 12 16<CR>
 0      1      2      3      4      5      6      7      8      9<CR><LF>
10      127    127    127    127    127    127<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

- Syntax Error<CR><LF> Formatting error
- Command not found<CR><LF> Command does not apply to your test system model

Command Revisions:

- 3.0.0 No revisions to this command

2.3.7 FADE ATTENUATOR COMMAND

Increment the attenuation for up to 16 attenuators from a starting dB value to an ending dB value with a specified interval time.

Syntax:

FA *-{options}* x y z t<CR> Fade attenuator **x** from **y** dB to **z** dB over interval time **t**
Step size defaults to attenuator's dB step size

FA *-{options}* x y z t STEP s<CR> Fade attenuator **x** from **y** dB to **z** dB over interval time **t**
Step size is user defined to be **s** dB

Options:

-Q	Quiet	Suppress feedback to user.
-I	Indefinite	Continuously repeat fade.
-R	Respond	Send response when set to the user.
-T	Timestamp	Include [HH:MM:SS] timestamp with response.
-X	Swap	Swap start and end values during indefinite operation.

Notes:

- The interval time t can range from 1 to 9999.
- Interval time uses postfix 'M' for milliseconds or postfix 'S' for seconds.
- The firmware is multi-threaded. The FA command will not affect other users.
- Up to 16 attenuators can be faded simultaneously in the same time period.
- Use the escape command to exit indefinite fade.
- Use the escape command to terminate any erroneous FA commands.
- The 'fade started' and 'fade stopped' messages are only sent back to the user who send the fade command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

FA 1 0 63 500M<CR> Fade attenuator 1 from 0dB to 63dB at 1dB steps every 500mS
Fade Started<CR><LF> Response as command begins.
Fade Finished<CR><LF> Response as command ends.

FA 5 127 0 1S<CR> Fade attenuator 5 from 127dB to 0dB at 1dB steps every 1Sec
Fade Started<CR><LF> Response as command begins.
Fade Finished<CR><LF> Response as command ends.

FA 5 127 0 1S STEP 2<CR> Fade attenuator 5 from 127dB to 0dB at 2dB steps every 1Sec
Fade Started<CR><LF> Response as command begins.
Fade Finished<CR><LF> Response as command ends.

FA 1 0 127 1S, 2 127 0 1S<CR> Fade attenuators 1, 2 simultaneously in the same time period
Fade Started<CR><LF> Response as command begins.
Fade Finished<CR><LF> Response as command ends.

(Include the quiet option)

FA -Q 1 0 63 500M<CR> Fade command with no response sent back to the user.

(Include the respond option)

```
FA -R 1 0 5 100M<CR>
Fade Atten 1 Started From 0dB to 5dB by 1dB every 100MS<CR><LF>
Atten #1 = 0dB<CR><LF>
Atten #1 = 1dB<CR><LF>
Atten #1 = 2dB<CR><LF>
Atten #1 = 3dB<CR><LF>
Atten #1 = 4dB<CR><LF>
Atten #1 = 5dB<CR><LF>
Fade Atten 1 Finished<CR><LF>
```

(Include the timestamp option)

```
FA -T 1 0 10 1S<CR>
Fade Atten 1 Started From 0dB to 10dB by 1dB every 1S<CR><LF>
[04:00:23] Atten #1 = 0dB<CR><LF>
[04:00:24] Atten #1 = 1dB<CR><LF>
[04:00:25] Atten #1 = 2dB<CR><LF>
[04:00:26] Atten #1 = 3dB<CR><LF>
[04:00:27] Atten #1 = 4dB<CR><LF>
[04:00:28] Atten #1 = 5dB<CR><LF>
[04:00:29] Atten #1 = 6dB<CR><LF>
[04:00:30] Atten #1 = 7dB<CR><LF>
[04:00:31] Atten #1 = 8dB<CR><LF>
[04:00:32] Atten #1 = 9dB<CR><LF>
[04:00:33] Atten #1 = 10dB<CR><LF>
Fade Atten 1 Finished<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Atten X does not exist<CR><LF>	Attenuator address out of range
Invalid value entry: X<CR><LF>	Attenuation value out of range
Invalid time entry: X<CR><LF>	Time duration out of range
Atten X In use by X:USER<CR><LF>	Attenuator executing command from another user
Atten X is locked by X:USER<CR><LF>	Attenuator locked by another user
Atten X is a member of Block X<CR><LF>	Attenuator is assigned to a block
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command
3.3.25 Indefinite option added

2.3.8 VARIABLE ATTENUATOR HANDOVER COMMAND

Handover test up to 8 pairs of attenuators from a starting dB value to an ending dB value with a specified interval time.

Syntax:

```
VAHND -{options} a b x y t<CR>
```

Attenuator **a** fades from **x** dB to **y** dB w/ interval time **t**
 Attenuator **b** fades from **y** dB to **x** dB w/ interval time **t**
 Step size defaults to attenuator's dB step size

```
VAHND -{options} a b x y t STEP s<CR>
```

Attenuator **a** fades from **x** dB to **y** dB w/ interval time **t**
 Attenuator **b** fades from **y** dB to **x** dB w/ interval time **t**
 Step size is user defined to be **s** dB

Options:

-Q	Quiet	Suppress feedback to user.
-I	Indefinite	Continuously repeat handover.
-R	Respond	Send response when set to the user.
-T	Timestamp	Include [HH:MM:SS] timestamp with response.
-X	Swap	Swap start and end values during indefinite operation.

Notes:

- The interval time **t** can range from 1 to 9999.
- Interval time uses postfix 'M' for milliseconds or postfix 'S' for seconds.
- The firmware is multi-threaded. The VAHND command will not affect other users.
- Up to 8 pairs of attenuators can be faded simultaneously in the same time period.
- Use the escape command to exit indefinite handover.
- Use the escape command to terminate any erroneous VAHND commands.
- The 'handover started' and 'handover stopped' messages are only sent back to the user who send the command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
VAHND 1 2 0 63 500M<CR>
Handover Started<CR><LF>
Handover Finished<CR><LF>
```

Atten #1 (0-63dB) Atten #2 (63-0dB) in 1dB steps every 500mSec
 Response as command begins.
 Response as command ends.

```
VAHND 5 9 127 0 1S<CR>
Handover Started<CR><LF>
Handover Finished<CR><LF>
```

Atten #5 (127-0dB) Atten #9 (0-127dB) in 1dB steps every 1Sec
 Response as command begins.
 Response as command ends.

```
VAHND 5 9 127 0 1S STEP 2<CR>
Handover Started<CR><LF>
Handover Finished<CR><LF>
```

Atten #5 (127-0dB) Atten #9 (0-127dB) in 2dB steps every 1Sec
 Response as command begins.
 Response as command ends.

```
VAHND 1 3 0 127 1S, 2 4 127 0 1S<CR>
Handover Started<CR><LF>
Handover Finished<CR><LF>
```

Dual Handover for atten pair #1, #3 and atten pair #2, #4
 Response as command begins.
 Response as command ends.

(Include the quiet option)

```
VAHND -Q 1 2 0 10 100M<CR>
```

The quiet option suppresses feedback to the user.

(Include the respond option)

```
VAHND -R 1 2 0 10 100M<CR>
Handover Atten 1 and 2 Stated From 0dB to 10dB by 1dB every 100MS<CR><LF>
Atten #1 = 0dB<CR><LF>
Atten #2 = 10dB<CR><LF>
Atten #1 = 1dB<CR><LF>
Atten #2 = 9dB<CR><LF>
Atten #1 = 2dB<CR><LF>
Atten #2 = 8dB<CR><LF>
...
Atten #1 = 10dB<CR><LF>
Atten #2 = 0dB<CR><LF>
Handover Atten 1 and 2 Finished<CR><LF>
```

(Include the timestamp option)

```
VAHND -T 1 2 0 10 1S<CR>
Handover Atten 1 and 2 Started From 0dB to 10dB by 1dB every 1S<CR><LF>
[07:23:00] Atten #1 = 0dB<CR><LF>
[07:23:00] Atten #2 = 10dB<CR><LF>
[07:23:01] Atten #1 = 1dB<CR><LF>
[07:23:01] Atten #2 = 9dB<CR><LF>
[07:23:02] Atten #1 = 2dB<CR><LF>
[07:23:02] Atten #2 = 8dB<CR><LF>
...
[07:23:10] Atten #1 = 10dB<CR><LF>
[07:23:10] Atten #2 = 0dB<CR><LF>
Handover Atten 1 and 2 Finished<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Atten X does not exist<CR><LF>	Attenuator address out of range
Invalid value entry: X<CR><LF>	Attenuation value out of range
Invalid time entry: X<CR><LF>	Time duration out of range
Atten X In use by X:USER<CR><LF>	Attenuator executing command from another user
Atten X is locked by X:USER<CR><LF>	Attenuator locked by another user
Atten X is a member of Block X<CR><LF>	Attenuator is assigned to a block
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command
 3.3.25 Indefinite options added

2.3.9 BLOCK COMMAND

The block command is used to assign attenuators into a single grouping called a block. All attenuators that are organized into blocks can only be manipulated with block commands (Set Block, Fade Block, Variable Block Handover). When a block is set to an attenuation value all attenuators in the block are set to that attenuation value. Only attenuators that have a common dB step size can be organized into the same block. However, blocks can have different device maximum attenuations in which case the lowest attenuation level of an attenuator is used as the default block maximum attenuation.

Syntax:

```
BLOCK -{Options} x Keyword y<CR>           Syntax for keywords
BLOCK x1 x2 ... x16<CR>                   Syntax for block details response
```

Keywords:

ADD	Add attenuator(s) to block
REMOVE	Remove attenuators(s) from block
CLEAR	Remove all attenuators from block and clear block settings
MIN	Set minimum dB level of the block
MAX	Set maximum dB level of the block

Options:

-L	Lock	Lock the block so that no other user can change its settings.
-U	Unlock	Unlock the block so all users can use the block.
-F	Force	Force Lock/Unlock (required if block locked by another user)

Notes:

- If all attenuators are removed from a block it is considered clear.
- Attenuators added to a block are set to the blocks dB value.
- Attenuators removed from a block are set to their maximum dB values.
- Attenuators can be added to a block that already has attenuators.
- Attenuators in a block are able to be set by SB/FB/VBHND commands only.
- Number of blocks created is limited to half the number of attenuators or 64 blocks maximum.
- Admin user can restrict the use of BLOCK using RESTRICT command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

(Assign attenuators to a block)

```
BLOCK 1 ADD 1 2<CR>
Block #1 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
BLOCK 2 ADD 3<CR>
Block #2 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 3<CR><LF>
```

```
BLOCK 3 ADD 13 14 15 16<CR>
Block #3 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 13,14,15,16<CR><LF>
```

(Assign attenuator to existing block that already contains an attenuator)

```
BLOCK 2 ADD 4<CR>
Block #2 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

(Remove attenuators from a block)

```
BLOCK 3 REMOVE 13 14<CR>
```

```
Block #3 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 15,16<CR><LF>
```

```
BLOCK 1 REMOVE 1 2<CR>
```

```
Block 1 is clear<CR><LF>
```

(Clear a block)

```
BLOCK 3 CLEAR<CR>
```

```
Block 3 is clear<CR><LF>
```

```
BLOCK 1 2 CLEAR<CR>
```

```
Block 1 is clear<CR><LF>
```

```
Block 2 is clear<CR><LF>
```

(Set minimum dB level of the block)

```
BLOCK 1 MIN 10<CR>
```

```
Block #1 = 127dB, Min 10dB, Max 127dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
BLOCK 2 3 MIN 15<CR>
```

```
Block #2 = 127dB, Min 15dB, Max 127dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

```
Block #3 = 127dB, Min 15dB, Max 127dB, Step 1dB, Not Locked, PATS: 5,6<CR><LF>
```

(Set maximum dB level of the block)

```
BLOCK 1 MAX 95<CR>
```

```
Block #1 = 95dB, Min 10dB, Max 95dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
BLOCK 2 3 MAX 63<CR>
```

```
Block #2 = 63dB, Min 15dB, Max 63dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 15dB, Max 63dB, Step 1dB, Not Locked, PATS: 5,6<CR><LF>
```

(Assign minimum/maximum dB levels in one command)

```
BLOCK 4 5 MIN 20 MAX 100 LOCK<CR>
```

```
Block #4 = 100dB, Min 20dB, Max 100dB, Step 1dB, Not Locked, PATS: 10,11<CR><LF>
```

```
Block #5 = 100dB, Min 20dB, Max 100dB, Step 1dB, Not Locked, PATS: 12,13<CR><LF>
```

(Include lock option)

```
BLOCK -L 1<CR>
```

```
Block #1 = 31dB, Min 10dB, Max 95dB, Step 1dB, Locked by 3:USER3, PATS: 1,2<CR><LF>
```

```
BLOCK -L 2 3<CR>
```

```
Block #2 = 63dB, Min 15dB, Max 63dB, Step 1dB, Locked by 3:USER3, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 15dB, Max 63dB, Step 1dB, Locked by 3:USER3, PATS: 5,6<CR><LF>
```

(Include unlock option)

```
BLOCK -U 1<CR>
```

```
Block #1 = 31dB, Min 10dB, Max 95dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
BLOCK -L 2 3<CR>
```

```
Block #2 = 63dB, Min 15dB, Max 63dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 15dB, Max 63dB, Step 1dB, Not Locked, PATS: 5,6<CR><LF>
```

(Include force lock option to steal locked block from another user)

```
BLOCK -FL 1<CR>
```

```
Block #1 = 31dB, Min 10dB, Max 95dB, Step 1dB, Locked by 5:USER5, PATS: 1,2<CR><LF>
```

```
BLOCK -FL 2 3 4<CR>
```

```
Block #2 = 63dB, Min 15dB, Max 63dB, Step 1dB, Locked by 5:USER5, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 15dB, Max 63dB, Step 1dB, Locked by 5:USER5, PATS: 5,6<CR><LF>
```

```
Block #4 = 100dB, Min 20dB, Max 100dB, Step 1dB, Locked by 5:USER5, PATS: 10,11<CR><LF>
```

(Include force unlock option to unlock block that was locked by another user)

```
BLOCK -FU 1<CR>
```

```
Block #1 = 31dB, Min 10dB, Max 95dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
BLOCK -FU 2 3 4<CR>
```

```
Block #2 = 63dB, Min 15dB, Max 63dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 15dB, Max 63dB, Step 1dB, Not Locked, PATS: 5,6<CR><LF>
```

```
Block #4 = 100dB, Min 20dB, Max 100dB, Step 1dB, Not Locked, PATS: 10,11<CR><LF>
```

(Block details response)

```
BLOCK 1<CR>
```

```
Block #1 = 31dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
BLOCK 2 3<CR>
```

```
Block #2 = 63dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 5,6<CR><LF>
```

```
BLOCK 1 2 3 4<CR>
```

```
Block #1 = 31dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
Block #2 = 63dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
```

```
Block #3 = 63dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 5,6<CR><LF>
```

```
Block #4 = 100dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 7,8<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
```

```
Atten X does not exist<CR><LF>
```

```
Atten X In use by X:USER<CR><LF>
```

```
Atten X is locked by X:USER<CR><LF>
```

```
Atten X is a member of Block X<CR><LF>
```

```
Command not found<CR><LF>
```

```
Formatting error
```

```
Attenuator address out of range
```

```
Attenuator executing command from another user
```

```
Attenuator locked by another user
```

```
See Block Errors
```

```
Command does not apply to your test system model
```

Command Revisions:

3.0.0 No revisions to this command

2.3.10 SET BLOCK COMMAND

Set the attenuation for up to 16 blocks.

Syntax:

SB -{options} x1 y1, x2 y2, ..., x16, y16<CR>	Set block with address and dB value
SB -{options} x1 Iy1, ..., x16 Dy16<CR>	Increment/Decrement value modifier
SB -M{options} x1, x2, ..., x16<CR>	Set a list of blocks to their maximum dB value
SB -V{options} y x1, x2, ..., x16<CR>	Set a list of blocks to the same dB value

Options:

-M Max dB	Set a list of blocks to their maximum attenuation value.
-V Value	Set a list of blocks to the same attenuation value.
-R Respond	Notify the user of the new setting.
-T Timestamp	Include [HH:MM:SS] timestamp with response.

Notes:

- The syntax for the set block command mimics the syntax for the set attenuator command.
- The expected parameter list changes with the -M and -V options.
- Increment/Decrement modifiers cannot be used with the -M and -V options.
- The SB command has no user feedback unless using the -R or -T options.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

SB 2 10<CR>	Set block 2 to 10dB
SB 4 63<CR>	Set block 4 to 63dB
SB 1 10, 2 20, 3 30<CR>	Set block 1 to 10db, block 2 to 20dB, block 3 to 30dB
SB 1 10, 2 I5, 3 D3<CR>	Set block 1 to 10db, increment block 2 by 5dB, decrement block 3 by 3dB

(Include the set to maximum option)

SB -M 1<CR>	Set block 1 to maximum attenuation
SB -M 2, 3, 4<CR>	Set blocks 2, 3, 4 to maximum attenuation

(Include the set list to same value option)

SB -V 56 1, 2, 3, 4<CR>	Set blocks 1, 2, 3, 4 to 56dB
-------------------------	-------------------------------

(Include the respond option)

SB -R 3 16<CR>	Set block #3 to 16dB with response
Block #3 = 16dB<CR><LF>	Response

(Include the timestamp option)

SB -T 1 10, 2 20, 3 30, 4 40<CR>	Set blocks 1, 2, 3, 4 with timestamp response
[15:45:28] Block #1 = 10dB<CR><LF>	Response
[15:45:28] Block #2 = 20dB<CR><LF>	
[15:45:28] Block #3 = 30dB<CR><LF>	
[15:45:28] Block #4 = 40dB<CR><LF>	

(Combination of options)

```
SB -RM 1, 2, 3, 4<CR>
Block #1 = 127dB<CR><LF>
Block #2 = 127dB<CR><LF>
Block #3 = 127dB<CR><LF>
Block #4 = 127dB<CR><LF>
```

Set blocks 1, 2, 3, 4 to maximum dB and respond
Response

```
SB -RV 95 1<CR>
Block #1 = 95dB<CR><LF>
```

Set block 1 to 95dB and respond
Response

```
SB -RV 100 2, 3, 4<CR>
Block #2 = 100dB
Block #3 = 100dB
Block #4 = 100dB<CR><LF>
```

Set blocks 2, 3, 4 to 100dB and respond
Response

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Block X does not exist<CR><LF>
Invalid value entry: X<CR><LF>
Increment of Block X above block max
Decrement of Block X below block min
Block X In use by X:USER<CR><LF>
Block X locked by X:USER<CR><LF>
Command not found<CR><LF>
```

Formatting error
Block address out of range
Attenuation value out of range
Command failure because value out of range
Command failure because value out of range
Block executing command from another user
Block locked by another user
Command does not apply to your test system model

Command Revisions:

```
3.0.0    Command added to firmware
3.3.18  Increment/Decrement feature added
```

2.3.11 READ BLOCK COMMAND

Read the attenuation setting for up to 16 blocks.
Additional block information is available with the use of the options.

Syntax:

RB -{Options} x1, x2, ..., x15, x16<CR> Up to 16 block addresses can be included.

Options:

-A	Attenuators	Include list of attenuators assigned to the block.
-D	dB range	Include minimum/maximum attenuation of block.
-S	Step size	Include attenuation step size of the block.
-L	Locked	Include if block is locked/unlocked.
-V	Verbose	Use verbose option in place of -ADSL combination.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RB 1<CR>
Block #1 = 127dB<CR><LF>
```

```
RB 1 2<CR>
Block #1 = 127dB<CR><LF>
Block #2 = 127dB<CR><LF>
```

(Return a list of attenuators assigned to the block)

```
RB -A 1<CR>
Block #1 = 127dB, PATS: 1,2<CR><LF>
```

```
RB -A 3, 4<CR>
Block #3 = 127dB, PATS: 5,6<CR><LF>
Block #4 = 127dB, PATS: 7,8<CR><LF>
```

(Return the dB range)

```
RB -D 1 2<CR>
Block #1 = 127dB, Min 0dB, Max 127dB<CR><LF>
Block #2 = 127dB, Min 0dB, Max 127dB<CR><LF>
```

(Return the step size)

```
RB -S 1<CR>
Block #1 = 127dB, Step 1dB<CR><LF>
```

```
RB -S 1, 2, 3, 4<CR>
Block #1 = 127dB, Step 1dB<CR><LF>
Block #2 = 127dB, Step 1dB<CR><LF>
Block #3 = 127dB, Step 1dB<CR><LF>
Block #4 = 127dB, Step 1dB<CR><LF>
```

(Return the lock status)

```
RB -L 1<CR>
Block #1 = 127dB, Not Locked<CR><LF>
```

```
RB -L 1, 2, 3, 4<CR>
Block #1 = 127dB, Not Locked<CR><LF>
Block #2 = 127dB, Not Locked<CR><LF>
Block #3 = 127dB, Locked by 3:USER3<CR><LF>
Block #4 = 127dB, Locked by 3:USER3<CR><LF>
```

(Include the verbose option)

```
RB -V 1<CR>
Block #1 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
```

```
RB -V 2, 3<CR>
Block #2 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 3,4
Block #3 = 127dB, Min 0dB, Max 127dB, Step 1dB, Locked by 3:USER3, PATS: 5,6<CR><LF>
```

(Combination of options)

```
RB -AD 1, 2<CR>
Block #1 = 127dB, Min 0dB, Max 127dB, PATS: 1,2<CR><LF>
Block #2 = 127dB, Min 0dB, Max 127dB, PATS: 3,4<CR><LF>
```

```
RB -SL 1, 2, 3, 4<CR>
Block #1 = 127dB, Step 1dB, Not Locked<CR><LF>
Block #2 = 127dB, Step 1dB, Not Locked<CR><LF>
Block #3 = 127dB, Step 1dB, Locked by 3:USER3<CR><LF>
Block #4 = 127dB, Step 1dB, Locked by 3:USER3<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Block X does not exist<CR><LF>	Block address out of range
Block X is clear<CR><LF>	Block does not exist
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command

2.3.12 READ ALL BLOCKS COMMAND

Read the attenuation setting for all blocks.

Additional block information is available with the use of the options.

Syntax:

```
RAB -{options}<CR>           Read all blocks
RAB -{options} start<CR>    Read all blocks starting from block start
RAB -{options} start stop<CR> Read all blocks between start and stop
```

Options:

```
-A Attenuators   Include list of assigned attenuators.
-D dB range     Include minimum/maximum attenuation of attenuator
-S Step size    Include dB step size of attenuator
-L Locked       Include if block is locked/unlocked
-V Verbose      Use verbose option in place of -ADSL combination.
```

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RAB<CR>           Read all blocks command
Block #1 = 127dB<CR><LF> Response
Block #2 = 127dB<CR><LF>
Block #3 = 127dB<CR><LF>
Block #4 = 127dB<CR><LF>
```

```
RAB 3<CR>        Read all blocks starting with block 3
Block #3 = 127dB<CR><LF> Response
Block #4 = 127dB<CR><LF>
```

```
RAB 2 3<CR>      Read all blocks in between block 2 and 3
Atten #2 = 127dB<CR><LF> Response
Atten #3 = 127dB<CR><LF>
```

(Return a list of attenuators assigned to the block)

```
RAB -A<CR>
Block #1 = 127dB, PATS: 1,2<CR><LF>   PATS 1, 2 = Programmable Attenuators 1, 2
Block #2 = 127dB, PATS: 3,4<CR><LF>   PATS 3, 4 = Programmable Attenuators 3, 4
...
```

(Include dB range information)

```
RAB -D<CR>
Block #1 = 127dB, Min 0dB, Max 127dB<CR><LF>
Block #2 = 127dB, Min 0dB, Max 127dB<CR><LF>
...
```

(Include device step size)

```
RAB -S<CR>
Block #1 = 127dB, Step 1dB<CR><LF>
Block #2 = 127dB, Step 1dB<CR><LF>
Block #3 = 127dB, Step 1dB<CR><LF>
Block #4 = 127dB, Step 1dB<CR><LF>
```

(Include lock state of block)

```
RAB -L<CR>
Block #1 = 127dB, Not Locked<CR><LF>
Block #2 = 127dB, Not Locked<CR><LF>
Block #3 = 127dB, Locked by 3:USER3<CR><LF>
Block #4 = 127dB, Locked by 3:USER3<CR><LF>
```

(Include verbose option)

```
RAB -V<CR>
Block #1 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 1,2<CR><LF>
Block #2 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked, PATS: 3,4<CR><LF>
Block #3 = 127dB, Min 0dB, Max 127dB, Step 1dB, Locked by 3:USER3, PATS: 5,6<CR><LF>
Block #4 = 127dB, Min 0dB, Max 127dB, Step 1dB, Locked by 3:USER3, PATS: 7,8<CR><LF>
```

(Combination of options)

```
RAB -DSL<CR>
Block #1 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked<CR><LF>
Block #2 = 127dB, Min 0dB, Max 127dB, Step 1dB, Not Locked<CR><LF>
Block #3 = 127dB, Min 0dB, Max 127dB, Step 1dB, Locked by 3:USER3<CR><LF>
Block #4 = 127dB, Min 0dB, Max 127dB, Step 1dB, Locked by 3:USER3<CR><LF>
```

```
RAB -DS 1 3<CR>
Block #1 = 127dB, Min 0dB, Max 127dB, Step 1dB<CR><LF>
Block #2 = 127dB, Min 0dB, Max 127dB, Step 1dB<CR><LF>
Block #3 = 127dB, Min 0dB, Max 127dB, Step 1dB<CR><LF>
Block #4 = 127dB, Min 0dB, Max 127dB, Step 1dB<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
All blocks are free<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
No blocks exist
Command does not apply to your test system model
```

Command Revisions:

3.0.0 No revisions to this command

2.3.13 FADE BLOCK COMMAND

Increment the attenuation for up to 16 blocks from a starting dB value to an ending dB value with a specified interval time.

Syntax:

FB -{options} x y z t<CR> Fade block **x** from **y** dB to **z** dB at interval time **t**
Step size defaults to block's dB step size

FB -{options} x y z t STEP s<CR> Fade block **x** from **y** dB to **z** dB at interval time **t**
Step size is user defined to be **s** dB

Options:

-Q	Quiet	Suppress feedback to user.
-I	Indefinite	Continuously repeat fade.
-R	Respond	Send response when set to the user.
-T	Timestamp	Include [HH:MM:SS] timestamp with response.
-X	Swap	Swap start and end values during indefinite operation.

Notes:

- The interval time **t** can range from 1 to 9999.
- Interval time uses postfix 'M' for milliseconds or postfix 'S' for seconds.
- The firmware is multi-threaded. The FB command will not affect other users.
- Up to 16 blocks can be faded simultaneously in the same time period.
- Use the escape command to exit indefinite fades.
- Use the escape command to terminate any erroneous FB commands.
- The 'fade started' and 'fade stopped' messages are only sent back to the user who send the fade command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

FB 1 0 63 500M<CR>	Fade block 1 from 0dB to 63dB in 1dB steps every 500ms
Block Fade Started<CR><LF>	Response as command begins
Block Fade Finished<CR><LF>	Response as command ends

FB 5 127 0 1S<CR>	Fade block 5 from 127dB to 0dB in 1dB steps every 1Sec
Block Fade Started<CR><LF>	Response as command begins
Block Fade Finished<CR><LF>	Response as command ends

FB 5 127 0 1S STEP 2<CR>	Fade block 5 from 127dB to 0dB in 2dB steps every 1Sec
Block Fade Started<CR><LF>	Response as command begins
Block Fade Finished<CR><LF>	Response as command ends

FB 1 0 127 1S, 2 127 0 1S<CR>	Fade blocks 1, 2 simultaneously in the same time period
Block Fade Started<CR><LF>	Response as command begins
Block Fade Finished<CR><LF>	Response as command ends

(Include the quiet option)

FB -Q 1 0 63 500M<CR>	Fade command sent and no response back to user is sent
-----------------------	--

(Include the respond option)

```

FB -R 1 0 5 1S<CR>
Fade Block 1 Started From 0dB to 5dB by 1dB every 1S<CR><LF>
Block #1 = 0dB<CR><LF>
Block #1 = 1dB<CR><LF>
Block #1 = 2dB<CR><LF>
Block #1 = 3dB<CR><LF>
Block #1 = 4dB<CR><LF>
Block #1 = 5dB<CR><LF>
Fade Block 1 Finished<CR><LF>

```

(Include the timestamp option)

```

FB -T 1 0 10 500M<CR>
Fade Block 1 Started From 0dB to 10dB by 1dB every 500MS<CR><LF>
[13:32:41] Block #1 = 0dB<CR><LF>
[13:32:42] Block #1 = 1dB<CR><LF>
[13:32:42] Block #1 = 2dB<CR><LF>
[13:32:43] Block #1 = 3dB<CR><LF>
[13:32:43] Block #1 = 4dB<CR><LF>
[13:32:44] Block #1 = 5dB<CR><LF>
[13:32:44] Block #1 = 6dB<CR><LF>
[13:32:45] Block #1 = 7dB<CR><LF>
[13:32:45] Block #1 = 8dB<CR><LF>
[13:32:46] Block #1 = 9dB<CR><LF>
[13:32:46] Block #1 = 10dB<CR><LF>
Fade Block 1 Finished<CR><LF>

```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Block X does not exist<CR><LF>	Block address out of range
Invalid value entry: X<CR><LF>	Attenuation value out of range
Invalid value entry: X<CR><LF>	Time duration out of range
Block X In use by X:USER<CR><LF>	Block executing command from another user
Block X locked by X:USER<CR><LF>	Block locked by another user
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command
3.3.25 Indefinite option added

2.3.14 VARIABLE BLOCK HANDOVER COMMAND

Handover test up to 8 pairs of blocks from a starting dB value to an ending dB value with a specified interval time.

Syntax:

```
VBHND -{options} a b x y t<CR>
```

Block **a** fades from **x** dB to **y** dB w/ interval time **t**
 Block **b** fades from **y** dB to **x** dB w/ interval time **t**
 Step size defaults to attenuator's dB step size

```
VBHND -{options} a b x y t STEP s<CR>
```

Block **a** fades from **x** dB to **y** dB w/ interval time **t**
 Block **b** fades from **y** dB to **x** dB w/ interval time **t**
 Step size is user defined to be **s** dB

Options:

-Q	Quiet	Suppress feedback to user.
-I	Indefinite	Continuously repeat handover.
-R	Respond	Send response when set to the user.
-T	Timestamp	Include [HH:MM:SS] timestamp with response.
-X	Swap	Swap start and end values during indefinite operation.

Notes:

- The interval time **t** can range from 1 to 9999.
- Interval time uses postfix 'M' for milliseconds or postfix 'S' for seconds.
- The firmware is multi-threaded. The VBHND command will not affect other users.
- Up to 8 pairs of blocks can be faded simultaneously in the same time period.
- Use the escape command to exit indefinite handover.
- Use the escape command to terminate any erroneous VBHND commands.
- The 'handover started' and 'handover stopped' messages are only sent back to the user who send the command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
VBHND 1 2 0 63 500M<CR>
```

```
Block Handover Started<CR><LF>
Block Handover Finished<CR><LF>
```

Block #1 (0-63dB) Block #2 (63-0dB) at 1dB steps at 500mSec
 Response as command begins
 Response as command ends

```
VBHND 3 4 127 0 1S<CR>
```

```
Block Handover Started<CR><LF>
Block Handover Finished<CR><LF>
```

Block #3 (127-0dB) Block #4 (0-127dB) at 1dB steps at 1Sec
 Response as command begins
 Response as command ends

```
VBHND 5 9 127 0 1S STEP 2<CR>
```

```
Block Handover Started<CR><LF>
Block Handover Finished<CR><LF>
```

Block #5 (127-0dB) Block #9 (0-127dB) at 2dB steps at 1Sec
 Response as command begins
 Response as command ends

```
VBHND 1 2 0 127 1S, 3 4 127 0 1S<CR>
```

```
Block Handover Started<CR><LF>
Block Handover Finished<CR><LF>
```

Dual Handover for block pair #1, #2 and block pair #3, #4
 Response as command begins
 Response as command ends

(Include the quiet option)

```
VBHND -Q 1 2 0 10 100M<CR>
```

The quiet option suppresses user feedback

(Include the respond option)

```
VBHND -R 1 2 0 10 100M<CR>
```

```
Handover Block 1 and 2 Started From 0dB to 10dB by 1dB every 100MS <CR><LF>
```

```
Block #1 = 0dB<CR><LF>
```

```
Block #2 = 10dB<CR><LF>
```

```
Block #1 = 1dB<CR><LF>
```

```
Block #2 = 9dB<CR><LF>
```

```
Block #1 = 2dB<CR><LF>
```

```
Block #2 = 8dB<CR><LF>
```

```
...
```

```
Block #1 = 10dB<CR><LF>
```

```
Block #2 = 0dB<CR><LF>
```

```
Handover Block 1 and 2 Finished <CR><LF>
```

(Include the timestamp option)

```
VBHND -T 2 4 0 5 1S<CR>
```

```
Handover Block 2 and 4 Started From 0dB to 5dB by 1dB every 1S
```

```
[14:24:39] Block #2 = 0dB
```

```
[14:24:39] Block #4 = 5dB
```

```
[14:24:40] Block #2 = 1dB
```

```
[14:24:40] Block #4 = 4dB
```

```
[14:24:41] Block #2 = 2dB
```

```
[14:24:41] Block #4 = 3dB
```

```
[14:24:42] Block #2 = 3dB
```

```
[14:24:42] Block #4 = 2dB
```

```
[14:24:43] Block #2 = 4dB
```

```
[14:24:43] Block #4 = 1dB
```

```
[14:24:44] Block #2 = 5dB
```

```
[14:24:44] Block #4 = 0dB
```

```
Handover Block 2 and 4 Finished<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
```

```
Block X does not exist<CR><LF>
```

```
Invalid value entry: X<CR><LF>
```

```
Invalid value entry: X<CR><LF>
```

```
Block X In use by X:USER<CR><LF>
```

```
Block X locked by X:USER<CR><LF>
```

```
Command not found<CR><LF>
```

Formatting error

Block address out of range

Attenuation value out of range

Time duration out of range

Block executing command from another user

Block locked by another user

Command does not apply to your test system model

Command Revisions:

3.0.0 No revisions to this command

3.3.25 Indefinite option added

2.3.15 SET PATH COMMAND

Set the attenuation for a path through the test system.

Syntax:

SP `-{options} x y z`<CR> Set attenuator on path from port **x** to port **y** to **z** dB.

Options:

-R Respond Notify the user of the new setting.
 -S Store Store the change in battery backed up memory.
 -T Timestamp Include [HH:MM:SS] timestamp with response.

Notes:

- The SP command has no user feedback unless using the `-R` or `-T` options.
- Test systems with different port configurations will have different attenuator/path addressing.
- Use the RAP command to view all attenuator/path addressing for your specific model.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
SP 1 2 100<CR>                      Set path [1, 2] to 100dB
SP 2 4 127<CR>                      Set path [2, 4] to 127dB
SP 1 1 0, 2 2 127<CR>              Set path [1, 1] to 0dB, Set path [2, 2] to 127dB
```

(Include the respond option)

```
SP -R 1 1 0<CR>                      Set path [1, 1] to 0dB w/ response
Atten #1 path [1, 1] = 0dB<CR><LF>
```

```
SP -R 1 2 50<CR>                      Set path [1, 2] to 50dB w/ response
Atten #2 path [1, 2] = 50dB<CR><LF>
```

```
SP -R 2 2 95<CR>                      Set path [2, 2] to 95dB w/ response
Atten #6 path [2, 2] = 95dB<CR><LF>
```

```
SP -R 2 3 127<CR>                      Set path [2, 3] to 127dB w/ response
Atten #7 path [2, 3] = 127dB<CR><LF>
```

(Include the store option)

```
SP -S 1 1 63<CR>                      Set path [1, 1] to 63dB and store the dB value.
Stored dB value is used by the RECALL command.
```

```
SP -S 1 2 127<CR>                      Set path [1, 2] to 127dB and store the dB value.
Stored dB value is used by the RECALL command.
```

(Include the timestamp option)

```
SP -T 1 1 63<CR>
[15:26:17] Atten #1 path [1, 1] = 63dB<CR><LF>
```

```
SP -T 1 3 32<CR>
[15:27:00] Atten #3 path [1, 3] = 32dB<CR><LF>
```

```
SP -T 3 4 95<CR>
[15:28:54] Atten #12 path [3, 4] = 95dB<CR><LF>
```

```
SP -T 4 4 0<CR>
[15:29:23] Atten #16 path [4, 4] = 0dB<CR><LF>
```

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Atten X does not exist<CR><LF>
Invalid value entry: X<CR><LF>
Atten X In use by X:USER<CR><LF>
Atten X is locked by X:USER<CR><LF>
Atten X is a member of Block X<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
Attenuator address out of range
Attenuation value out of range
Attenuator executing command from another user
Attenuator locked by another user
Attenuator is assigned to a block
Command does not apply to your test system model
```

Command Revisions:

3.0.0 No revisions to this command

2.3.16 READ PATH COMMAND

Read the attenuation setting for up to 16 attenuators. Additional attenuator information is available with the use of the options.

Syntax:

RP -{options} x y<CR>

Read dB setting for a single path.

RP -{options} x1 y1, x2 y2, ... ,x16 y 16<CR>

Read dB setting for up to 16 paths.

Options:

- M Max dB Include maximum attenuation of the attenuator.
- S Step Size Include dB step size of attenuator.
- L Locked Include if attenuator is locked/unlocked.
- B Blocked Include if attenuator is assigned to a block.
- V Verbose Use verbose option in place of -MSLB combination.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RP 1 1<CR>
Atten #1 path [1, 1] = 127dB<CR><LF>
```

```
RP 1 2, 1 3<CR>
Atten #2 path [1, 2] = 127dB
Atten #3 path [1, 3] = 127dB<CR><LF>
```

(Include the maximum attenuation information)

```
RP -M 1 4<CR>
Atten #1 = 127dB, Max 127dB<CR><LF>
```

(Include the device step size information)

```
RP -S 2 1<CR>
Atten #5 path [2, 1] = 0dB, Step 1dB <CR><LF>
```

(Include the lock state of attenuator)

```
RP -L 2 2<CR>
Atten #6 path [2, 2] = 0dB, Not Locked <CR><LF> Reply if attenuator is not locked
or
Atten #6 path [2, 2] = 127dB, Locked by 3:USER3 <CR><LF> Reply if attenuator is locked
```

(Include the block state of attenuator)

```
RP -B 2 3<CR>
Atten #7 path [2, 3] = 95dB, Not Blocked <CR><LF> Reply if attenuator is not assigned to block
or
Atten #7 path [2, 3] = 95dB, Block 1 <CR><LF> Reply if attenuator is assigned to block
```

(Include the verbose response)

```
RP -V 2 4, 3 1, 3 2<CR>
Atten #8 path [2, 4] = 0dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #9 path [3, 1] = 0dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #10 path [3, 2] = 0dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

(Combination of options)

```
RP -MS 3 3, 3 4<CR>
Atten #11 path [3, 3] = 0dB, Max 127dB, Step 1dB<CR><LF>
Atten #12 path [3, 4] = 0dB, Max 127dB, Step 1dB<CR><LF>
```

```
RP -LB 4 1, 4 2, 4 3, 4 4<CR>
Atten #13 path [4, 1] = 0dB, Not Locked, Not Blocked<CR><LF>
Atten #14 path [4, 2] = 0dB, Not Locked, Not Blocked<CR><LF>
Atten #15 path [4, 3] = 0dB, Not Locked, Not Blocked<CR><LF>
Atten #16 path [4, 4] = 0dB, Not Locked, Not Blocked<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
Command does not apply to your test system model
```

Command Revisions:

3.0.0 No revisions to this command

2.3.17 READ ALL PATHS COMMAND

Return the attenuation settings for all paths.

Syntax:

RAP -{options}<CR>	Read all paths
RAP -{options} x y<CR>	Read all paths starting from path [x, y]
RAP -{options} x1 y1, x2, y2<CR>	Read all paths from [x1, y1] to [x2, y2]

Option:

-C	Checksum	Reply only with the checksum (Cyclic Redundancy Check) information
-M	Max dB	Include maximum attenuation of the attenuator
-S	Step size	Include dB step size of attenuator
-L	Locked	Include if attenuator is locked/unlocked
-B	Blocked	Include if attenuator is assigned to a block
-V	Verbose	Use verbose option in place of -CMSLB combination.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

RAP<CR>	Read all paths.
Checksum = 0x2b5a	Response for a 16 path test system
Atten #1 path [1, 1] = 127dB<CR><LF>	
Atten #2 path [1, 2] = 127dB<CR><LF>	
Atten #3 path [1, 3] = 127dB<CR><LF>	
Atten #4 path [1, 4] = 127dB<CR><LF>	
Atten #5 path [2, 1] = 127dB<CR><LF>	
Atten #6 path [2, 2] = 127dB<CR><LF>	
Atten #7 path [2, 3] = 127dB<CR><LF>	
Atten #8 path [2, 4] = 127dB<CR><LF>	
Atten #9 path [3, 1] = 127dB<CR><LF>	
Atten #10 path [3, 2] = 127dB<CR><LF>	
Atten #11 path [3, 3] = 127dB<CR><LF>	
Atten #12 path [3, 4] = 127dB<CR><LF>	
Atten #13 path [4, 1] = 127dB<CR><LF>	
Atten #14 path [4, 2] = 127dB<CR><LF>	
Atten #15 path [4, 3] = 127dB<CR><LF>	
Atten #16 path [4, 4] = 127dB<CR><LF>	
RAP 4 3<CR>	Read all paths starting from path [4, 3]
Checksum = 0x2b5a<CR><LF>	Response
Atten #15 path [4, 3] = 127dB<CR><LF>	
Atten #16 path [4, 4] = 127dB<CR><LF>	
RAP 3 1, 3 4<CR>	Read all paths from path [3, 1] to path [3, 4]
Checksum = 0x2b5a<CR><LF>	Response
Atten #9 path [3, 1] = 127dB<CR><LF>	
Atten #10 path [3, 2] = 127dB<CR><LF>	
Atten #11 path [3, 3] = 127dB<CR><LF>	
Atten #12 path [3, 4] = 127dB<CR><LF>	

(Include the maximum attenuation information)

```
RAP -M<CR>
Checksum = 0x2b5a<CR><LF>
Atten #1 path [1, 1] = 127dB, Max 127dB<CR><LF>
Atten #2 path [1, 2] = 127dB, Max 127dB<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Max 127dB<CR><LF>
```

(Include the dB step size information)

```
RAP -S<CR>
Checksum = 0x2b5a<CR><LF>
Atten #1 path [1, 1] = 127dB, Step 1dB<CR><LF>
Atten #2 path [1, 2] = 127dB, Step 1dB<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Step 1dB<CR><LF>
```

(Include the lock state of attenuator)

```
RAP -L<CR>
Checksum = 0x16ca<CR><LF>
Atten #1 path [1, 1] = 95dB, Locked by 3:USER3<CR><LF>
Atten #2 path [1, 2] = 127dB, Not Locked<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Not Locked<CR><LF>
```

(Include the block state of attenuator)

```
RAP -B<CR>
Checksum = 0x2b5a<CR><LF>
Atten #1 path [1, 1] = 127dB, Block 1<CR><LF>
Atten #2 path [1, 2] = 127dB, Not Blocked<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Not Blocked<CR><LF>
```

(Include only the checksum information)

```
RAP -C<CR>
Checksum = 0x16ca<CR><LF>
```

(Include the verbose response)

```
RAP -V 4<CR>
Checksum = 0x16ca<CR><LF>
Atten #1 path [1, 1] = 95dB, Max 127dB, Step 1dB, Locked by 3:USER3, Not Blocked<CR><LF>
Atten #2 path [1, 2] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #3 path [1, 3] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

(Combination of options)

```
RAP -MSLB 2 2, 3 2<CR>
Checksum = 0x2b5a
Atten #6 path [2, 2] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #7 path [2, 3] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #8 path [2, 4] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #9 path [3, 1] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
Atten #10 path [3, 2] = 127dB, Max 127dB, Step 1dB, Not Locked, Not Blocked<CR><LF>
```

```
RAP -LB<CR>
Checksum = 0x2b5a
Atten #1 path [1, 1] = 127dB, Not Locked, Block 1<CR><LF>
Atten #2 path [1, 2] = 127dB, Not Locked, Not Blocked<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Not Locked, Not Blocked<CR><LF>
```

```
RAP -MS<CR>
Checksum = 0x2b5a
Atten #1 path [1, 1] = 127dB, Max 127dB, Step 1dB<CR><LF>
Atten #2 path [1, 2] = 127dB, Max 127dB, Step 1dB<CR><LF>
...
Atten #16 path [4, 4] = 127dB, Max 127dB, Step 1dB<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
Command does not apply to your test system model
```

Command Revisions:

3.0.0 No revisions to this command

2.4 SWITCH COMMANDS

All of the commands listed in this section are used to control RF switches that are internal to the test system.

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2.4.1 SWITCH ATTRIBUTE CONTROL

Lock/Unlock up to 16 switches in a single command. The STARTUP keyword can be used to set the boot state for all devices in the test system. The AUTOSAVE keyword can be used to save to BBRAM after each set switch command is executed. The READ keyword can be used to check the STARTUP or READ settings.

Option Syntax:

```
SWITCH -{options} x1<CR>           Set attributes for single switch.
SWITCH -{options} x1, x2 ..., x16<CR> Set attributes for up to 16 switch.
```

Options:

-L	Lock	Only allow the switch to be modified by the current connection.
-U	Unlock	Remove this connection's switch lock.
-F	Force	Ignore current switch lock and relock to current connection.
-K	Manual Lock	Ignore modification made by the keypad/display.
-R	Respond	Notify the user of the new setting.

Keyword Syntax:

```
SWITCH {-L, -U} ALL<CR>
SWITCH STORE={BBRAM, FLASH}<CR>
SWITCH RECALL={BBRAM, FLASH}<CR>
SWITCH STARTUP={FLASH, BBRAM}<CR>
SWITCH AUTOSAVE={TRUE or FALSE}<CR>
SWITCH READ={STARTUP, AUTOSAVE, FLASH, or BBRAM}<CR>
```

Keyword Descriptions:

ALL	Lock or unlock ALL switches.
STORE	Save the current state of the switches in memory.
RECALL	Set the switches to values stored in BBRAM or FLASH.
STARTUP	Set system to boot to either BBRAM settings or FLASH settings.
AUTOSAVE	Causes set switch command to automatically save to BBRAM at each set.
READ	Allow user to check saved start-up value settings.

Notes:

- If a switch is locked other users are prevented from changing the state of the switch.
- If a switch is locked, the Force option can be used to steal the lock on the switch.
- If Manual Lock is set, then other remote users can still use the switch. Only the manual user is locked out.
- The manual interface can LOCK and STEAL locks if not locked out.
- Lock is denoted on the display for manual users by putting the character "L" before the switch address.
- Manual lock is denoted on the display for manual users by putting the character "M" before the switch address.
- When a user disconnects all the devices they have locked are automatically unlocked.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
SWITCH -L 1<CR>           Lock switch 1

SWITCH -RL 8<CR>         Lock switch 8 with response
Switch #2 Locked by YOU<CR><LF> Response
```

SWITCH -L 2, 4<CR>	Lock switches 2, 4
SWITCH -K 1, 3<CR>	Lock out manual control for switches 1, 3
SWITCH -LK 5, 6<CR>	Lock and lockout manual control for switches 5, 6
SWITCH -U 1, 2<CR>	Remove all locks for switch 1, 2
SWITCH -UK 6<CR>	Remove manual lockout only for switch 6
SWITCH -L ALL<CR>	Lock all switches
SWITCH -FL 5, 6, 7<CR> Switch #1 Lock changed to 3:USER3<CR><LF>	Steal lock for switches 5, 6, 7 Response to original user
SWITCH -UF 5, 6, 7<CR> Switch #1 Unlocked by 4:USER4<CR><LF>	Force unlock switches 5, 6, 7 Response to original user
SWITCH STARTUP=BBRAM<CR>	Set test system boot to BBRAM.
SWITCH AUTOSAVE=TRUE<CR>	Save to BBRAM after each SS command.
SWITCH READ=BBRAM<CR>	Respond w/ current BBRAM stored settings.
SWITCH READ=STARTUP<CR>	Respond w/ current boot state type.
SWITCH READ=AUTOSAVE<CR>	Respond w/ auto save option.
SWITCH STORE=BBRAM<CR>	Store the current state of the switches in BBRAM.
SWITCH STORE=FLASH<CR>	Store the current state of the switches in FLASH.
SWITCH RECALL=BBRAM<CR>	Set the switches to the state saved in BBRAM.
SWITCH RECALL=FLASH<CR>	Set the switches to the state saved in FLASH.

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Switch X does not exist<CR><LF>	Switch address out of range
Switch X In use by X:USER<CR><LF>	Switch executing command for another user
Switch X is locked by X:USER<CR><LF>	Switch locked by another user
Command not found<CR><LF>	Command does not apply to your test system model

Startup:

By default at startup the RF switches are set to the port settings saved in battery backed up RAM (BBRAM). The BBRAM settings can be changed using the SWITCH STORE or the SS -S (i.e. Set Switch w/ Store option). If SWITCH AUTOSAVE is enabled then any command that changes RF switch values will also update the BBRAM setting for those RF switches. Mechanically latching RF switches have SWITCH AUTOSAVE enabled by factory default.

The SWITCH STARTUP=FLASH command also provides the option to set the RF switches to the values stored in flash memory at startup. The flash memory has a limit around 10,000 writes and can take multiple seconds to store the new values. Because of these limitations there are no options to update values stored in flash on the fly. See STORE=FLASH option of the SWITCH command, and the STORE FLASH command to update values stored in FLASH memory.

If memory corruption of the data stored in FLASH or BBRAM occurs then the factory default settings are used at startup.

Command Revisions:

3.2.0 Command added to firmware.

2.4.2 SET SWITCH COMMAND

Set the port setting for up to 16 switches.

Syntax:

```
SS -{options} x1 y1<CR>           Set single switch with address and port
SS -{options} x1 y1, x2 y2, ..., x16 y16<CR> Set up to 16 switches w/ address and port
```

Options:

```
-R Respond    Notify the user of the new setting
-S Store      Store the new port setting in battery backed up memory (BDRAM).
-T Timestamp  Include [HH:MM:SS] timestamp with response.
```

Notes:

- The SS command has no user feedback unless using the `-R` or `-T` options.
- The settings stored in BDRAM using the `-S` option can be used by the RECALL command or at system startup.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
SS 2 4<CR>           Set switch 2 to port J4
SS 5 1<CR>           Set switch 5 to port J1
SS 1 1, 2 3, 3 5<CR> Set switch 1 to port J1, 2 to port J3, 3 to port J5
```

(Include the respond option)

```
SS -R 3 2<CR>           Set switch #3 with response
Switch #3 = J2<CR><LF> Response
```

(Include the store option)

```
SS -S 1 2<CR>           Set switch 1 to port J3 and store setting to BDRAM.
This stored value can be used by the recall command.
```

(Include the timestamp option)

```
SS -T 1 2, 2 4<CR>           Set switches 1 and 2 with timestamp response
[10:02:21] Switch #1 = J2<CR><LF> Response
[10:02:21] Switch #2 = J4<CR><LF>
```

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>           Formatting error
Switch X does not exist<CR><LF> Switch address out of range
Switch X In use by X:USER<CR><LF> Switch executing command from another user
Switch X is locked by X:USER<CR><LF> Switch locked by another user
Command not found<CR><LF>      Command does not apply to your test system model
```

Command Revisions:

3.2.0 Command added to firmware.

2.4.3 READ SWITCH COMMAND

Read the port setting for up to 16 switches.

Additional switch information is available with the use of the options.

Syntax:

RS -{options} x<CR>	Read port setting for a single switch.
RS -{options} x1, x2, ..., x16<CR>	Read port settings for up to 16 switches.

Options:

-M Range	Include minimum and maximum port settings.
-L Locked	Include if switch is locked/unlocked.
-V Verbose	Use verbose option in place of -ML combination.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

RS 1<CR>	Read switch 1
Switch #1 = J2<CR><LF>	Response

RS 1, 4<CR>	Read switches 1, 4
Switch #1 = J2<CR><LF>	Response
Switch #4 = J2<CR><LF>	

(Include range information)

RS -M 1<CR>	Command
Switch #1 = J1, Min 1 Max 4<CR><LF>	Response

(Include the lock state of switch)

RS -L 1<CR>	Command
Switch #1 = J2, Not Locked<CR><LF>	Response if switch is not locked
or	
Switch #1 = J3, Locked by 3:CALVIN<CR><LF>	Response if switch is locked

(Include the verbose response)

RS -V 1, 3, 5<CR>	
Switch #1 = J2, Min 1 Max 4, Not Locked<CR><LF>	
Switch #3 = J3, Min 1 Max 4, Not Locked <CR><LF>	
Switch #5 = J1, Min 1 Max 4, Locked by 3:CALVIN <CR><LF>	

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Switch X does not exist<CR><LF>	Switch address out of range
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

3.2.0	Command added to firmware.
-------	----------------------------

2.4.4 SET ALL SWITCHES COMMAND

Set all switches to the same port setting.

Syntax:

SAS -{options} x<CR>	Set all switches to port x
SAS -{options} x y<CR>	Set all switches from x on to port y
SAS -{options} x y z<CR>	Set all switches between x and y to port z

Options:

-R	Respond	Notify the user of the new setting.
-Q	Quiet	Suppress feedback to user.
-T	Timestamp	Include [HH:MM:SS] timestamp with response.

Notes:

- This command will attempt to change the state of all switches in a system.
- Using this command should be avoided when more than one user is working with the test system.
- This command respects all (In Use and Locking) switch attributes.
- This command can be restricted by the administrator with the RESTRICT command.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

SAS 4<CR>	Set all switches in the system to port J4
Switches #1-16 set to J4<CR><LF>	Response
SAS 12<CR>	Set all switches in the system to port J12
Switches #1-16 set to J12<CR><LF>	Response
SAS -Q 4<CR>	Set all switches w/ quiet option (i.e. no response to user)
SAS 6 2<CR>	Set all switches from 6 on to port J2
Switches #6-16 set to J2<CR><LF>	Response
SAS 6 14<CR>	Set all switches from 6 on to port J14
Switches #6-16 set to J14<CR><LF>	Response
SAS 2 6 3<CR>	Set all switches between 2 and 6 to port J3
Switches #2-6 set to J3<CR><LF>	Response
SAS 4 10 12<CR>	Set all switches between 4 and 10 to port J12
Switches #4-10 set to J12<CR><LF>	Response

(Include the respond option)

```
SAS -R 2 6 1<CR>
Switch #2 = J1<CR><LF>
Switch #3 = J1<CR><LF>
Switch #4 = J1<CR><LF>
Switch #5 = J1<CR><LF>
Switch #6 = J1<CR><LF>
```

Set all switches between 2 and 6 to port J1 and respond
Response

(Include the timestamp option)

```
SAS -RT 4<CR>
[06:03:43] Switch #1 = J4<CR><LF>
[06:03:43] Switch #2 = J4<CR><LF>
[06:03:43] Switch #3 = J4<CR><LF>
[06:03:43] Switch #4 = J4<CR><LF>
[06:03:43] Switch #5 = J4<CR><LF>
[06:03:43] Switch #6 = J4<CR><LF>
[06:03:43] Switch #7 = J4<CR><LF>
[06:03:43] Switch #8 = J4<CR><LF>
[06:03:43] Switch #9 = J4<CR><LF>
[06:03:43] Switch #10 = J4<CR><LF>
[06:03:43] Switch #11 = J4<CR><LF>
[06:03:43] Switch #12 = J4<CR><LF>
[06:03:43] Switch #13 = J4<CR><LF>
[06:03:43] Switch #14 = J4<CR><LF>
[06:03:43] Switch #15 = J4<CR><LF>
[06:03:43] Switch #16 = J4<CR><LF>
```

Set all switches to port J4 with time stamp response
Response

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Value X out of range of Switch X<CR><LF>	Switch port value out of range
Switch X In use by X:USER<CR><LF>	Switch executing command from another user
Switch X is locked by X:USER<CR><LF>	Switch locked by another user
Command not found<CR><LF>	Command does not apply to your test system model

Command Revisions:

- 3.2.0 Command added to firmware.
- 3.2.2 Added response to SAS command. Added -Q option if no response is desired.

2.4.5 READ ALL SWITCHES COMMAND

Return the port value of all switches or a range of switches.

Syntax:

```
RAS -{options}<CR>           Read all switches
RAS -{options} x<CR>        Read all switches starting from switch x
RAS -{options} x y<CR>     Read all switches between x and y
```

Options:

```
-C Checksum  Reply only with the checksum (Cyclic Redundancy Check) information
-M Range     Include minimum and maximum port settings
-L Locked    Include if switch is locked/unlocked
-V Verbose   Use verbose option in place of -CML combination.
```

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RAS<CR>           Read all switches
Checksum = 0x2b5a<CR><LF>  Response
Switch #1 = J1<CR><LF>
Switch #2 = J2<CR><LF>
Switch #3 = J1<CR><LF>
Switch #4 = J2<CR><LF>
```

```
RAS 3<CR>        Read all switches starting from switch 3
Checksum = 0x2b5a<CR><LF>  Response
Switch #3 = J1<CR><LF>
Switch #4 = J2<CR><LF>
```

```
RAS 2 3<CR>     Read all switches in range 2 to 3
Checksum = 0x2b5a<CR><LF>  Response
Switch #2 = J2<CR><LF>
Switch #3 = J1<CR><LF>
```

(Include the port range information)

```
RAS -M<CR>
Checksum = 0x2b5a<CR><LF>
Switch #1 = J1, Min 1 Max 4<CR><LF>
Switch #2 = J2, Min 1 Max 4<CR><LF>
Switch #3 = J1, Min 1 Max 4<CR><LF>
Switch #4 = J2, Min 1 Max 4<CR><LF>
```

(Include the lock state of switch)

```
RAS -L<CR>
Checksum = 0xe96e<CR><LF>
Switch #1 = J1, Locked by 3:USER3<CR><LF>
Switch #2 = J2, Locked by 3:USER3<CR><LF>
Switch #3 = J1, Not Locked<CR><LF>
Switch #4 = J2, Not Locked<CR><LF>
```

(Include only the checksum information)

```
RAS -C<CR>
Checksum = 0x2b5a<CR><LF>
```

(Include the verbose response)

```
RAS -V 1 2<CR>
Checksum = 0xe96e<CR><LF>
Switch #1 = J1, Min 1 Max 4, Not Locked <CR><LF>
Switch #2 = J2, Min 1 Max 4, Not Locked <CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
Command does not apply to your test system model
```

Command Revisions:

3.2.0 Command added to firmware.

2.5 MATRIX COMMANDS

Description:

All of the commands listed in this section are used to control RF switches that are internal to the test system.

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2.5.1 MATRIX ATTRIBUTE CONTROL

Lock/Unlock up to 8 input ports, output ports, or paths in a single command. The STARTUP keyword can be used to set the boot state for all matrix ports in the test system. The AUTOSAVE keyword can be used to save to BBRAM after each set port command is executed. The READ keyword can be used to check the STARTUP or READ settings.

Option Syntax:

```
MATRIX -{options} x1 y1, x2 y2, ..., x8 y8<CR>    Set attributes for matrix path.
MATRIX -I{options} or -O{options} x1, x2, ..., x8<CR>
```

Options:

-I	Input	Select INPUT ports only.
-O	Output	Select OUTPUT ports only.
-L	Lock	Only allow the port to be modified by the current connection.
-U	Unlock	Remove this connection's port lock.
-F	Force	Ignore current port lock.
-K	Manual Lock	Ignore modifications made by the keypad/display.
-R	Respond	Notify the user of the new setting.

Keyword Syntax:

```
MATRIX {-L, -U} ALL<CR>
MATRIX STORE={BBRAM, FLASH}<CR>
MATRIX RECALL={BBRAM, FLASH}<CR>
MATRIX STARTUP={FLASH, BBRAM}<CR>
MATRIX AUTOSAVE={TRUE or FALSE}<CR>
MATRIX READ={STARTUP, AUTOSAVE, FLASH, or BBRAM}<CR>
```

Keyword Descriptions:

ALL	Select all Inputs and/or Outputs.
STORE	Save the current state of the ports in memory.
RECALL	Set the port to values stored in BBRAM or FLASH.
STARTUP	Set system to boot to either BBRAM settings or FLASH settings.
AUTOSAVE	Causes set port command to automatically save new state to BBRAM at each set.
READ	Read saved start-up value settings.

Notes:

- If a port is locked, other users are prevented from changing the state of the port.
- If a port is locked, the Force option can be used to steal the lock on the port.
- If Manual Lock is set, then other remote users can still use the port. Only the manual user is locked out.
- The manual interface can LOCK and STEAL locks if not locked out (-k option).
- Lock is denoted on the display for manual users by putting the character "L" before the port address.
- Manual lock is denoted on the display for manual users by putting the character "M" before the port address.
- When a user disconnects all the devices they have locked are automatically unlocked.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue.
 Commands sent to the test system must be terminated with a carriage return (i.e. <CR>).
 Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

MATRIX -LI 1<CR>	Lock input port 1
MATRIX -LI 5 6 8<CR>	Lock input ports 5, 6, and 8
MATRIX -LO 3<CR>	Lock output port 3
MATRIX -L 2 4<CR>	Lock input port 2 and output port 4
MATRIX -LIR 8<CR> Input 1 Locked by YOU<CR><LF>	Lock input port 8 with response Response
MATRIX -IK 1 3<CR>	Lock out manual control for input ports 1 and 3
MATRIX -LOK 5 6<CR>	Session lock and lockout manual control for output ports 5 and 6
MATRIX -UI 1 2<CR>	Remove all locks for input ports 1 and 2
MATRIX -UK 3 4<CR>	Remove manual lockout only for input port 3 and output port 4
MATRIX -LI ALL<CR>	Lock all input ports
MATRIX -FL 5 6<CR> Input 1 Lock changed to 3:USER3<CR><LF>	Steal lock for input port 5 and output port 6 Response to original user
MATRIX -FUI 5<CR> Input 1 Unlocked by 4:USER4<CR><LF>	Force unlock input port 5 Response to original user
MATRIX STARTUP=BBRAM<CR>	Set test system boot to BBRAM.
MATRIX AUTOSAVE=TRUE<CR>	Save to BBRAM after each SI/SO command.
MATRIX READ=BBRAM<CR>	Responds w/ current BBRAM stored settings.
MATRIX READ=STARTUP<CR>	Responds w/ current boot state type.
MATRIX READ=AUTOSAVE<CR>	Responds w/ auto save option.
MATRIX STORE=BBRAM<CR>	Store the current state of the switches in BBRAM.
MATRIX STORE=FLASH<CR>	Store the current state of the switches in FLASH.
MATRIX RECALL=BBRAM<CR>	Set the switches to the state saved in BBRAM.
MATRIX RECALL=FLASH<CR>	Set the switches to the state saved in FLASH.

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

Syntax Error<CR><LF>	Formatting error
Matrix Path X to Y does not exist<CR><LF>	Path address out of range or port does not exist
Matrix Inputs cannot be locked<CR><LF>	Matrix configuration may not support input locking
Matrix Outputs cannot be locked<CR><LF>	Matrix configuration may not support output locking
Input X is locked by Y:USER<CR><LF>	Input port locked by another user
Output X is locked by Y:USER<CR><LF>	Output port locked by another user
Command not found<CR><LF>	Command does not apply to your test system model

Startup:

By default at startup the matrix ports are set to the port settings saved in battery backed up RAM (BBRAM). The BBRAM settings can be changed using the SWITCH STORE or the SI/SO -S (i.e. Set Input w/ Store option). If MATRIX AUTOSAVE is enabled then any command that changes matrix port values will also update the BBRAM setting for those ports. Mechanically latching switches have MATRIX AUTOSAVE enabled by factory default.

The MATRIX STARTUP=FLASH command also provides the option to set the ports to the values stored in flash memory at startup. The flash memory has a limit around 10,000 writes and can take multiple seconds to store the new values. Because of these limitations there are no options to update values stored in flash on the fly. See STORE=FLASH option of the MATRIX command, and the STORE FLASH command to update values stored in FLASH memory.

If memory corruption of the data stored in FLASH or BBRAM occurs then the factory default settings are used at startup.

Command Revisions:

- 3.2.5 Command added to firmware.
- 3.3.21 Added Matrix ports cannot be locked error messages.

2.5.2 SET INPUT/ SET OUTPUT COMMAND

Set up to 8 input or output ports.

Syntax:

```
SI -{options} x1 y1, x2 y2, ..., x8 y8<CR>
SO -{options} x1 y1, x2 y2, ..., x8 y8<CR>
Set port by specifying input and output combination.
```

Options:

```
-R Respond      Notify the user of the new setting.
-S Store        Store the new port setting in battery backed up memory (BBRAM).
-T Timestamp    Include [HH:MM:SS] timestamp with response.
```

Notes:

- The SI/SO command has no user feedback unless using the `-R` or `-T` options.
- The settings stored in BBRAM using the `-S` option can be used by the RECALL command or at system startup.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. `<CR>`). Responses from the test system will terminate with carriage return and line feed (i.e. `<CR><LF>`).

```
SI 2 1<CR>           Set input port 2 to output port 1
SO 2 1<CR>           Set output port 2 to input port 1
SI 1 2, 2 3<CR>     Set input 1 to output 2, and input 2 to output 3
```

(Include the respond option)

```
SI -R 3 2<CR>           Set input port 3 with response
Input  3 <-> Output  2<CR><LF>  Response
```

(Include the store option)

```
SO -S 1 2<CR>           Set output port 1 to input port 2 and store setting to BBRAM.
This stored value can be used by the recall command.
```

(Include the timestamp option)

```
SO -T 1 2, 2 4<CR>     Set ports with timestamp response
[10:49:35] Output  3 <-> Input  4  Response
[10:49:35] Output  1 <-> Input  2
```

Errors:

In the event of an error in any part of the command, the command will be ignored in its entirety and an error message will be sent back to the user.

```
Syntax Error<CR><LF>           Formatting error
Matrix Path X to Y does not exist<CR><LF>  Path address out of range or port does not exist
Input X is locked by Y:USER<CR><LF>       Input port locked by another user
Output X is locked by Y:USER<CR><LF>      Output port locked by another user
Command not found<CR><LF>          Command does not apply to your test system model
```

Command Revisions:

3.2.5 Command added to firmware.

2.5.3 READ INPUT, READ OUTPUT COMMAND

Return the current setting of up to 8 ports.

Syntax:

```
RI -{options} x1, x2, ..., x8<CR>      Read input port setting.
RO -{options} x1, x2, ..., x8<CR>      Read output port settings.
```

Options:

```
-M Max Range  Include maximum port settings.
-L Locked      Include the user lock state of the port.
-V Verbose     Use verbose option in place of -ML combination.
```

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. <CR>). Responses from the test system will terminate with carriage return and line feed (i.e. <CR><LF>).

```
RI 1<CR>          Read input 1
Input 1 <-> Output 2<CR><LF>  Response
```

```
RO -V 3<CR>          Read output 3
Output 3 <-> Input 2, Max 16, Locked by 3:THAD<CR><LF>
```

(Include range information)

```
RI -M 1<CR>          Command
Input 1 <-> Output 2, Min 1 Max 4<CR><LF>  Response
```

(Include the lock state of the port)

```
RI -L 1<CR>          Command
Input 1 <-> Output 2, Not Locked<CR><LF>  Response if port is not locked
or
Input 1 <-> Output 2, Locked by 3:CALVIN<CR><LF>  Response if port is locked
```

(Include the verbose response)

```
RO -V 1, 3, 5<CR>
Output 1 <-> Input 2, Max 16, Not Locked
Output 3 <-> Input 4, Max 16, Not Locked
Output 5 <-> Input 6, Max 16, Not Locked
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>          Formatting error
Command not found<CR><LF>    Command does not apply to your test system model
```

Command Revisions:

3.2.5 Command added to firmware.

2.5.5 READ MATRIX PORTS COMMANDS

Return the current setting of a range of ports.

Syntax:

RAI `-{options} begin end<CR>` Read the current output port of all inputs.
RAO `-{options} begin end<CR>` Read the current input port of all outputs.
RMP `-{options}<CR>` Read all input and output ports.

Options:

-C Checksum Reply only with the checksum (Cyclic Redundancy Check) information.
-M Max Range Include maximum port settings.
-L Locked Include the user lock state of the port.
-V Verbose Use verbose option in place of `-CML` combination.

Examples:

Messages sent to the test system are in black and responses back to the user are in blue. Commands sent to the test system must be terminated with a carriage return (i.e. `<CR>`). Responses from the test system will terminate with carriage return and line feed (i.e. `<CR><LF>`).

```
RAI<CR> Read all input ports
Checksum = 0x2b5a<CR><LF> Response
Input 1 <-> Output 1
Input 2 <-> Output 2
...
Input 15 <-> Output 15
Input 16 <-> Output 16
```

```
RAO 10<CR> Read all output ports starting from out port 10
Checksum = 0x2b5a<CR><LF> Response
Output 10 <-> Input 10
Output 11 <-> Input 11
...
Input 15 <-> Output 15
Input 16 <-> Output 16
```

```
RMP<CR> Read all matrix ports
Checksum = 0x2b5a<CR><LF> Response
Input 1 <-> Output 1
Input 2 <-> Output 2
...
Input 15 <-> Output 15
Input 16 <-> Output 16
Output 1 <-> Input 1
Output 2 <-> Input 2
...
Output 3 <-> Input 3
Output 4 <-> Input 4
```

(Include the port range information)

```
RAI -M<CR>
Checksum = 0x2b5a<CR><LF>
Input  1 <-> Output  1, Max 16
Input  2 <-> Output  2, Max 16
Input  3 <-> Output  3, Max 16
Input  4 <-> Output  4, Max 16
```

(Include the lock state of switch)

```
RAI -L<CR>
Checksum = 0xe96e<CR><LF>
Input  1 <-> Output  1, Locked by 3:USER3<CR><LF>
Input  2 <-> Output  2, Locked by 3:USER3<CR><LF>
Input  3 <-> Output  3, Not Locked<CR><LF>
```

(Include only the checksum information)

```
RAI -C<CR>
Checksum = 0x2b5a<CR><LF>
```

Errors:

In the event of an error, the command will be ignored and an error message will be sent back to the user.

```
Syntax Error<CR><LF>
Command not found<CR><LF>
```

```
Formatting error
Command does not apply to your test system model
```

Command Revisions:

3.2.5 Command added to firmware.

2.6 Legacy Commands

With all of the new commands and the addition of command options into firmware 3.x.x , some remote commands used in previous firmware have become unnecessary. The 3.x.x firmware labels these commands as legacy commands. The help command for firmware 3.x.x replies with a list of all remote commands. The description for some of the commands lists them as legacy commands.

SAR	(Legacy) Set attenuation with response functionality replaced by SA command option -R
SMA	(Legacy) Set multiple attenuators functionality replaced by SA command
VHND	(Legacy) Variable handover functionality replaced by VAHND command
SSR	(Legacy) Set switch with response functionality replaced by SS command option -R
SMS	(Legacy) Set multiple switches functionality replaced by the SS command
CB	(Legacy) Change baud rate functionality replaced by SERIAL command
*IDN?	(Legacy) System Identification
*OPC?	(Legacy) Last Operation Complete Query
CHAN	(Legacy) Set Attenuation Channel
CHAN?	(Legacy) Read Attenuation Channel
ATTN	(Legacy) Set Attenuation of Channel
ATTN?	(Legacy) Read Attenuation of Channel

Support:

All legacy commands listed in the help command are available for use with your test system. To view the complete help remote command list send the command **HELP<CR>**. The syntax of the legacy commands are not listed in this manual. There are individual help files available for each legacy command that is listed by the help command. To see the help file for the SMA command send the command **HELP SMA<CR>**. The test system will respond with a detailed help file for the SMA command that lists the syntax and examples.

3.0 REMOTE INTERFACING, SCRIPTING AND USABILITY

The test system uses plain-text carriage return terminated strings as the remote commands. The test system will respond with plain-text carriage return/linefeed terminated strings. These commands strings and responses are the same regardless if the RS-232 port or Ethernet port is being used to communicate with the test system. The responses are meant to be human readable, and should not necessarily be used for scripted interfaces or custom GUI integration.

JFW provides a graphical user interface program (GUI) that can establish a connection to the test system via RS-232 or Ethernet connection. The GUI program will give access to common commands and features of the test system. Connecting to the test system can also be accomplished using a terminal program or programmatically using a programming/scripting language that can send and receive plain-text carriage return/linefeed terminated commands.

3.1 SERIAL vs. ETHERNET

The serial interface provides the lowest speed for sending and receiving commands. Even at its top speed of 115200 baud the RS-232 connection is still slower than using a network connection. Streaming commands through the serial port may provide better performance over using a network connection in cases where network has high latency or is under high demand.

3.2 ETHERNET USER COUNT

The default Ethernet user count is set to 4 connections. This limits the maximum number of Ethernet connections to the test system to 4 users. Increasing the user count allows more simultaneous connections to the test system but it also increases the overall test system latency because it has to allow time to interact with the new user spot. Typically each user spot adds up to 250 microseconds of latency regardless if the spot is connected or not connected. In general the added latency of increasing the user count is insignificant when sending information through the network. The user count should be set to a number considered reasonable for general use of the test system and is not something that should be adjusted often.

3.3 FLASH MEMORY

Flash memory is used to save system information that will persist through power cycles, power loss, and battery failure. Writing to this memory can take up to a few seconds, during which time no other operations can be processed. The flash memory has a limited lifetime of 10k writes minimum. Listed below are remote commands that write to flash memory:

<u>Command</u>	<u>Description</u>
SERIAL	If serial settings updated, triggers Flash memory write.
NET	If network settings updated, triggers Flash memory write.
PROMPT	IF used w/ option -D, triggers flash memory write.
STORE	If used w/ keyword FLASH, triggers flash memory write.
ATTEN	If used w/ STORE=FLASH, triggers flash memory write.
SWITCH	If used w/ STORE=FLASH, triggers flash memory write.
REBOOT	ALL command processing is halted.

3.4 COMMAND EXECUTION

The test system is designed in such a way that all users including the manual interface (if equipped) is given equal amounts of time to look for, parse, execute, and respond to commands. The latency of getting information to and sending information from the test system are ignored because each network or interface has their own latency characteristics. Once the command is received by the test system parsing typically only takes a few milliseconds. The amount of time in execution depends on the command and the devices being controlled. The set attenuator command (i.e. SA x y<CR>) typically takes 3 milliseconds to execute after arriving in the receive buffer.

To increase system response most commands give the user the option to request feedback of command execution. If no request is made then no feedback is generated and sent back to the user. Generating and sending responses adds time to command execution.

Consider the two cases:

- 1) SA 1 10 2 20 3 30 4 40
- 2) SA -R 1 10 2 20 3 30 4 40

The first case generates no response and may takes 4 milliseconds to parse, set the attenuator devices, and return. Adding the -R option signals that feedback should be generated and the command may still only take 4 milliseconds to parse, and set the attenuator devices, however it may take another 50 milliseconds after the device set to generate and transmit all the information back to the client. If high throughput is the goal, then avoid requesting feedback for every command and poll settings only at critical points.

3.5 MULTI-SET COMMAND EXECUTION

Remote commands are processed and executed in a first-in-first-out manner (FIFO). Many commands such as “set attenuator” can set up to 16 attenuators using a single remote command. It is quicker and more efficient when needing to set multiple devices to use the multi-set features of the remote commands.

Example #1: Multi-Set w/ different dB values

If six attenuators are being used, and if the test procedure allows, it is best to send a single remote command setting all six attenuators, instead of sending six individual set commands. As the single command is parsed and executed, the six attenuators are set in a FIFO manner. Up to 16 attenuators can be set with a single set attenuator command.

```
6 commands sent → SA 1 10, SA 2 20, SA 3 30, SA 4 40, SA 5 50, SA 6 60
1 command sent  → SA 1 10, 2 20, 3 30, 4 40, 5 50, 6 60
```

Example #2: Multi-Set to same dB value

For this example, six attenuators need set to 63dB. Instead of sending six set attenuator commands, we could instead use the “-V” option of the set attenuator command and send only a single command. As the “-V” command is parsed and executed, the eight attenuators are set in a FIFO manner.

```
6 commands sent → SA 1 63, SA 2 63, SA 3 63, SA 4 63, SA 5 63, SA 6 63
1 command sent  → SA -V 63, 1, 2, 3, 4, 5, 6
```

3.6 SCRIPTING

Scripts are a collection of normal plain-text carriage return/linefeed terminated commands that are generated to automate a test sequence. The scripts can be sent using any of the interfacing methods outlined above and require no special commands or procedure to execute. The user should check all devices that are being controlled by the script are ready to be used. For example, a “set attenuator” command in a script might not execute properly if the attenuator is locked by another user or if it is assigned to a block.

Scripting Notes

1. Any command line beginning with '/' will be ignored and can be used for comments inside a script.
2. All commands sent in the script are executed sequentially.
3. Ensure the last command in the script is terminated with a carriage return or the last command will not execute.

Script Execution Time

If you can use the multi-set functionality of the set attenuator command, the time it takes for your script to execute will decrease. By setting multiple attenuators with a single remote command, network latency and command parsing times are reduced. The next few examples show how script execution time can be decreased.

Script Example #1: Individual Commands

The below script would generate 64 commands. Each command may take 7ms to be sent to the test system, and another 3ms to be process and execute. The total script would take over 600ms to complete

Cycle 1	Cycle 2	Cycle 3	Cycle 4
SA 1 0	SA 1 0	SA 1 0	SA 1 0
SA 2 0	SA 2 0	SA 2 0	SA 2 0
SA 3 0	SA 3 0	SA 3 0	SA 3 0
SA 4 0	SA 4 0	SA 4 0	SA 4 0
SA 1 10	SA 1 10	SA 1 10	SA 1 10
SA 2 10	SA 2 10	SA 2 10	SA 2 10
SA 3 10	SA 3 10	SA 3 10	SA 3 10
SA 4 10	SA 4 10	SA 4 10	SA 4 10
SA 1 20	SA 1 20	SA 1 20	SA 1 20
SA 2 20	SA 2 20	SA 2 20	SA 2 20
SA 3 20	SA 3 20	SA 3 20	SA 3 20
SA 4 20	SA 4 20	SA 4 20	SA 4 20
SA 1 30	SA 1 30	SA 1 30	SA 1 30
SA 2 30	SA 2 30	SA 2 30	SA 2 30
SA 3 30	SA 3 30	SA 3 30	SA 3 30
SA 4 30	SA 4 30	SA 4 30	SA 4 30

Script Example #2: Multi-Set Commands

Using the “-V” option with the set attenuator command reduces the number of remote commands needed from sixty-four to just sixteen. Each “-V” command takes just a bit longer, say 10ms, to be sent over the network and another 5ms to process and set the devices. The total time for script execution is around 250ms. Much less than example #1 that used sixty-four individual remote commands. Most of the latency introduced into Example #1 is from the network overhead of sending forty-eight additional command.

Cycle 1	Cycle 2	Cycle 3	Cycle 4
SA -V 0 1 2 3 4			
SA -V 10 1 2 3 4			
SA -V 20 1 2 3 4			
SA -V 30 1 2 3 4			

4.0 UPDATING TO FIRMWARE 3.x.x

4.1 UPDATE REQUEST

To inquire if a previously purchased test system can be upgraded to firmware 3.x.x please email a request to the engineering department (jfwengr@jfwindustries.com). Please include the JFW model number of the test system. Most JFW test systems that are Ethernet or RS-232 controlled can be easily updated to run 3.x.x firmware.

4.2 HARDWARE DIFFERENCES

Most JFW test system models can be upgraded to firmware 3.x.x without any significant hardware changes. However, it may not be possible for EVERY existing test system model to be upgraded to firmware 3.x.x without significant changes. Listed below are a few of the most standard hardware changes.

Mode Slide Switch

Previous generations of JFW test system had a slide switch that was used to select between Ethernet and RS-232 models. Firmware 3.x.x allows the Ethernet port and RS-232 port to operate simultaneously. The slide switch can be removed or left intact. It provides no function for firmware 3.x.x.

RS-232 Ports

Previous generation of JFW test systems had two serial ports: “RS-232” and “Ethernet Configuration”. Firmware 3.x.x has only one serial port. Firmware 3.x.x allows the user to set RF components and configure network settings using the single RS-232 port.

Internal Serial DC Cable

The cable that runs from the microcontroller to the “RS-232” port on the rear panel is not wired for hardware flow control (RTC/CTS). If you are using the serial port to control the test system, we recommend replacing this DC cable with an updated cable that is wired for hardware flow control. If you upgrade you internal cable, you will be able to run at much higher Baud rates (i.e. greater than 38400 Baud). The JFW part number for the new cable is #016-1046-flowc-xx where “xx” is the length in inches.

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