



PROFESSIONAL

ControlSpace

SERIAL CONTROL PROTOCOL v5.14.1



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1 About

This ControlSpace Serial Control Protocol document covers the following products:

- *ControlSpace EX-1280C, EX-12AEC, and EX-440C conference processors*
- *ControlSpace EX-1280 processor*
- *ControlSpace ESP-880, ESP-1240, ESP-4120, ESP-1600 processors*
- *ControlSpace ESP-00 Series II, ESP-00, ESP-88 processors*
- *PowerMatch PM8500N, PM8250N, PM4500N, PM4250N amplifiers*
- *PowerShare PS404D, PS604D amplifiers*
- *MSA12X powered steerable array loudspeaker*
- *ControlSpace WP, EP and EX Dante® endpoint audio interfaces*
-

This protocol provides a communication mechanism for Bose Professional ControlSpace, PowerMatch and PowerShare products to interface with third-party control systems such as AMX, Crestron, Extron, or any other controller capable of following this protocol.

The purpose of this document is to provide programmers and integrators the necessary details on the available commands, their behavior and syntax.

Note: *Whenever this document references the ESP-880 it applies equally to the ESP-880A and ESP-880AD, unless otherwise specified.*

Note: *Whenever this document references the ESP-1240 it applies equally to the ESP-1240A and ESP-1240AD, unless otherwise specified.*

Note: *Whenever this document references the ESP-00 it applies equally to the current ESP-00 II, and to the legacy ESP-00 and ESP-88 processors.*

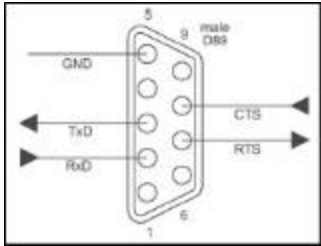
2 Connection

Using the RS-232 Serial Port (ESP and EX only)

When using RS-232, a 3-wire connection is sufficient to communicate with the ESP or EX processors (use of the CTS/RTS pins on the ESP is optional). ESP Processors use a 9-way D connector configured as DTE, so a crossover (or null-modem) cable will be required to connect directly to a PC, whereas the EX processors use a miniature Phoenix connector and can be wired as required. When using an RS-232 connection, there is no time limit between characters of a command, so it is possible to enter commands using a "dumb" terminal.

The default communication settings are shown below. If required these settings can be changed via ControlSpace Designer™ software.

	ESP-00	ESP-880/1240/4120/1600 EX-1280C/440C/1280
Baud	38,400	115,200
Data bits	8	8
Parity	None	None
Stop bits	1	1



RS-232 Panel Connector
Pinout (DTE)

Using Serial-over-Ethernet (ESP, EX, PowerMatch, PowerShare)

ESP, EX, PowerMatch (networked), and PowerShare products can be controlled via serial commands sent over Ethernet using a TCP/IP connection. Communication is via the same physical Ethernet connection used for the ControlSpace Designer software but a dedicated port number (10055) is provided for third-party control allowing them to operate simultaneously.

Note: The third-party control connection will be closed when going on-line with ControlSpace Designer software to allow the new design to be loaded. The control connection can be re-established once on-line. Most control systems can do this automatically.

ESP, EX, PowerMatch (networked), and PowerShare products can support up to the maximum number of simultaneous serial-over-Ethernet connections (in addition to the physical RS-232 serial port on ESP/EX) according to the table below:

Products	Maximum number of SoIP connections
EX-1280C, EX-12AEC, and EX-440C	32
EX-1280	32
ESP-880, ESP-1240, ESP-4120, ESP-1600	32
ESP-00 Series II, ESP-00, ESP-88	8
PM8500N, PM8250N, PM4500N, PM4250N	32
PS404D, PS604D	8

These connections are shared with any instances of ControlSpace Remote that use the same communication method. Once the maximum number of connections have been established, additional requests will be refused until one of the existing connections is closed. Serial output and

asynchronous feedback is sent to all active connections (including the physical RS-232 port on ESP/EX) and Serial input will monitor all active connections for the specified strings. In contrast, responses to query commands are returned only to the connection that initiated the query.

The ESP-00, PowerMatch and PowerShare products use a fixed port number of '10055' for third-party control connections. 1U ESPs (880/1240/4120/1600) and EX devices also use the same port by default but allow the port to be changed or disabled via the device properties in the ControlSpace Designer software if required.

It's important to note that ESP, EX, PowerMatch, and PowerShare products only act as Server for serial-over-Ethernet connections; the connection must be initiated by the Client device.

Using Serial-over-Ethernet (MSA12X Loudspeaker)

The MSA12X powered steerable array loudspeaker can be controlled via serial commands sent over Ethernet but uses UDP packets and a fixed port number of **49494**.

If the MSA12X loudspeaker is connected to an EX processor, any settings sent to the loudspeaker directly can be overridden by those programmed in the processor.

MSA12X Endpoint UDP Control Port	49494
Maximum number of SoIP connections	1

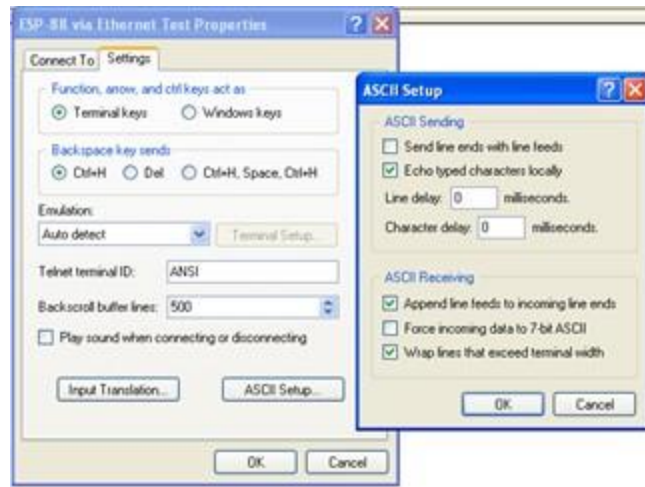
Using Serial-over-Ethernet (WP, EP and EX Endpoints)

Endpoints can also be controlled via serial commands sent over Ethernet, but these use UDP packets and a fixed port number of "49494". Where endpoints are paired with EX processors, any settings sent to the endpoint directly can be overridden by those programmed in the processor. When paired, changes should only be made via ControlSpace Designer software while online with the EX processor.

For reference, a list of the ports used by ControlSpace devices is provided below:

ESP, EX, PM and PS Serial-over-Ethernet	10055
ControlSpace Designer software	10001,10002
Scan/Discovery	9010
Firmware updates	9008, 9009
Inter-device communication	2005, 2006, 2007
Endpoint UDP Control	49494

Using 'Hyperterminal' configured for TCP/IP (as shown below) is a convenient way to test these commands.



Note: HyperTerminal is no longer bundled with newer versions of Microsoft Windows® operating systems. Freeware or open-source solutions such as ClearTerminal, RealTerm, PuTTY or Hercules are available online and can be used to test commands as well.

3 Command Format

All commands and responses are sent using ASCII characters, terminated with a <CR> (carriage return, ASCII 0x0D).

The available commands are divided into the following categories per their scope.

System Commands	(Parameter Sets, Groups ...)
Device Commands	(Inputs, Outputs, Set IP address, Get alarm status ...)
Module Commands	(Signal processing parameters ...)
MSA12X Commands	(Input gain, Input source, Load preset, Standby ...)
Endpoint Commands	(Input gain, Phantom power, Logic I/O ...)

System and Device Commands

Numerical values for System and Device Commands are entered using hexadecimal ASCII. For example, 16 (decimal) is entered as 10 (hex) and 34 (decimal) is entered as 22 (hex).

- > Command should be capital letters
- > A space after the command is optional (SS 10 or SS10 are both acceptable)
- > A comma "," is used as the separator
- > Hexadecimal values do not require a suffix ("A3h" not allowed – should be "A3")
- > Hexadecimal values can be sent in upper or lower case (SS A or SS a are both acceptable, but responses are always in lower case)
- All commands are terminated with a <CR> (Carriage Return – ASCII 0x0D)
- > No acknowledgement is sent. Following a 'Set' command with a 'Get' is a convenient method for confirming the command was successful

Module Commands:

Numerical values for Module Commands are entered as simple ASCII text. For example, -28dB is entered simply as "-28"

- > Command should be capital letters
- > A space after the command is optional (SA "xx" or SA"xx" are both acceptable)
- > Module name must be unique and should always be enclosed in quotes ("Name")
- > Command may have 1,2 or 3 Indices separated by ">" (ASCII 0x3E)
- > Set commands and Get responses always end with "=" (ASCII 0x3D) followed by the parameter value
- Numerical values are entered as simple ASCII text without the units (e.g. -28dB is simply entered as "-28")
- Multiple commands sent on a single line are separated by a semi-colon (ASCII 0x3B)
- > All commands are terminated with a <CR> (Carriage Return – ASCII 0x0D)
- > Devices respond with 'ACK' (ASCII 0x06) if successful or 'NAK nn' if unsuccessful where nn is a 2-digit error code

Subscription Commands:

Subscription is used to obtain current value without the need to solicit data periodically. As value changes, new value will be sent if being subscribed.

- > Command should be capital letters
- > All commands are terminated with a <CR> (Carriage Return – ASCII 0x0D)

MSA12X and Endpoint Commands:

Numerical values for MSA12X and Endpoint Commands are entered as basic ASCII text. For example, -15dB would be entered as “-15.0”.

- > Commands should be capital letters
- > Command may have 1 or 2 parameters separated by <SPACE> (ASCII 0x20)
- > Numerical values are entered as simple ASCII text without the units (e.g. -15dB is simply entered as “-15.0”)
- > All commands are terminated with a <CR> (Carriage Return – ASCII 0x0D)
- > Devices respond with “ACK” and an echo of received command if successful or “NACK” if unsuccessful. Note that these are text strings and not the ASCII <ACK> and <NAK> characters used in the Module Commands.

4 System Commands

System commands are used to invoke changes across multiple devices simultaneously and use constructs programmed via ControlSpace Designer software (such as Parameter Sets and Groups). Commands issued to the designated 'RTC/Main' device will be echoed to all other devices on the network (assuming they are correctly connected to the same network). Otherwise, commands should be issued to one of the devices involved in the construct being controlled (e.g. if a Group spans two ESPs, then the Group command should only be issued to one of those two devices, not to others).

System commands use hexadecimal notation for numerical values and only 'Get' commands generate a response. Following a 'Set' command with a 'Get' is a useful way to confirm command success.

- 4.1 Set/Get Parameter Set (SS, GS)
- 4.2 Set/Get Group Volume Master Level (SG, GG)
- 4.3 Set Group Volume Increment/Decrement (SH)
- 4.4 Set/Get Group Volume Master Mute (SN, GN)
- 4.5 Set/Get Room Combine (SRC, GRC)
- 4.6 Set/Get Parameter Set Lists (GA, SA)

4.1 Set/Get Parameter Set (SS, GS)

To recall or invoke Parameter Set *n*:

`SS n <CR>` where *n* is the Parameter Set number, 1 – FFh (1–255 decimal)

To query for the last invoked Parameter Set:

`GS<CR>`

Response:

`S n<CR>` where *n* = 0 – FF (*n* = 0 if no Parameter Set recalled, e.g. after power-up)

EXAMPLES:

<code>SS b<CR></code>	<i>Recall Parameter Set 11 (hex = b)</i>
<code>GS<CR></code>	<i>Query for last invoked Parameter Set</i>
<code>S 5<CR></code>	<i>Response indicating Parameter Set 5 was invoked last</i>

4.2 Set/Get Group Master Level (SG, GG)

Groups of ESP inputs, outputs or gain blocks have a range of -60dB to +12dB, whereas PowerMatch and PowerShare Amplifier outputs do not have gain and therefore have a maximum level of 0dB (78h).

To set the master level of Group *n* to level *l*:

`SG n,l <CR>` where *n* is the Group number, 1 – 40h (1-64 decimal)
l is the level, 0h (-60dB) to 90h (+12dB) in 0.5dB steps (0-144 dec)
or PM and PS, 0h (-60dB) to 78h (0dB) in 0.5dB steps (0-120 dec)
FFh (-60.5dB/-∞) on all devices (255 dec)

To set the source selector channel of Group *n* to channel *l*:

`SG n,l <CR>` where *n* is the Group number, 1 – 40h (1-64 decimal)
l is the channel to select, 1 – 20h (1-32 decimal)

To query the level of Group *n*

GG *n* <CR> where *n* is the Group number, 1 – 40h (1-64 decimal)

Response:

GG *n,l* where *n,l* are the same as above.

To query the source selector channel of Group *n*

GG *n* <CR> where *n* is the Group number, 1 – 40h (1-64 decimal)

Response:

GG *n,l* where *n,l* are the same as above.

EXAMPLES:

SG 2,78<CR> Set level for Group 2 to 0dB
GG 2<CR> Query the level for Group 2
GG 2,80<CR> Response indicating Group 2 is set to 1dB

4.3 Set Group Level Increment/Decrement (SH)

To increment (or decrement) the master level of Group *n* by *x* number of 0.5dB steps:

SH *n,d,x*<CR> where *n* is the Group number, 1 – 40h (1-64 decimal)
d is the direction, 1=up or 0=down
x is the number of 0.5dB steps in hexadecimal (e.g. 5dB = A)

EXAMPLES:

SH 2,1,6<CR> Increase the level of Group 2 by 3dB
SH 7,0,3<CR> Decrease the level of Group 7 by 1.5dB

4.4 Set/Get Group Master Mute (SN, GN)

To set or change the Mute state for Group *n*:

SN *n,m*<CR> where *n* is the Group number, 1 – 40h (1-64 decimal)
m is the state, M = Mute, U = Un-mute, T = Toggle mute state

To query the Mute state of Group *n*:

GN *n* <CR> where *n* is the Group number, 1 – 40h (1-64 decimal)

Response:

GN *n,m* where *n,m* are the same as above.

EXAMPLES:

SN 4,M<CR> Engage Mute for Group 4
GN 4<CR> Query the Mute status for Group 4
GN 4,M<CR> Response indicating Group 4 is Muted

4.5 Set/Get Room Combine (SRC, GRC) [EX Only]

Room Combine Groups allow several rooms to be organized and managed together using Conference Room Router modules. Once the Conference Room Router module for each of the rooms has been added to a Room Combine Group it becomes possible to join or split rooms in different combinations,

routing the audio between them and linking their master volume controls together. This is typically used for adaptable conference rooms where dividing partitions can be added to split rooms or removed to combine several smaller rooms into one large room.

These commands are used to join or split pairs of rooms within a given Room Combine Group, much like the physical partitions. Rooms can be referenced by their number or name. Both of which are defined in the Room Combine Group configuration panel.

To join two rooms together using room numbers:

`SRC n,a,b,s <CR>` where *n* is the Room Combine Group number, 1-6
a,b are the room numbers, 1-6
s is the state, J = Join and S = Split

To join two rooms together using room names:

`SRC "N","A","B",s <CR>` where *N* is the Room Combine Group name
A,B are the room names
s is the state, J = Join and S = Split

To query whether two rooms are joined using room numbers:

`GRC n,a,b <CR>` where *n* is the Room Combine Group number, 1-6
a,b are the room numbers, 1-6

Response:

`GRC n,a,b,s <CR>` where *n* is the Room Combine Group number, 1-6
a,b are the room numbers, 1-6
s is the state, J = Join and S = Split

To query whether two rooms are joined using room names:

`GRC n,"A","B" <CR>` where *n* is the Room Combine Group number, 1-6
A,B are the room names

Response:

`GRC n,"A","B",s <CR>` where *n* is the Room Combine Group number, 1-6
A,B are the room names
s is the state, J = Join and S = Split

To query which rooms are currently joined:

`GRC n <CR>` where *n* is the Room Combine Group number (or name)

Response:

`GRC n,[a,b][c,d,f] <CR>` where *n* is the Room Combine Group number
a-f are the room numbers and the brackets "[]" indicate which rooms are joined

EXAMPLES:

`SRC 2,"Victory","Trafalgar",J<CR>` Join rooms named "Victory" and "Trafalgar" from RC Group 2

`SRC 1,2,4,S<CR>` Split rooms 2 and 4 in Room Combine Group 1

`GRC "Ground Floor"<CR>` Query for currently joined rooms in the "Ground Floor" RC Group

`GRC "Ground Floor",[2,4,5][1,3]<CR>` Response indicating rooms 2,4 and 5 are joined, and rooms 1 and 3 are joined

4.6 Set/Get Parameter Set Lists (SA, GA)

Parameter Set Lists are logical groupings of Parameter Sets. These commands are used to query for or change the currently selected Parameter Set in a Parameter Set List and to query the last recalled Parameter Set.

To query for the current selection of a Parameter Set List:

GA "A">2 <CR> where **A** is the Parameter Set List's name

Response:

GA "A">2=**n** <CR> where **A** is the Parameter Set List's name
 n is the index of the current selection

or

<NAK>01 **A** not recognized as valid Parameter Set List name

or

<NAK>02 number after '>' not 1 or 2

To change the current selection of a Parameter Set List:

SA "A">1=**n** <CR> where **A** is the Parameter Set List's name
 n is index of the Parameter Set in the list to select

Response:

<ACK> Selection set to nearest possible selection
 (1 if **n** = 0, max selection if **n** greater than max selection, otherwise **n**)

or

<NAK>01 **A** not recognized as valid Parameter Set List name

or

<NAK>02 number between '>' and '=' not 1 or 2

or

<NAK>03 **n** set to a negative value

5 Device Commands

Device commands should be issued directly to the relevant ControlSpace device and will invoke changes locally within that device. Device commands use hexadecimal notation for numerical values and generally only 'Get' commands generate a response. Following a 'Set' command with a 'Get' is a useful way to confirm successful execution.

- 5.1 Set/Get Input/Output Volume (SV, GV)
- 5.2 Set Volume Increment/Decrement (SI)
- 5.3 Set/Get Input/Output Mute (SM, GM)
- 5.4 Get Signal Level (GL)
- 5.5 Set/Get IP Address (IP)
- 5.6 Network Parameters (NP)
- 5.7 Reset/Reboot Device (RESET)
- 5.8 Set/Get Standby Status (SY, GY) [PowerMatch and PowerShare Only]
- 5.9 Get Configuration (GC) [PowerMatch Only]
- 5.10 Set/Get Fault Status (SF, GF) [PowerMatch Only]
- 5.11 Clear Fault/Alarms (CF) [PowerMatch Only]
- 5.12 Set/Get Alarm Reporting/Status (SR, GR) [PowerMatch Only]
- 5.13 Get/Clear Alarm History/Log (GH, CH) [PowerMatch and PowerShare Only]

The Volume (SV, GV, SI) and Mute (SM, GM) commands allow control of input/output levels and mutes directly, referenced by a slot and channel number per the physical architecture of the device, rather than by Module name. Whilst these commands are still currently supported it is recommended that Module commands (SA, GA) be used to control the input and output modules for new projects.

The ESP-00 has 8 audio card slots and each card can support up to 8 channels, although many cards only have 4 channels and do not use channels 5-8. These commands are not supported on Surround decoder, Dante and CobraNet cards.

The ESP-880/1240/4120/1600, EX, PowerMatch and PowerShare devices have a fixed architecture but still allow channels to be referenced using pseudo 'slot' numbers as described in Table 1 and Table 2.

Table 1

Slot	ESP-00	ESP-880	ESP-880A	ESP-880AD	ESP-1240	ESP-1240A	ESP-1240AD	ESP-4120	ESP-1600	EX-1280C	EX-440C	EX-12AEC	EX-1280	
1	Flexible	In 1-4	In 1-4	In 1-4	In 1-4	In 1-4	In 1-4	In 1-4	In 1-4	Out 1-4	Out 1-4		Out 1-4	
2		Out 1-4	Out 1-4	Out 1-4	Out 1-4	Out 1-4	Out 1-4	Out 1-4	In 5-8	Out 5-8			Out 5-8	
3		In 5-8	In 5-8	In 5-8	In 5-8	In 5-8	In 5-8	Out 5-8	In 9-12	In 1-4	In 1-4		In 1-4	
4		Out 5-8	Out 5-8	Out 5-8	In 9-12	In 9-12	In 9-12	Out 9-12	In 13-16	In 5-8			In 5-8	
5		ESPLink Out 1-8	AmpLink Out 1-8	AmpLink Out 1-8	ESPLink Out 1-8	AmpLink Out 1-8	AmpLink Out 1-8	ESPLink Out 1-8	ESPLink Out 1-8	In 9-12				In 9-12
6				Dante In/Out 1-32			Dante In/Out 1-32			AmpLink Out 1-8	AmpLink Out 1-4			AmpLink Out 1-8
7										Dante In/Out 1-64	Dante In/Out 1-16	Dante In/Out 1-16		Dante In/Out 1-64
8										AEC In/Out 1-12	AEC In/Out 1-8	AEC In/Out 1-12		
9									VoIP In/Out 1-2	VoIP In/Out 1				
A									USB	USB			USB	
B									PSTN	PSTN				

Slot	PM8xxxN	PM4xxxN	PSx04D
1	In A-D	In A-D	In 1-4
2	Out 1-4	Out 1-4	Out 1-4
3	In E-H		
4	Out 5-8		

Table 2

Note: For 8ch PowerMatch and PowerShare devices the Get Signal Level (GL) command only uses Slot 1 (for Inputs) and Slot 2 (for Outputs) for all 8 channels.

5.1 Set/Get Input/Output Volume (SV, GV)

Input and output volume levels are referenced by slot and channel numbers per the physical architecture of the device (refer to [Table 1](#) at the start of this section). PowerMatch and PowerShare devices only support volume control of the outputs, not the inputs.

Note: Set Volume commands will be ignored if the channel is muted.

To set the input/output volume of slot *s*, channel *c*, to level *l*:

`SV s,c,l <CR>` where *s* is the slot number (refer to [Table 1](#) at the start of this section)
c is the channel number, 1 – 8 (for ESP), 1 - 4 (for PM and PS)
l is the level, 0h(-60dB) to 90h(+12dB) in 0.5dB steps (0-144 dec) or PM and PS 0h(-60dB) to 78h(0dB) in 0.5dB steps (0-120 dec)

To query the input/output level of slot *s*, channel *c*:

`GV s,c<CR>` where *s* is the slot number, (refer to [Table 1](#) at the start of this section)
c is the channel number, 1 – 8 (for ESP), 1 - 4 (for PM and PS)

For slots with high numbers of channels, the channel number is relative to the slot, not to the device. Examples:

- EX-1280C Analog Input 12 = Slot 5, Ch 4
- ESP-880A Analog Output 6 = Slot 4, Ch 2

Furthermore, slot and channel numbers are hexadecimal. Examples:

- EX-440C Dante Input 12 = Slot 7, Ch C (Ch 12 = 0x0C)
- EX-1280C USB Input 1 = Slot A, Ch 1 (Slot 10 = 0x0A)

For slots with both inputs and outputs, the set of output channels immediately follows the set of input channels. Examples:

- Dante In 1–16 = Ch 1–16 & Dante Out 1–16 = Ch 17–32
- USB In 1–2 = Ch 1–2 & USB Out 1–2 = Ch 3–4
- EX-12AEC Dante Output 7 = Slot 7, Ch 17 (Ch 23 (16 inputs + 7th output) = 0x17)
- EX-1280C USB Output 1 = Slot A, Ch 3 (Ch 3 (2 inputs + 1st output))

Response:

`GV s,c,l` where *s,c,l* are the same as above

EXAMPLES:

`SV 1,3,50<CR>` Set volume for slot 1, channel 3 to -20dB
`GV 2,1<CR>` Query the volume level for slot 2, channel 1
`GV 2,1,78<CR>` Response indicating the level for slot 2 channel 1 is set to 0dB

5.2 Set Volume Increment/Decrement (SI)

Input and output volume levels are referenced by slot and channel numbers per the physical architecture of the device (refer to [Table 1](#) at the start of this section). PowerMatch and PowerShare devices only support volume control of the outputs, not the inputs.

Note: Set Volume Increment/Decrement commands will be ignored if the channel is muted.

To increment (or decrement) the level of slot *s*, channel *c*:

`SI s,c,d,x<CR>` where *s* is the slot number (refer to [Table 1](#) at the start of this section)
c is the channel number, 1 – 8 (for ESP), 1 - 4 (for PM and PS)
d is the direction, 1=up or 0=down
x is the number of 0.5dB steps in hexadecimal (e.g. 5dB = A)

EXAMPLES:

`SI 2,3,1,6<CR>` Increase the level of slot 2, channel 3 by 3dB
`SI 4,1,0,3<CR>` Decrease the level of slot 4, channel 1 by 1.5dB

5.3 Set/Get Input/Output Mute (SM, GM)

Input and output volume levels are referenced by slot and channel numbers per the physical architecture of the device (refer to [Table 1](#) at the start of this section). PowerMatch and PowerShare devices only support volume control of the outputs, not the inputs.

To set or change the Mute status for slot *s*, channel *c*:

SM *s,c,m*<CR> where ***s*** is the slot number (refer to [Table 1](#) at the start of this section)
c is the channel number, 1 – 8 (for ESP), 1 - 4 (for PM and PS)
m is the state, M = Mute, U = Un-mute, T = Toggle mute state

To query the Mute status for slot *s*, channel *c*:

GM *s,c*<CR> where ***s*** is the slot number, (refer to [Table 1](#) at the start of this section)
c is the channel number, 1 – 8 (for ESP), 1 - 4 (for PM and PS)

Response:

GM *s,c,m* where ***s,c,m*** are the same as above

EXAMPLES:

SM 2,1,M<CR> Engage Mute for slot 2, channel 1
GM 3,2<CR> Query the Mute status for slot 3, channel 2
GM 3,2,U<CR> Response indicating slot 3, channel 2 is un-muted

5.4 Get Signal Level (GL)

This command can be used to query the current signal levels for inputs, outputs, and AEC on processors and amplifiers.

The GL command returns an array of channel levels in hexadecimal. The level must be converted to the appropriate unit for the queried device and channel type by first converting the level to decimal and then applying the following formula, unless otherwise noted.

$$dB_{unit} = \frac{level - 120}{2}$$

- All analog input, digital input, and digital output levels are represented as dBFS from -60.0dBFS to 0.0dBFS in 0.5dB steps.

$$dBFS = dB_{unit}$$

- Fixed I/O ESP and EX analog output levels are represented as dBu from -35.0dBu to 25.0dBu in 0.5dB steps.

$$dBu = dB_{unit} + 25$$

- ESP-00 analog output levels are represented as dBu from -36.0dBu to 24.0dBu in 0.5dB steps.

$$dBu = dB_{unit} + 24$$

- PowerMatch and PowerShare analog output levels are represented as dBV max from -60.0dBV to 0.0dBV in 0.5dB steps. For a mono channel, $V_{max} = 71V = 0dBV$. For a bridged/quad channel, $V_{max} = 141V = 0dBV$.

$$dBV = dB_{unit}$$

- EX processors with an AEC module provide three different levels – input, ERL, and ERLE.
 - Input levels are represented as dBFS from -60.0dBFS to 0.0dBFS in 0.5dB steps.

$$dBFS = dB_{unit}$$

- ERL levels are represented as dB from -60.0dB to +20.0dB in 0.5dB steps.

$$dB = dB_{unit}$$

- ERLE levels are represented as dB from -60.0dB to 0.0dB in 0.5dB steps.

$$dB = dB_{unit}$$

To query the current signal level for channels in slot s:

Request:

GL **s**<CR> where **s** is the slot index (refer to GL Indices)

Response:

GL **s [1,...,N]**<CR> where **s** is the slot index (refer to GL Indices) and **1..N** are the current signal levels for channels 1 to N.

To query the current signal levels for parameters p in slot s:

Request:

GL **s,p**<CR> where **s** is the slot index and **p** is the parameter index (refer to GL Indices)

Response:

GL **s,p [1,...,N]**<CR> where **s** is the slot index, **p** is the parameter index (refer to GL Indices), and **1..N** are the current signal levels for channels 1 to N.

EXAMPLES:

GL 1<CR>	Request ESP analog input levels for channels 1-4 (Slot 1)
GL 1 [78,1,40,64]<CR>	Response indicating ESP input levels are 0.0, -59.5, -28.0, and -10.0dBFS
GL 2<CR>	Request PowerMatch output levels for channels 1-8 (Slot 2)
GL 2 [0,0,0,0,0,0,64,64]<CR>	Response indicating PowerMatch output level is -10.0dBV max on channels 7 and 8
GL 8,3<CR>	Request AEC ERLE levels (Slot 8, Parameter 3)
GL 8,3 [28,0,0,0,0,0,0,0,0,0]<CR>	Response indicating AEC ERLE level for channel 1 is -40.0dB

GL Indices

Module	ESP-00 II	ESP-880	ESP-880A	ESP-880AD	ESP-1240	ESP-1240A	ESP-1240AD	ESP-1600	ESP-4120	EX-12AEC	EX-440C	EX-1280	EX-1280C	PM4250N PM4500	PM8250N PM8500N	PS404D PS604D
In 1-4		1	1	1	1	1	1	1	1		3	3	3	1	1	1
In 5-8		3	3	3	2	2	2	2				4	4		1	
In 9-12					3	3	3	3				5	5			
In 13-16								4								
Out 1-4		2	2	2	4	4	4		2		1	1	1	2	2	2
Out 5-8	Slot Index	4	4	4					3			2	2		2	
Out 9-12									4							
ESPLink		5			5			5	5							
AmpLink			5	5		5	5				6	6	6			
Dante				6			6			7	7	7	7			
VoIP											9		9			
USB											A	A	A			
PSTN											B		B			
AEC (Input)										8,1	8,1		8,1			
AEC (ERL)										8,2	8,2		8,2			
AEC (ERLE)										8,3	8,3		8,3			

5.5 Set/Get IP Address (IP)

The Set and Get IP address commands provide an alternative method for querying and changing the IP address of ControlSpace Devices when the Hardware Manager in ControlSpace Designer software is unavailable. This can be particularly useful when the network settings for an ESP (which does not have a front panel display) are unknown, but you do have access to the RS232 serial port.

To query the current IP address for the device:

IP<CR>

Response:

IP xxx.xxx.xxx.xxx <CR>

To set or change the IP address for the device:

IP xxx.xxx.xxx.xxx <CR>

EXAMPLES:

IP<CR>

Query the current IP address for the device

IP 192.168.0.160<CR>

Response indicating an IP address of 192.168.0.160 is set

IP 192.168.1.160<CR>

Command changing the IP address to 192.168.1.160 (after boot)

Note: When using the IP command to change IP address, the changes do not take effect until after the device has been re-booted.

5.6 Network Parameters (NP)

The Network Parameter command allows additional network settings such as; Subnet Mask, Default Gateway and DHCP mode to be set or queried. There is also a command to return all network settings (including the IP address) to their default network settings. This can be particularly useful when the network settings for an ESP (which does not have a front panel display) are unknown, but you do have access to the RS232 serial port.

To query a specific network setting for the device:

`NP p<CR>` where **p** is the network parameter to query, T = Type (DHCP or Static, not available for ESP-00),
M = Subnet Mask, G = Default Gateway

Response:

`NP p,v <CR>` where **p** is the is the network parameter queried
v is the value, D = DHCP or S = Static IP for Type <or>
xxx.xxx.xxx.xxx address for Subnet Mask and Default Gateway

To set a specific network setting for the device:

`NP p,v<CR>` where **p** is the network parameter to set, T = Type (DHCP or Static),
M = Subnet Mask, G = Default Gateway
v is the value, D = DHCP or S = Static IP for Type <or>
xxx.xxx.xxx.xxx address for Subnet Mask and Default Gateway

To reset all network parameters for the device to defaults:

`NP F<CR>`

Note: Any changes to network parameters do not take effect until after the device has been re-booted or restarted using the 'RESET<CR>' command.

EXAMPLES:

<code>NP M<CR></code>	Query the current Subnet Mask for the device
<code>NP M,255.255.255.0<CR></code>	Response indicating a Subnet Mask of 255.255.255.0
<code>NP M,255.255.255.128<CR></code>	Command to change Mask to 255.255.255.128 (after reboot)
<code>NP G,192.168.0.2<CR></code>	Command to change Gateway to 192.168.0.2 (after reboot)
<code>NP T<CR></code>	Query the current networking mode for the device
<code>NP T,D<CR></code>	Response indicating device is currently set to DHCP
<code>NP T,S<CR></code>	Command for device to change to static IP addresses
<code>NP F<CR></code>	Command to reset network settings to defaults

Default Network Settings

Device	Mode	IP Address	Default Gateway
ESP-00/88	Static	192.168.0.160/24	192.168.0.1/24
ESP-880/880A/880AD ESP-1240/1240A/1240AD ESP-1600/4120 EX-12AEC/440C/1280/1280C PM4250N/4500N/8250N/8500N PS404D/604D	DHCP	169.254.0.0/16	N/A

Note: For the EX processor, resetting all network parameters to their defaults applies to the control connection only. The VoIP settings remain unaffected.

5.7 Reset/Reboot Device (RESET)

The Reset command instructs a device to restart (the equivalent of power-cycling or rebooting). This can be useful when making IP address or Network Parameter changes remotely since the changes only take effect after the device has been rebooted.

When connected via RS232, an ESP will send a “Ready” string once the boot process is completed, whereas serial-over-Ethernet connections will need to be re-established once sufficient time has elapsed. The time it takes for a device to boot varies depending on the device type and the installed cards.

To reset/reboot a device:

`RESET<CR>`

Note: Just like when the device is rebooted manually, all the current settings in the device will be lost and the device will revert to its power-on (flashed) settings.

EXAMPLE:

`RESET<CR>` Request the device to restart/reboot

5.8 Set/Get Standby Status (SY, GY) [PowerMatch and PowerShare Only]

The Set and Get Standby Status commands allow the power state of an individual PowerMatch and PowerShare amplifier to be controlled remotely. Since entering or exiting standby is not immediate, adequate time should be allowed for the process to complete.

Alternatively, the power state can also be controlled via Parameter Set using the device’s ‘Standby’ property. This option allows multiple PowerMatch and PowerShare devices to be controlled together.

Note: This command is not supported on ESP devices

To set or change the standby state for a PowerMatch and PowerMatch amplifier:

`SY s<CR>` where `s` is the state, S = Standby, N = Normal

To query the current standby state for the device:

`GY<CR>` where `s` is the slot number, (refer to [Table 1](#) at the start of this section)

Response:

`GY s <CR>` where `s` is the state, S = Standby, N = Normal

EXAMPLES:

SY S<CR> *Put the PowerMatch and PowerShare device into standby mode*
GY <CR> *Query the current standby state*
GY N<CR> *Response indicating PowerMatch and PowerShare device is in Normal state (On)*

5.9 Get Configuration (GC) [PowerMatch Only]

The Get Configuration (GC) command returns the current output configuration of a PowerMatch amplifier. Knowledge of the output configuration can be useful when using the module (SA/GA) commands to change parameters.

To query the current output configuration

GC<CR>

Response:

GC 1,2,3,4,5,6,7,8<CR> where **1-8** is the configured state for each channel of the Amplifier (1-4 for PM4250N/PM4500N): IN= Independent (Mono), BL = Bridged (LoZ), B7 = Bridged (70v), B1 = Bridged (100v), PA = Parallel, QL = Quad (LoZ), Q7 = Quad (70v), Q1 = Quad (100v)

EXAMPLES:

GC <CR> *Query the current output configuration*
GC IN,IN,BL,BL,Q7,Q7,Q7,Q7<CR> *Response indicating channels 1&2 are Independent, 3&4 are Bridged (Lo-Z) and 5-8 are in Quad (70v) mode*

5.10 Set/Get Fault Status (SF, GF) [PowerMatch Only]

The Get Fault Status (GF) command queries the current state of the Fault Output on a PowerMatch amplifier. The Set Fault status (SF) command enables or disables unsolicited transmission of changes to the Fault Output state. The format of the unsolicited message is the same as the response to the Get Fault status (GF) command.

Note: *The Set Fault status (SF) preference is not retained on power down and will default to 'Off' each time the amplifier is powered up.*

To set (enable or disable) unsolicited notification of Fault Output state changes:

SF **n**<CR> where **n** is the notification state, O = On, F = Off

To query the current Fault status:

GF<CR>

Response:

GF **f**<CR> where **f** is the current Fault status, F= Fault, C = No Fault

EXAMPLES:

SF O<CR> *Enable unsolicited output of Fault Output state changes*
GF <CR> *Query the current status of the Fault Output*
GF F<CR> *Response indicating that the PowerMatch device is currently in a fault state*

5.11 Clear Fault/Alarms (CF) [PowerMatch Only]

The Clear Fault/Alarms (CF) command clears any currently active alarm conditions, and resets the Fault Output on a PowerMatch device. Note that if any alarm or fault conditions are still present after the reset, the alarm status and Fault output will be automatically set again.

To clear currently active alarm conditions/Fault output:

CF<CR>

Response:

<ACK><CR>

EXAMPLES:

CF<CR>

Command to clear active alarms/reset fault state

<ACK><CR>

Response indicating action was successful

5.12 Set/Get Alarm Reporting/Status (SR, GR) [PowerMatch Only]

The Get Alarm Reporting (GR) command queries the current alarm/fault status for a channel of a PowerMatch amplifier, whilst the Set Alarm Reporting (SR) command enables or disables unsolicited transmission of alarm and fault events when they occur. The format of the unsolicited message is the same as the response to the Get Alarm Status (GR) command.

Note: The Set Alarm Reporting (SR) preference is not retained on power down and will default to 'Off' each time the amplifier is powered up.

To set (enable or disable) unsolicited notification of alarm/fault notifications:

SR *n*<CR> where *n* is the notification state, O = On, F = Off

Unsolicited notification format:

GR *c,s,t,x*<CR> where *c* is the channel number, 1 – 8 (or 0 for non-channel specific alarms such as Digital Audio Loss or AC Mains Loss)

s is the severity; W=Warning, F=Fault, S= System

t is the alarm type; N=No Alarm, O=Open, S=Short, A=ACLoss, D=Digital Audio Loss, I=I-Share Jumper Missing, L=Limiting, C=Clip (Input), P=Protection, Z = Other

x is the condition; S=Set, C=Clear (not used for all alarms/faults)

To query the current alarm status for a single channel:

GR *c*<CR> where *c* is the channel number, 1 – 8 (1 – 4 for PM4500N/PM4250N)

Response:

GR *c,s,t*<CR> where *c* is the channel number, 1 – 8

s is the severity; W= Warning, F=Fault, S= System, N=No Alarm

t is the alarm type; N=None, O=Open, S=Short, I=I-Share Jumper Missing, Z = Other

Note: If multiple alarms/faults exist for the same channel, the one with the highest severity will be returned.

The transient nature of alarms such as limiting or clipping means they cannot be queried manually.

To receive such alarms, turn on automatic notification. Only the first instance of limiting or clipping for a given channel is reported, so for continued monitoring alarms should be cleared after each notification.

EXAMPLES:

SR O<CR>	Enable unsolicited notification of Alarm/Fault conditions
GR 5,F,I,S<CR>	Unsolicited notification that the I share jumper is missing for channels 5 & 6
GR 6,F,I,S<CR>	
GR 4<CR>	Query the current alarm/fault status for channel 4
GR 4,F,S<CR>	Response indicating that ch4 has a 'SHORT' fault condition

5.13 Get/Clear Alarm History/Log (GH, CH) [PowerMatch, PowerShare Only]

The Get Alarm History (GH) command requests a dump of the internal alarm history/log to the serial output, whilst the Clear Alarm History (CH) command causes the internal alarm log to be cleared.

Note: The alarm log is returned in a similar format to the front panel display or the alarm panel in ControlSpace Designer software. Actual time/date values will only be returned if there has been no loss in power since last connected to ControlSpace Designer software. Otherwise, relative values since last power-up will be returned.

To query/request the alarm log:

GH<CR>

Response:

GH [Time, Date, Description<CR>

Time, Date, Description<CR>

.....

Time, Date, Description]<CR>

To clear the internal alarm history/log

CH<CR>

Response:

<ACK><CR>

EXAMPLES:

CH<CR>	Request Alarm log be cleared
<ACK><CR>	Response indicating command was successful

6 Module Commands

Module commands allow control of parameters for a specific signal processing module on a specific device.

Set/Get Module Parameter (SA, GA), Invoke Module Action (MA)

The Set and Get Module Parameter commands provide access to virtually any parameter from any signal processing module of any ControlSpace device. Devices and Modules are referenced by their label assigned via ControlSpace Designer software. Unlike the ESP and EX devices where most signal processing module labels are user-definable, only the Input and Amp Output modules can be renamed on PowerMatch and PowerShare devices.

Note: Module labels must be unique. If two modules within the same device have the same name, then the SA, GA and MA commands will not work correctly. For example; if an Output module and a PEQ module are both named "Left" neither module will respond correctly.

In combination with the module label, the parameter to change or query is identified using 1, 2 or (for a few modules only) 3 indices. These indices are unique to each type of module and are detailed at the end of this section.

Automatic notification (#Module Name)

In addition to querying the parameters for each module, it is also possible to receive automatic notifications when a module's parameters change by prefixing the module name with "#" in ControlSpace Designer software. For example, by renaming module "Hall" to "#Hall", a GA (Get Module Parameter) response will be issued over the serial connection when any of the parameters for that module are changed by other devices in the system, such as CC-16 or CC-64 user interfaces.



Note: For Analog I/O on EX-Processors the "#" should be added to the individual channel name, not the container block.

Note: A response will not be sent if the change is made via serial command.

To set or change a module parameter (SA):

SA "Module Name">Index 1>Index 2=Value<CR>

where "Module Name"	is a unique Label set using Designer software
>	'greater than' (ASCII 0x3E) is the separator between indices
Index 1	Index 1 is the primary index (all modules)
Index 2	Index 2 is a secondary index (some modules)
=	'equals' (ASCII 0x3D) indicates Value follows
Value	Value of parameter referenced by Module/Indices

Response:

<ACK> if command is successful (ASCII 0x06)

or

<NAK> *nn* if command is received but unsuccessful (ASCII 0x15),

where *nn* is a 2-digit error code, detailed in the following table:

Code	Error
01	Invalid Module Name (no match found for module name – or duplicate name)
02	Illegal Index (index value or quantity incorrect for specified module)
03	Value is out-of-range (value is not permitted for the specified parameter)
99	Unknown error

To query a module parameter (GA):

GA "Module Name">Index 1>Index 2<CR>

where "Module Name" is a unique Label set using Designer software

> 'greater than' (ASCII 0x3E) is the separator between indices

Index 1 **Index 1** is the primary index (all modules)

Index 2 **Index 2** is a secondary index (some modules)

Response:

GA "Module Name">Index 1>Index 2>=Value<CR>

For ESP processors, it is possible to send a Module command to a different device than the one on which the module resides, provided the ESPs are correctly networked together. This facility is not available for PowerMatch amplifiers so commands should be sent to each device individually.

To set or change a module parameter on a different Device (SA):

SA @ "Device Name" "Module Name">Index 1>Index 2=Value<CR>

where @ 'at' (ASCII 0x40) identifies that the command is for a different device

"Device Name" is the unique device label from ControlSpace Designer

Response:

<ACK> if command is successful (ASCII 0x06)

or

<NAK> *nn* if command is received but unsuccessful (ASCII 0x15),

where *nn* is a 2-digit error code – same as above

To query a module parameter on a different Device (GA):

GA @ "Device Name" "Module Name">Index 1>Index 2 <CR>

where @ 'at' (ASCII 0x40) identifies that the command is for a different device

"Device Name" is the unique device label from ControlSpace Designer

Response:

GA "Module Name">Index 1>Index 2>=Value<CR>

There are a few modules (e.g. PSTN Input or VoIP Input) that, in addition to having parameters that can be adjusted, also have actions that can be invoked (e.g. Make Call) using the Module Action (MA) command.

To invoke an action for a module (MA): *(Only supported on a limited number of modules)*

MA "Module Name">Index 1=Parameter<CR>

where "Module Name" is the unique module name from Designer software
 > 'greater than' (ASCII 0x3E) is the separator between indices
 Index 1 **Index 1** is the primary index
 = 'equals' (ASCII 0x3D) indicates Parameter follows
 Parameter Parameter required by Module Action

Response:

<ACK> if command is successful (ASCII 0x06)

or

<NAK> *nn* if command is received but unsuccessful (ASCII 0x15),

where *nn* is a 2-digit error code – same as above

6.1 ESP/EX Module Indices



6.1.1 INPUT Module

For EX processors, inputs are displayed as a composite module with a user-specified number of channels but are still addressed individually via serial command using the 'channel' label (e.g. "Input 1"), and to receive automatic notification of changes the "#" prefix should be added to the 'channel' label and not the 'container' label.

Depending on the card type or processor, the Input module has up to 5 parameters which can be controlled, selected using the appropriate value for



	Parameter	Format	Mic/Line II, 1U ESP or EX	Legacy Mic/Line or 4x4	
Index 1	1	Type	M,L	Unused	
	2	Gain	NN	0,14,24,32,44,54,64	
	3	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step	
	4	Mute	O,F,T	O=On, F=Off, T=Toggle	
	5	Phantom	O,F,T	O=On, F=Off, T=Toggle	

EXAMPLES:

SA"Input 1">3=-21<CR>

Set the level for Input module "Input 1" to -21dB

SA"Input 1">4=O<CR>

Set the mute for Input module "Input 1" to On

GA"Input 2">5<CR>

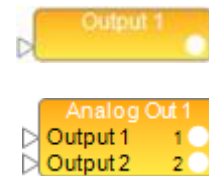
Query whether phantom power is active for Input module "Input 2"

GA"Input 2">5=F<CR>

Response indicating phantom power for "Input 2" is currently Off

6.1.2 OUTPUT Module

For EX processors, outputs are displayed as a composite module with a user-specified number of channels but are still addressed individually via serial command using the 'channel' label (e.g. "Output 2"), and to receive automatic notification of changes the "#" prefix should be added to the 'channel' label and not the 'container' label.



The Output module has 3 parameters which can be controlled, selected using the appropriate value for **Index 1**.

		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

<code>SA"Output 1">1=-3.5<CR></code>	<i>Set the level for Output module "Output 1" to -3.5dB</i>
<code>SA"Output L">2=F<CR></code>	<i>Set the mute for Output module "Output L" to Off</i>
<code>GA"Main L">1<CR></code>	<i>Query the current level for Output module "Main L"</i>
<code>GA"Main L">1=-6<CR></code>	<i>Response indicating "Main L" is currently set to -6dB</i>

6.1.3 ESPLink Module [ESP Only]

ESPLink outputs are presented as a single composite module, but are controlled as individual channels, addressed using a combination of the module and channel name: "[ModuleName]-[ChannelName]". By default, this would be "ESPLink 1-Ch 1" to "ESPLink 1-Ch 8" respectively, but both labels can be changed in ControlSpace Designer software.



There are 3 parameters which can be controlled for each output, selected using the appropriate value for **Index 1**.

		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

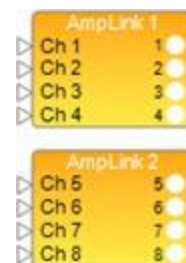
EXAMPLES:

<code>SA"ESPLink 1-Ch 1">1=-3.5<CR></code>	<i>Set the level for channel 1 of ESPLink 1 to -3.5dB</i>
<code>SA"ESPLink 1-Ch 5">2=F<CR></code>	<i>Set the mute for channel 5 of ESPLink 1 to Off</i>
<code>GA"ESPLink 1-Ch 3">1<CR></code>	<i>Query the current level for channel 3 of ESPLink 1</i>
<code>GA"ESPLink 1-Ch 3">1=-6<CR></code>	<i>Response indicating channel 3 is set to -6dB</i>

6.1.4 AmpLink Module

For EX and ESP processors with AmpLink support, AmpLink outputs are displayed as a composite module with a user-specified number of channels, but are controlled as individual outputs, addressed using a combination of the module and channel name: “[ModuleName]-[ChannelName]”. By default, this would be “AmpLink-Ch 1” to “AmpLink 1-Ch 8” respectively, but both labels can be changed in ControlSpace Designer software.

There are 3 parameters which can be set for each output, selected by using the appropriate value for **Index 1**.



		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"AmpLink-Ch 2">1=-4.5<CR> *Set the level for channel 2 of AmpLink to -4.5dB*
 SA"AmpLink-Ch 5">2=O<CR> *Set the mute for channel 5 of AmpLink to ON*
 GA"AmpLink-Ch 7">1<CR> *Query the current level for channel 7 of AmpLink*
 GA"AmpLink-Ch 7">1=-9<CR> *Response indicating channel 3 is currently set to -9dB*

6.1.5 DANTE I/O Modules

SA/GA commands are supported to control Dante input and output modules using the channel name as “[ModuleName]-[ChannelName]”. Polarity is only supported on Dante Outputs. This also enables subscription (SUB and UNS commands) for Dante Module entries.



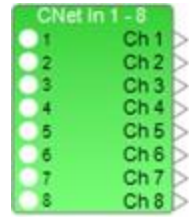
		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"Dante 1-Input 1">1=10.0<CR> *Set the level for Channel 1 of Dante Input to 10.0dB*
 SA"Dante 1-Input 1">2=O<CR> *Set the mute for Channel 1 of Dante Input to ON*
 GA"Dante 1-Input 3">1<CR> *Query the current level for Channel 3 of Dante Input*
 GA"Dante 1-Input 3">1=11.0<CR> *Response indicating Channel 3 of Dante Input is currently set to 11.0 dB*

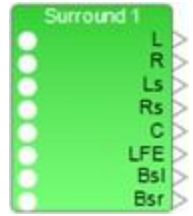
6.1.6 COBRANET I/O Modules [ESP-00 only]

Direct control of CobraNet Input and Output modules via serial command is not currently supported. Instead, parameters can be changed indirectly using Parameter Sets.



6.1.7 SURROUND INPUT Module [ESP-00 only]

In total there are 11 parameters which can be accessed for this module, selected simply by using the appropriate value for **Index 1**. By their nature Output Format and Room Type will be read-only.



		Parameter	Format	Value Range
Index 1	1	Input Source	O,C	O=Optical, C=Coaxial
	2	Output Format (read-only)	SSSSS	N=No Signal, PCM16=PCM, DD51=Dolby5.1, DTS51=DTS5.1, ES61D=DTS6.1 Discrete ES61M=DTS6.1 Matrix DD1=Dolby1.0, DD2=Dolby2.0, DTS1=DTS1.0, DTS2=DTS2.0, DTS21=DTS2.1, DTS30=DTS3.0, DTS40=DTS4.0, DTS50=DTS5.0
	3	Room Type (read-only)	S,L,N	S=Small, L=Large, N=None
	4	Left Front Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	5	Right Front Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	6	Left Surround Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	7	Right Surround Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	8	Center Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	9	LFE (Sub) Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	10	Back Surround Left Level	(-)NN.N	-60.5 to 12.0, 0.5 step
	11	Back Surround Right Level	(-)NN.N	-60.5 to 12.0, 0.5 step

EXAMPLES:

SA"Surround 1">1=C<CR>

Select the coaxial input for Surround card "Surround 1"

SA"Surround 1">8=-5<CR>

Set the center channel level for "Surround 1" to -5dB

GA"Surround 1">2<CR>

Query the current Output Format from the digital stream

GA"Surround 1">2=DD51<CR>

Response indicating current format is Dolby Digital 5.1

6.1.8 PSTN INPUT Module [EX Only]

The PSTN (Public Switched Telephone Network) Input module is only available on EX processors. In addition to controlling the audio input, this module also carries the call settings for PSTN. Call settings are accessed by setting **Index 1 = 0** and the audio input parameters by setting **Index 1 = 1**.



Call Settings (Index 1=0)		Format	Value Range
Index 2	1	Call Status (read-only)	SSSSSS Current call status description. One of: "HANGUP" "INCOMING" "ACTIVE" "ERROR"
	2	Caller ID (read-only)	SS&SS&SS "MM/DD hh:mm&Number&Name" e.g., "10/31 11:10&15085555555&AName"
	3	Ring Level	(-)NN.N -30 to +10dB, 1dB step
	4	DTMF Level	(-)NN.N -20 to +10dB, 1dB step
	5	<i>Reserved</i>	
	6	Auto Answer	N # Of rings, 0 (off) to 8, 1 step
	7	Country Code	NNN 0 to 196, configures PSTN to work with the telephone system of the specified country. See Appendix A for country list.
	8	Call Active (read-only)	O,F O=On, F=Off
	9	Manual Hook	O,F,T O=On, F=Off, T=Toggle

Audio Input (Index 1=1)		Format	Value Range
Index 2	1	Level	(-)NN.N -60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T O=On, F=Off, T=Toggle

EXAMPLES:

SA"PSTN In 1">0>3=-6<CR> Set the ring level for PSTN input "PSTN In 1" to -6 dB
 SA"PSTN In 1">0>6=4<CR> Set PSTN input "PSTN In 1" to auto-answer after 4 rings
 GA"PSTN In 1">1>2<CR> Query whether the input "PSTN In 1" is muted
 GA"PSTN In 1">1>2=O<CR> Response indicating that the "PSTN In 1" input is muted

In addition, the PSTN Input module also makes use of the **Module Action (MA)** command to allow the following actions to be invoked for the PSTN line.

Module Actions		Format	Value Range
Index 1	1	Dial Key	SSSSSS 0-9,#,*,! (! is same as 'Hook Flash') (This action is available only during an active call.)
	2	Make Call	SSSSSS "08707414500" <or> "101"
	3	End Call	-
	4	Answer Call	-

EXAMPLES:

MA"PSTN In 1">2="08707414500"<CR> Initiate call to "08707414500" via PSTN line
 MA"PSTN In 1">3<CR> End current call on PSTN Line "PSTN In 1"
 MA"PSTN In 1">1="#"<CR> Press the "#" key on PSTN Line "PSTN In 1"

6.1.9 PSTN OUTPUT Module [EX Only]

The PSTN (Public Switched Telephone Network) Output module is only available on EX processors. There are 2 parameters which can be controlled, selected using the appropriate value for **Index 1**.



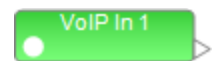
Parameter		Format	Value Range
Index 1	1	Level	(-)NN.N -60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T O=On, F=Off, T=Toggle

EXAMPLES:

SA"PSTN Out 1">1=-8.0<CR> Set the level for "PSTN Out 1" to -8.0dB
 GA"PSTN Out 1">2<CR> Query the state of the mute for PSTN Output "PSTN Out 1"
 GA"PSTN Out 1">2=F<CR> Response indicating that "PSTN Out 1" is currently unmuted

6.1.10 VoIP INPUT Module [EX Only]

The VoIP (Voice over IP) Input module is only available on EX processors. In addition to controlling the audio input, this module also carries the call settings for the VoIP Line. Call settings are accessed using **Index 1 = 0**, and the audio input parameters using **Index 1 = 1**.



Note: VoIP network and registration settings are configured via a web page interface, accessible via ControlSpace Designer software or directly by entering the VoIP IP address in a browser.

Call Settings (Index 1=0)		Format	Value Range	
Index 2	0	Account Status (read-only)	SSSSSS Current account status description. One of: "NOT_CONFIGURED" "CONFIGURED" "P2P_REGISTERED" "PROXY_REGISTERING" "PROXY_REGISTERED" "PROXY_TIMEOUT"	
	1	Call Status (read-only)	SSSSSS Current call status description. One of: "INCOMING" "DIALING" "RINGBACK" "ACTIVE" "HANGUP" "HOLD_STATE_PEER"	
	2	Caller ID (read-only)	SS<SS@SS> " Name <sip:User@Domain/Host>" e.g. " ConfRm12 <sip:201@192.168.0.15>"	
	3	<i>Reserved</i>		
	4	<i>Reserved</i>		
	5	<i>Reserved</i>		
	6	Call Active (read-only)	O,F	O=On, F=Off
	7	Auto Answer	N	# Of rings, 0 (off) to 8, 1 step

Audio Input (Index 1=1)		Format	Value Range
Index 2	1	Level	(-)NN.N -60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T O=On, F=Off, T=Toggle

EXAMPLES:

SA"VoIP In 1">1>1=-6<CR>

Set the level for "VoIP In 1" to -6 dB

SA"VoIP In 1">0>7=5<CR>

Set VoIP input "VoIP In 1" to auto-answer after 5 rings

GA"VoIP In 1">0>1<CR>

Query the current call status for "VoIP In 1"

GA"VoIP In 1">0>1="ACTIVE"<CR>

Response indicating "VoIP In 1" has an active call

In addition, the VoIP Input module also makes use of the **Module Action (MA)** command to allow the following actions to be invoked for the VoIP line.

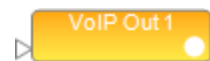
Module Actions		Format	Value Range	
Index 1	1	Dial Key	S	0-9,#,* (This action is available only during an active call.)
	2	Make Call	SSSSSSS	"08707414500" <or> "101" <or> "sip:1234@192.168.1.240"
	3	End Call	-	
	4	Answer Call	-	
	5	TransferCall	SSSSSSS	"08707414500" <or> "101" <or> "sip:1234@192.168.1.240"

EXAMPLES:

MA"VoIP In 1">2="08707414500"<CR> *Initiate call to "08707414500" via "VoIP In 1"*
MA"VoIP In 1">3<CR> *End call on VoIP Line "VoIP In 1"*
MA"VoIP In 1">1="#"<CR> *Press the "#" key on VoIP Line "VoIP In 1"*

6.1.11 VoIP OUTPUT Module [EX Only]

The VoIP Output module is only available on EX processors. There are 2 parameters which can be controlled, selected using the appropriate value for **Index 1**.



Audio Input (Index 1=1)		Format	Value Range	
Index 2	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"VoIP Out 1">1=-12<CR> *Set the level for "VoIP Out 1" to -12dB*
GA"Line 1">2<CR> *Query the state of the mute for VoIP output "Line 1"*
GA"VoIP Out 1">2=O<CR> *Response indicating that "Line 1" is currently muted*

6.1.12 USB INPUT Module [EX Only]

The USB Input module is currently only supported on EX processors. The two channels of the USB Input are controlled individually, with the value for **Index 1** selecting the channel and **Index 2** selecting between the two parameters.



Audio Input (Index 1=1)		Format	Value Range	
Index 2	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"USB In 1">1>1=-21<CR> Set the level of the left channel of USB Input "USB In 1" to -21dB
 GA"USB In 1">2>2<CR> Query whether the right channel of USB Input "USB In 1" is muted
 Response indicating the right channel of "USB In 1" is currently
 un-muted
 GA"USB In 1">2>2=F<CR> un-muted

6.1.13 USB OUTPUT Module [EX Only]

The USB Output module is currently only supported on EX processors. The two channels of the USB Output are controlled individually, with the value for **Index 1** selecting the channel and **Index 2** selecting between the two parameters.



Audio Input (Index 1=1)		Format	Value Range
Index 2	1	Level	(-)NN.N
	2	Mute	O,F,T

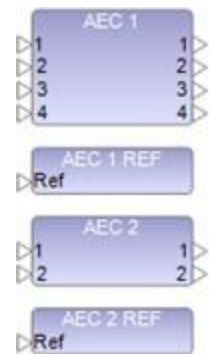
EXAMPLES:

SA"USB Out 1">2>1=-16.5<CR> Set the level of the right channel of USB Output "USB Out 1" to -16.5dB
 GA"USB Out 1">1>2<CR> Query whether the left channel of USB Output "USB Out 1" is muted
 Response indicating the left channel of "USB Out 1" is currently
 un-muted
 GA"USB Out 1">1>2=F<CR>

6.1.14 ACOUSTIC ECHO CANCELLER Module [EX Only]

The Acoustic Echo Canceller module on EX processors has a total of 12 channels that can be sub-divided into 4 modules, each with a dedicated reference input in ControlSpace Designer software, but remains a single module of 12 channels via serial command, addressed as "AEC".

Index 1 is used to select the input (1-12) and **Index 2** is used to select the parameter to adjust per the table below.



Input Parameters (Index 1 = 1-12)		Format	Value Range	
Index 1	1	Reserved		
	2	Reserved		
	3	Reserved		
	4	Reserved		
	5	Internal Mute	O,F,T	O=On, F=Off, T=Toggle
	6	AEC Enable	O,F,T	O=On, F=Off, T=Toggle
	7	NLP Control	N	1 = Light, 2 = Medium, 3 = Strong
	8	CN Enable (global)	O,F,T	O=On, F=Off, T=Toggle
	9	NR Level	NN	0 to 32dB, 1 step
	10	Reference (read-only)	N	1 to 4

EXAMPLES:

<code>SA"AEC">6>5=O<CR></code>	<i>Mute input 6 of the "AEC" module</i>
<code>SA"AEC">4>7=2<CR></code>	<i>Set the NLP Control for input 4 to Medium</i>
<code>GA"AEC">8>9<CR></code>	<i>Query the current NR level for input 8</i>
<code>GA"AEC">16>2=9<CR></code>	<i>Response indicating the NR level for input 8 is 9dB</i>

6.1.15 AGC Module (Enhanced) [EX only]

The Enhanced AGC module has a maximum of 32 inputs and is only available on EX processors. It has 10 parameters that can be controlled for each input, plus one global parameter. The Input (or Overall Module) is selected by **Index 1** and the parameter to be controlled by **Index 2** per the tables below:



Index 1: Selects desired Input (1-32) or 0 for Output/Module

Output/Module (Index 1 = 0)		Format	Value Range
1x 2	1	Max Total Gain	NN.N 0 to 60.0 dB, 1 Step

Input Parameters (Index 1 = 1-32)			Format	Value Range
Index 2	1	Activity Threshold	(-)NN.N	-70.0 to 0 dB, 1 Step
	2	Target Level - Minimum	(-)NN.N	-40.0 to 24 dB, 1 Step
	3	Target Level - Maximum	(-)NN.N	-40.0 to 24 dB, 1 Step
	4	Cut Rate	NNNN.N	0.0 to 9000 dB/s, 0.1 Step
	5	Cut Range	NN.N	0 to 30 dB, 1 Step
	6	Cut Hold	NN.N	0 to 60 s, 1 Step
	7	Boost Rate	NNNN.N	0.0 to 9000 dB/s, 0.1 Step
	8	Boost Range	NN.N	0 to 30 dB, 1 Step
	9	Boost Hold	NN.N	0 to 60 s, 1 Step
	10	Bypass	O,F,T	O=On, F=Off, T=Toggle
	11	Reserved		
	12	Reserved		
	13	Reserved		
	14	Reserved		
	15	Reserved		

EXAMPLES:

<code>SA"AGC 1">0>1=20.0<CR></code>	Set the Max Gain that can be applied across all channels of "AGC 1" to 20dB
<code>SA"AGC 1">2>2=-6.0<CR></code>	Set the Target Level – Minimum for channel 2 of "AGC 1" to -6.0 dB
<code>GA"Mic AGC">6>10<CR></code>	Query the current state of the Bypass for channel 10 of "Mic AGC"
<code>GA"Mic AGC">6>10=F<CR></code>	Response indicating Bypass for channel 10 of "Mic AGC" is OFF

6.1.16 AGC Module (Legacy)

This module has 3 parameters selected using the appropriate value for **Index 1**.

Note: The mono AGC module does not have Detector selection and hence Index 1=1 would not be used.



		Parameter	Format	Value Range
Index 1	1	Detector (stereo)	L,R,M	L=Left, R=Right, M=Mix
	2	Threshold	(-)NN.N	0 to -40 dBFS 0.5 Step
	3	Reserved		
	4	Reserved		
	5	Reserved		
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"AGC 1">1=M<CR> Set the detector of stereo AGC module "AGC 1" to Mix
 SA"AGC 1">2=-20<CR> Set the threshold for AGC module "AGC 1" to -20dBFS
 GA"BGM">6<CR> Query the current state of the bypass for "BGM"
 GA"BGM">6=F<CR> Response indicating bypass for module "BGM" is Off

6.1.17 ARRAY EQ Module

For this module, **Index 1** should always be set to **1**. There are 7 parameters which can be controlled on the Array EQ module, selected using the appropriate value for **Index 2**. By the nature of the module you would not use the Array parameters (7 & 8) and the Advanced parameters (1, 2 & 3) at the same time.



Index 1 = 1	Parameter	Format	Value Range	
Index 2	1	Center Freq	NNN	100 to 4000Hz
	2	Tilt	NN.N	0.0 to 10.0. 0.1 step
	3	Gain	(-)NN.N	-12.0dB to 2.0dB, 0.1dB step
	4	Reserved		
	5	Bypass	O,F,T	O=On, F=Off, T=Toggle
	6	Advanced	O,F,T	O=On, F=Off, T=Toggle
	7	# Modules	N	2 to 8, 1 step
	8	Vertical Angle	NN	20-100, 5 step

EXAMPLES:

SA"Array EQ 1">1>7=6<CR> Set the qty of RoomMatch™ modules for "Array EQ 1" to 6
 SA"Main L">1>8=80<CR> Set the Vertical coverage angle for "Main L" to 80 deg
 GA"Array EQ">1>5<CR> Query the current state of Bypass for "Array EQ"
 GA"Array EQ">1>5=O<CR> Response indicating Bypass for "Array EQ" is currently On

6.1.18 AMM – GAIN SHARING Module [EX/1U ESP Only]

The Gain Sharing AMM (Automatic Mic Mixer) module can be configured with 4-32 inputs. **Index 1** is used to select the input (1-32) and **Index 2** is used to select the parameter to adjust per the table below. In addition, there are some output and overall module parameters that may be adjusted by setting Index 1 = 0.



Index 1: Selects desired Input (1-32) or 0 for Output/Module

Output/Module (Index 1 = 0)		Format	Value Range
Index 2	1	Gain	(-)NN.N
	2	Mute	O,F,T
	3	Slope	N.NN
	4	Attack	NN.N
	5	Hold	NNNN.N
	6	Decay	NNNNN.N
	7	Input RMS Avg.	NNN.N
	8	Output RMS Avg.	NNN.N
	9	Bypass All	O,F,T

Input (Index 1 = 1-32)		Format	Value Range
Index 2	1	Gain	(-)NN.N
	2	Mute	O,F,T
	3	Priority	N
	4	Bypass	O,F,T
	5	Mute Group	NN

EXAMPLES:

<code>SA"AMM 1">0>2=T<CR></code>	<i>Toggle the state of the output mute for module "AMM 1"</i>
<code>SA"AMM 1">0>3=1.00<CR></code>	<i>Set the Slope parameter for "AMM 1" to 1.00</i>
<code>SA"AMM 1">6>1=-10<CR></code>	<i>Set the Gain for input 6 of "AMM 1" to -10dB</i>
<code>SA"AMM 1">4>3=2<CR></code>	<i>Set the Priority for input 4 of "AMM 1" to 2 (2nd highest)</i>
<code>SA"AMM 1">24>4=O<CR></code>	<i>Set the Bypass for input 24 of "AMM 1" to On</i>
<code>GA"AMM 1">16>2<CR></code>	<i>Query the current state of Mute for input 16 of "AMM 1"</i>
<code>GA"AMM 1">16>2=O<CR></code>	<i>Response indicating input 16 of "AMM 1" is Muted</i>

6.1.19 AMM - GATED Module (Legacy) [ESP Only]

The legacy Gated Automatic Mic Mixer (AutoMix) module is available with 4, 6 or 8 inputs.

Index 1 is used to select the input (1-8) and **Index 2** is used to select the parameter to adjust per the table below. In addition there are some output parameters that may be adjusted by setting **Index 1 = 0**. Some parameters are only relevant for particular detection modes (such as Push-to-talk) and would otherwise be unused.

Index 1: Selects desired Input (1-8) or 0 for Output



Output/Module (Index 1 = 0)		Format	Value Range
Index 2	1	Gain	(-)NN.N
	2	NOM	O,F,T
	3	Mute	O,F,T
	4	NOM Limit	N

Input Parameters (Index 1 = 1-8)		Format	Value Range	
Index 2	1	Priority	O, F, T	
	2	Gain	(-)NN.N	
	3	Detection	N	
	4	Threshold	(-)NN.N	
	5	Gate Depth	(-)NN.N	
	6	Hold	NNNN	
	7	Ducking Depth	(-)NN.N	
	8	Decay	NNNNN	
	9	Reserved		
	10	High Pass	NNNN	
	11	Low Pass	NNNN	
	12	RMS Avg.	NNN	
	13	Reserved		
	14	Attack	NN.N	
	15	Push to Talk	O, F, T	
	16	Mute	O, F, T	

EXAMPLES:

SA"AMM 1">0>3=T<CR>

Toggle the state of the output mute for module "AMM 1"

SA"AMM 1">6>4=-40<CR>

Set the Threshold for input 6 of "AMM 1" to -40dB

SA"AMM 1">4>3=2<CR>

Set the Detection mode for input 4 of "AMM 1" to Last On

GA"AMM 1">3>1<CR>

Query the current state of Priority for input 3 of "AMM 1"

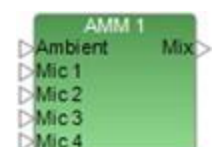
GA"AMM 1">3>1=O<CR>

Response indicating input 3 of "AMM 1" is set to Priority

6.1.20 AMM - GATED Module (Enhanced) [EX Only]

The enhanced gated Automatic Mic Mixer module can be configured with 4 to 32 inputs.

Index 1 is used to select the input (1-8) and **Index 2** is used to select the parameter to adjust per the table below. In addition, there are some output and Automatic Threshold Sensing (ATS) parameters that may be adjusted by setting **Index 1** = 0.



Index 1: Selects desired Input (1-32) or 0 for Output/ATS

Output/ATS Parameters (Index 1 = 0)		Format	Value Range	
Index 2	1	Gain	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	2	Mute	O, F, T	O=On, F=Off, T=Toggle
	3	NOM Enable	O, F, T	O=On, F=Off, T=Toggle
	4	NOM Limit	N	1 to # Channels (max 32)
	5	Designated Mic On	N, None, LMH	1 to # Channels (max 32), "None" or "Last Mic Hold"
	6	Reserved		
	7	Reserved		
	8	ATS Attack	NNNN.N	100 to 10000 ms, 1 step
	9	ATS Release	NNNN.N	10 to 1000 ms, 1 step
	10	ATS Margin	(-)NN.N	-18 to 18 dB, 1 step
	11	ATS Source	I,A	I = Mic Mix, A = Ambient Input
	12	ATS Sensitivity	(-)NN.N	-20.0 to 20.0 dB, 0.5 step
	13	ATS LPF Frequency	NNNN.N	20 to 20000 Hz, 0.1 step
	14	ATS HPF Frequency	NNNN.N	20 to 20000 Hz, 0.1 step
	15	ATS Slope	NN.N	6.0 = -6 dB/oct, 12.0 = -12 dB/oct
	16	ATS Filter Enable	O, F, T	O=On, F=Off, T=Toggle
	17	Direct Outputs	O, F, T	O=On, F=Off, T=Toggle

Input Parameters (Index 1 = 1-032)		Format	Value Range	
Index 2	1	Priority	N	1,2,3,4,5 (1=Highest)
	2	Gain	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	3	Mute	O, F, T	O=On, F=Off, T=Toggle
	4	Mute Group	N, None	1 to # channels-1 (max 31) or None
	5	Manual Threshold	(-)NN.N	-80.0 to 0.0 dB, 0.5 step
	6	Auto-Threshold	O, F, T	O=On, F=Off, T=Toggle
	7	Bypass	O, F, T	O=On, F=Off, T=Toggle
	8	Direct Output	R,S	R=Pre, S=Post
	9	Low Pass	NNNNN.N	20 to 20000 Hz, 0.1 step
	10	High Pass	NNNNN.N	20 to 20000 Hz, 0.1 step
	11	RMS Averaging	NNNN.N	1 to 1000 ms, 1 step
	12	Ducker Depth	(-)NN.N	-60.0 to 0.0 dB, 0.5 step
	13	Gate Depth	(-)NN.N	-70.0 to 0.0 dB, 0.5 step
	14	Gate Attack	NNN.N	0.5 to 500 ms, 0.5 step
	15	Gate Hold	NNNNN.N	1 to 50000 ms, 1 step
	16	Gate Decay	NNNNN.N	1 to 50000 ms, 1 step
	17	NOM Gain	O, F, T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"AMM 1">0>2=T<CR>

Toggle the state of the output mute for module "AMM 1"

SA"AMM 1">6>7=-40<CR>

Set the Threshold for input 6 of "AMM 1" to -40dB

SA"AMM 1">4>2=P<CR>

Set the Control mode for input 4 of "AMM 1" to PTT

GA"AMM 1">3>1<CR>

Query the current state of Priority for input 3 of "AMM 1"

GA"AMM 1">3>1=2<CR>

Response indicating input 3 of "AMM 1" is set to Priority level 2

6.1.21 COMPRESSOR/LIMITER Module

This module has 6 parameters that can be controlled, selected using the appropriate value for **Index 1**. For a mono Compressor module set the Detection Input to 'L' (Left) to use the Signal input or 'S' to use the Sidechain input, 'R' and 'M' are unused.



		Parameter	Format	Value Range
Index 1	1	Detect Input	L,R,M,S	L=Left, R=Right, M=Mix, S=Sidechain
	2	Threshold	(-)NN.N	0 to -40 dBFS, 0.5 Step
	3	Ratio	NN.N	1 to 20, 0.1 step
	4	Attack	NNN.N	0.5 to 100 ms, 0.5 step
	5	Release	NNNN.N	1 to 1000 ms, 0.5 step
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"CompLim 1">1=M<CR> Set the detection input for module "CompLim 1" to Mix
SA"CompLim 1">2=-20<CR> Set the threshold for module "CompLim 1" to -20dBFS
GA"Main Out">6<CR> Query the current state of the bypass for "Main Out"
GA"Main Out">6=F<CR> Response indicating bypass for module "Main Out" is currently Off

6.1.22 CONFERENCE ROOM ROUTER Module [EX]

The Conference Room Router module is only available on EX processors. The number of Far End Inputs, Pre-AEC Mic Inputs, Aux and Overhead Outputs are user-definable in ControlSpace Designer software and can be queried as part of the Configuration parameters. This module has many controllable Parameters, organized into groups, selected by **Index 1**.



With **Index 1 = 0** the configuration of the module can be determined to allow the appropriate controls to be configured on the external control panel.

Configuration Parameters (Index 1 = 0)		Format	Value Range	
Index 2	1	#Far End Inputs (Read-only)	N	0 to 8
	2	#Pre-AEC Mic Inputs (Read-only)	NN	0 to 32
	3	#Overhead Outputs (Read-only)	NN	0 to 16
	4	Room Combine Member (Read-only)	O,F	O=On, F=Off
	5	RC Room Number (Read-only)	N	0 (not in RC Group) 1 to 6
	6	RC Room Name (Read-only)	SSSSS	e.g. "CRR 1" <or> "Room 1"
	7	Room Combine State (Read-only)*	Brackets "[]" indicate which rooms are joined	e.g., "[1][2][3]" = Rooms 1, 2 & 3 split; "[1,2][3]" = Rooms 1 & 2 combined; "[1,2,3]" = Rooms 1, 2 & 3 combined
	8	Stereo > Mono Attenuation (Read-only)	-N.N	-3.0,-4.0,-5.0 or -6.0 dB
	9	Matrix Mode (Read-only)	N,A	N=Normal, A=Advanced

* To modify room combinations, use [SRC system commands](#).

With **Index 1 = 1** the room/output controls can be accessed including the master volume control and the master mic mix and non-mic mix levels.

Room/Output Parameters (Index 1 = 1)		Format	Value Range	
Index 2	1	Master Volume	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	2	Master Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Mic Mix Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	4	Mic Mix Mute	O,F,T	O=On, F=Off, T=Toggle
	5	Non-Mic Mix Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	6	Non-Mic Mix Mute	O,F,T	O=On, F=Off, T=Toggle
	7	Pre-AEC Mic Mix Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	8	Pre-AEC Mic Mix Mute	O,F,T	O=On, F=Off, T=Toggle
	9	RC Group Number (Read-only)	N	1 to 6

With **Index 1 = 2** the Program level/mute and up-to 8 Far End input levels/mutes can be controlled.

Program/Far End Inputs (Index 1 = 2)		Format	Value Range	
Index 2	1	Program Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	2	Program Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Far End 1 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	4	Far End 1 Mute	O,F,T	O=On, F=Off, T=Toggle
	5	Far End 2 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	6	Far End 2 Mute	O,F,T	O=On, F=Off, T=Toggle
	7	Far End 3 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	8	Far End 3 Mute	O,F,T	O=On, F=Off, T=Toggle
	9	Far End 4 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	10	Far End 4 Mute	O,F,T	O=On, F=Off, T=Toggle
	11	Far End 5 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	12	Far End 5 Mute	O,F,T	O=On, F=Off, T=Toggle
	13	Far End 6 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	14	Far End 6 Mute	O,F,T	O=On, F=Off, T=Toggle
	15	Far End 7 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	16	Far End 7 Mute	O,F,T	O=On, F=Off, T=Toggle
	17	Far End 8 Level	(-)NN.N	-60.5 to 12.0 dB, 0.5 step
	18	Far End 8 Mute	O,F,T	O=On, F=Off, T=Toggle

With **Index 1 = 3-6** the Normal or Advanced Matrix can be controlled, with Index 1 = 3/5 controlling whether the cross-point is On/Off and Index 1 = 4/6 controlling the level at the cross-point per the table below:

Matrices (Index 1 = 3-6)		Parameter	Format	Value Range	
Index 1	3	Normal Matrix	Cross-point On/Off	O,F,T	O=On, F=Off, T=Toggle
	4		Cross-point Level	(-)NN.N	-60.5 to 0.0 dB, 0.5 step
	5	Advanced Matrix	Cross-point On/Off	O,F,T	O=On, F=Off, T=Toggle
	6		Cross-point Level	(-)NN.N	-60.5 to 0.0 dB, 0.5 step

The cross-point to control is selected with **Index 2** in the format **(input,output)**. Since the inputs and outputs of the matrix change with the configuration, the easiest way to identify which cross-point to control is to view the matrix in ControlSpace Designer software. Note that some changes to the matrix will be overridden by other changes (e.g. changing the Stereo > Mono attenuation).

EXAMPLES:

SA"CRR 1">1>2=T<CR> *Toggle the state of the master mute for module "CRR 1"*
SA"CRR 1">2>1=-40.0<CR> *Set the Program level for "CRR 1" to -40.0 dB*
SA"CRR 1">1>7=All<CR> *Route the Mic Mix for "CRR 1" to program output*
SA"Room 2">2>12=O<CR> *Mute Far End input 4 of CRR called "Room 2"*
SA"CRR 3">3>(1,1)=O<CR> *Turn on the Input 1 to Output 1 cross-point of the Normal Matrix for "CRR 3"*
GA"CRR 1">1>1<CR> *Query the Master Volume level of "CRR 1"*
GA"CRR 1">1>1=-3.0<CR> *Response indicating Master Volume level is set to -3.0dB*

6.1.23 CROSSOVER Module


Available parameters for the Crossover vary per section (Low, Mid and High) and depending on the type of Crossover there can be 2, 3 or 4 sections.






Index 1 is used to select the Crossover section to control per the Crossover type per the table below.

		2 Way	3 Way	4 Way
Index 1	1	LOW	LOW	LOW
	2	HIGH	MID	LO MID
	3	-	HIGH	HIMID
	4	-	-	HIGH

Index 2 is then used to select the parameter to change, dependent on the Crossover section selected by Index 1 per the tables below.

LOW		Parameter	Format	Value Range
Index 2	1	Type	SSSSS	e.g. But12 
	2	Frequency	NNNNN	20Hz to 20000Hz
	3	<i>Reserved</i>		
	4	Polarity	O,F,T	O=On, F=Off, T=Toggle
	5	Mute	O,F,T	O=On, F=Off, T=Toggle

MID		Parameter	Format	Value Range
Index 2	1	Type (HPF)	SSSSS	e.g. But12 
	2	Frequency	NNNNN	20Hz to 20000Hz
	3	Type (HPF)	SSSSS	e.g. But12 
	4	Frequency	NNNNN	20Hz to 20000Hz
	5	<i>Reserved</i>		
	6	Polarity	O,F,T	O=On, F=Off, T=Toggle
	7	Mute	O,F,T	O=On, F=Off, T=Toggle

HIGH		Parameter	Format	Value Range
Index 2	1	Type	SSSSS	e.g. But12 
	2	Frequency	NNNNN	20Hz to 20000Hz
	3	<i>Reserved</i>		
	4	Polarity	O,F,T	O=On, F=Off, T=Toggle
	5	Mute	O,F,T	O=On, F=Off, T=Toggle

Filter type descriptors

Type	Slope	Value
Butterworth	6dB/oct	But6
	12dB/oct	But12
	18dB/oct	But18
	24dB/oct	But24
	36dB/oct	But36
Bessel	48dB/oct	But48
	12dB/oct	Bes12
	18dB/oct	Bes18
	24dB/oct	Bes24
	36dB/oct	Bes36
	48dB/oct	Bes48
	12dB/oct	Lin12
Linkwitz-Reilly	24dB/oct	Lin24
	36dB/oct	Lin36
	48dB/oct	Lin48

EXAMPLES:

SA"X-Over">1>2=80<CR>

Set the freq. for the Low section of "X-Over" to 80Hz

SA"X-Over">1>1=But24<CR>

Set the Low section of "X-Over" to Butterworth 24dB/oct

GA"X-Over 2">4>5<CR>

Query mute status of the High section of 4way "X-Over 2"

GA"X-Over 2">4>5=F<CR>

Response indicating High section of "X-Over 2" is unmuted

6.1.24 DELAY Module

Delay modules are available with 1, 2, 4 or 8 output taps. The delay time for each tap can be adjusted individually or bypassed. The maximum module delay is 3 seconds for the ESP-00 and 1 second for 1U ESP and EX processors. Index 1 is used to select the desired tap and Index 2 is used to select the parameter to adjust per the table below.



Index 1: Selects the desired Delay output tap (1-8).

	Parameter	Format	ESP-00	1U ESP/EX
Index 2	1	Delay time	NNNNNN	0 to 144000 samples (3s)
	2	Bypass	O,F,T	0=On, F=Off, T=Toggle

EXAMPLES:

SA"Delay 1">4>1=2592<CR>

Set the delay time for tap 4 of module "Delay 1" to 54msec (54msec = 0.054sec, 0.054x48000 = 2592 samples)

SA"Out Delay">2>2=F<CR>

Set bypass for tap 2 of Delay module "Out Delay" to Off

GA"Delay 2">1>1<CR>

Query the current delay time for tap 1 of "Delay 2"

GA"Delay 2">1>1=9600<CR>

Response with delay time for tap 1 of "Delay 2" is 200ms

6.1.25 DUCKER Module

There are 6 parameters that can be controlled for this module, selected using the appropriate value for **Index 1**. Index 1=1 is reserved and should not be used. Ducker will be active if either the Sidechain is above Threshold OR the Engage Ducker logic input is On.



		Parameter	Format	Value Range
Index 1	1	<i>Reserved</i>		
	2	Threshold	(-)NN.N	0 to -40 dBFS, 0.5 Step
	3	Range	(-)NN.N	0 to -60 dBFS, 0.5 Step
	4	Attack	NNN.N	0.5 to 100 ms, 0.5 step
	5	Hold	NNNN	0 to 1000 ms, 1 step
	6	Decay	NNNNN	5 to 50000 ms, 1 step
	7	Bypass	O,F,T	O=On, F=Off, T=Toggle
	8	Engage Ducker (Logic)	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"Ducker 1">2=-5<CR>

Set the threshold for module "Ducker 1" to -5dBFS

SA"Ducker 1">3=-60<CR>

Set the range (attenuation) for "Ducker 1" to -60dBFS

GA"Page Over">7<CR>

Query the current state of the bypass for "Page Over"

GA"Page Over">7=O<CR>

Response indicating bypass for "Page Over" is On

6.1.26 GAIN Module

Gain modules have a single Level and Mute parameter irrespective of the number of channels. These are selected using **Index 1** per the table below.



		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5.0dB to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"Main Volume">2=F<CR>

Set mute state of Gain module "Main Volume" to un-muted

GA"Gain 4">1<CR>

Query the current level of Gain module "Gain 4"

GA"Gain 4">1=3<CR>

Response indicating level of "Gain 4" is currently 3dB

6.1.27 GATE Module

There are 7 parameters which can be set for this module, selected by using the appropriate value for **Index 1**. For a mono Gate module set the Detector to 'L' (Left) to use the Signal input or 'S' to use the Sidechain input, 'R' and 'M' are unused.



	Parameter	Format	Value Range
Index 1	1	Detector	L,R,M,S L=Left, R=Right, M=Mix, S=Sidechain
	2	Threshold	(-)NN.N 0 to -40 dBFS, 0.5 Step
	3	Range	(-)NN.N 0 to -70 dBFS, 0.5 Step
	4	Attack	NNN.N 0.5 to 100ms, 0.5 step
	5	Hold	NNNN 0 to 1000 ms, 1 step
	6	Decay	NNNNN 5 to 50000 ms, 1 step
	7	Bypass	O,F,T O=On, F=Off, T=Toggle

EXAMPLES:

SA"Gate 1">6=2000<CR> Set the Decay time for module "Gate 1" to 2000ms
 SA"Gate 1">7=T<CR> Toggle the state of the Bypass for module "Gate 1"
 GA"Gate 1">7<CR> Query the current state of the Bypass for "Gate 1"
 GA"Gate 1">7=F<CR> Response indicating Bypass for module "Gate 1" is Off

6.1.28 GPO Module

Depending on the device the GPO module may have 5 or 8 GPO pins. The pin to control is selected using **Index 1**. The ESP-00 can have two cards, presented as separate modules, addressed by the module name.



Index 1: Output pin: 1-8

Value: State: O = On, F = Off, T = Toggle

EXAMPLES:

SA"GP Out">2=O<CR> Turn on GPO pin 2 on a fixed I/O device
 SA"GP Out 2">3=T<CR> Toggle GPO pin 3 on the second card of an ESP-00 with 2 GPIO cards
 GA"GP Out 1">4<CR> Query the state of GPO pin 4
 GA"GP Out 1">4=F<CR> Response indicating GPO pin 4 is Off

6.1.29 1/3 OCTAVE GRAPHIC EQ Module

Each of the 31 bands can be adjusted individually, selected using the appropriate value for **Index 1**. In addition, there is also a "Bypass all" function selected by setting **Index 1** to 32.



		Frequency	Format	Value Range
Index 1	1	20Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	2	25Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	3	31.5Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	4	40Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	5	50Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	6	63Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	7	80Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	8	100Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	9	125Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	10	160Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	11	200Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	12	250Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	13	315Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	14	400Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	15	500Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	16	630Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	17	800Hz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	18	1kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	19	1.25kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	20	1.6kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	21	2kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	22	2.5kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	23	3.15kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	24	4kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	25	5kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	26	6.3kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	27	8kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	28	10kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	29	12.5kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	30	16kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	31	20kHz	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	32	Bypass All	O,F,T	O=On, F=Off, T=Toggle
	33	Reserved		

EXAMPLES:

<code>SA"GEQ 1">18=-3.5<CR></code>	<i>Reduce the 1kHz band of GEQ module "GEQ 1" by 3.5dB</i>
<code>SA"GEQ 1">24=5<CR></code>	<i>Increase the 4kHz band of GEQ module "GEQ 1" by 5dB</i>
<code>GA"GEQ Bar">11<CR></code>	<i>Query the current level for the 200Hz band of "GEQ Bar"</i>
<code>GA"GEQ Bar">11=-6<CR></code>	<i>Response indicating the 200Hz band is currently at -6dB</i>

6.1.30 LOGIC INPUT Module [EX Only]

The Logic Input module has a user-definable number of inputs (max. 16) and is used to drive down-stream logic programmed in the design. The pin to control is selected using the appropriate value for **Index 1**. Currently the only parameter is the State, set by **Index 2** = 1.



Index 1: Input pin: 1-16

Index 2: 1 = State:

Value: O = On, F = Off, T = Toggle, P = Pulse (momentary action)

EXAMPLES:

<code>SA"Logic Input 1">10>1=O<CR></code>	<i>Set input 10 for module "Logic Input 1" to On</i>
<code>SA"Logic Input 1">6>1=P<CR></code>	<i>Perform a momentary push of input 6 (automatically resets to Off)</i>
<code>GA"System Mode">2>1<CR></code>	<i>Query the state of input 2 on module "System Mode"</i>
<code>GA"System Mode">2>1=O<CR></code>	<i>Response indicating input 2 of module "System Mode" is On</i>

6.1.31 LOGIC OUTPUT Module [EX Only]

The Logic Output module has a user-definable number of outputs (max. 16) and is used to convey logic states from the system to the outside world to indicate system mode or status etc. Typically, this module would be queried rather than set, but both are permitted. The pin to control is selected using the appropriate value for **Index 1**. Currently the only parameter is the State, set by **Index 2** = 1.



Index 1: Output pin: 1-16

Index 2: 1 = State:

Value: O = On, F = Off, T = Toggle, P = Pulse (momentary action)

EXAMPLES:

<code>SA"Logic Output 2">2>1=O<CR></code>	<i>Set output 2 on module "Logic Output 2" to On</i>
<code>SA"Logic Output 2">3>1=T<CR></code>	<i>Toggle the state of output 3 on module "Logic Output 2"</i>
<code>GA"Status">4>1<CR></code>	<i>Query the state of output 4 on module "Status"</i>
<code>GA"Status">4>1=F<CR></code>	<i>Response indicating output 4 on module "Status" is Off</i>

6.1.32 LOGIC PROCESSING Module [EX Only]

The Logic Block can be configured with a user-definable number of inputs and outputs (max. 16) and is unusual in that it is a container for logic gates, adding an additional layer. Controllable Gates within the Logic Block are addressed as though they are additional parameters of the parent Logic Block. Parameters indicated as read-only should not be set, otherwise unexpected side-effects will occur.



Index 1 selects between the inputs (Index 1 = 1), outputs (Index 1 = 2) and any other controllable gate inside the block (Index 1 =3 or above).

		Parameter	Notes
Index 1	1	Inputs (read-only)	Query state of input (O=On, F=Off)
	2	Outputs (read-only)	Query state of output (O=On, F=Off)
	3	Controllable Gates/Logic	Gates within the Logic Block are enumerated in the order in which they were added.

Inputs and Outputs are always allocated indices 1 and 2 respectively, then any other controllable gates are allocated the next available index (ID) as they are added to the block.

Index 2: Selects the desired input, output or channel of the controllable gate inside the Logic Block.

Index 3: Selects the desired parameter, for each type of gate, per the tables below.

6.1.32.1 TOGGLE/FF Gate

The Toggle/FF Gate has a single controllable parameter per channel, the Toggle State, and an overall Set and Reset accessible when **Index 2** (channel) = 0.



Master Flip Flop (Index 2 = 0)		Format	Value Range
Index 3	1	Set All Outputs ON	O=On, F=Off, T=Toggle, P=Pulse
	2	Reset All Outputs OFF	O=On, F=Off, T=Toggle, P=Pulse

Channel Toggle (Index 2 = 1-16)		Format	Value Range
	1	Toggle State	O=On, F=Off, T=Toggle

EXAMPLES:

SA"Logic Block 1">3>0>1=P<CR> *Set all outputs of Toggle/FF gate (ID:3) inside "Logic Block 1" to On*

SA"Mic Logic">6>2>1=O<CR> *Force On ch2 of Toggle/FF gate (ID:6) inside "Mic Logic" block*

GA"Logic Block 1">4>3>1<CR> *Query the current state of ch3 of Toggle/FF gate (ID:4)*

GA"Logic Block 1">4>3>1=F<CR> *Response indicating ch3 of Toggle/FF gate (ID:4) is Off*

6.1.32.2 PULSE Gate

The Pulse Gate has 4 controllable parameters per channel, selected using the appropriate value for **Index 3**.



	Parameter	Format	Value Range
Index 3	1	On Time	NNNN 100 to 6000 ms, Step 100
	2	Off Time	NNNN 100 to 6000 ms, Step 100
	3	Single Pulse	O,F,T O=On, F=Off, T=Toggle
	4	Force ON	O,F,T O=On, F=Off, T=Toggle
	5	Output State (read-only)	O,F O=On, F=Off

EXAMPLES:

SA"Main Logic">5>1>2=400<CR> *Set Off time for ch1 of Pulse gate (ID:5) inside "Main Logic" to 400mS*

SA"Logic Block 1">5>4>3=O<CR> *Set ch4 of Pulse gate (ID:5) inside "Logic Block 1" to give a single pulse*

GA"Logic Block 1">3>2>4<CR> *Query whether ch2 of Pulse gate (ID:3) is currently forced ON*

GA"Logic Block 1">3>2>4=O<CR> *Response indicating ch2 of Pulse gate (ID:3) is forced ON*

6.1.32.3 DEBOUNCE Gate

The Debounce Gate has 2 controllable parameters per channel, selected using **Index 3**.



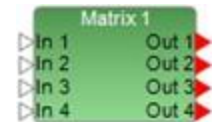
		Parameter	Format	Value Range
Index 3	1	On Delay	NNNN	100 to 6000 ms, Step 100
	2	Off Delay	NNNN	100 to 6000 ms, Step 100
	3	Output State (read-only)	O,F	O=On, F=Off

EXAMPLES:

<code>SA"Rm Combine">4>2>1=800<CR></code>	<i>Set On Delay for ch2 of Debounce (ID:4) in "Rm Combine" to 800mS</i>
<code>SA"Logic Block 2">6>3>2=200<CR></code>	<i>Set Off Delay for ch3 of Debounce (ID:6) in "Logic Block 2" to 200mS</i>
<code>GA"Logic Block 1">6>4>3<CR></code>	<i>Query current output state for ch4 of Debounce (ID:6)</i>
<code>GA"Logic Block 1">6>4>3=O<CR></code>	<i>Response indicating ch4 output of Debounce (ID:6) is currently OFF</i>

6.1.33 MATRIX MIXER Module

The Matrix Mixer module supports a user-definable number of inputs and outputs (max. 32) and allows cross-points to be turned on/off or the level at the cross-point to be adjusted. It also allows entire input or output channels to be muted.



Index 1 is used to select whether the cross-point state (on/off), level, input channel mute, or output channel mute will be adjusted per the table below.

		Parameter	Notes
Index 1	1	On/Off	Set Cross-point On/Off
	2	Level	Set Level
	3	Mute	Input Channel Mute
	4	Mute	Output Channel Mute

Index 2 is then used to select which cross-point is to be controlled; stepping through the available outputs for input 1, then through the available outputs for input 2, and so on. **Index 2** will be the same irrespective of whether the state (on/off) or level is being controlled, but **Index 1** and the **Value** will change.

In the following tables: M = # of inputs and N = # of outputs in the module.

Cross-point On/Off (Index 1 = 1)		Format	Value Range	
Index 2	1	Cross-point(1,1)	O,F,T	O=On, F=Off, T=Toggle
	2	Cross-point(1,2)	O,F,T	O=On, F=Off, T=Toggle
	Index 2 = (Input # -1) x Size of Matrix + Output #:			
	MxN	Cross-point(M,N)	O,F,T	O=On, F=Off, T=Toggle

Cross-point Level (Index 1 = 2)		Format	Value Range
Index 2	1	Cross-point(1,1)	(-)NN.N
	2	Cross-point(1,2)	(-)NN.N
	Index 2 = (Input # -1) x Size of Matrix + Output #:		
	MxN	Cross-point(M,N)	(-)NN.N

Index 1 = 3 Mute		Format	Value Range
Index 2	1-32	Input Channel 1-32	O,F,T

Index 1 = 4 Mute		Format	Value Range
Index 2	1-32	Output Channel 1-32	O,F,T

EXAMPLES:

SA"Matrix 1">1>2=O<CR>	Set cross-point 2 (input 1, output2) for "Matrix 1" to On
SA"Mix">2>8=-20<CR>	Set level for cross-point 8 (in2,out4 for 4x4) "Mix" to -20dB
SA"Matrix 1">3>3=F<CR>	Set input channel three to mute
SA"Matrix 1">4>16=O<CR>	Set output channel sixteen to unmute
GA"My Matrix">1>16<CR>	Query the current state for cross-point 16 (in4,out4 for 4x4)
GA"My Matrix">1=16=F<CR>	Response indicating cross-point 16 is currently Off
GA"My Matrix 1">3>8<CR>	Query the current mute/unmute state for input channel eight

6.1.34 PARAMETRIC EQ Module

Parametric EQ modules are available with 3, 5, 7 or 9 fixed bands, or a user-defined number of bands (max 16). The same parameters are adjustable for each band. **Index 1** is used to select which band to adjust (1-16) and **Index 2** is used to select the parameter to adjust per the table below.



Index 1: Selects desired Parametric EQ band 1-16

		Parameter	Format	Value Range
Index 2	1	Frequency	NNNNN	20 to 20000Hz
	2	Q	NN.N	0.10 to 10.0, 0.1 step
	3	Gain	(-)NN.N	-20.0dB to +20.0dB, 0.1dB step
	4	Slope	(-)NN.N	0,-6,-12dB/oct
	5	Type	SS	B, HS, LS, HC, LC, N (see below)
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

The parameters in use for each band will be dependent on the **Type** of filter selected per the table below.

Type	String	Freq.	Q	Gain	Slope	Bypass
Band	B	o	o	o		o
High Shelf	HS	o		o		o
Low Shelf	LS	o		o		o
High Cut (Low Pass)	HC	o			o	o
Low Cut (High pass)	LC	o			o	o
Notch	N	o	o	o		o

EXAMPLES:

SA"PEQ 1">1>1=2000<CR> Set the frequency for band 1 of module "PEQ 1" to 2kHz
SA"Room EQ">2>5=LC<CR> Use a 'Low Cut' (High Pass) filter for band 2 of "Room EQ"
GA"House L">5>3<CR> Query the gain for band 5 of PEQ module "House L"
GA"House L">5>3=-2<CR> Response indicating band 5 of "House L" is at -2dB

6.1.35 PEAK/RMS LIMITER Module

This module has 6 parameters that can be controlled, selected using the appropriate value for **Index 1**. For a mono Peak/RMS Limiter module, set the Detection Input to 'L' (Left) to use the Signal input or 'S' to use the Sidechain input, 'R' and 'M' are unused. Parameters indicated as 'Reserved' should not be used.



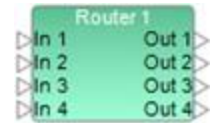
	Parameter	Format	Value Range
Index 1	1	Detect Input	L,R,M,S L=Left, R=Right, M=Mix, S=Sidechain
	2	PK Threshold	(-)NN.N 0 to -40 dBFS, 0.5 Step
	3	<i>Reserved</i>	
	4	<i>Reserved</i>	
	5	<i>Reserved</i>	
	6	Bypass	O,F,T O=On, F=Off, T=Toggle
	7	RMS Threshold	(-)NN.N 0 to -40 dBFS, 0.5 Step
	8	RMS Attack	NNNNN 500 to 10,000ms, 100 step
	9	RMS Release	NNNNN 500 to 10,000ms, 100 step
	10	<i>Reserved</i>	

EXAMPLES:

SA"PkRMSLim 1">1=R<CR> Set the Detect Input for stereo "PkRMSLim 1" to R(ight)
SA"Limiter 1">7=-20<CR> Set the RMS limiter threshold for "Limiter 1" to -20dBFS
GA"Array L">2<CR> Query the Peak limiter threshold for "Array L"
GA"Array L">2=-6<CR> Response indicating the Peak limiter threshold is -6dBFS

6.1.36 ROUTER Module

The Router module is available with a user-definable number of inputs and outputs, but the command format remains the same. **Index 1** is used to select the output channel and the Value indicates the desired input to be routed to that output.



Index 1: Output number: 1-32

Value: Input number: 0-32 where 0 = Off (no input routed)

EXAMPLES:

- SA"Router 1">1=5<CR> Set output 1 of Router module "Router 1" to input 5
- SA"Router 2">3=0<CR> Set output 3 of Router module "Router 2" to Off (no input)
- GA"Select">4<CR> Query which input is routed to output 4 of "Select"
- GA"Select">4=2<CR> Response indicating output 4 of "Select" is set to input 2

6.1.37 SIGNAL GENERATOR Modules

The available parameters for Signal Generator modules vary according to the type (Sine, Noise and Sweep), but the same command format is used.

Index 1 is used to select the type of Signal Generator module being controlled per the table below.



Signal		
Index 1	1	Sine Wave
	2	White Noise
	3	Pink Noise
	4	Sweep

When a Noise module is used it is possible to switch between White or Pink noise by setting **Index 1** to values 2 or 3 respectively, without additional indices (e.g. SA "Noise 1">1=3 to set Pink Noise)

Index 2 is then used to select the parameter to change dependent on the Generator type selected by Index 1 per the tables below.

Sine Wave (Index 1 = 1)		Format	Value Range
Index 2	1	Frequency	NNNNN
	2	Gain	(-)NN.N
	3	Mute	O,F,t
			O=On, F=Off, T=Toggle

White Noise (Index 1 = 2)		Format	Value Range
Index 2	1	Gain	(-)NN.N
	2	Mute	O,F,t
			O=On, F=Off, T=Toggle

Pink Noise (Index 1 = 3)		Format	Value Range
Index 2	1	Gain	(-)NN.N
	2	Mute	O,F,t

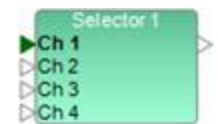
Sweep (Index 1 = 4)		Format	Value Range
Index 2	1	Gain	(-)NN.N
	2	Slow/Fast	S,F
	3	Repeat	O,F
	4	Start/Stop	O,F

EXAMPLES:

SA"Sine 1">1>1=500<CR> Set the frequency for Sine Generator "Sine 1" to 500Hz
SA"Noise 1">1=2<CR> Set Noise Generator "Noise 1" to White noise
SA"Noise 1">2>2=O Set the Mute state of White noise gen "Noise 1" to Muted
GA"Sweep 1">4>2<CR> Query whether module "Sweep 1" is set to Slow or Fast
GA"Sweep 1">4>2=F<CR> Response indicating "Sweep 1" is currently set to Fast

6.1.38 SOURCE SELECTOR Module

The Source Selector module is available in both mono and stereo versions, each with a user-definable number of inputs (Max. 16), but the command format is the same. **Index 1** is always 1 and the **Value** is used to select the input.



Index 1: Channel (always =1)

Value: Input number: 1-16

EXAMPLES:

SA"Selector 1">1=5<CR> Set Source Selector module "Selector 1" to input 5
GA"Bar">1<CR> Query which input is currently selected for module "Bar"
GA"Bar">1=2<CR> Response indicating input 2 is currently selected

6.1.39 SPEAKER PARAMETRIC EQ Module

The Speaker Parametric EQ module has 9 bands of parametric EQ, a band-pass filter and alignment delay. The same parameters are adjustable for each parametric EQ band. **Index 1** is used to select the EQ band to adjust (1-9) or 0 to select the Band Pass, Alignment Delay and EQ Gain parameters. **Index 2** is then used to select the desired parameter to adjust per the tables below.



Index 1: Selects the desired EQ Band (1-9) or 0 for Band Pass/Delay/EQ Gain

Band Pass/Align Delay/ EQ Gain (Index 1 = 0)		Format	Value Range	
Index 2	1	<i>Reserved</i>		
	2	<i>Reserved</i>		
	3	Gain	(-)NN.N	-15.0dB to +15.0dB, 0.5dB step
	4	Align Delay	NNN	0 to 480 samples
	5	Type (High)	*1	e.g. But12 →
	6	Fre- quency	NNNNN	20 to 20000Hz
	7	Type (Low)	*1	e.g. But12 →
	8	Fre- quency	NNNNN	20 to 20000Hz
	9	Lo Bypass	O,F,T	O=On, F=Off, T=Toggle
	10	Hi Bypass	O,F,T	O=On, F=Off, T=Toggle
	11	Polarity	O,F,T	O=On, F=Off, T=Toggle

Filter type descriptors

Type	Slope	Value
But- terworth	6dB/oct	But6
	12dB/oct	But12
	18dB/oct	But18
	24dB/oct	But24
	36dB/oct	But36
Bessel	48dB/oct	But48
	12dB/oct	Bes12
	18dB/oct	Bes18
	24dB/oct	Bes24
	36dB/oct	Bes36
Linkwitz- Reily	48dB/oct	Bes48
	12dB/oct	Lin12
	24dB/oct	Lin24
	36dB/oct	Lin36
	48dB/oct	Lin48

		Parameter	Format	Value Range
Index 2	1	Frequency	NNNNN	20 to 20000Hz
	2	Q	NN.N	0.10 to 10.0, 0.1 step
	3	Gain	(-)NN.N	-20.0dB to +20.0dB, 0.1dB step
	4	<i>Reserved</i>		
	5	Type	XX	B, HS, LS, N (see below)
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

The parameters in use for each band will be dependent on the Type of filter selected per the table below.

Type	String	Freq.	Q	Gain	Bypass
Band	B	o	o	o	o
High Shelf	HS	o		o	o
Low Shelf	LS	o		o	o
Notch	N	o	o	o	o

EXAMPLES:

SA"SPEQ 1">0>5=Bes36<CR> Set the HP Filter type for "SPEQ 1" to Bessel 36dB/oct
 SA"Array L">2>1=200<CR> Set the frequency for PEQ band 2 of "Array L" to 200Hz
 GA"Array L">0>3<CR> Query the EQ gain SPEQ module "Array L"
 GA"Array L">0>3=2<CR> Response indicating the EQ gain is currently at +2dB

6.1.40 STANDARD MIXER Module

The Standard Mixer module is available with a user-defined number of inputs and outputs (max. 32), and allows control of input level/mute, output level/mute and cross-point routing. Cross-point routing can be set using two different methods; the first routes all the outputs for a given input with a single command, the second allows an individual cross-point (input,output) to be controlled directly.



Index 1 is used to select whether an input, output or a cross-point (and the cross-point method) is being controlled per the table below.

	Parameter	Notes
Index 1	1	Input Set Input Parameters
	2	Output Set Output Parameters
	3	Cross-point A Route Input to Multiple Outputs
	4	Cross-point B Set Cross-point On/Off Directly

Index 2 is then used to select the parameter to set or query dependent on whether an input, output or cross-point was selected by the first index.

In the following tables M = # of inputs and N = # of outputs in the module.

	Input Parameters (Index 1 = 1)	Format	Value Range
Index 2	1	Input 1 Level	(-)NN.N -60.5 to +12.0dB, 0.5 step
	2	Input 1 Mute	O,F,T O=On, F=Off, T=Toggle
	Mx2-1	Input M Level	(-)NN.N -60.5 to +12.0dB, 0.5 step
	Mx2	Input M Mute	O,F,T O=On, F=Off, T=Toggle

Output Parameters (Index 1 = 2)		Format	Value Range	
Index 2	1	Output 1 Level	(-)NN.N	-60.5 to +12.0dB, 0.5 step
	2	Output 1 Mute	O,F,T	O=On, F=Off, T=Toggle
	Nx2-1	Output N Level	(-)NN.N	-60.5 to +12.0dB, 0.5 step
	Nx2	Output N Mute	O,F,T	O=On, F=Off, T=Toggle

Cross-point Routing A – Routing an input to multiple outputs with a single command (Index 1=3)

Cross-point Routing A (Index 1 = 3)		Format	Value Range	
Index 2	1	Input 1 Routing	XXXXXXXX	Hex representation of routing
	2	Input 2 Routing	XXXXXXXX	Hex representation of routing
	M	Input M Routing	XXXXXXXX	Hex representation of routing

The desired output routing for an input is sent as an array of eight Hex values, where each Hex value represents the routing for 4 channels converted from Binary. This allows the routing for 32 outputs to be set in a single command. Even when the Standard Mixer module used has less than 32 outputs all 8 Hex values should be sent.

Example:

To route input 1 to outputs: 1,6,9,12,15,18,21,22,23,24,27,28,29 & 31 the array of Hex values would be '84924F3A' as illustrated:

	Output Channels																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Input 1	O	-	-	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	O	O	O	-	-	O	O	O	-	O	-
Hex Value	8				4				9				2				4				F				3				A			

Cross-point Routing B – Controlling a cross-point (input,output) directly (Index 1=4)

Index 2: (input,output)

Value: O=On,F=Off,T=Toggle

EXAMPLES:

SA"StdMixer 1">1>1=-3<CR>	Set the level for input 1 of module "StdMixer 1" to -3dB
SA"My Mixer">2>16=O<CR>	Set mute state for output 8 of module "My Mixer" to On
SA"Mix">3>2=C0000000<CR>	Route input 2 to outputs 1 & 2 on "Mix" using cross-point 1
SA"Theatre">4>(4,5)=O<CR>	Route input 4 to output 5 on "Theatre" using cross-point 2
GA"Mix">3>4<CR>>	Query the routing for input 4 of "Mix" using cross-point 1
GA"Mix">3>4=03000000<CR>	Response indicating input 4 is routed to outputs 7&8
GA"Theatre">4>(6,8)<CR>	Query whether input 6 is routed to output 8 on "Theatre"
GA"Theatre">4>(6,8)=F<CR>	Response indicating input 6 is not routed to output 8

6.1.41 TONE CONTROL EQ Module

The Tone EQ module has a gain and bypass control for each of the 3 bands, selected using the appropriate value for **Index 1** per the following table.



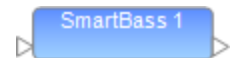
		Parameter	Format	Value Range
Index 1	1	Low Gain	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	2	Low Bypass	O,F,T	O=On, F=Off, T=Toggle
	3	Mid Gain	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	4	Mid Bypass	O,F,T	O=On, F=Off, T=Toggle
	5	High Gain	(-)NN.N	-15.0dB to +15.0dB, 0.1dB step
	6	High Bypass	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"ToneEQ L">1>=-4<CR>	Set the Low band of Tone EQ module "ToneEQ L" to -4dB
SA"Hall EQ">6>=O<CR>	Bypass the High band of Tone EQ module "Hall EQ"
GA"ToneEQ 1">3<CR>	Query the current level for the Mid band of "ToneEQ 1"
GA"ToneEQ 1">3>=-3<CR>	Response indicating the Mid band is currently at -3dB

6.1.42 SMARTBASS Module [EX/1U ESP Only]

The SmartBass module has one input and one output and is available on all processors except the ESP-00 Series II processor. There is a single parameter that can be controlled, selected using the appropriate value for **Index 1**.



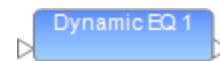
		Parameter	Format	Value Range
Index 1	1	Bypass	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"SmartBass 1">1>=O<CR>	Enable bypass
GA"SmartBass 1">1<CR>	Get the bypass state

6.1.43 DYNAMIC EQ Module [EX/1U ESP Only]

The Dynamic EQ module has one input and one output and is available on all processors except the ESP-00 Series II processor. There is a single parameter that can be controlled, selected using the appropriate value for **Index 1**.



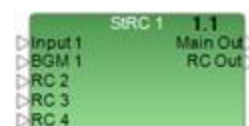
		Parameter	Format	Value Range
Index 1	1	Bypass	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"Dynamic EQ 1">1=O<CR> Enable bypass
 GA"Dynamic EQ 1">1<CR> Get the bypass state

6.1.44 STANDARD ROOM COMBINER Module

The Standard Room Combiner module allows for simpler and more efficient scenarios that do not need the advanced mixing of the Conference Room Combiner module. Each room has optional Background Music sources, optional room inputs, and a main output.



Index 1 is always 1.

		Parameter	Format	Value Range
Index 2	1	BGM Source	N	0=None, N=BGM N
	2	BGM Gain	(-)NN.N	-60.5dB to +12.0dB, 0.5dB step
	3	BGM Mute	O,F,T	O=On, F=Off, T=Toggle
	4	Main Input Gain	(-)NN.N	-60.5dB to +12.0dB, 0.5dB step
	5	Main Input Mute	O,F,T	O=On, F=Off, T=Toggle
	6	Main Output Gain	(-)NN.N	-60.5dB to +12.0dB, 0.5dB step
	7	Main Output Mute	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"StRC 1">1>1=3<CR> Set the BGM source to "BGM 3"
 SA"StRC 1">1>5=O<CR> Mute the Main Input
 GA"StRC 1">1>2<CR> Query the current level for the BGM gain
 GA"StRC 1">1>2=-3<CR> Response indicating the BGM gain is currently at -3dB

6.1.45 PREDICTIVE FEEDBACK SUPPRESSION Module [EX/1U ESP Only]

The PFS (Predictive Feedback Suppression) module has one input and one output. Its parameters are divided into logical groups, with Index 1 selecting between those groups. Index 2 selects parameters within those groups. Note that during normal operation, the gain and center frequency values of dynamic filters will be changed automatically as feedback is detected.



Bypass Parameters (Index 1 = 0)			Format	Value Range
Index 2	2	Bypass Dynamic Filter Detection	O,F,T	O=On, F=Off, T=Toggle

Update Parameters (Index 1 = 1)			Format	Value Range
Index 2	1	Dynamic Filter Release Time	NNNNN	1 second to 43200 seconds

Filter Parameters (Index 1 = 2-17)			Format	Value Range
Index 2	1	Gain	(-)NN.N	-24.0 dB to 0.0 dB, 0.1 dB step
	2	Center Frequency	NNNNN	20Hz to 20,000Hz
	3	Q	NN.N	0.10 to 14.4, 0.1 step
	4	Bypass	O,F,T	O=On, F=Off, T=Toggle

Static Filter Parameters (Index 1 = 18)			Format	Value Range
Index 2	1 to 16	Filter is Static	O,F,T	O=On, F=Off, T=Toggle

System Gain Parameters (Index 1 = 19)			Format	Value Range
Index 2	0	Gain	(-)NN.N	0.0dB to 12.0dB, 0.5dB step

GUI Parameters (Index 1 = 20)			Format	Value Range
Index 2	0	Bypass All Filters	O,F,T	O=On, F=Off, T=Toggle
	1	Un-Bypass All Filters	O,F,T	O=On, F=Off, T=Toggle
	2	Set All Filters Static	O,F,T	O=On, F=Off, T=Toggle
	3	Set All Filters Dynamic	O,F,T	O=On, F=Off, T=Toggle
	4	Clear All Dynamic Filters	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"PFS 1">1>1=300<CR>

Set the Dynamic Filter Release Time to 300 seconds

SA"PFS 1">20>4=O<CR>

Clear all Dynamic Filters

GA"PFS 1">19>0<CR>

Query the current level for the system gain

GA"PFS 1">19>0=9.0<CR>

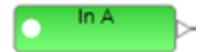
Response indicating the system gain is currently at 9dB

6.2 PowerMatch® And PowerShare Module Indices



6.2.1 INPUT Module

There are 3 parameters which can be set for this module selected by using the appropriate value for **Index 1**.



Note: Digital Sensitivity for PowerMatch and Analog Sensitivity is global and set via the properties for the device.

	Parameter	Format	Value Range	
Index 1	1	Analog Sensitivity	NN.N	0, 4, 12, 24 dBu for PM only
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Source	O,F,T	O=On, F=Analog, T=Toggle

EXAMPLES:

<code>SA"In A">1=4<CR></code>	Set the Input Sensitivity for "In A" to 4dBu
<code>SA"Desk L">3=O<CR></code>	Select Digital input source for input "Desk L"
<code>GA"In D">2<CR></code>	Query the current Mute state for "In D"
<code>GA"In D">2=F<CR></code>	Response indicating that "In D" is currently un-muted


6.2.2 SIGNAL GENERATOR Module [Power Match Only]

Index 1 should always be set to 5 to access this module. There are 8 parameters that can be controlled for this module, selected using the appropriate value for **Index 2**.



Note: The routing for the Signal Generator is set via the Matrix Mixer module, where it appears as input 9.

Index 1: PowerMatch Signal Generator (always=5)

(Index 1 = 5)		Parameter	Format	Value Range
Index 2	1	Level	(-)NN.N	-60.5 to 12.0dB, 0.5 step
	2	Repeat	O,F	O=On, F=Off
	3	Mute	O,F,T	O=On, F=Off, T=Toggle
	4	Type	N	1 to 4 
	5	Tone Freq	NNNNN	20 to 20000Hz
	6	Start Freq	NNNNN	20 to 20000Hz
	7	End Freq	NNNNN	20 to 20000Hz
	8	Duration	N	1 to 5s, step 1

Sig Gen Type	
1	Pink Noise
2	White Noise
3	Tone
4	Sweep

EXAMPLES:

SA"SigGen 1">5>4=1<CR>

Set the Signal Generator "SigGen 1" to output Pink Noise

SA"SigGen 1">5>1=-10<CR>

Set the level for Signal Generator "SigGen 1" to -10dB


GA"SigGen 1">5>3<CR>

Query the current Mute state for module "SigGen 1"

GA"SigGen 1">5>3=O<CR>

Response indicating that "SigGen 1" is currently muted

6.2.3 INPUT PARAMETRIC EQ Module

The Input Parametric EQ modules have 5 bands for PowerMatch and 9 bands for PowerShare. The same parameters are adjustable for each band. **Index 1** is used to select the band to adjust (1-9) and **Index 2** is used to select the parameter to adjust per the table below. 

Index 1: Selects desired Parametric EQ band 1-9 (1-5 for PowerMatch)

		Parameter	Format	Value Range
Index 2	1	Frequency	NNNNN	20 to 20000Hz
	2	Q	NN.N	0.10 to 10.0, 0.1 step
	3	Gain	(-)NN.N	-20.0dB to +20.0dB, 0.1dB step
	4	Slope	-NN	0,-6,-12dB/oct
	5	Type	XX	B, HS, LS, HC, LC, N (see below)
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

The parameters in use for each band will be dependent on the **Type** of filter selected per the table below.


Type	String	Freq.	Q	Gain	Slope	Bypass
Band	B	o	o	o		o
High Shelf	HS	o		o		o
Low Shelf	LS	o		o		o
High Cut (Low Pass)	HC	o			o	o
Low Cut (High pass)	LC	o			o	o
Notch	N	o	o	o		o

Note: Labels for PowerMatch and PowerShare Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels for PowerMatch are "PEQ-5band A" through to "PEQ-5band H" per the channel. Module labels for PowerShare are "PEQ-9band 1" through to "PEQ-9band 4" per the channel.

EXAMPLES:

SA"PEQ-5band A">1>1=2000<CR> Set the frequency for band 1 of channel A to 2kHz
SA"PEQ-5band D">4>5=HS<CR> Use a 'High Shelf' filter for band 4 of channel D
GA"PEQ-5band F">3>6<CR> Query the Bypass state for band 3 of channel F"
GA"PEQ-5band F">3>6=F<CR> Response indicating Bypass for band 3 is Off

6.2.4 ARRAY EQ Module [PowerMatch Only]

Due to the internal architecture of the PowerMatch, the Array EQ module is actually addressed as band 6 of the Input Parametric EQ module, hence **Index 1 = 6**. **Index 2** is then used to select the parameter to adjust per the table below. Parameters that are indicated as 'Reserved' should not be used. 

Index 1: Selects Array EQ band of Input Parametric module (always=6)

(Index 1 = 6)	Parameter	Format	Value Range	
Index 2	1	Center Freq	NNN	100 to 4000Hz
	2	Tilt	NN.N	0.0 to 10.0. 0.1 step
	3	Gain	(-)NN.N	-12.0dB to +2.0dB, 0.1dB step
	4	Array	M.VVV	M=2 to 8, VVV=20 to 100, 5 step
	5	<i>Reserved</i>		
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle
	7	<i>Reserved</i>		

Note: Labels for PowerMatch Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels are "PEQ-5band A" through to "PEQ-5band H" per the channel.

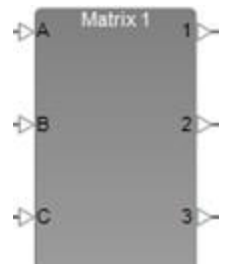
EXAMPLES:

- SA"PEQ-5band A">6>4=4.080<CR> Set the Array settings for channel A, Array EQ module to 4x modules & 80 deg vertical coverage
- SA"PEQ-5band C">6>3=-6<CR> Set the Gain for channel C Array EQ to -6dB
- GA"PEQ-5band E">6>6<CR> Query the Bypass state for Array EQ on channel E
- GA"PEQ-5band E">6>6=O<CR> Response indicating Bypass for channel E is On

6.2.5 MATRIX MIXER Module

The Matrix Mixer module allows cross-points to be switched on/off or the level at the cross-point to be adjusted. It also allows entire input or output channels to be muted.

Index 1 is used to select whether the cross-point state (on/off), level, input channel mute, or output channel mute will be adjusted per the table below.



		Parameter	Notes
Index 1	1	On/Off	Set Cross-Point On/Off
	2	Level	Set Level
	3	Mute	Input Channel Mute
	4	Mute	Output Channel Mute

Index 2 is then used to select which cross-point is to be controlled; stepping through the available outputs for input 1, then through the available outputs for input 2, and so on. **Index 2** will be the same irrespective of whether the state (on/off) or level is being controlled, but **Index 1** and the **Value** will change.

In the following tables: M = # of inputs and N = # of outputs in the module.

Index 1 = 1 On/Off		Format	Value Range
Index 2	1	Cross Point(1,1)	O,F,T
	2	Cross Point(1,2)	O,F,T
	Index 2 = (Input # -1) x 8 + Output #:		
	72	Cross Point(9,8)	O,F,T

Index 1 = 2 Level		Format	Value Range
Index 2	1	Cross Point(1,1)	(-)NN.N
	2	Cross Point(1,2)	(-)NN.N
	Index 2 = (Input # -1) x 8 + Output #:		
	72	Cross Point(9,8)	(-)NN.N

Note: Labels for PowerMatch and PowerShare Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module label is "Matrix 1".

Index 1 = 3 Mute			Format	Value Range
Index 2	1-32	Input Channel 1-32	O,F,T	O=On, F=Off, T=Toggle

Index 1 = 4 Mute			Format	Value Range
Index 2	1-32	Output Channel 1-32	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

<p>SA"Matrix 1">1>26=O<CR></p> <p>SA"Matrix 1">1>65=O<CR></p> <p>SA"Matrix 1">3>3=F<CR></p> <p>SA"Matrix 1">4>16=O<CR></p> <p>GA"Matrix 1">2>4<CR></p> <p>GA"Matrix 1">2>4=F<CR></p> <p>GA"Matrix 1">3>8<CR></p>	<p><i>Set cross-point 26 (Input D, Output2) on "Matrix 1" to On</i></p> <p><i>Set cross-point 65 (SigGen, Output1) on "Matrix 1" to On</i></p> <p><i>Set input channel three to mute</i></p> <p><i>Set output channel sixteen to unmute</i></p> <p><i>Query the current level for cross-point 4 (Input A, Output 4)</i></p> <p><i>Response indicating cross-point 4 is currently Off</i></p> <p><i>Query the current mute/unmute state for input channel eight</i></p>
--	--



6.2.6 BAND PASS Module

Index 1 should always be set to 1 to access this module. The 6 parameters that can be set for this module are then selected by using the appropriate value for **Index 2**. Parameters that are indicated as 'Reserved' should not be used.



Index 1: Selects module (always=1)

Filter type descriptors

	Parameter	Format	Value Range	
Index 2	1	Type(HPF)	SSSSS e.g. But12 	
	2	Frequency	NNNNN 20Hz to 20000Hz	
	3	Type(LPF)	SSSSS e.g. But12 	
	4	Frequency	NNNNN 20Hz to 20000Hz	
	5	Reserved		
	6	Reserved		
	7	Reserved		
	8	HP Bypass	O,F,T	O=On, F=Off, T=Toggle
	9	LP Bypass	O,F,T	O=On, F=Off, T=Toggle

Type	Slope	Value
Butterworth	6dB/oct	But6
	12dB/oct	But12
	18dB/oct	But18
	24dB/oct	But24
	36dB/oct	But36
Bessel	48dB/oct	But48
	12dB/oct	Bes12
	18dB/oct	Bes18
	24dB/oct	Bes24
Linkwitz-Reilly	36dB/oct	Bes36
	48dB/oct	Bes48
	12dB/oct	Lin12
	24dB/oct	Lin24
Linkwitz-Reilly	36dB/oct	Lin36
	48dB/oct	Lin48

Note: Labels for PowerMatch and PowerShare Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels are "Band Pass 1" through to "Band Pass 8" per the channel.

EXAMPLES:

SA"Band Pass 1">1>3=But24<CR>

Set LP filter for channel 1 to Butterworth 24db/oct

SA"Band Pass 5">1>2=80<CR>

Set frequency for channel 5 high-pass to 80Hz

GA"Band Pass 7">1>9<CR>

Query the Bypass state for LPF on channel 7

GA"Band Pass 7">1>9=F<CR>

Response channel 7 LPF Bypass is currently Off

6.2.7 SPEAKER PARAMETRIC EQ Module

The Speaker Parametric EQ module has; 9 bands of parametric EQ and a band-pass filter. The Band Pass section is addressed as a separate module (see above).



For PowerMatch only, an EQ gain, polarity, and alignment delay are included as well. **Index 1** is used to select the EQ band to adjust (1-9) or setting **Index 1** to 0 selects the EQ Gain/Polarity parameters. **Index 2** is then used to select the desired parameter to adjust per the tables below.

Index 1: Selects the desired EQ Band (1-9) or 0 for EQ Gain/Polarity

Gain/Polarity (Index 1= 0)		Format	Value Range
Index 2	1	Reserved	
	2	Reserved	
	3	Gain	(-)NN.N
	4	Polarity	O,F,T
			-15.0B to +15.0dB, 0.5dB step (PM only)
			O=On, F=Off, T=Toggle

PEQ Band (Index 1 = 1-9)		Format	Value Range
Index 2	1	Frequency	NNNNN
	2	Q	NN.N
	3	Gain	(-)NN.N
	4	Reserved	
	5	Type	XX
	6	Bypass	O,F,T
			200 to 20000Hz
			0.10 to 10.0, 0.1 step
			-20.0dB to +20.0dB, 0.1dB step
			B, HS, LS, N (see below)
			O=On, F=Off, T=Toggle

The Parameters in use for each band will be dependent on the **Type** of filter selected per the table below.

Type	String	Freq.	Q	Gain	Bypass
Band	B	o	o	o	o
High Shelf	HS	o		o	o
Low Shelf	LS	o		o	o
Notch	N	o	o	o	o

Note: Labels for PowerMatch and PowerShare Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels are "SpeakerPEQ 1" through to "SpeakerPEQ 8" per the channel.

EXAMPLES:

- SA"SpeakerPEQ 1">6>5=LS<CR> Set type for PEQ band 6 of Channel 1 to Low-Shelf
- SA"SpeakerPEQ 4">2>1=200<CR> Set the freq. for PEQ band 2 of Channel 4 to 200Hz
- GA"SpeakerPEQ 6">0>3<CR> Query the EQ gain for Channel 6 SPEQ module
- GA"SpeakerPEQ 6">0>3=2<CR> Response indicating the EQ gain is currently +2dB

6.2.8 LIMITER Module

Index 1 should always be set to 0 to access this module. There are 5 parameters that can be controlled for this module, selected using the appropriate value for **Index 2**. The Link Group parameter is only included in PowerMatch. Parameters indicated as 'Reserved' should not be used.



Index 1: Selects module (always=0)

		Parameter	Format	Value Range	
Index 2	1	Peak Threshold	NNN.N	0.5 to 71.0 V (or 142.0 for bridged), 0.5 Step	
	2	RMS Threshold	NNN.N	0.5 to 50.0 V (or 142.0 for bridged), 0.5 Step	
	3	RMS Attack	NNNNNN	500 to 10,000ms, 100 step	
	4	RMS Release	NNNNNN	500 to 10,000ms, 100 step	
	5	Link Group	N	0 (no link group), 1 to 4 (PM only)	
	6	<i>Reserved</i>			
	7	<i>Reserved</i>			
	8	<i>Reserved</i>			
	9	<i>Reserved</i>			
	10	<i>Reserved</i>			
	11	<i>Reserved</i>			
	12	<i>Reserved</i>			

Note: Labels for PowerMatch and PowerShare Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels are "Limiter 1" through to "Limiter 8" per the channel.

EXAMPLES:

- SA"Limiter 3">0>1=50<CR> Set the Peak limiter threshold for channel 3 to 50V
- SA"Limiter 1">0>2=25<CR> Set the RMS limiter threshold for channel 1 to 25V
- GA"Limiter 5">0>5<CR> Query whether channel 5 is part of a limiter Link Group
- GA"Limiter 5">0>5=2<CR> Response indicating channel 5 is a member of Link Group 2

6.2.9 DELAY Module

The Delay module on PowerMatch and PowerShare amplifiers has a single tap, hence **Index 1** is always 1. **Index 2** is then used to select the parameter to adjust per the tables below (PM and PS have different Index 2 parameters). Parameters indicated as 'Reserved' should not be used.



Index 1: Selects Delay tap (always=1)

Index 2: PowerMatch Only

		Parameter	Format	Value Range
Index 2	1	Delay time	NNNNN	0 to 144000 samples (3s)
	2	Bypass	O,F,T	O=On, F=Off, T=Toggle
	3	Align Delay	NNN	0 to 480 samples

Index 2: PowerShare Only

		Parameter	Format	Value Range
Index 2	1	Delay time	NNNNN	0 to 2400 samples (50ms)
	2	<i>Reserved</i>		
	3	Bypass	O,F,T	O=On, F=Off, T=Toggle

Note: Labels for PowerMatch and PowerShare Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels are "Delay 1" through to "Delay 8" per the channel for PowerMatch and "Delay 3" through to "Delay 4" for PowerShare.

EXAMPLES:

SA"Delay 1">1>1=2592<CR> Set the delay time for channel 1 to 54msec (54msec = 0.054sec, 0.054x48000 = 2592 samples)

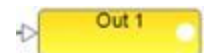
SA"Delay 6">1>2=F<CR> Set Delay bypass for channel 6 to Off

GA"Delay 2">1>1<CR> Query the current delay time channel 2

GA"Delay 2">1>1=9600<CR> Response with delay time for channel 2 is 200ms (9600 samples, 9600/48000 = 0.2sec = 200msec)

6.2.10 AMP OUTPUTModule

There are 3 parameters that can be controlled for this module, selected using the appropriate value for **Index 1**.



		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to 0.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

SA"Out Main">1>1=-3.5<CR> Set the level for Output module "Out Main" to -3.5dB

SA"Output L">2>2=T<CR> Toggle the mute state for Amp Output "Output L"

GA"Out 1">1>1<CR> Query the current level for channel 1 Amp Output

GA"Out 1">1>1=-6<CR> Response indicating channel 1 is currently set to -6dB

7 MSA12X Commands

These commands allow for basic control and monitoring of MSA12X Powered Steerable Array Loudspeakers, using serial commands sent over Ethernet.

Note: For commands that reference specific modules, the modules in a 2-module array are identified as 1 and 3 (not 1 and 2).

- 7.1 Identify/Find Unit (ID/FU)
- 7.2 Array Module Count (ARRAY)
- 7.3 Input Gain (IG)
- 7.4 Input Source (INPUT/GINPUT)
- 7.5 Input Backup (GBKSTG)
- 7.6 Standby (STANDBY/GETSBST)
- 7.7 Auto-Standby (STANDBY/GETSBTIME)
- 7.8 Load Preset (LOAD/GCP)
- 7.9 Audio Level (AUDIOLEVEL)

- 7.10 Module Status (STATUS)
- 7.11 Module Firmware Version (VERSION)

7.1 ID/FU Identify Device/Find Unit

The Identify and Find commands can be used to locate a module within a given array by flashing its Status LED on and off. The Find command will flash the LED for 5 seconds and then cease, whereas the Identify command allows the indication to persist until a second command is sent to turn it off, or the device is power cycled.

To activate the Find function:

`FU n<CR>` where *n* is the module within the array: 1,2 or 3 (2 module array=1 & 3)
Response:
`ACK FU n<CR>`

To activate or deactivate the Identify function:

`ID n s<CR>` where *n* is the module within the array, 1,2 or 3 (2 module array=1 & 3)
s is the state, 1=On, 0=Off
Response:
`ACK ID n s<CR>`

EXAMPLES:

`ID 21<CR>` Command activating the Identify function for 2nd module of 3-module array
`ACK ID 21<CR>` Response indicating Identify function for 2nd module is on
`FU<CR>` Command activating Find function

7.2 Array Module Count (ARRAY)

This command returns the number of modules within the MSA12X array.

To query the number of modules in the array:

ARRAY<CR>

Response:

ACK ARRAY *n*<CR>

where *n* is the number of modules in the array: 1, 2, or 3

EXAMPLES:

ARRAY<CR>

Query for module count of array

ACK ARRAY 3<CR>

Response confirming module count of 3

7.3 Input Gain (IG)

This command allows the pre-amplifier gain for either the analog or Dante input to be adjusted or queried.

To set or change the Input Gain for input type *t*:

IG *t g*<CR>

where *t* is the input type: A (Analog) or D (Dante)
g is the gain: 0.0, 14.0, or 24.0

Response:

ACK IG *t g*<CR>

where *t,g* are the same as above.

To query the Input Gain for input type *t*:

IG *t Q*<CR>

where *t* is the same as above.

Response:

ACK IG *t g*<CR>

where *t,g* are the same as above.

EXAMPLES:

IG D 14.0<CR>

Set Input Gain for the Dante input to +14.0 dB

ACK IG D 14.0<CR>

Response confirming Input Gain for Dante was changed to +14.0 dB

IG A Q<CR>

Query the Input Gain for the Analog input

ACK IG A +0.0<CR>

Response indicating Analog Input Gain is currently 0.0 dB

7.4 Input Source (INPUT/GINPUT)

These commands allow the input source to be queried or selected manually when backup mode is not being used (Backup Strategy=Force). If backup mode is active (Backup Strategy=Signal Presence) then the command to select the input source will be ignored.

To set or change the Input Source (when backup is not being used):

INPUT 1 *t*<CR>

where *t* is the input type: 0 (Dante) or 1 (Analog)

Response:

ACK INPUT 1 *t*<CR>

where *t* is the same as above.

To query the Input Source:

GINPUT<CR>

Response:

ACK GINPUT *t*<CR>

where *t* is the input type, ANALOG or DANTE.

EXAMPLES:

INPUT 1 0<CR>	Set Input Source to Dante (when backup is not being used)
ACK INPUT 1 0<CR>	Response confirming Input Source is Dante
GINPUT<CR>	Query the active Input Source
ACK GINPUT ANALOG<CR>	Response indicating active Input Source is Analog

7.5 Input Backup (GBKSTG)

This command can be used to determine whether backup mode is active (Backup Strategy = Signal Presence) or whether the Input Source can be changed manually (Backup Strategy = Force).

To query the current Backup Strategy:

GBKSTG<CR>

Response:

ACK GBKSTG **b**<CR> where **b** is the strategy: FORCE (backup is inactive; manual input selection) or SP 1 (backup is active - automatic failover to Analog).

EXAMPLES:

GBKSTG<CR>	Query current Backup Strategy
ACK GBKSTG SP 1<CR>	Response confirming backup is active (Backup Strategy = Signal Presence)
ACK GBKSTG FORCE<CR>	Response confirming backup is inactive (Backup Strategy = Force)

7.6 Standby (STANDBY/GETSBST)

These commands are used to put the array into its Standby state or to wake it from being in Standby.

To change the Standby condition of the array:

STANDBY **a**<CR> where **a** is the Standby action, NOW (enter Standby immediately) or WAKE (exit Standby immediately)

Response:

ACK STANDBY **a**<CR> where **a** is the same as above.

To query the current Standby state of the array:

GETSBST<CR>

Response:

ACK GETSBST **s**<CR> where **s** is the Standby state, 0=Not in Standby, 1=In Standby.

EXAMPLES:

STANDBY NOW<CR>	Instruct array to enter Standby state immediately
ACK STANDBY NOW<CR>	Response confirming array entering Standby state
GETSBST<CR>	Query whether the array is currently in Standby state
ACK GETSBST 0<CR>	Response confirming array is not in Standby

7.7 Auto-Standby (STANDBY/GETSBTIME)

These commands are used to adjust the amount of time the array will wait, without any audio signal present, before automatically entering its Standby state. If the time is set to 0 the array will never enter Standby state automatically, even if there is no audio signal being received.

To change the Auto-Standby wait time of the array:

STANDBY **w**<CR> where **w** is the time to wait in minutes (0–120)

Response:

ACK STANDBY **w**<CR> where **w** is the same as above.

To query the current Auto-Standby wait time of the array:

GETSBTIME<CR>

Response:

ACK GETSBTIME **w**<CR> where **w** is the same as above.

EXAMPLES:

STANDBY 60<CR>	Set the wait time before automatically entering Standby to 60 mins
ACK STANDBY 60<CR>	Response confirming wait time is now 60 mins
STANDBY 0<CR>	Turn off Auto-Standby feature by setting wait time to 0 mins
ACK STANDBY 0<CR>	Response confirming wait time is now 0 mins and therefore disabled
GETSBST<CR>	Query the current wait time for Auto-Standby
ACK GETSBST 0<CR>	Response confirming wait time for Auto-Standby is 30 mins

7.8 Load Preset (LOAD/GCP)

Using the ControlSpace Designer Software it is possible to create and store configurations with different parameter settings for the MSA12X loudspeaker as Presets, which can then be recalled with a single command. There are ten Presets available, numbered 1 through 10 in the software, but invoked as indices 0 through 9 via command.

Note: The default Preset that will be recalled when the device is powered-on is configured in the software, but those settings can be overridden by recalling another preset via this command, if needed.

To recall settings stored as preset **p:**

LOAD **p**<CR> where **p** is the preset index 0–9 (preset number-1)

Response:

ACK LOAD **p**<CR> where **p** is the same as above

To query the last preset recalled (note that individual settings may have changed since):

GCP<CR>

Response:

ACK GCP **p**<CR> where **p** is the preset index 0-9 (preset number-1).

EXAMPLES:

LOAD 2<CR>	Recall settings from Preset 3 (saved via ControlSpace Designer)
ACK LOAD 2<CR>	Response confirming settings from Preset 3 recalled
GCP<CR>	Query the last invoked preset
ACK LOAD 8<CR>	Response confirming last invoked preset was 9

7.9 Audio Level (AUDIOLEVEL)

This command returns the current input signal level and presence indication for the array.

To query the current audio level:

AUDIOLEVEL<CR>

Response:

ACK AUDIOLEVEL*i l*<CR> where *i* is the signal indication, 1=Presence, 18=Clip, 19=Limit
l is level, 32-bit hex, containing 24-bit level (ignore 2 MSB)
Convert the hex value to an integer and then the dB level can be found using: $20 * \log_{10}(\text{level} / 16777215)$

EXAMPLES:

AUDIOLEVEL<CR>	Command query current audio level
ACK AUDIOLEVEL 1 0x00199999<CR>	Response indicating signal is present, and the level is -20.0dB
ACK AUDIOLEVEL 0 0x00000000<CR>	Response indicating signal not present

7.10 Module Status (STATUS)

The Status command can provide information about the current health of each module in the array, reporting any warnings or faults. Some information about MSA12X status is only available through CSD and is not accessible through the Status command.

To query warning status for module *n*:

STATUS 0 *n*<CR> where *n* is the module within the array, 1,2 or 3 (2 module array=1 & 3)

Response:

ACK STATUS 0 *n w*<CR> where *n* is the module within the array, 1,2 or 3
w is the warning code, 0=No Warning, 18=Signal Clip, 19=Amplifier Limiting, 20=High Temperature

To query fault status for module *n*:

STATUS 1 *n*<CR> where *n* is the module within the array, 1,2 or 3 (2 module array=1 & 3)

Response:

ACK STATUS 1 *n f*<CR> where *n* is the module within the array, 1,2 or 3
f is the fault code, 1101=Driver Fault, 1104=Temperature Fault, 1105=Amp/Internal Connection Fault

EXAMPLES:

STATUS 0 2<CR>	Query warning status for module 2 of the (3-module) array
ACK STATUS 0 2 0<CR>	Response indicating no active warning for module 2
ACK STATUS 0 2 20<CR>	Response indicating High Temperature warning for module 2
STATUS 1 1<CR>	Query fault status for module 1 of the array
ACK STATUS 1 1 0<CR>	Response indicating no known faults for module 1
ACK STATUS 1 1 1101<CR>	Response indicating possible driver fault for module 1

7.13 Module Firmware Version (VERSION)

This command queries the current firmware version installed on the modules of the array. It is expected that in normal operation all modules should have the same version of firmware installed.

To query the firmware version for the module:

VERSION *n*<CR> where *n* is the module within the array, 1,2 or 3 (2 module array=1 & 3)

Response:

ACK VERSION *n x.x*<CR> where *n* is the module within the array, 1,2 or 3
 x.x is the firmware version number

8 Endpoint Commands

Endpoint commands are used to control or query state of remote interfaces such as under-table boxes or endpoints.

Note: When an endpoint is configured with ControlSpace Designer, changing endpoint settings directly using the following commands may result in unexpected behavior.

- 8.1 Identify/Find Unit (ID/FU)
- 8.2 Input Gain (IG)
- 8.3 Input Source (IS)
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- 8.11 Query Audio Settings (QUERY)
- 8.12 Restore Factory Defaults (DEFAULTS)
- 8.13 Query Firmware Version (VERSION)

8.1 ID/FU Identify Device/Find Unit

These commands are used to locate a device by flashing its power LED on and off. The Find Unit command will flash the LEDs for 5 seconds and then cease, whereas the Identify Device command allows the indication to persist until a second command is sent to turn it off, or the device is reset or power cycled.

To activate the Find Unit feature:

FU<CR>

Response:

ACK FU<CR>

To activate or deactivate the Identify function:

ID *s*<CR> where *s* is the state, 1 = On, 0 = Off

Response:

ACK ID *s*<CR>

EXAMPLES:

ID 1<CR>

Command turning on the Identify function

ACK ID 1<CR>

Response indicating Identify function is on

FU<CR>

Command activating Find Unit function

8.2 Input Gain (IG) [EX-4ML, EX-8ML, EP40, EP22, WP22B/BU]

This command allows the pre-amplifier gain for a specific input to be adjusted. The available gain options vary per model:

Model	Gain Values
EX-4ML/EX-8ML/EP40	0.0, 15.0, 30.0, 45.0
EP22/WP22B/WP22BU	0.0, 25.0, 40.0

To set or change the Input Gain for channel **c**:

IG **c g**<CR> where **c** is the channel number
g is the gain (see above)

Response:

ACK IG **c g**<CR> where **c,g** are the same as above.

To query the Input Gain for channel **c**: (EX-4ML/EX-8ML Only)

IG **c Q**<CR> where **c** is the channel number
(or 0 to receive the current values
for all channels)

Response:

ACK IG **c g**<CR> where **c,g** are the same as above.

EXAMPLES:

IG 2 15.0<CR> Set Input Gain for channel 2 to +15.0 dB
ACK IG 2 Response confirming Input Gain for channel 2 was changed to +15.0 dB
15.0<CR>
IG 6 Q<CR> Query the Input Gain for channel 6
ACK IG 6 Response indicating Input Gain for channel 6 is currently +30.0 dB
30.0<CR>

8.3 Input Source (IS) [WP22BU]

This command selects the input source for channel 2 of the WP22BU wall plate only.

To set or change the Input Source for channel **c**:

IS **c s**<CR> where **c** is the channel number (Channel 2
for WP22BU)
s is the source A, B or A+B

Response:

ACK IS **c s**<CR> where **c,s** are the same as above.

EXAMPLES:

IS 2 B<CR> Set Input Source for channel 2 to "B"
ACK IS 2 Response confirming Input Source for channel 2 was changed to B
B<CR>

8.4 Phantom Power (PP) [EX-4ML, EX-8ML, EP40, EP22, WP22B/U]

This command activates, deactivates or queries the current state of the phantom power for a specified input channel.

To set or change the Phantom power for channel **c**:

`PP c s<CR>` where **c** is the channel number, 1 – 8
s is the state, 1 = On, 0 = Off

Response:

`ACK PP c s<CR>` where **c,s** are the same as above.

To query the state of Phantom power for channel **c**: (EX-4ML/EX-8ML Only)

`PP c Q<CR>` where **c** is the channel number
(or 0 to receive the current values for all channels)

Response:

`ACK PP c s<CR>` where **c,s** are the same as above.

EXAMPLES:

`PP 4 1<CR>` Turn On Phantom Power for channel 4
`ACK PP 4 1<CR>` Response confirming Phantom Power for channel 4 is On
`PP 7 Q<CR>` Query the state of Phantom Power for channel 7
`ACK PP 7 0<CR>` Response indicating that Phantom Power for channel 7 is currently Off

8.5 Output Gain (OG) [EP22]

This command is used to select the gain level on a specific output of the EP22 only.

To set or change the Input Gain for channel **c**:

`OG c g<CR>` where **c** is the channel number
g is the gain, 0.0 or 10.0

Response:

`ACK OG c g<CR>` where **c,g** are the same as above.

EXAMPLES:

`OG 1 10.0<CR>` Set Output Gain for channel 1 to +10.0 dB
`ACK OG 1 10.0<CR>` Response confirming Output Gain for channel 1 was changed to +10.0 dB

8.6 Read Signal Level (RSL) [EX-4ML, EX-8ML]

This command queries the current signal levels for each of the available channels on the EX-4ML and EX-8ML devices only. The EX-8ML will return 8 values and the EX-4ML will return 4 values.

To query the current signal levels:

`RSL<CR>`

Response:

`ACK RSL 1 2 3 4 5 6 7 8<CR>` where **1-8** are the current signal levels for each channel. Possible values are -99, -40, -9, -3 dB.

EXAMPLES:

RSL<CR>	Command requesting current signal levels
ACK RSL -99 -3 -9 -40<CR>	Response indicating ch1 is off, ch2 is >= -3dB, ch3 is >= -9dB and < -3dB and ch4 is >= -40dB and < -9dB

8.7 Read/Write Logic Output (RLO/WLO) [EX-4ML, EX-8ML]

These commands allow each of the logic outputs of the EX-4ML or EX-8ML devices to be set or queried. The EX-4ML has 8 logic outputs (2 per channel) and the EX-8ML has 16 logic outputs.

To set or change the state of logic output *p*:

WLO *p s*<CR> where *p* is the logic output, 1 – 16 (for EX-8ML), 1 – 8 (for EX-4ML)
s is the state, 1 = On, 0 = Off

Response:

ACK WLO *p s*<CR> where *p,s* are the same as above.

To query the state of logic output *p*:

RLO *p*<CR> where *p* is the logic output, 1 – 16 (for EX-8ML), 1 – 8 (for EX-4ML)
(or 0 to receive the current setting for all outputs)

Response:

ACK RLO *p s*<CR> where *p* is the logic output, 1 – 16 (for EX-8ML), 1 – 8 (for EX-4ML)
s is the state, 1 = On, 0 = Off

EXAMPLES:

WLO 4 0<CR>	Turn off logic output 4
ACK WLO 4 0<CR>	Response confirming logic output 4 is Off
RLO 2<CR>	Query the state of logic output 2
ACK WLO 2 1<CR>	Response indicating logic output pin 2 is On
RLO 0<CR>	Query the state of all logic outputs
ACK RLO 0 0<CR>	Response acknowledging the query first, followed by:
ACK RLI 1 0<CR>	Response confirming logic output 1 is Off
ACK RLI 2 0<CR>	Response confirming logic output 2 is Off
ACK RLI 3 0<CR>	Response confirming logic output 3 is Off (response for each channel)
	Response confirming logic output 8 is On
ACK RLI 8 1<CR>	

8.8 Read Logic Input (RLI) [EX-4ML, EX-8ML]

This command allows each of the logic inputs of the EX-4ML and EX-8ML to be queried. The EX-4ML has 4 logic inputs (one per channel) and the EX-8ML has 8 logic inputs.

Note: This is the de-bounced value, not an instantaneous reading of the pin.

To query the state of a logic input *p*:

`RLI p<CR>` where *p* is the logic input, 1 – 8 (for EX-8ML), 1 – 4 (for EX-4ML)
(or 0 to receive the current state of all outputs)

Response:

`ACK RLI p s<CR>` where *p* is the logic input, 1 – 8 (for EX-8ML), 1 – 4 (for EX-4ML)
s is the state, 1 = On, 0 = Off

EXAMPLES:

`RLI 7<CR>` Query the state of the logic input 7
`ACK RLI 7 1<CR>` Response confirming logic input 7 is On
`RLI 0<CR>` Query the state of all logic inputs
`ACK RLI 0 0<CR>` Response acknowledging the query first, followed by:
`ACK RLI 1 0<CR>` Response confirming logic input 1 is Off
`ACK RLI 2 1<CR>` Response confirming logic input 2 is On
`ACK RLI 3 0<CR>` Response confirming logic input 3 is Off
`ACK RLI 4 1<CR>` Response confirming logic input 4 is On

8.9 Set Logic Event (EVNT) [EX-4ML, EX-8ML]

This command configures the EX-4ML or EX-8ML to automatically send an event notification when the state of one of its logic inputs changes. Events can be set to occur on rising edge (RISE), falling edge (FALL), BOTH or OFF. The event notification will be sent as a UDP packet to the IP address/port specified by the SASIP command. This can remove the need to constantly poll for the state of logic inputs. This mechanism is used when EX endpoints are paired with EX processors and making changes to these settings could cause unexpected side-effects in that scenario.

To set or change event notification for logic input *p*:

`EVNT p e<CR>` where *p* is the logic input, 1 – 8 (for EX-8ML), 1 – 4 (for EX-4ML)
e is the event type, RISE, FALL, BOTH or OFF

Response:

`ACK EVNT p e<CR>` where *p, e* are the same as above

EXAMPLES:

`EVNT 9 BOTH<CR>` Turn on event notification for logic input 9, for both rising and falling edge
`ACK EVNT 9 BOTH<CR>` Response confirming event notification for logic input 9
`EVNT 5 FALL<CR>` Turn on event notification when logic input 5 turns Off
`ACK EVNT 5 FALL<CR>` Response confirming event notification for logic input 5

8.10 Set Event Notification IP Address (SASIP) [EX-4ML, EX-8ML]

This command is used to specify the IP address and port number that UDP messages are sent to when an event occurs (enabled via the EVNT command), triggered by a change to a logic input on the EX-4ML or EX-8ML. The event mechanism is used when EX endpoints are paired with EX processors and making changes to these settings could cause unexpected side-effects in that scenario.

To set or change notification address *a* and port *p*:

`SASIP a:p<CR>` where ***a*** is the IP address in the format xxx.xxx.xxx.xxx
p is the port number xxxxx

Response:

`ACK SASIP
a:p<CR>` where ***a:p*** are the same as above

EXAMPLES:

`SASIP 192.168.0.100:41494<CR>` Set the notification address to 192.168.0.100 port 41494
`ACK SASIP`
`192.168.0.100:41494<CR>` Response confirming new notification address

8.11 Query Audio Settings (QUERY)

The Query command allows remote systems to get a snapshot of the current state of the device with a single command. When a Query command is sent, the response includes the state of all the audio parameters for the device. The response will be different for each model per the controls available, and each setting is separated with a space.

To query the current settings for all audio parameters:

`QUERY<CR>`

Response:

`ACK QUERY IG1=0.0 IG2=0.0 IG3=0.0 IG4=0.0 IG5=0.0 IG6=0.0 IG7=0.0 IG8=0.0 PP1=OFF PP2-
2=OFF PP3=OFF PP4=OFF PP5=OFF PP6=OFF PP7=OFF PP8=OFF ID=OFF <CR>`

8.12 Restore Factory Defaults (DEFAULTS)

The Defaults command forces the device to return to factory settings. Where applicable, Input and Output gains are set to 0.0, Phantom power is turned Off for all channels and Logic outputs are Off for all channels. These settings are also stored to Preset 0 for use at power-up. Settings in other Presets remain unaffected.

To reset the endpoint settings back to their defaults:

`DEFAULTS<CR>`

Response:

`ACK DEFAULTS<CR>`

8.13 Query Firmware Version (VERSION)

This command queries the current firmware version loaded on endpoint devices only.

To query the firmware version for the device:

`VERSION<CR>`

Response:

`ACK VERSION x.x<CR>`

9 Subscription Commands

Subscription commands are used in obtaining current parameter value without the need to periodically polling for data. It starts with registering using SUB command and GET command as its argument. After registering, new value will be sent to subscriber as it changes. This update will stop when command UNS is sent, or connection is broken.

9.1 Device Subscription Support (SUB without Argument)

9.2 Subscribing for Data Change (SUB with Argument)

9.3 Unsubscribing from Data Change (UNS)

GET commands in System Commands section that have subscription support.

Command Name	GET Command Syntax
Get Parameter Set	GS
Get Group Volume Master Level	GG n
Get Group Volume Master Mute	GN n,m
Get Parameter Set Lists	GA "Parameter Set List Name">1 or GA "Parameter Set List Name">2

GET commands in Device Commands section that have subscription support.

Command Name	GET Command Syntax
Get Input/Output Volume	GV s,c
Get Input/Output Mute	GM s,c

GET commands in Module Commands section that have subscription support.

Command Name	GET Command Syntax
Get Module Parameter	GA "Module Name">Index 1>Index 2

9.1 Device Subscription Support (SUB without Argument)

This command is used to query for device subscription support.

To query device subscription support:

```
SUB<CR>
```

Response:

```
SUB yes<CR>
```

Response indicates device supports subscription. Other forms of response indicate subscription is not supported.

9.2 Subscribing for Data Change (SUB with Argument)

This command is used to setup for unsolicited update of data change.

To setup for unsolicited update of data change:

SUB "Text String of GET Command"<CR> where "Text String of GET Command" is the GET command in System Commands, Device Commands, or Module Commands section.

Response:

SUB "Text String of GET Command",yes<CR> Response indicates command is subscribed properly. Other forms of response indicate subscription is not successful, or command is not supported by subscription.

EXAMPLES:

System Command:

SUB "GG 1"<CR> Subscribe to unsolicited update of data change for volume control in group 1.

Response:

SUB "GG 1",yes<CR> Response indicates command is subscribed properly. Other forms of response indicate subscription is not successful, or command is not supported by subscription.
GG 1,5b<CR> Unsolicited current value of volume control at time of subscription.

Device Command:

SUB "GV 1,1"<CR> Subscribe to unsolicited update of data change for volume control of slot 1 channel 1.

Response:

SUB "GV 1,1",yes<CR> Response indicates command is subscribed properly. Other forms of response indicate subscription is not successful, or command is not supported by subscription.
GV 1,1,75<CR> Unsolicited current value of volume control at time of subscription.

Module Command:

SUB "GA "Gain 1">2"<CR> Subscribe to unsolicited update of data change for mute control in module Gain 1.

Response:

SUB "GA "Gain 1">2",yes<CR> Response indicates command is subscribed properly. Other forms of response indicate subscription is not successful, or command is not supported by subscription.
GA "Gain 1">2=0<CR> Unsolicited current value of mute control at time of subscription.

9.3 Unsubscribing from Data Change (UNS)

This command is used to stop unsolicited update of data change.

To stop unsolicited update of data change:

UNS "Text String of GET Command"<CR> where "Text String of GET Command" is the GET command in System Commands, Device Commands, or Module Commands section.

Response:

UNS "Text String of GET Command",yes<CR> Response indicates command is unsubscribed properly. Other forms of response indicate un-subscription is not successful, or command is not supported by subscription.

EXAMPLES:

System Command:

UNS "GG 1"<CR> Unsubscribe from unsolicited update of data change for volume control in group 1.

Response:

UNS "GG 1",yes<CR> Response indicates command is unsubscribed properly. Other forms of response indicate unsubscribe is not successful, or command is not supported.

Device Command:

UNS "GV 1,1"<CR> Unsubscribe from unsolicited update of data change for volume control of slot 1 channel 1.

Response:

UNS "GV 1,1",yes<CR> Response indicates command is unsubscribed properly. Other forms of response indicate unsubscribe is not successful, or command is not supported.

Module Command:

UNS "GA "Gain 1">2"<CR> Unsubscribe from unsolicited update of data change for mute control in module Gain 1.

Response:

UNS "GA "Gain 1">2",yes<CR> Response indicates command is unsubscribed properly. Other forms of response indicate unsubscribe is not successful, or command is not supported.

Appendix A: PSTN Country Codes

Code	Country	Code	Country	Code	Country
0	JAPAN	26	BRUNEI_DARUSSALAM	52	DOMINICA
1	ALBANIA	27	BULGARIA	53	ECUADOR
2	ALGERIA	28	-	54	EGYPT
3	-	29	BURUNDI	55	EL_SALVADOR
4	-	30	BELARUS	56	-
5	ANGUILLA	31	CAMEROON	57	ETHIOPIA
6	ANTIGUA_AND_BARBUDA	32	CANADA	58	FALKLAND_ISLANDS
7	ARGENTINA	33	-	59	FIJI
8	ASCENSION	34	CAYMAN_ISLANDS	60	FINLAND
9	AUSTRALIA	35	CENTRAL_AFRICAN_REPUBLIC	61	FRANCE
10	AUSTRIA	36	CHAD	62	FRENCH_POLYNESIA
11	-	37	CHILE	63	-
12	BAHRAIN	38	CHINA	64	GABON
13	BANGLADESH	39	COLOMBIA	65	GAMBIA
14	BARBADOS	40	COMOROS	66	GERMANY
15	BELGIUM	41	-	67	ANGOLA
16	-	42	COOK_ISLANDS	68	GHANA
17	-	43	COSTA_RICA	69	GIBRALTAR
18	BERMUDAS	44	-	70	GREECE
19	-	45	CYPRUS	71	-
20	-	46	CZECH_REPUBLIC	72	GUAM
21	-	47	CAMBODIA	73	-
22	BRAZIL	48	-	74	GUERNSEY
23	-	49	DENMARK	75	GUINEA
24	-	50	DJIBOUTI	76	-
25	BRITISH_VIRGIN_ISLANDS	51	DOMINICAN_REPUBLIC	77	GUAYANA

Code	Country	Code	Country	Code	Country
78	–	102	LIBERIA	126	NEW_ZEALAND
79	HONDURAS	103	–	127	–
80	HONG_KONG	104	LIECHTENSTEIN	128	NIGER
81	HUNGARY	105	LUXEMBOURG	129	NIGERIA
82	ICELAND	106	MACAO	130	NORWAY
83	INDIA	107	MADAGASCAR	131	OMAN
84	INDONESIA	108	MALAYSIA	132	PAKISTAN
85	IRAN	109	MALAWI	133	PANAMA
86	–	110	MALDIVES	134	PAPUA_NEW_GUINEA
87	IRELAND	111	MALI	135	PARAGUAY
88	ISRAEL	112	MALTA	136	PERU
89	ITALY	113	MAURITANIA	137	PHILIPPINES
90	COTE_DIVOIRE	114	MAURITIUS	138	POLAND
91	JAMAICA	115	MEXICO	139	PORTUGAL
92	–	116	–	140	PUERTO_RICO
93	JERSEY	117	–	141	QATAR
94	JORDAN	118	MONTSERRAT	142	ROMANIA
95	–	119	MOROCCO	143	RWANDA
96	KIRIBATI	120	MOZAMBIQUE	144	SAINT_KITTS_AND_NEVIS
97	SOUTH_KOREA	121	–	145	–
98	KUWAIT	122	–	146	SAINT_HELENA_AND_ASCENSION
99	–	123	NETHERLANDS	147	SAINT_LUCIA
100	LEBANON	124	–	148	–
101	–	125	NEW_CALEDONIA	149	SAINT_THOMAS

Code	Country	Code	Country	Code	Country
150	SAO_TOME_AND_PRINCIPE	174	TURKEY	198	SLOVENIA
151	SAINT_VICENT_AND_THE_GRENADINES	175	TURKS_AND_CAICOS_ISLANDS	199	LITHUANIA
152	SAUDI_ARABIA	176	TUVALU	200	–
153	SENEGAL	177	UGANDA	–	
154	SEYCHELLES	178	UKRAINE	–	
155	SIERRA_LEONE	179	UNITED_ARAB_EMIRATES	240	CROATIA
156	SINGAPORE	180	UNITED_KINGDOM	241	KAZAKHSTAN
157	SOLOMON_ISLANDS	181	UNITED_STATES	242	–
158	–	182	BURKINA_FASO	243	–
159	SOUTH_AFRICA	183	URUGUAY	244	–
160	SPAIN	184	RUSSIA	245	–
161	SRI_LANKA	185	VANUATU	246	–
162	–	186	–	247	–
163	SURINAME	187	VENEZUELA	248	LATVIA
164	SWAZILAND	188	VIETNAM	249	ESTONIA
165	SWEDEN	189	–	250	US_VIRGIN_ISLANDS
166	SWITZERLAND	190	–	251	–
167	SYRIA	191	YEMEN	252	–
168	–	192	–	253	UNIVERSAL
169	THAILAND	193	SERBIA	254	TAIWAN
170	–	194	–		
171	–	195	ZAMBIA		
172	TRINIDAD_AND_TOBAGO	196	–		
173	TUNISIA	197	SLOVAKIA		

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