

ControlSpace®

SERIAL CONTROL PROTOCOL v5.3



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1 About

This ControlSpace® Serial Control Protocol document covers the following products:

ControlSpace EX-1280C conference 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
ControlSpace WP, EP and EX Dante™ Endpoint audio interfaces

This protocol provides a communication mechanism for Bose ControlSpace and PowerMatch 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 behaviour and syntax.

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.

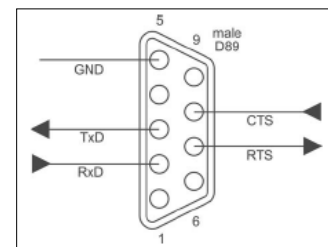
2 Connection

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 (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-1280C uses a miniature Phoenix connector and can be wired as required.

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
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 and PowerMatch)

ESP, EX and (networked) PowerMatch 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 and (networked) PowerMatch products can support up to eight simultaneous serial-over-Ethernet connections (in addition to the physical RS232 serial port on ESP/EX). These connections are shared with any instances of ControlSpace Remote which use the same communication method. Once eight connections have been established, additional requests will be refused until one of the existing connections has been closed. Serial output and asynchronous feedback is sent to all active connections (including the physical RS232 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 and PowerMatch 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 and PowerMatch products only act as Server for serial-over-Ethernet connections, the connection must be initiated by the Client device.

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

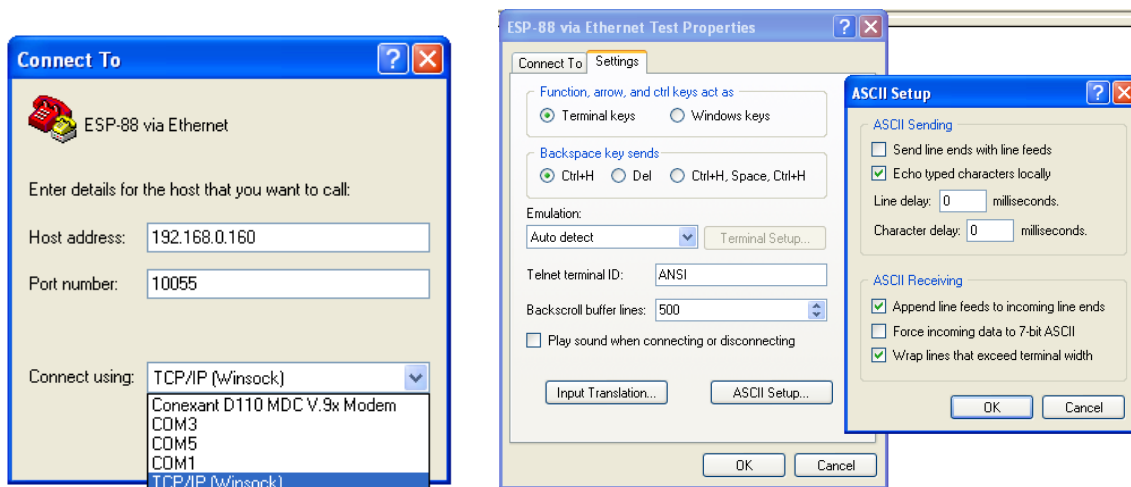
ControlSpace® SERIAL CONTROL PROTOCOL

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 and PM 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 or PuTTY 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). There is no time limit between characters of a command so it is possible to enter commands using a “dumb terminal”. 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 ..)
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.

Endpoint Commands:

Numerical values for Module 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:

`SS b <CR>`

Recall Parameter Set 11 (hex = b)

`GS <CR>`

Query for last invoked Parameter Set

`S 5 <CR>`

Response indicating Parameter Set 5 was invoked last

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 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, 0h(-60dB) to 78h(0dB) in 0.5dB steps (0-120 dec)

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.

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
where *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 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 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.

ESP-880/1240/4120/1600, EX and PowerMatch devices have a fixed architecture but still allow channels to be referenced using the following pseudo ‘slot’ numbers:

Slot	ESP-00	ESP-880	ESP-1240	ESP-4120	ESP-1600	EX-1280C	PM8xxxN	PM4xxxN
1	Flexible	In 1-4	In 1-4	In 1-4	In 1-4	Out 1-4	In A-D	In A-D
2		Out 1-4	Out 1-4	Out 1-4	In 5-8	Out 5-8	Out 1-4	Out 1-4
3		In 5-8	In 5-8	Out 5-8	In 9-12	In 1-4	In E-H	
4		Out 5-8	In 9-12	Out 9-12	In 13-16	In 5-8	Out 5-8	
5		ESPLink	ESPLink	ESPLink	ESPLink	In 9-12		
6						AmpLink		
7						Dante		
8						AEC		
9					VoIP			
10					USB			
11					PSTN			

Table 1

Note: For 8ch PowerMatch 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 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)
l is the level, 0h(-60dB) to 90h(+12dB) in 0.5dB steps (0-144 dec)
 or PM 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)

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 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)
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 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)
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)

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 or outputs on an ESP or PowerMatch device. The levels returned for inputs and ESP outputs are dBFS in hexadecimal format. To convert to dBu, first convert to decimal and then add 24dB for ESP-00 and 25dB for ESP-880/1240/ 4120/1600. For PM outputs the levels returned are dBV max in hexadecimal format. For a mono channel, Vmax (0dB/78h/120d) = 71V, and for a bridged/quad channel Vmax (0dB/78h/120d) = 141V.

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

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

Response:

`GL s [1,2,3,4,5,6,7,8]` *s* is the slot number (refer to [Table 1](#) at the start of this section)
1-8 are the dBFS levels for each channel (ESP/PM input)
 or dBVmax for each channel (PM output)
 0h(-60dB) to 78h(0dB) in 0.5dB steps (0-120 decimal)

Note: 4 channel cards will only return 4 values.

EXAMPLES:

`GL 1<CR>` Query signal levels for slot 1
`GL 1 [78,1,40,64]<CR>` Response indicating levels are 0,-59.5,-28,-10dBFS
`GL 2<CR>` Query signal levels for PowerMatch output levels
`GL 2 [0,0,0,0,0,64,64]<CR>` Response indicating ch7& 8 are at -10dBVmax

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.

5.7 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 factory default 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 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 factory 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:

NP M<CR>

Query the current Subnet Mask for the device

NP M,255.255.255.0<CR>

Response indicating a Subnet Mask of 255.255.255.0

NP M,255.255.255.128<CR>

Command to change Mask to 255.255.255.128 (after reboot)

NP G,192.168.0.2<CR>

Command to change Gateway to 192.168.0.2 (after reboot)

NP T<CR>

Query the current networking mode for the device

NP T,D<CR>

Response indicating device is currently set to DHCP

NP T,S<CR>
NP F<CR>

Command for device to change to static IP addresses
Command to reset network settings to factory defaults

Factory default network settings

Device Type	IP Address	Subnet Mask	Default Gateway	Type
ESP-00/88	192.168.0.160	255.255.255.0	192.168.0.1	N/A
ESP-880/4120/1240/1600	192.168.0.160	255.255.255.0	192.168.0.1	DHCP
EX-1280C	192.168.0.160	255.255.255.0	192.168.0.1	DHCP
PM8500N/PM8250N	192.168.0.80	255.255.255.0	192.168.0.1	DHCP
PM4500N/PM4250N	192.168.0.40	255.255.255.0	192.168.0.1	DHCP

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

5.8 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.

5.9 Set/Get Standby Status (SY, GY) [PowerMatch Only]

The Set and Get Standby Status commands allow the power state of an individual PowerMatch 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 devices to be controlled together.

Note: This command is not supported on ESP devices

To set or change the standby state for a 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>`

Response:

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

EXAMPLES:

`SY S <CR>`

Put the PowerMatch device into standby mode

`GY <CR>`

Query the current standby state

`GY N <CR>`

Response indicating PowerMatch device is in Normal state (On)

5.10 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.

5.11 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.

5.12 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

5.13 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, 0 = 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 0<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

5.14 Get/Clear Alarm History/Log (GH, CH) [PowerMatch 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 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: 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

parameter (GA):

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

module

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”).

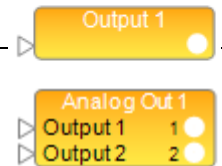
Depending on the card type or processor, the Input module has up to 5 parameters which can be controlled, selected using the appropriate value for **Index 1**.

		Parameter	Format	Mic/Line II, 1U ESP or EX	Legacy Mic/Line or 4x4
Index 1	1	Type	M,L	Unused	M=Mic, L=Line
	2	Gain	NN	0,14,24,32,44,54,64	0,14,24,42,48,54,64
	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:

<p>SA"Input 1">3=-21<CR> SA"Input 1">4=0<CR> GA"Input 2">5<CR> GA"Input 2">5=F<CR></p>	<p><i>Set the level for Input module "Input 1" to -21dB</i> <i>Set the mute for Input module "Input 1" to On</i> <i>Query whether phantom power is active for Input module "Input 2"</i> <i>Response indicating phantom power for "Input 2" is currently Off</i></p>
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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”).

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

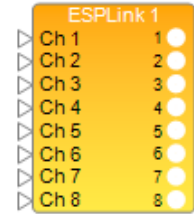
		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

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

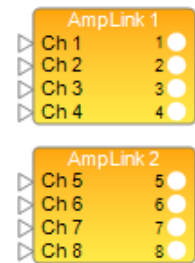
		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

EXAMPLES:

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

6.1.4 AMPLink Module [EX Only]

For EX processors, AMPLink outputs are displayed as a composite module with a user-specified number of channels, but are controlled as individual outputs. By default, the channels are labelled “Ch 1” to “Ch 8” and are addressed as “AMPLink-Ch 1” to “AMPLink-Ch 8” respectively, but channel labels can be changed in ControlSpace Designer software. The “AMPLink-” prefix is fixed irrespective of the displayed module names.



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

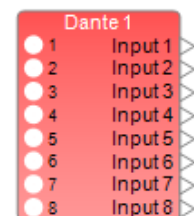
		Parameter	Format	Value Range
Index 1	1	Level	(-)NN.N	-60.5 to +12.0dB, 0.5dB step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle
	3	Polarity	O,F,T	O=On, F=Off, T=Toggle

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*

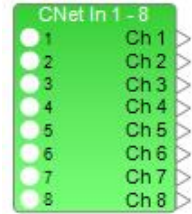
6.1.5 DANTE I/O Modules

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



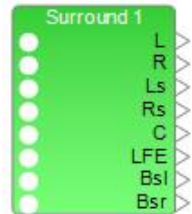
6.1.6 COBRANET I/O Modules [ESP-00 only]

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>
- SA"Surround 1">8=-5<CR>
- GA"Surround 1">2<CR>
- GA"Surround 1">2=DD51<CR>

Select the coaxial input for Surround card "Surround 1"
Set the center channel level for "Surround 1" to -5dB
Query the current Output Format from the digital stream
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=0<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	S	0-9,#,*,! (! is same as 'Hook Flash')
	2	Make Call	SSSSSS	"08707414500" <or> "101"
	3	End Call	-	
	4	Answer Call	-	
	5	<i>Reserved</i>		
	6	Ignore 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**.

	<i>Parameter</i>	<i>Format</i>	<i>Value Range</i>
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

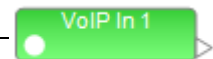
GA"PSTN Out 1">2<CR>

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)		<i>Format</i>	<i>Value Range</i>	
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)		<i>Format</i>	<i>Value Range</i>
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,#,*
	2	Make Call	SSSSSS	"08707414500" <or> "101" <or> "sip:1234@192.168.1.240"
	3	End Call	-	
	4	Answer Call	-	
	5	Transfer Call	SSSSSS	"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">5<CR> Answer the incoming call on VoIP Line "VoIP In 1"
 MA"VoIP In 1">1="0"<CR> Press the "0" key on VoIP Line "VoIP In 1"

6.1.11 VoIP OUTPUT Module [EX Only]



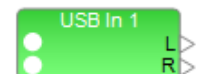
The VoIP Output module is only available on EX processors. There are 2 parameters which can be controlled, selected using the appropriate value for **Index 1**.

		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"VoIP Out 1">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=0<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.

		Parameter	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
 GA"USB In 1">2>2=F<CR> Response indicating the right channel of "USB In 1" is currently unmuted

6.1.13 USB OUTPUT Module [EX Only]



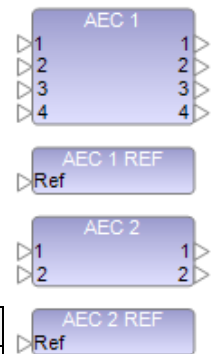
The USB Output module is currently only supported on EX processors. The two channels of the USB Output are controlled individually, with the value for **Index 1** selecting the channel and **Index 2** selecting between the two parameters.

		Parameter	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 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
 GA"USB Out 1">1>2=F<CR> Response indicating the left channel of "USB Out 1" is currently unmuted

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".

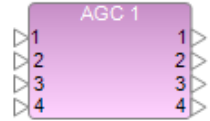
Index 1 is used to select the input (1-12) and **Index 2** is used to select the parameter to adjust per the table below.

Input Parameters (Index 1 = 1-12)		Format	Value Range	
Index 2	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:

SA"AEC">6>5=0<CR> Mute input 6 of the "AEC" module
 SA"AEC">4>7=2<CR> Set the NLP Control for input 4 to Medium
 GA"AEC">8>9<CR> Query the current NR level for input 8
 GA"AEC">16>2=9<CR> Response indicating the NR level for input 8 is 9dB

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
ix 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 0=On, F=Off, T=Toggle
	11	Reserved	
	12	Reserved	
	13	Reserved	
	14	Reserved	
	15	Reserved	

EXAMPLES:

```
SA"AGC 1">0>1=20.0<CR>
SA"AGC 1">2>2=-6.0<CR>
GA"Mic AGC">6>10<CR>
GA"Mic AGC">6>10=F<CR>
```

Set the Max Gain that can be applied across all channels of "AGC 1" to 20dB
 Set the Target Level – Minimum for channel 2 of "AGC 1" to -6.0 dB
 Query the current state of the Bypass for channel 10 of "Mic AGC"
 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>

SA"AGC 1">2=-20<CR>

GA"BGM">6<CR>

GA"BGM">6=F<CR>

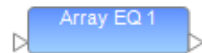
Set the detector of stereo AGC module "AGC 1" to Mix

Set the threshold for AGC module "AGC 1" to -20dBFS

Query the current state of the bypass for "BGM"

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	220 to 700Hz
	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>

SA"Main L">1>8=80<CR>

GA"Array EQ">1>5<CR>

GA"Array EQ">1>5=0<CR>

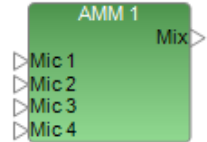
Set the qty of RoomMatch™ modules for "Array EQ 1" to 6

Set the Vertical coverage angle for "Main L" to 80 deg

Query the current state of Bypass for "Array EQ"

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 -60.5 to 12.0 dB, 0.5 step
	2	Mute	O,F,T 0=On, F=Off, T=Toggle
	3	Slope	N.NN 0.01 to 2.00, 0.01 step
	4	Attack	NN.N 0.5 to 100.0 ms, 0.5 step
	5	Hold	NNNN.N 0 to 1000.0 ms, 1 step
	6	Decay	NNNNN.N 5 to 50000.0 ms, 5 step
	7	Input RMS Avg.	NNN.N 1 to 500.0 ms, 1 step
	8	Output RMS Avg.	NNN.N 1 to 500.0 ms, 1 step
	9	Bypass All	O,F,T 0=On, F=Off, T=Toggle

Input (Index 1 = 1-32)		Format	Value Range
Index 2	1	Gain	(-)NN.N -60.5 to 12.0 dB, 0.5 step
	2	Mute	O,F,T 0=On, F=Off, T=Toggle
	3	Priority	N 1,2,3,4,5 (1=Highest)
	4	Bypass	O,F,T 0=On, F=Off, T=Toggle
	5	Mute Group	NN 0=None, 1 to # channels -1

EXAMPLES:

- SA"AMM 1">0>2=T<CR>
- SA"AMM 1">0>3=1.00<CR>
- SA"AMM 1">6>1=-10<CR>
- SA"AMM 1">4>3=2<CR>
- SA"AMM 1">24>4=0<CR>
- GA"AMM 1">16>2<CR>
- GA"AMM 1">16>2=0<CR>

- Toggle the state of the output mute for module "AMM 1"*
- Set the Slope parameter for "AMM 1" to 1.00*
- Set the Gain for input 6 of "AMM 1" to -10dB*
- Set the Priority for input 4 of "AMM 1" to 2 (2nd highest)*
- Set the Bypass for input 24 of "AMM 1" to On*
- Query the current state of Mute for input 16 of "AMM 1"*
- Response indicating input 16 of "AMM 1" is Muted*

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 -60.5 to 0.0 dB, 0.5 step
	2	NOM	O,F,T 0=On, F=Off, T=Toggle
	3	Mute	O,F,T 0=On, F=Off, T=Toggle
	4	NOM Limit	N 1 to # Channels (4,6,8)

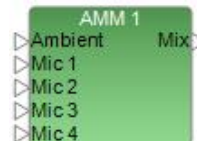
Input Parameters (Index 1 = 1-8)		Format	Value Range	
Index 2	1	Priority	O, F, T 0=On, F=Off, T=Toggle	
	2	Gain	(-)NN.N -60.5 to 0.0 dB, 0.5 step	
	3	Detection	N 1=Threshold, 2=LastOn, 3=PushToTalk, 4=Bypass	
	4	Threshold	(-)NN.N -80.0 to 0.0 dB, 0.5 step	
	5	Gate Depth	(-)NN.N -70.0 to 0.0 dB, 0.5 step	
	6	Hold	NNNNN 1 to 50000 ms, 1 step	
	7	Ducking Depth	(-)NN.N -60.0 to 0.0 dB, 0.5 step	
	8	Decay	NNNNN 5 to 50000 ms, 1 step	
	9	<i>Reserved</i>		
	10	High Pass	NNNN 20 to 1000 Hz	
	11	Low Pass	NNNNN 1000 to 20000 Hz	
	12	RMS Avg.	NNN 1 to 500 ms, 1 step	
	13	<i>Reserved</i>		
	14	Attack	NN.N 0.5 to 100.0ms, 0.5 step	
	15	Push to Talk	O, F, T 0=On, F=Off, T=Toggle	
	16	Mute	O, F, T 0=On, F=Off, T=Toggle	

EXAMPLES:

```
SA"AMM 1">0>3=T<CR>
SA"AMM 1">6>4=-40<CR>
SA"AMM 1">4>3=2<CR>
GA"AMM 1">3>1<CR>
GA"AMM 1">3>1=0<CR>
```

Toggle the state of the output mute for module "AMM 1"
Set the Threshold for input 6 of "AMM 1" to -40dB
Set the Detection mode for input 4 of "AMM 1" to Last On
Query the current state of Priority for input 3 of "AMM 1"
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	<i>Reserved</i>		
	7	<i>Reserved</i>		
	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 = 1-32)		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	NNNN.N	20 to 20000 Hz, 0.1 step
	10	High Pass	NNNN.N	20 to 20000 Hz, 0.1 step
	11	RMS Averaging	NNNN.N	1 to 1000 ms, 1 step

Input Parameters (Index 1 = 1-32)			Format	Value Range
Index 2	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	NNNN.N	1 to 50000 ms, 1 step
	16	Gate Decay	NNNN.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 Manual 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

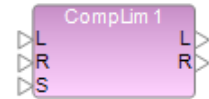
GA"AMM 1">3>1<CR>

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

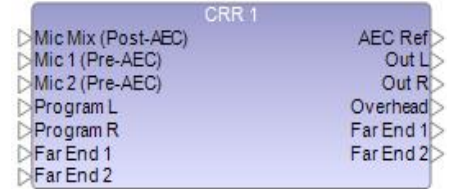
GA"Main Out">6<CR>

Query the current state of the bypass for "Main Out"

GA"Main Out">6=F<CR>

Response indicating bypass for "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	0=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)	SSSSS	"{1 2}" = 1-2 Split, "{1+2}" = 1-2 Joined e.g. "{1 2}{2+3}" = Room 1 solo, Rooms 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

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	0=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	0=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	0=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	0=On, F=Off, T=Toggle
	9	RC Group Number	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>
- SA"CRR 1">2>1=-40.0<CR>
- SA"CRR 1">1>7=All<CR>
- SA"Room 2">2>12=0<CR>
- SA"CRR 3">3>(1,1)=0<CR>
- GA"CRR 1">1>1<CR>
- GA"CRR 1">1>1=-3.0<CR>

- Toggle the state of the master mute for module "CRR 1"*
- Set the Program level for "CRR 1" to -40.0 dB*
- Route the Mic Mix for "CRR 1" to program output*
- Mute Far End input 4 of CRR called "Room 2"*
- Turn on the Input 1 to Output 1 cross-point of the Normal Matrix for "CRR 3"*
- Query the Master Volume level of "CRR 1"*
- 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, dependant 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	Reserved	
	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 (LPF)	SSSSS e.g. But12 →
	4	Frequency	NNNNN 20Hz to 20000Hz
	5	Reserved	
	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	Reserved	
	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	
	48dB/oct	But48	
	Bessel	12dB/oct	Bes12
		18dB/oct	Bes18
24dB/oct		Bes24	
36dB/oct		Bes36	
	48dB/oct	Bes48	
	Linkwitz-Reily	12dB/oct	Lin12
		24dB/oct	Lin24
		36dB/oct	Lin36
48dB/oct		Lin48	

EXAMPLES:

SA"X-Over">1>2=80<CR>
 SA"X-Over">1>1=But24<CR>
 GA"X-Over 2">4>5<CR>
 GA"X-Over 2">4>5=F<CR>

Set the freq. for the Low section of "X-Over" to 80Hz
 Set the Low section of "X-Over" to Butterworth 24dB/oct
 Query mute status of the High section of 4way "X-Over 2"
 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)	0 to 48000 samples (1s)
	2	Bypass	O,F,T	O=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	Reserved		
	2	Threshold	(-)NN.N	0 to -40 dBFS 0.5 Step
	3	Range	(-)NN.N	0 to -70dBFS, 0.5 step
	4	Attack	NNN.N	0.5 to 100ms, 0.5 step
	5	Hold	NNNN	0 to 1000ms, 1 step
	6	Decay	NNNNN	5 to 50000ms, 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:

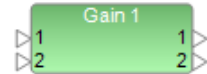
SA"Ducker 1">2>=-5<CR> Set the threshold for module "Ducker 1" to -5dBFS

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>0<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 -70dBFS, 0.5 step
	4	Attack	NNN.N	0.5 to 100ms, 0.5 step
	5	Hold	NNNN	0 to 1000ms, 1 step
	6	Decay	NNNNN	5 to 50000ms, 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=0<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

GEQ 1

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.

	<i>Frequency</i>	<i>Format</i>	<i>Value Range</i>
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
33	<i>Reserved</i>		

EXAMPLES:

SA"GEQ 1">18=-3.5<CR>

Reduce the 1kHz band of GEQ module "GEQ 1" by 3.5dB

SA"GEQ 1">24=5<CR>

Increase the 4kHz band of GEQ module "GEQ 1" by 5dB

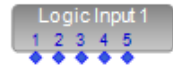
GA"GEQ Bar">11<CR>

Query the current level for the 200Hz band of "GEQ Bar"

GA"GEQ Bar">11=-6<CR>

Response indicating the 200Hz band is currently at -6dB

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:

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

6.1.31 LOGIC OUTPUT Module [EX Only]



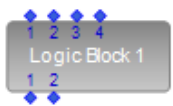
The Logic Output module has a user-definable number of outputs (max. 16) and is used to convey logic states from the system to the outside world to indicate system mode or status etc. Typically, this module would be queried rather than set, but both are permitted. The pin to control is selected using 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

EXAMPLES:

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

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).

		<i>Parameter</i>	<i>Notes</i>
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.

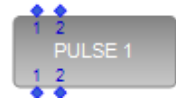
Master Flip Flop (Index 2 = 0)		Forma t	Value Range
Index 3	1	Set All Outputs ON	O,F,T,P
	2	Reset All Outputs OFF	O,F,T,P
Channel Toggle (Index 2 = 1-16)		Forma t	Value Range
Index 3	1	Toggle State	O,F,T

EXAMPLES:

SA"Logic Block 1">3>0>1=P<CR>
 SA"Mic Logic">6>2>1=O<CR>
 GA"Logic Block 1">4>3>1 <CR>
 GA"Logic Block 1">4>3>1 =F<CR>

Set all outputs of Toggle/FF gate (ID:3) inside "Logic Block 1" to On
 Force On ch2 of Toggle/FF gate (ID:6) inside "Mic Logic" block
 Query the current state of ch3 of Toggle/FF gate (ID:4)
 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**.

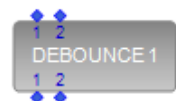
Parameter		Forma t	Value Range
Index 3	1	On Time	NNNN
	2	Off Time	NNNN
	3	Single Pulse	O,F,T
	4	Force ON	O,F,T
	5	Output State (read-only)	O,F

EXAMPLES:

SA"Main Logic">5>1>2=400<CR>
 SA"Logic Block 1">5>4>3=O<CR>
 GA"Logic Block 1">3>2>4 <CR>
 GA"Logic Block 1">3>2>4 =O<CR>

Set Off time for ch1 of Pulse gate (ID:5) inside "Main Logic" to 400ms
 Set ch4 of Pulse gate (ID:5) inside "Logic Block 1" to give a single pulse
 Query whether ch2 of Pulse gate (ID:3) is currently forced ON
 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**.

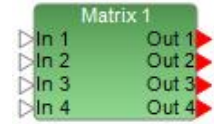
Parameter		Forma t	Value Range
Index 3	1	On Delay	NNNN
	2	Off Delay	NNNN
	3	Output State (read-only)	O,F

EXAMPLES:

SA"Rm Combine">4>2>1=800<CR>
 SA"Logic Block 2">6>3>2=200<CR>
 GA"Logic Block 1">6>4>3<CR>
 GA"Logic Block 1">6>4>3=F<CR>

Set On Delay for ch2 of Debounce (ID:4) in "Rm Combine" to 800mS
 Set Off Delay for ch3 of Debounce (ID:6) in "Logic Block 2" to 200mS
 Query current output state for ch4 of Debounce (ID:6)
 Response indicating ch4 output of Debounce (ID:6) is currently OFF

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.

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

		Parameter	Notes
Index 1	1	On/Off	Set Cross-point On/Off
	2	Level	Set Level

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)	0,F,T	0=On, F=Off, T=Toggle
	2	Cross-point(1,2)	0,F,T	0=On, F=Off, T=Toggle
	Index 2 = (Input # -1) x Size of Matrix + Output #:			
	MxN	Cross-point(M,N)	0,F,T	0=On, F=Off, T=Toggle

Cross-point Level (Index 1 = 2)			Format	Value Range
Index 2	1	Cross-point(1,1)	(-)NN.N	-60.5 to 0.0dB, 0.5 step
	2	Cross-point(1,2)	(-)NN.N	-60.5 to 0.0dB, 0.5 step
	Index 2 = (Input # -1) x Size of Matrix + Output #:			
	MxN	Cross-point(M,N)	(-)NN.N	-60.5 to 0.0dB, 0.5 step

EXAMPLES:

SA"Matrix 1">1>2=0<CR>
 SA"Mix">2>8=-20<CR>
 GA"My Matrix">1>16<CR>
 GA"My Matrix">1=16=F<CR>

Set cross-point 2 (input 1, output2) for "Matrix 1" to On
 Set level for cross-point 8 (in2,out4 for 4x4) "Mix" to -20dB
 Query the current state for cross-point 16 (in4,out4 for 4x4)
 Response indicating cross-point 16 is currently Off

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

		<i>Parameter</i>	<i>Format</i>	<i>Value Range</i>
Index 2	1	Frequency	NNNN	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	0	0	0		0
High Shelf	HS	0		0		0
Low Shelf	LS	0		0		0
High Cut (Low Pass)	HC	0			0	0
Low Cut (High pass)	LC	0			0	0
Notch	N	0	0	0		0

EXAMPLES:

SA"PEQ 1">1>1=2000<CR>
 SA"Room EQ">2>5=LC<CR>
 GA"House L">5>3<CR>
 GA"House L">5>3=-2<CR>

*Set the frequency for band 1 of module "PEQ 1" to 2kHz
 Use a "Low Cut" (High Pass) filter for band 2 of "Room EQ"
 Query the gain for band 5 of PEQ module "House L"
 Response indicating band 5 of "House L" is at -2dB*

6.1.35 PEAK/RMS LIMITER Module



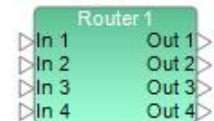
This module has 6 parameters that can be controlled, selected using the appropriate value for **Index 1**. For a mono Peak/RMS Limiter module, set the Detection Input to 'L' (Left) to use the Signal input or 'S' to use the Sidechain input, 'R' and 'M' are unused. Parameters indicated as 'Reserved' should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

	<i>Parameter</i>	<i>Format</i>	<i>Value Range</i>
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 0=On, F=Off, T=Toggle
	7	RMS Threshold	(-)NN.N 0 to -40 dBFS 0.5 Step
	8	RMS Attack	NNNN 500 to 10,000ms, 100 step
	9	RMS Release	NNNN 500 to 10,000ms, 100 step
	10	<i>Reserved</i>	

EXAMPLES:

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

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:

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

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.

		<i>Signal</i>
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)		<i>Format</i>	<i>Value Range</i>	
Index 2	1	Frequency	NNNN	20 to 20000Hz
	2	Gain	(-)NN.N	-60.5 to +12.0dB, 0.5 step
	3	Mute	O,F,T	O=On, F=Off, T=Toggle

White Noise (Index 1 = 2)		<i>Format</i>	<i>Value Range</i>	
Index 2	1	Gain	(-)NN.N	-60.5 to +12.0dB, 0.5 step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

Pink Noise (Index 1 = 3)		<i>Format</i>	<i>Value Range</i>	
Index 2	1	Gain	(-)NN.N	-60.5 to +12.0dB, 0.5 step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

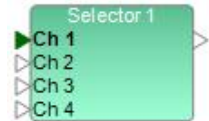
Sweep (Index 1 = 4)		<i>Format</i>	<i>Value Range</i>	
Index 2	1	Gain	(-)NN.N	-60.5 to +12.0dB, 0.5 step
	2	Slow/Fast	S,F	S=Slow, F=Fast
	3	Repeat	O,F	O=On (repeat), F=Off (no repeat)
	4	Start/Stop	O,F	O=On (start), F=Off (stop)

EXAMPLES:

```
SA"Sine 1">1>1=500<CR>
SA"Noise 1">1=2<CR>
SA"Noise 1">2>2=0
GA"Sweep 1">4>2<CR>
GA"Sweep 1">4>2=F<CR>
```

Set the frequency for Sine Generator "Sine 1" to 500Hz
 Set Noise Generator "Noise 1" to White noise
 Set the Mute state of White noise gen "Noise 1" to Muted
 Query whether module "Sweep 1" is set to Slow or Fast
 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

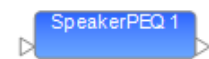
GA"Bar">1<CR>

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

Filter type descriptors

Band Pass/Align Delay/ EQ Gain (Index 1 = 0)		Format	Value Range	
Index 2	1	Reserved		
	2	Reserved		
	3	Gain	(-)NN.N	-15.0B to +15.0dB, 0.5dB step
	4	Align Delay	NNN	0 to 480 samples
	5	Type (High)	*1	e.g. But12 →
	6	Frequency	NNNNN	20 to 20000Hz
	7	Type (Low)	*1	e.g. But12 →
	8	Frequency	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

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-Reily	36dB/oct	Bes36
	48dB/oct	Bes48
	12dB/oct	Lin12
	24dB/oct	Lin24
Linkwitz-Reily	36dB/oct	Lin36
	48dB/oct	Lin48

PEQ Band (Index 1 = 1-9)		Format	Value Range	
Index 2	1	Frequency	NNNN	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	Reserved		
	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	0	0	0	0
High Shelf	HS	0		0	0
Low Shelf	LS	0		0	0
Notch	N	0	0	0	0

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.

		Parameters	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
	2	Input 1 Mute	O,F,T
	Mx2-1	Input M Level	(-)NN.N
	Mx2	Input M Mute	O,F,T

Output Parameters (Index 1 = 2)		Format	Value Range
Index 2	1	Output 1 Level	(-)NN.N
	2	Output 1 Mute	O,F,T
	Nx2-1	Output N Level	(-)NN.N
	Nx2	Output N Mute	O,F,T

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
	2	Input 1 Routing	XXXXXXXX
	M	Input M Routing	XXXXXXXX

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	0	-	-	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	0	0	0	-	-	0	0	0	-	0	-
Hex Value	8				4				9				2				4				F				3				A			

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

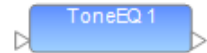
Index 2: (input,output)
 Value: O=On,F=Off,T=Toggle

EXAMPLES:

```
SA"StdMixer 1">1>1=-3<CR>
SA"My Mixer">2>16=0<CR>
SA"Mix">3>2=C0000000<CR>
SA"Theatre">4>(4,5)=0<CR>
GA"Mix">3>4<CR>
GA"Mix">3>4=03000000<CR>
GA"Theatre">4>(6,8)<CR>
GA"Theatre">4>(6,8)=F<CR>
```

Set the level for input 1 of module "StdMixer 1" to -3dB
 Set mute state for output 8 of module "My Mixer" to On
 Route input 2 to outputs 1 & 2 on "Mix" using cross-point 1
 Route input 4 to output 5 on "Theatre" using cross-point 2
 Query the routing for input 4 of "Mix" using cross-point 1
 Response indicating input 4 is routed to outputs 7&8
 Query whether input 6 is routed to output 8 on "Theatre"
 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.

	<i>Parameter</i>	<i>Format</i>	<i>Value Range</i>
Index 1	1	Low Gain	(-)NN.N -15.0dB to +15.0dB, 0.1dB step
	2	Low Bypass	O,F,T 0=On, F=Off, T=Toggle
	3	Mid Gain	(-)NN.N -15.0dB to +15.0dB, 0.1dB step
	4	Mid Bypass	O,F,T 0=On, F=Off, T=Toggle
	5	High Gain	(-)NN.N -15.0dB to +15.0dB, 0.1dB step
	6	High Bypass	O,F,T 0=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=0<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 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.

	<i>Parameter</i>	<i>Format</i>	<i>Value Range</i>
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 0=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 0=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 0=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=0<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

6.1.43 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	0=On, F=Off, T=Toggle

Update Parameters (Index 1 = 1)			Format	Value Range
Index 2	1	Dynamic Filter Release Time	NNNNN	1 second to 4320 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	0=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	0=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	0=On, F=Off, T=Toggle
	1	Un-Bypass All Filters	O,F,T	0=On, F=Off, T=Toggle
	2	Set All Filters Static	O,F,T	0=On, F=Off, T=Toggle
	3	Set All Filters Dynamic	O,F,T	0=On, F=Off, T=Toggle
	4	Clear All Dynamic Filters	O,F,T	0=On, F=Off, T=Toggle

EXAMPLES:

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

SA"PFS 1">20>4=0<CR>

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

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

Set the Dynamic Filter Release Time to 300 seconds

Clear all Dynamic Filters

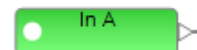
Query the current level for the system gain

Response indicating the system gain is currently at 9dB

6.2 PowerMatch® 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 is global and set via the properties for the PowerMatch device.

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

EXAMPLES:

SA"In A">1=4<CR>

Set the Input Sensitivity for "In A" to 4dBu

SA"Desk L">3=0<CR>

Select Digital input source for input "Desk L"

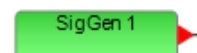
GA"In D">2<CR>

Query the current Mute state for "In D"

GA"In D">2=F<CR>

Response indicating that "In D" is currently un-muted

6.2.2 SIGNAL GENERATOR Module




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 (Repeat), 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=0<CR> Response indicating that "SigGen 1" is currently muted

6.2.3 INPUT PARAMETRIC EQ Module



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

Index 1: Selects desired Parametric EQ band 1-5

		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	0	0	0		0
High Shelf	HS	0		0		0
Low Shelf	LS	0		0		0
High Cut (Low Pass)	HC	0			0	0
Low Cut (High pass)	LC	0			0	0
Notch	N	0	0	0		0

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.

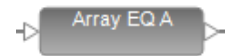
EXAMPLES:

SA"PEQ-5band A">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



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 220 to 700Hz	
	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	Advanced	O,F,T O=On, F=Off, T=Toggle	

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

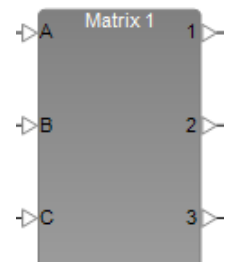
GA"PEQ-5band E">6>6=0<CR>

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.

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



		Parameter	Notes
Index 1	1	On/Off	Set Cross-Point On/Off
	2	Level	Set Level

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	O=On, F=Off, T=Toggle

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	-60.5 to 0.0dB, 0.5 steps

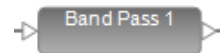
Note: Labels for PowerMatch Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module label is "Matrix 1".

EXAMPLES:

SA"Matrix 1">1>26=0<CR>
 SA"Matrix 1">1>65=0<CR>
 GA"Matrix 1">2>4<CR>
 GA"Matrix 1">2>4=F<CR>

Set cross-point 26 (Input D, Output2) on "Matrix 1" to On
 Set cross-point 65 (SigGen, Output1) on "Matrix 1" to On
 Query the current level for cross-point 4 (Input A, Output 4)
 Response indicating cross-point 4 is currently Off

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)

	<i>Parameter</i>	<i>Format</i>	<i>Value Range</i>	
Index 2	1	Type(HPF)	SSSSS e.g. But12 →	
	2	Frequency	NNNNN 20 to 20000Hz	
	3	Type(LPF)	SSSSS e.g. But12 →	
	4	Frequency	NNNNN 20 to 20000Hz	
	5	<i>Reserved</i>		
	6	<i>Reserved</i>		
	7	<i>Reserved</i>		
	8	HP Bypass	O,F,T	0=On, F=Off, T=Toggle
	9	LP Bypass	O,F,T	0=On, F=Off, T=Toggle

Filter type descriptors

<i>Type</i>	<i>Slope</i>	<i>Value</i>
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
	36dB/oct	Lin36
	48dB/oct	Lin48

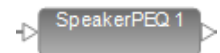
Note: Labels for PowerMatch Signal Processing modules (other than Input and Amp Output) are fixed and cannot be changed in the same way as ESP modules. Module labels are "Band Pass 1" through to "Band Pass 8" per the channel.

EXAMPLES:

SA"Band Pass 1">1>3=But24<CR>
 SA"Band Pass 5">1>2=80<CR>
 GA"Band Pass 7">1>9<CR>
 GA"Band Pass 7">1>9=F<CR>

Set LP filter for channel 1 to Butterworth 24db/oct
 Set frequency for channel 5 high-pass to 80Hz
 Query the Bypass state for LPF on channel 7
 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, a band-pass filter and alignment delay, but on the PowerMatch the Band Pass section is addressed as a separate module (see above). **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	-15.0dB to +15.0dB, 0.5dB step
	4	Polarity	O,F,T	O=On, F=Off, T=Toggle

PEQ Band (Index 1 = 1-9)		Format	Value Range	
Index 2	1	Frequency	NNNN	200 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	Reserved		
	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.

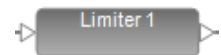
Type	String	Freq.	Q	Gain	Bypass
Band	B	0	0	0	0
High Shelf	HS	0		0	0
Low Shelf	LS	0		0	0
Notch	N	0	0	0	0

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 "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. Parameters indicated as 'Reserved' should not be used.

Index 1: Selects module (always=0)

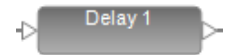
(Index 1 = 0)	Parameter	Format	Value Range
Index 2	1	Peak Threshold	NNN.N 0.5 to 71.0 V (or 142.0 for bridged), 0.5 Step
	2	RMS Threshold	NNN.N 0.5 to 71.0 V (or 142.0 for bridged), 0.5 Step
	3	RMS Attack	NNNNNN 500 to 10,000ms, 100 step
	4	RMS Release	NNNNNN 500 to 10,000ms, 100 step
	5	Link Group	N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

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 "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 amplifiers has a single tap, hence **Index 1** is always 1. **Index 2** is then used to select the parameter to adjust per the table below.

Index 1: Selects Delay tap (always=1)

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

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 “Delay 1” through to “Delay 8” per the channel.

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

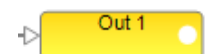
GA"Delay 2">1>1<CR>

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 OUTPUT Module



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	0=On, F=Off, T=Toggle
	3	Polarity	O,F,T	0=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>1=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=-6<CR>`*Response indicating channel 1 is currently set to -6dB*

7 Endpoint Commands

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

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.

- 7.1 Identify/Find Unit (ID/FU)
- 7.2 Input Gain (IG)
- 7.3 Input Source (IS)
- 7.4 Phantom Power (PP)
- 7.5 Output Gain (OG)
- 7.6 Read Signal Level (RSL)
- 7.7 Read/Write Logic Output (RLO/WLO)
- 7.8 Read Logic Input (RLI)
- 7.9 Set Logic Event (EVNT)
- 7.10 Set Event Notification IP Address (SASIP)
- 7.11 Load/Save Preset (LOAD/SAVE)
- 7.12 Query Audio Settings (QUERY)
- 7.13 Restore Factory Defaults (DEFAULTS)
- 7.14 Query Firmware Version (VERSION)

7.1 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 de-activate 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*

7.2 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 15.0<CR> *Response confirming Input Gain for channel 2 was changed to +15.0 dB*
 IG 6 Q<CR> *Query the Input Gain for channel 6*
 ACK IG 6 30.0<CR> *Response indicating Input Gain for channel 6 is currently +30.0 dB*

7.3 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 B<CR> *Response confirming Input Source for channel 2 was changed to B*

7.4 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:

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

7.5 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:

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

7.6 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>

ACK RSL -99 -3 -9 -40<CR>

Command requesting current signal levels

Response indicating ch1 is off, ch2 is >= -3dB, ch3 is >= -9dB and < -3dB and ch4 is >= -40dB and < -9dB

7.7 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>

ACK WLO 4 0<CR>

RLO 2<CR>

ACK WLO 2 1<CR>

Turn off logic output 4

Response confirming logic output 4 is Off

Query the state of logic output 2

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)
ACK RLI 8 1<CR>	Response confirming logic output 8 is On

7.8 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 inputs)

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, On = 1, Off = 0

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

7.9 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:

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

7.10 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 the 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:

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

7.11 Load/Save Preset (LOAD/SAVE)

The Load and Save commands allow different parameter settings to be saved as Presets, and then be recalled with a single command. There are ten Presets available: 0 through 9. Changes made in ControlSpace Designer software are stored in Preset 0, and Preset 0 is recalled at power up. Saving or recalling of other Presets is not supported in ControlSpace Designer software.

To save the current gain, phantom power and logic output settings as a preset *p*:

`SAVE p<CR>` where *p* is the preset number 0-9

Response:

`ACK SAVE p<CR>` where *p* is the same as above.

To load saved values for gain, phantom power and logic output settings from preset *p*:

`LOAD p<CR>` where *p* is the preset number 0-9

Response:

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

EXAMPLES:

<code>SAVE 2<CR></code>	<i>Save the current settings for gain, phantom power and logic outs as preset 2</i>
<code>ACK SAVE 2<CR></code>	<i>Response confirming settings saved as preset 2</i>

LOAD 8<CR>
ACK LOAD 8<CR>

Load the values from preset 8
Response confirming preset 8 is loaded

7.12 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=OFF PP3=OFF PP4=OFF
PP5=OFF PP6=OFF PP7=OFF PP8=OFF ID=OFF <CR>

7.13 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>

7.14 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>

Appendix A: PSTN Country Codes

<i>Code</i>	<i>Country</i>	<i>Code</i>	<i>Country</i>	<i>Code</i>	<i>Country</i>
0	JAPAN	40	COMOROS	80	HONG_KONG
1	ALBANIA	41	-	81	HUNGARY
2	ALGERIA	42	COOK_ISLANDS	82	ICELAND
3	-	43	COSTA_RICA	83	INDIA
4	-	44	-	84	INDONESIA
5	ANGUILLA	45	CYPRUS	85	IRAN
6	ANTIGUA_AND_BARBUDA	46	CZECH_REPUBLIC	86	-
7	ARGENTINA	47	CAMBODIA	87	IRELAND
8	ASCENSION	48	-	88	ISRAEL
9	AUSTRALIA	49	DENMARK	89	ITALY
10	AUSTRIA	50	DJIBOUTI	90	COTE_DIVOIRE
11	-	51	DOMINICAN_REPUBLIC	91	JAMAICA
12	BAHRAIN	52	DOMINICA	92	-
13	BANGLADESH	53	ECUADOR	93	JERSEY
14	BARBADOS	54	EGYPT	94	JORDAN
15	BELGIUM	55	EL_SALVADOR	95	-
16	-	56	-	96	KIRIBATI
17	-	57	ETHIOPIA	97	SOUTH_KOREA
18	BERMUDAS	58	FALKLAND_ISLANDS	98	KUWAIT
19	-	59	FIJI	99	-
20	-	60	FINLAND	100	LEBANON
21	-	61	FRANCE	101	-
22	BRAZIL	62	FRENCH_POLYNESIA	102	LIBERIA
23	-	63	-	103	-
24	-	64	GABON	104	LIECHTENSTEIN
25	BRITISH_VIRGIN_ISLANDS	65	GAMBIA	105	LUXEMBOURG
26	BRUNEI_DARUSSALAM	66	GERMANY	106	MACAO
27	BULGARIA	67	ANGOLA	107	MADAGASCAR
28	-	68	GHANA	108	MALAYSIA
29	BURUNDI	69	GIBRALTAR	109	MALAWI
30	BELARUS	70	GREECE	110	MALDIVES
31	CAMEROON	71	-	111	MALI

ControlSpace® SERIAL CONTROL PROTOCOL

32	CANADA	72	GUAM	112	MALTA
33	-	73	-	113	MAURITANIA
34	CAYMAN_ISLANDS	74	GUERNSEY	114	MAURITIUS
35	CENTRAL_AFRICAN_REPUBLIC	75	GUINEA	115	MEXICO
36	CHAD	76	-	116	-
37	CHILE	77	GUAYANA	117	-
38	CHINA	78	-	118	MONTSERRAT
39	COLOMBIA	79	HONDURAS	119	MOROCCO

<i>Code</i>	<i>Country</i>	<i>Code</i>	<i>Country</i>	<i>Code</i>	<i>Country</i>
120	MOZAMBIQUE	160	SPAIN	200	-
121	-	161	SRI_LANKA	-	
122	-	162	-	-	
123	NETHERLANDS	163	SURINAME	240	CROATIA
124	-	164	SWAZILAND	241	KAZAKHSTAN
125	NEW_CALEDONIA	165	SWEDEN	242	-
126	NEW_ZEALAND	166	SWITZERLAND	243	-
127	-	167	SYRIA	244	-
128	NIGER	168	-	245	-
129	NIGERIA	169	THAILAND	246	-
130	NORWAY	170	-	247	-
131	OMAN	171	-	248	LATVIA
132	PAKISTAN	172	TRINIDAD_AND_TOBAGO	249	ESTONIA
133	PANAMA	173	TUNISIA	250	US_VIRGIN_ISLANDS
134	PAPUA_NEW_GUINEA	174	TURKEY	251	-
135	PARAGUAY	175	TURKS_AND_CAICOS_ISLANDS	252	-
136	PERU	176	TUVALU	253	UNIVERSAL
137	PHILIPPINES	177	UGANDA	254	TAIWAN
138	POLAND	178	UKRAINE		
139	PORTUGAL	179	UNITED_ARAB_EMIRATES		
140	PUERTO_RICO	180	UNITED_KINGDOM		
141	QATAR	181	UNITED_STATES		
142	ROMANIA	182	BURKINA_FASO		
143	RWANDA	183	URUGUAY		
144	SAINT_KITTS_AND_NEVIS	184	RUSSIA		
145	-	185	VANUATU		
146	SAINT_HELENA_AND_ASCENSION	186	-		
147	SAINT_LUCIA	187	VENEZUELA		
148	-	188	VIETNAM		
149	SAINT_THOMAS	189	-		
150	SAO_TOME_AND PRINCIPE	190	-		
151	SAINT_VICENT_AND_THE_GRENADINES	191	YEMEN		
152	SAUDI_ARABIA	192	-		
153	SENEGAL	193	SERBIA		

ControlSpace® SERIAL CONTROL PROTOCOL

154	SEYCHELLES	194	-		
155	SIERRA_LEONE	195	ZAMBIA		
156	SINGAPORE	196	-		
157	SOLOMON_ISLANDS	197	SLOVAKIA		
158	-	198	SLOVENIA		
159	SOUTH_AFRICA	199	LITHUANIA		

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