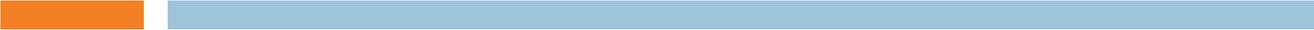


ClearOne[®]



StreamNet[™]

**STREAMNET-ENABLED DEVICES/
AMX CONTROL INSTALLATION GUIDE**

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StreamNet-Enabled Devices/AMX Control Installation Guide

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AV Distribution and Control using StreamNet

StreamNet technology based products are designed to distribute audio, video and control data using standard networking technology. By embracing open standards, we have developed a system that leverages reliability, expandability and cost-effectiveness for customers.

Using standardized Ethernet TCP/IP protocols to distribute audio and video streams over LANs, StreamNet offers scalability enabling virtually unlimited zones and sources along with the most advanced integration capabilities available in distributed audio and video.

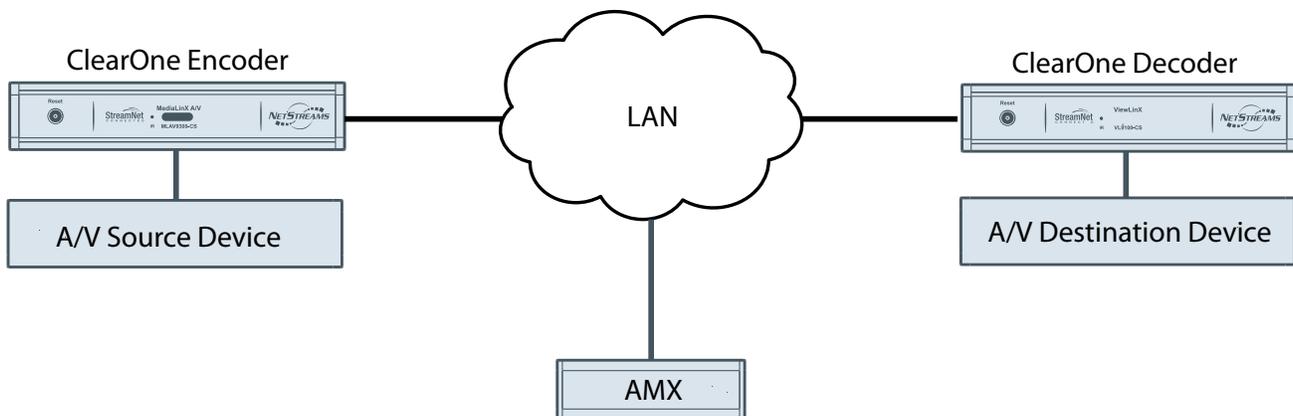
With StreamNet, seamless communication with other third-party systems, such as lighting control systems, automation systems and security systems is easily achieved. Some customers, however, choose to use the third-party system controllers to manage the entire system including StreamNet audio video distribution. In order to assist AMX control system users, we have developed control modules which are detailed and explained in this document..

DISTRIBUTION MODEL WITH STREAMNET-ENABLED PRODUCTS

AV distribution using StreamNet-enabled products places the encoders and decoders at the individual sources and destinations. The encoders and decoders interface with the network to move signals and commands to and from their destinations and sources.

- **Encoders** are placed at the AV sources to convert the source outputs, place the signals on the network and to receive their own commands from the IP network.
- **Decoders** are placed with the destination devices to receive and convert the signal data from source encoders and to receive their own commands from the IP network.
- **Comm and UI Modules** provide the AMX control needed for the use of the ClearOne StreamNet devices.

The GUI and the command processing programming that are essential to this control and communication are contained in software modules loaded into the AMX GUI and processing devices.



DOWNLOADED ITEMS

The downloaded AMX ClearOne Module.zip file contains the following:

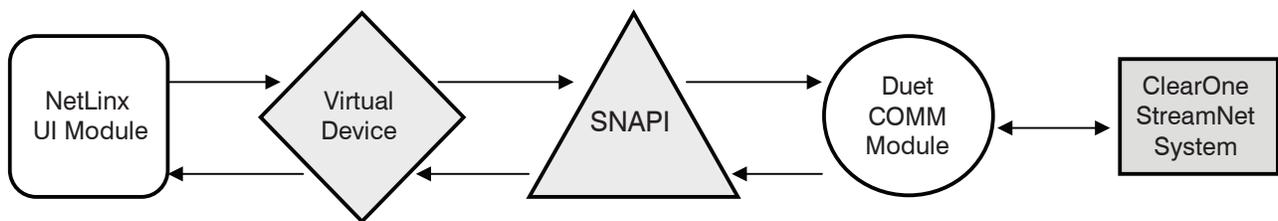
- Sample program with user interface
- Required libraries
- AMX Module specific files

SOFTWARE MODULE OVERVIEW

Duet COMM Module - The Duet COMM module translates between the standard interface described below and the switcher serial protocol. It parses the buffer for responses from the switcher, sends strings to control the switcher and receives commands from the UI module or telnet sessions.

UI Module - A User Interface (UI) module is also provided. This module uses the standard interface described below and parses the command responses for feedback.

The following diagram gives a graphical view of the interface between the interface code and the Duet COMM module.



Some functionality in the device interface may not be implemented in the API interface. In cases where device functions are desired but not API-supported, the PASSTHRU command may be used to send any and all device-protocol commands to the device. See the PASSTHRU command and the Adding Functions to Modules section later in this guide for more information.

A sample UI module and a touch panel file are provided in the module package. These are not intended to cover every possible application but can be expanded as needed to meet the requirements of a particular installation.



Upload
ClearOne StreamNet Demo v1.0 XPANEL.exe

Implementation

The ClearOne StreamNet system is a networked Audio/Video streaming system. This makes it loosely defined as a Switcher where the Audio/Video signals from a source “stream” to one or multiple destinations (Renderer, Zone or Room).

To interface to the AMX ClearOne StreamNet module the programmer must perform the following steps:

1. Define the device ID for the switcher that will be controlled.
2. Define the virtual device ID that the ClearOne StreamNet COMM module will use to communicate with the main program and User Interface. Duet virtual devices use device numbers 41000 - 42000.
3. If a touch panel interface is desired, a touch panel file “ClearOne StreamNet Demo v1_0.TP4” and module (“ClearOne StreamNet UI Module v1_0.axs”) have been created for testing.
4. The Duet ClearOne_StreamNet_dr1_0_0 module must be included in the program with a DEFINE_MODULE command. This command starts execution of the module and passes in the following key information: the device ID of the switcher to be controlled and the virtual device ID for communicating to the main program.

An example of how to do this is shown below.

```
DEFINE_DEVICE
```

```
dvStreamNet = 0:3:0;
```

```
vdvStreamNet = 41001:1:0;
```

```
vdvRendererZ1 = 41001:1:0;
```

```
vdvRendererZ2 = 41001:2:0;
```

```
vdvRendererZ3 = 41001:3:0;
```

```
vdvRendererZ4 = 41001:4:0;
```

```
vdvRendererZ5 = 41001:5:0;
```

```
vdvRendererZ6 = 41001:6:0;
```

```
vdvRendererZ7 = 41001:7:0;
```

```
vdvRendererZ8 = 41001:8:0;
```

```
vdvRendererZ9 = 41001:9:0;
```

```
vdvRendererZ10 = 41001:10:0;
```

```
vdvRendererZ11 = 41001:11:0;
```

```
vdvRendererZ12 = 41001:12:0;
```

```
vdvRendererZ13 = 41001:13:0;
```

```
vdvRendererZ14 = 41001:14:0;
```

```
vdvRendererZ15 = 41001:15:0;
```

```
vdvRendererZ16 = 41001:16:0;
```

```

dvPanel = 10001:1:0;
DEFINE_CONSTANT
CHAR IP_ADDRESS[] = '10.15.0.111' DEFINE_VARIABLE
VOLATILE DEV dvRendererZones[] =
{
    vdvRendererZ1, vdvRendererZ2,
    vdvRendererZ3, vdvRendererZ4,
    vdvRendererZ5, vdvRendererZ6,
    vdvRendererZ7, vdvRendererZ8,
    vdvRendererZ9, vdvRendererZ10,
    vdvRendererZ11, vdvRendererZ12,
    vdvRendererZ13, vdvRendererZ14,
    vdvRendererZ15, vdvRendererZ16
}

DEFINE_START
DEFINE_MODULE 'ClearOne StreamNet UI Module v1_0' modUI(dvPanel, vdvStreamNet,
dvRendererZones);
DEFINE_MODULE 'ClearOne_StreamNet_dr1_0_0' modStreamNet(vdvStreamNet, dvStreamNet);
DEFINE_EVENT
DATA_EVENT[vdvStreamNet]
{
    ONLINE:
    {
        WAIT 50 'SETTLE'
        {
            SEND_COMMAND vdvStreamNet, "'PROPERTY-IP_Address,' ,IP_ADDRESS'"
            SEND_COMMAND vdvStreamNet, 'REINIT'
        }
    }
}
}

```

Upon initialization, the AMX COMM module will communicate with the switcher and information will be exchanged.

- » **Note:** For information on loading modules into AMX devices, please refer to the appropriate AMX documentation.

Port Mapping

This module uses multiple virtual devices in order to distinguish events for one zone from another. In the case with the ClearOne StreamNet module, each Renderer, Zone or Room will be automatically assigned to a virtual device upon initialization. The terms Renderer, Zone or Room are interchangeable and will be used throughout this document. The assignment is solely based on how the integrator configured the ClearOne StreamNet System.

The ClearOne StreamNet system is a networked Audio/Video streaming system. This makes it loosely defined as a Switcher, where the Audio/Video signals from a source “stream” to one or multiple destinations (Renderer, Zone or Room). This module supports up to 128 sources and 128 destinations. In this version of the module, you will only be able to control the zone and not the source. Future versions will add source control. So each virtual device gives you access to a single zone. Zone control is limited to Volume and Preamp components. Switching command will be available through the first virtual device only.

- » **Note:** In order to get the required unsolicited information from the ClearOne StreamNet system, you must create a “SUBSCRIBER” in the ClearOne programming that assigns all of the renderer (Zone, Room) “Players” to that Subscriber. When creating the Subscriber use the IP address of the AMX controller and Port 50000. Port 50000 is the UDP port that the AMX system will use to listen for these unsolicited messages from the ClearOne system.

Port Mapping Table

Virtual Device	Channels	Levels	Control	Feedback
41001:1:0 (Switcher, Volume and PreAmp components).	24, 25, 26, 164, 165, 166, 167, 168, 169, 199, 251, 252	1, 2, 3, 4	All	All
41001:2:0 – 41001:128:0 (Volume and PreAmp componets)	24, 25, 26, 164, 165, 166, 167, 168, 169, 199	1,2,3,4	All Equalizer	All Equalizer

Channels

The UI module controls the switcher via channel events (StreamNet commands Pulse, On, and Off) sent to the COMM module. The channels supported by the COMM module are listed below. These channels are associated with the virtual device(s) and are independent of the channels associated with the touch panel device.

Virtual Device Channel Events Table

» Note: An '*' indicates an extension to the standard API.

Channel	Description
24	ON: Ramp Volume Up – used for feedback also OFF: Stop Ramping
25	ON: Ramp Volume Down – use for feedback also OFF: Stop Ramping
26	PULSE: Cycle Volume Mute
164	ON: Ramp Balance Right – used for feedback also OFF: Stop Ramping
165	ON: Ramp Balance Left – used for feedback also OFF: Stop Ramping
166	ON: Ramp Bass Up – used for feedback also OFF: Stop Ramping
167	ON: Ramp Bass Down – used for feedback also OFF: Stop Ramping
168	ON: Ramp Treble Up – used for feedback also OFF: Stop Ramping
169	ON: Ramp Treble Down – used for feedback also OFF: Stop Ramping
199	ON: Set Volume Mute On – used for feedback also OFF: Set Volume Mute Off
251	ON: Device is Online – used for feedback only OFF: Device is not Online
252	ON: Data is Initialized – use for feedback only OFF: Data is not Initialized
*301	PULSE: AV MODE ON - Enable Zone Streaming, used also for feedback indicating status.
*302	PULSE: AV MODE OFF - Disable Zone Streaming.
*303	PULSE: Cycle AV Mode – Toggles AV Mode.

Channel	Description
*310	PULSE: MultiRoom Mode On – Joins Multiroom mode, use also for feedback indicating status.
*311	PULSE: MultiRoom Mode Off – Leaves MultiRoom mode
*312	PULSE: Cycle MultiRoom Mode
*321	Feedback Only: When on indicates that the zone is sleeping.
*322	Feedback Only: When on indicates that the zone has audio control capabilities. (Volume, PreAmp) component controls.
*330	Feedback Only: When on indicates that the Virtual Device has been assigned a Renderer, Zone or Room.

Levels

The UI module controls the switcher via level events (StreamNet command send_level) sent to the COMM module. The levels supported by the COMM module are listed below. These levels are associated with the virtual device(s) and are independent of the levels associated with the touch panel device.

Virtual Device Level Events Table

» Note: An '*' indicates an extension to the standard API.

Level	Description
1	Volume Level (range 0...255)
2	Balance Level (range -128...128)
3	Bass Level (range 0...255)
4	Treble Level (range 0...255)

Command Control

The User Interface module controls the switcher (StreamNet device) via command events (StreamNet command send_command) sent to the COMM module. The commands supported by the COMM module are listed below.

» Note: An '*' indicates an extension to the standard API.

Command	Description
CI<input> O<output> [,<output>]	Switch the input to the output or outputs for switch level ALL. Send this to the first virtual device only. <ul style="list-style-type: none"> » Note: See SOURCE_NAME command for input list. » Note: Outputs are associated with the Renderer, Zone or Rooms. These are directly correlated to the assignment of the virtual devices. See ROOM_NAME, DISPLAY_NAME commands. <input> : 0 = disconnect input channel 1..n = input channel <output> : 1..n = output channel CI1O3 CI3O4,5,6
CL<sl> I<input> O<output> [,<output>]	Switch the input to the output or outputs at the level specified. Send this to the first virtual device only. <ul style="list-style-type: none"> » Note: See SOURCE_NAME command for input list. » Note: Outputs are associated with the Renderer, Zone or Rooms. These are directly correlated to the assignment of the virtual devices. See ROOM_NAME, DISPLAY_NAME commands. » Note: Breakaway of signal levels is not supported. <sl> : ALL = All levels (both audio and video) <input> : 0 = disconnect input channel 1..n = input channel <output> : 1..n = output channel CLALLI1O3 CLALLI3O4,5,6
?DEBUG	Request the state of the debug feature. Send this to the first virtual device only. ?DEBUG

Command	Description
DEBUG-<value>	<p>Set the state of debugging messages in the UI module and the COMM module. Send this to the first virtual device only.</p> <p>» Note: See Programming Notes section.</p> <p><value> : 1 = set only error messages on 2 = set error and warning messages on 3 = set error, warning & info messages on 4 = set all messages on</p> <p>DEBUG-1</p>
*?DISPLAY_NAME	<p>Query the display name of the renderer or zone. Send this to any of the virtual devices.</p> <p>?DISPLAY_NAME</p> <p>Response: DISPLAY_NAME-Living Room Player</p>
?EQUALIZER	<p>Query Equalizer for all supported (bands) and their (gains). Send this to any of the virtual devices.</p> <p>Returns EQUALIZER-(band)=(gain)[,(band)=(gain)]+ where (band) ranges from 1 to 255 and its (gain) ranges from 0 to 255.</p> <p>?EQUALIZER</p> <p>Response: EQUALIZER-1=128,2=202,3=128,4=100,5=0</p>
?EQUALIZER-<band>[,<band>]+	<p>Query Equalizer for all given (bands). Send this to any of the virtual devices.</p> <p>Returns EQUALIZER-(band)=(gain)[,(band)=(gain)]+ where (band) ranges from 1 to 255 and its corresponding (gain) ranges from 0 to 255</p> <p>?EQUALIZER=1</p> <p>Response: EQUALIZER-1=128</p> <p>?EQUALIZER=1,3</p> <p>Response: EQUALIZER-1=128,3=200</p>
?EQUALIZER_BANDS	<p>Query Equalizer for all its supported (bands), where (band) numbers range from 1 to 255. Send this to any of the virtual devices.</p> <p>Returns EQUALIZER_BANDS-(band)[,(band)]+</p> <p>?EQUALIZER_BANDS</p> <p>Response: EQUALIZER_BANDS-1,2,3,4,5</p>

Command	Description
EQUALIZER- <band> = <gain> [, <band> = <gain>]+	Set Equalizer, given each (band) number which ranges from 1 to 255 and its corresponding (gain), which ranges from 0 to 255. Send this to the any of virtual devices. EQUALIZER-3=128 EQUALIZER-1=128,2=128,4=128
*?ID	Query the unique ID of the zone. Send this to any of the virtual devices. ?ID Response: ID-Dining Room Player
?INPUT-[<sl>,]<output>	Get the input channel currently connected to the specified output channel. Send this to the first virtual device only. <ul style="list-style-type: none"> » Note: If <sl> is not specified, then 'ALL' is assumed. » Note: This command returns a 'SWITCH-' response. <sl> : ALL AUDIO VIDEO <output> : 1..n = output channel ?INPUT-10 ?INPUT-AUDIO,3
*?IP_ADDRESS	Query the IP address of the renderer or zone. Send this to any of the virtual devices. ?IP_ADDRESS Response: IP_ADDRESS-10.15.0.10
*?MROOM_AUDIOSESSION	Query the assigned MultiRoom Audio Session Name. Send this to any of the virtual devices. ?MROOM_AUDIOSESSION Response: MROOM_AUDIOSESSION-MyParty
*MROOM_AUDIOSESSION	Assigns the MultiRoom audio session name. Send this to any of the virtual devices. <ul style="list-style-type: none"> » Note: This can be any name. MROOM_AUDIOSESSION-MyParty

Command	Description
?OUTPUT-[<sl>,<input>	<p>Get the output channel currently connected to the specified input channel. Send this to the first virtual device only.</p> <ul style="list-style-type: none"> » Note: If <sl> is not specified, then 'ALL' is assumed. » Note: This command returns a 'SWITCH-' response. <p><sl> : ALL AUDIO VIDEO</p> <p><input> : 1..n = output channel</p> <p>?OUTPUT-10 ?OUTPUT-AUDIO,3</p>
PASSBACK-<state>	<p>Enable or disable response reporting from the device. When enabled device responses will be sent as strings to the virtual device. Send this to the first virtual device only.</p> <ul style="list-style-type: none"> » Note: By default, this is set to off at startup. <p><state> : 0 = Off (default) 1 = On</p> <p>PASSBACK-0</p>
PASSTHRU-<string>	<p>Allows user the capability of sending commands directly to any unit with minimal processing by the Duet module. User must be aware of the protocol implemented by the unit to use this command. This gives the user access to features that may not be directly supported by the module. For more information, see the "Adding Functions to Modules" section below. Send this to the first virtual device only.</p> <p><string> : string to send to unit</p> <p>PASSTHRU-@PPS:0 (pause)</p>
*?PERM_ID	<p>Query the permanent id of the renderer. Send this to any of the virtual devices.</p> <p>?PERM_ID</p> <p>Response: PERM_ID-VL9300-CS1126400116102BEA8_3</p>
?PROPERTY-<key>	<p>Get the value of a property <key>. If the value is not initialized, an empty string is returned. Send this to the first virtual device only.</p> <p><key> : IP_Address</p> <p>?PROPERTY-IP_Address</p>

Command	Description
PROPERTY-<key>,<value>	<p>Set the value of property <key> to <value>. This must be followed by the REINIT command to take effect. These values are not initialized by default. Send this to the first virtual device only.</p> <p><key> : IP_Address <value> : string representing an IP address PROPERTY-IP_Address,10.0.0.5</p>
REINIT	<p>Re-initializes the communication link and data.</p> <p>» Note: This command deletes any messages waiting to go out to the device. Send this to the first virtual device only.</p> <p>REINIT</p>
*?ROOM_NAME	<p>Query the Room name of the renderer or zone. Send this to any of the virtual devices.</p> <p>?ROOM_NAME Response: ROOM_NAME-Dining Room</p>
*?SOURCE_NAME-<input>	<p>Query the source name of an input as configured in the system. Send this to the first virtual device only.</p> <p>?SOURCE_NAME-5 Response: SOURCE_NAME-5,BluRay Player</p>
?VERSION	<p>Query for the current version number of the Duet module. Send this to the first virtual device only.</p> <p>?VERSION</p>

Command Feedback

The COMM module provides feedback to the User Interface module for switcher changes via command events. The commands supported are listed below.

Command Feedback Definitions Table

- » NOTE: Feedback is only provided when there is a state change. If no state change resulted from the command sent in, then no feedback will be returned.

Command	Description
DEBUG-<value>	Returns the state of debugging messages in the UI module and the COMM module. <value> : 1 = set only error messages on 2 = set error and warning messages on 3 = set error, warning and info messages on 4 = set all messages on DEBUG-1
*DISPLAY_NAME-<name>	Reports from ANY virtual device the display that was configured for the assigned renderer or zone. <name> : any string value. DISPLAY_NAME-Dining Room Player
EQUALIZER <band> = <gain> [, <band> = <gain>] +	Reports from ANY virtual device, all bands and their gain values. <band> : 1...5 <gain> : 0...255 EQUALIZER-1=128,2=128,3=128,4=128,5=0
*ID-<id>	Reports from ANY virtual device, the ID that was configured for the assigned renderer or zone. <id> : any string value. ID-Dining Room Player
*IP_ADDRESS-<address>	Reports from ANY virtual device, the IP address that was configured for the assigned renderer or zone. <address> : any IP address value. IP_ADDRESS-192.168.1.100
*MROOM_AUDIOSESSION-<name>	Reports from ANY virtual device, the current assigned MultiRoom audio session name for the assigned renderer or zone. <name> : any string value. MROOM_AUDIOSESSION-MyParty

Command	Description
*PERM_ID-<id>	Reports from ANY virtual device, the current factory assigned id for the assigned renderer or zone. <id> any string value. PERM_ID-VL9300-CS1126400116102BEA8_3
PROPERTY-<key>,<value>	Feedback on the value of property <key>. » NOTE: An empty string is returned if the property has no value. <key> : IP_Address <value> : string representing an IP address PROPERTY-IP_Address,10.0.0.5
*ROOM_NAME-<name>	Reports from ANY virtual device, the current assigned room name for the assigned renderer or zone. <name> : any string value. ROOM_NAME-Master Bedroom
*SOURCE_NAME-<input>,<name>	Reports from the first virtual port only, the assigned source name for a given input. <input> : 1...128 <name> : any string value. SOURCE_NAME-1,BluRay Player
SWITCH-L<sl> I<input> O<output> [,<output>]	Reports all output channels that are currently connected to the specified input channel. <sl> : ALL <input> : 0 = no input channel connected 1..n = input channel <output> : 1..n = output channel SWITCH-LALLI1O1 SWITCH-LALLI1O1,3,5
VERSION-<version>	Reports the version number of the module. <version> : xx.yy.zz = module version number VERSION-1.0.0

Programming Notes

In order to establish a communication connection between the module and the device, the module must know what IP address to connect to. Use the PROPERTY- command to set the module's IP address and then use the REINIT command to force it to take affect. Here is an example of how these two commands are used:

```
Send_Command 41001:1:0, 'PROPERTY-IP_Address,192.168.103.30'
```

```
Send_Command 41001:1:0, 'REINIT'
```

Your virtual device (41001:1:0) and the IP address of your device (192.168.103.30) will differ from this example. Substitute the appropriate values where necessary.

Adding Functions to Modules

PASSTHRU COMMANDS TO THE DEVICE

The 'PASSTHRU-' command supplies a mechanism to allow additional device features to be added to software using the module. The 'PASSTHRU-' command allows protocol strings to be passed through the module. The device-specific protocol must be known in order to use this feature.

As an example, suppose that a module for a projector has not implemented the 'white balance adjustment' feature. The command that the projector protocol requires is 03H, 10H, 05H, 14H, followed by a checksum. The documentation for the 'PASSTHRU-' command specifies that the module will automatically generate the checksum. In this case, the following string should be sent from the UI code to implement 'white balance adjustment'.

```
send_command vdvDevice, "'PASSTHRU-', $03,$10,$05,$14"
```

The reason to use 'PASSTHRU-' instead of sending a protocol string directly to the device port is that the device may require command queuing, calculation of checksums or other internal processing which would not be done if the string was sent directly. Because of this, it is best to filter all communication TO the device through the module. The module documentation will indicate any processing that will be automatically done to the 'PASSTHRU-' command like checksum calculation.

RESPONSES FROM THE DEVICE

The module will automatically interpret replies from the device and pass these on to the application code according to the documented API. Some device replies may not be passed on to the application code. To see all replies from the device unfiltered by the module, enable PASSBACK and use a DATA_EVENT with a string handler in the UI code. Again, the device-specific protocol must be known in order to interpret these responses. Even when PASSBACK is enabled, the module will still interpret device responses according to the standard API.

Service and Support

If you need assistance setting up or operating your product, please contact us. We welcome your comments so we can continue to improve our products and better meet your needs.

TECHNICAL SUPPORT

Telephone: 1-800-283-5936

E-mail: tech.support@ClearOne.com

Web site: www.ClearOne.com, www.NetStreams.com

SALES

Telephone: 1-800-707-6994

E-mail: sales@ClearOne.com

TECHSALES

Telephone: 1-800-705-2103

E-mail: techsales@ClearOne.com

PRODUCT RETURNS

All product returns require a Return Material Authorization (RMA) number. Contact ClearOne Technical Support before returning your product. Make sure you return all the items and packing materials that originally shipped with your product.

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