# London Direct Inject protocol

Soundweb London devices will communicate with a third party device in accordance with the London Direct Inject protocol. This offers two way communication which allows a third party device to set or request the value of any parameter or meter. Crown, JBL, AKG devices do not respond to this protocol. Soundweb London devices are always listening for messages and do not need to be enabled for third party control.   The London Direct Inject protocol PDF document can be found in the Audio Architectinstallation folder.

Connections
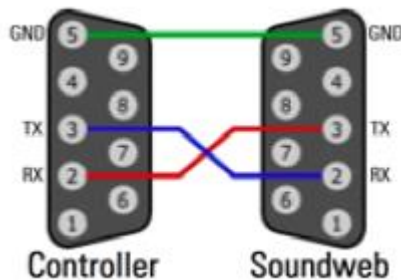
Most Soundweb London devices have a 100Mb/s RJ-45 port for control over an Ethernet network and a 9-pin D-type port for serial RS-232 control. Only pins 2,3,5 are used on the D-Type connection. BLU-Link, Dante, CobraNet and AVB connections are not used for any form of control. Control messages can be transmitted to single or multiple Soundweb devices. Messages destined for other Soundweb devices will be automatically forwarded via the network.

Communication

Soundweb London uses reliable communication mechanisms. The message structure is the same for both Ethernet and serial.
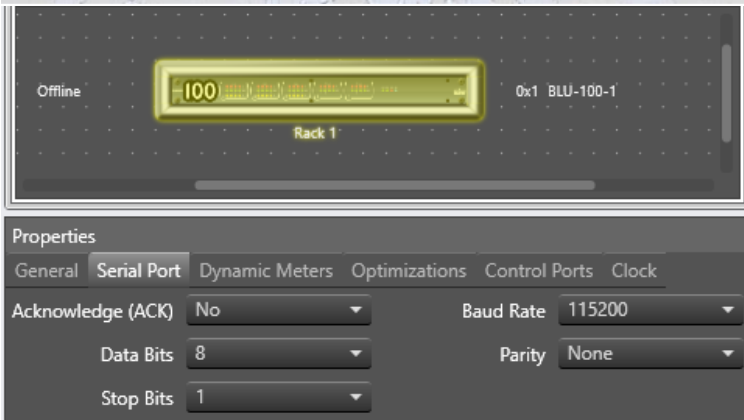
Correctly formatted serial messages transmitted to a Soundweb device are acknowledged with 0x06 which confirms receipt and checksum.   If the checksum is invalid then 0x15 is returned.   The Soundweb device can be set to wait for acknowledgement for each message it transmits to the third party controller.   If 0x06 or 0x15 is not received within 1 second then the Soundweb will re-transmit the message.   The baud rate and acknowledgement settings are found in Audio Architect Properties window.

Soundweb London devices listen on TCP port 1023 and will accept multiple connections. Acknowledgements are not used with Ethernet communication because TCP already offers reliable data delivery.   A third party device would normally open a socket and leave it open indefinitely.
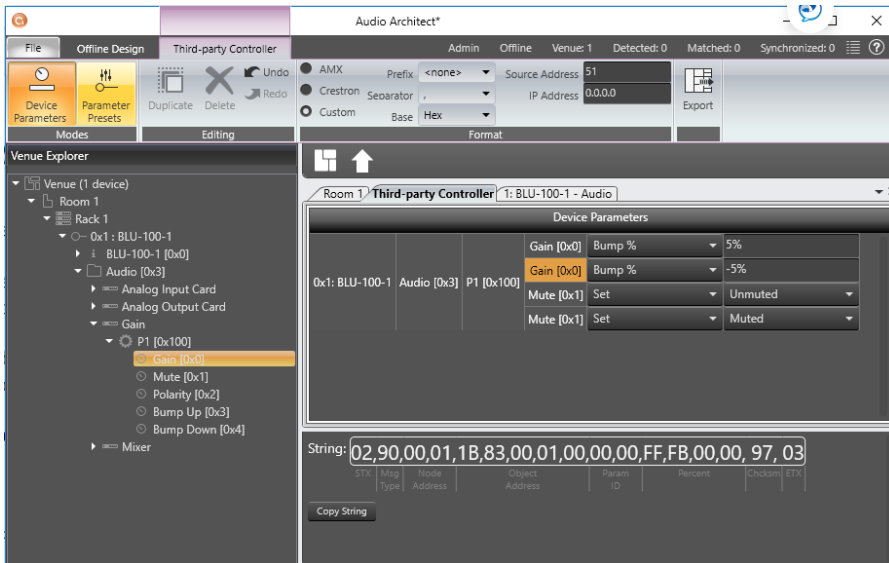
Generating London DI Messages

The Third-party Controller object in Audio Architect provides the means to generate London DI messages. The messages can be displayed singly or exported as a collection. In Add Devices mode, the Third-party Controller should be added to a Room from the Controllers folder of the Devices menu. Double click the device to open the Third-party Controller view.
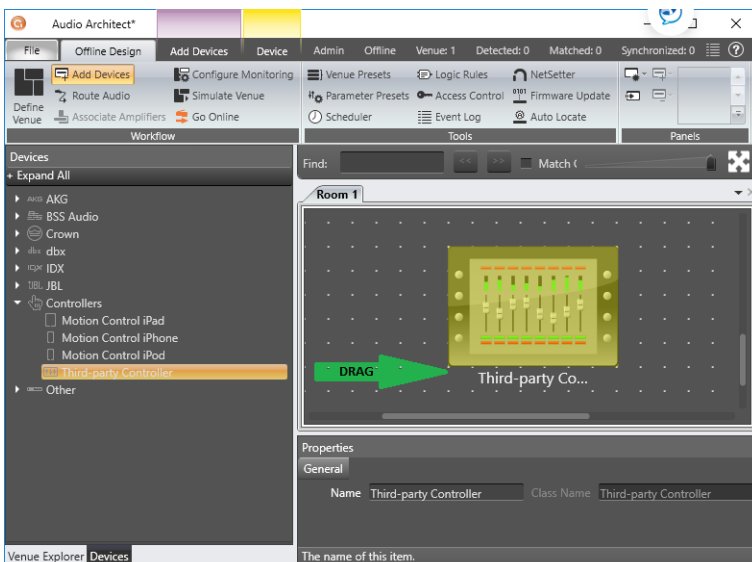
The Venue Explorer will list all available device parameters or Soundweb London Presets depending on the Mode selected in the ribbon. Simply drag and drop Soundweb London Presets, individual parameters or entire processing objects into the Third-party Controller view. The same parameters can be added multiple times from the Venue Explorer. Items can be selected and duplicated or removed using the functions in the ribbon.

For each added parameter choose the message type from the drop-down box then enter the Value required. There are no message type options for Soundweb London Presets. When an entry is selected the London DI message will appear in the lower section. The Format options in the ribbon allow the message to be displayed as required.

After clicking the Copy String button the message can be pasted into the application used to program the third party control system. The Source Address and IP Address settings are not used for London DI messages.

Using the third-party modules

BSS Audio have created modules for use with NetLinx Studio and SIMPL Windows. The modules are available as downloads from the BSS Audio website Resources page. Each contain fully featured modules for most Soundweb London processing objects, Help documents and example files featuring each module implemented in context.
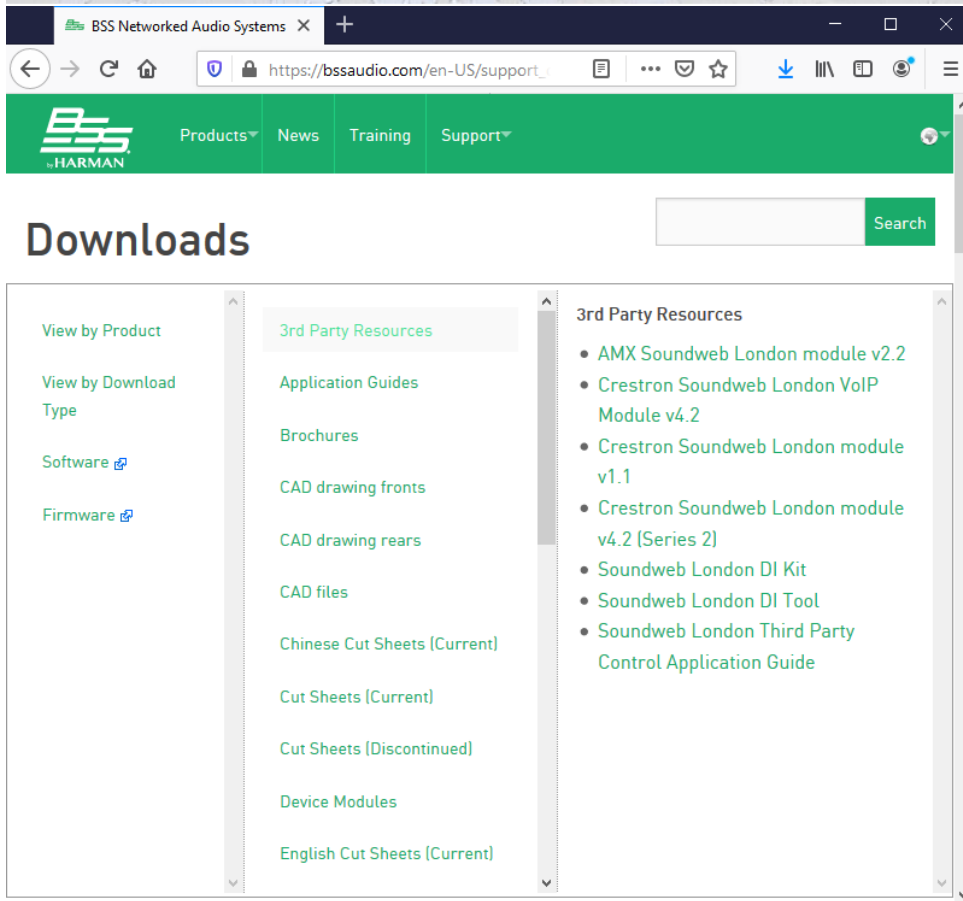
Once inserted into the third party design software, the modules will require addressing information from the Audio Architect venue file. The Node Address for each device and the Object ID for each Processing Object can be determined from within the application as described in this guide.

Message Start, Message End and Checksum

All London DI messages start with 0x02 and end with 0x03. The last byte in the message is the checksum which is a single-byte exclusive OR (XOR) of all the bytes in the body before byte substitution is applied.

STX	------- BODY--------	Check-sum	ETX
02		8B	03

Message Types

The first byte of a message determines the Message Type which can be used to SET a parameter value, BUMP a parameter up or down, GET (subscribe to) a parameter, and recall Soundweb London Presets.

Message Type
88

0x88 SET Set a parameter using Raw value.

0x89 SUBSCRIBE Subscribe to a parameter. Returns SET messages.

0x8A UNSUBSCRIBE Unsubscribe from a parameter. Stops returning SET message.

0x8C RECALL PRESET Recalls a Soundweb London Preset using preset ID number.

0x8D SET PERCENT Set a parameter using a percentage value.

0x8E SUBSCRIBE PERCENT Subscribe to a parameter. Returns SET PERCENT messages.

0x8F UNSUBSCRIBE PERCENT Unsubscribe from a parameter. Stops returning SET PERCENT messages.

0x90 BUMP PERCENT Bump the parameter up or down by a percentage value.

Setting a parameter using SET, SET PERCENT or BUMP PERCENT requires sending a single message addressed to a specific device. Recalling a Soundweb London Preset requires sending a single message. No addressing is used.

Subscribing to a parameter using SUBSCRIBE or SUBSCRIBE PERCENT requires sending a single message addressed to a specific device. The value of the parameter is immediately returned in the form of a SET or SET PERCENT message. Further messages are sent on any subsequent value changes of the parameter until an UNSUBSCRIBE message is sent or until the device is rebooted.

If a subscribed parameter's value is changed using BUMP PERCENT messages then the device will not return SET or SET PERCENT messages after every bump. Another subscribe message must be sent to find the new values.

Addressing Parameters

The address of a parameter consists of hierarchical fields:

Node Address (two bytes) identifies the physical device. Also called Device ID. Range 0x0001 to 0xFFFE (1 - 65,534)

Virtual Device (one byte) identifies the processing object category (Audio 0x03, Logic 0x02)

Object ID (three bytes) identifies the Processing Object (Mixer, EQ, Source Selector, etc).

Parameter ID (two bytes) identifies the parameter in the Processing Object (Gain, Mute, Source, etc)

| Node Address		Virtual Device	Object ID			Parameter ID	
00	01	03	00	01	00	00	01

The Node Address of a device is displayed in the Venue Explorer and in the Room view.
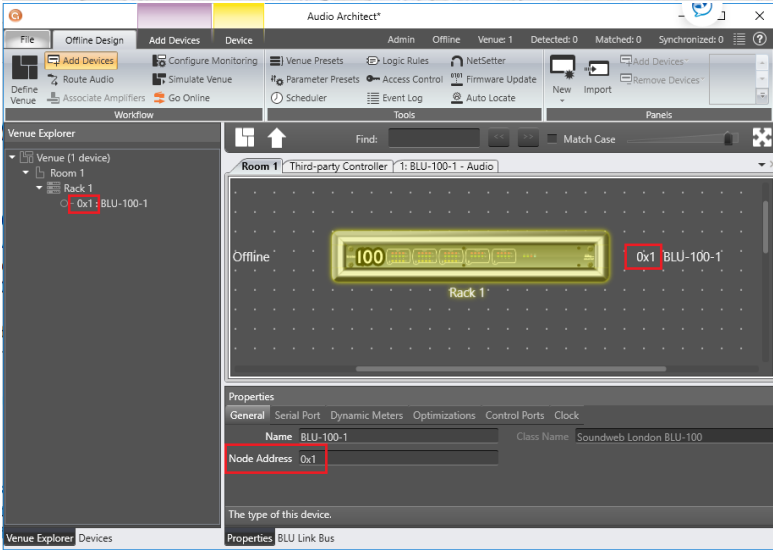
The Node Address, Virtual Device and Object ID are displayed together in the Properties window when a processing object is selected in the Configuration view.
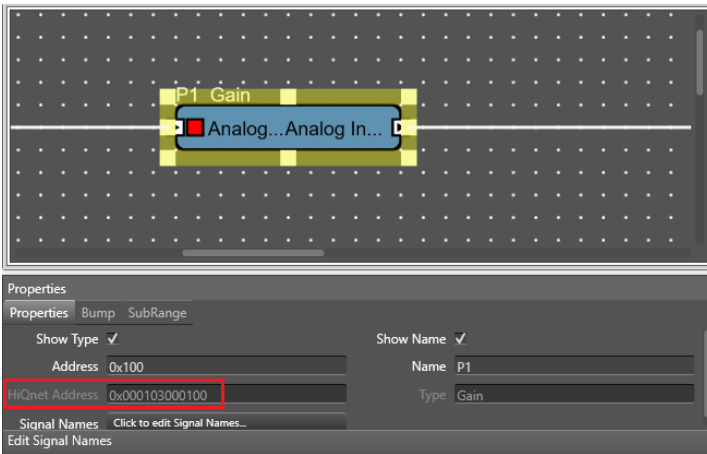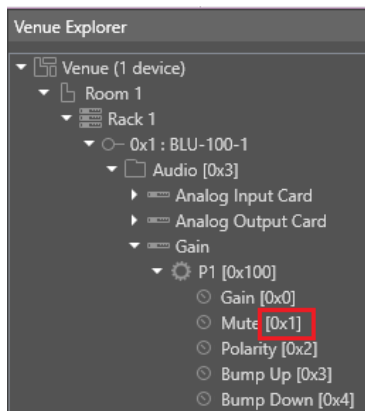

The Object ID for all processing objects is also displayed in the Venue Explorer.
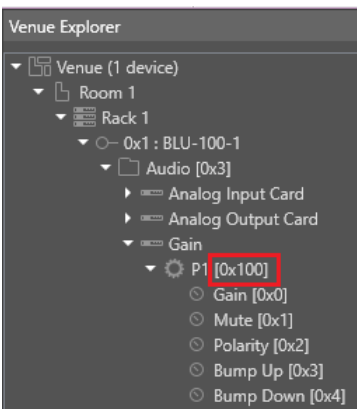
The Parameter IDs of a processing object are displayed in the Venue Explorer.

Parameter Values

Parameter values consist of four bytes (32 bit signed) and can represent a raw value or percentage. The raw values between maximum and minimum value depends on the type of parameter.

Percentage value - the range is always 0 - 100% and fractions thereof. (Raw = percentage value x 65536)

Two-state parameters - (e.g. mute) use values 0 and 1 (0% and 100%)

Multi-state parameter - (e.g. source selector, input card gain) use discreet values 0,1,2,3,4... depending on the number of enumerations (0% - 100%)

Variable parameters - (gain, threshold, pan) use specific values and scaling laws. Gain parameters use values -280,617 (0% -80dB) to 100,000 (100% +10dB). The value at unity gain is 0 (73.73%). The scale is logarithmic from -inf dB to -10dB. Above -10dB the scale is linear.

Meter parameters - use values -800,000 (0% -80dB) to 400,000 (100% +40dB) across a linear scale. The value at 0dB is 0 (66.66%). (dB value = Raw / 10,000)

Soundweb London Preset

The Soundweb London Preset recall message uses the Preset ID number as the four bytes Value. The Preset ID is displayed in the Soundweb London Preset window.

Byte Substitution

The message body cannot contain any of the special characters listed below. Byte substitution is performed on the message after the checksum as has been calculated.   Note that this will increase the length of the message.

    0x02 substitute with 0x1B 0x82
    0x03 substitute with 0x1B 0x83
    0x06 substitute with 0x1B 0x86
    0x15 substitute with 0x1B 0x95
    0x1B substitute with 0x1B 0x9B

STX	Message Type	Node Address		Virtual Device		Object ID			Parameter ID		Value				Check-sum	ETX
							Substituted Byte									
02	88	00	01	1B	83	00	01	00	00	01	00	00	00	01	8B	03
		<---- BODY ---->														

Message Structure (Byte substitution not shown)

SET, SUBSCRIBE, SUBSCRIBE PERCENT,BUMP PERCENT

STX	Message Type	Node Address		Virtual Device	Object ID			Parameter ID		Value				Check-sum	ETX
02	88	00	01	03	00	01	00	00	01	00	00	00	01	8B	03
	<---- BODY ---->														

UNSUBSCRIBE, UNSUBSCRIBE PERCENT

STX	Message Type	Node Address		Virtual Device	Object ID			Parameter ID		Check-sum	ETX
02	89	00	01	03	00	01	00	00	01	8B	03
	<---- BODY ---->										

SOUNDWEB LONDON PRESET RECALL

STX	Message Type	Value				Check-sum	ETX
02	8C	00	00	00	01	8B	03
	<---- BODY ---->						