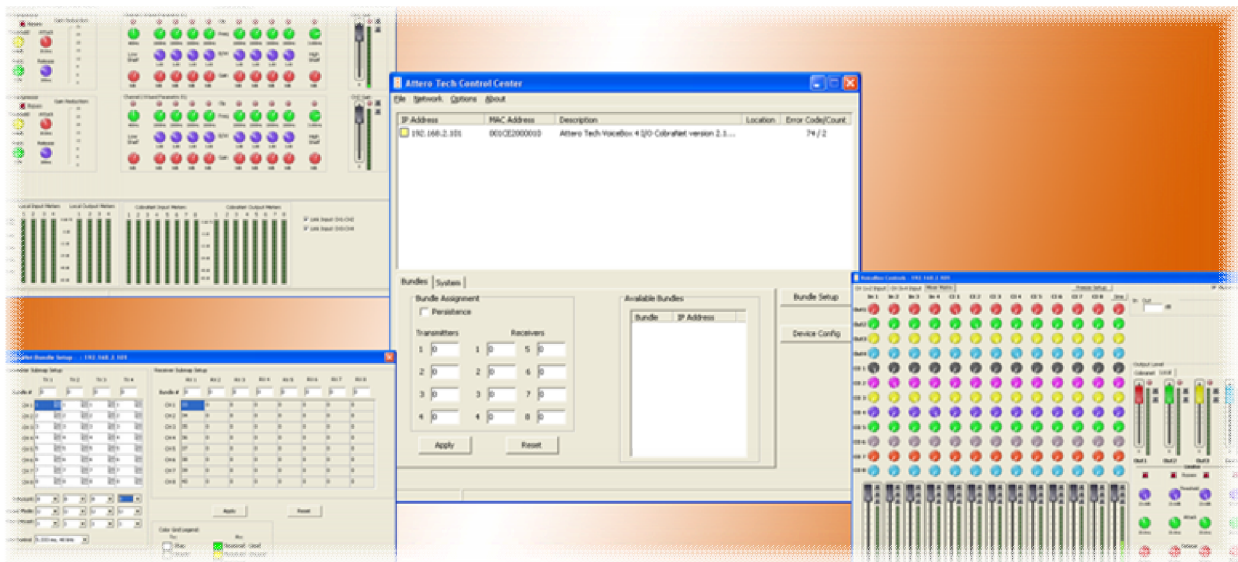


Control Center

Control for CobraNet Devices



User Manual

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1 – Overview

Attero Tech Control Center is an easy to use configuration and monitoring application for CobraNet devices. As well as being usable for configuring the generic parameters of any CobraNet device, such as the bundle setup for audio routing or serial bridge functionality, it also includes device specific setup for Attero Tech products such as the VoiceBox 4 I/O and the InBox and OutBox products.

Note: Whilst devices from manufacturers other than Attero Tech are detected and displayed, use the manufacturers' own software to set up their devices. Using Control Center to control a device from another manufacturer is at the user's own risk. Attero Tech bears no responsibility for the results if settings are altered on a non-Attero Tech CobraNet device.

1.1 – How to Use Attero Tech's Control Center

This manual is designed to give the user a guide on how to use the Attero Tech Control Center to view and control CobraNet devices on a network. The steps required to use the software are as follows:

- Install the application (see section 2)
- Run the application (see section 3)
- Select a network card to use (see section 3.2)
- Select a device to view its properties (see section 3.3)
- Configure the system parameters (if needed)
- Configure the audio routing and bundle setup (if needed)
- Configure the device setup (Attero Tech devices only)

This manual also includes an introduction to CobraNet in the appendices for those who are unfamiliar with CobraNet.

2 – Installing the Software

NOTE: It is recommended that the installation instructions be read prior to attempting installation of the software.

2.1 – PC Requirements

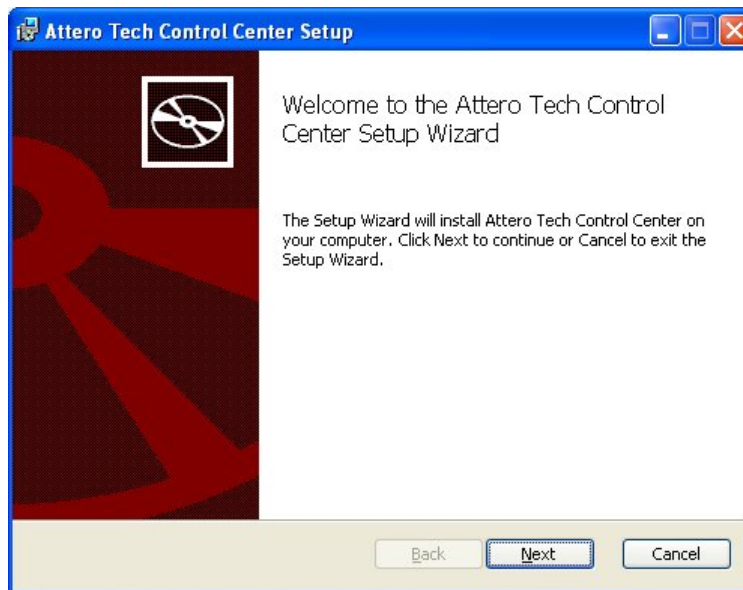
- Windows 2000, XP or Vista
- SNMP services installed and enabled (some versions of Windows 2000 may have SNMP disabled)
- 10/100 Mbit/s wired Ethernet Network Interface Card

2.2 – Installation Method

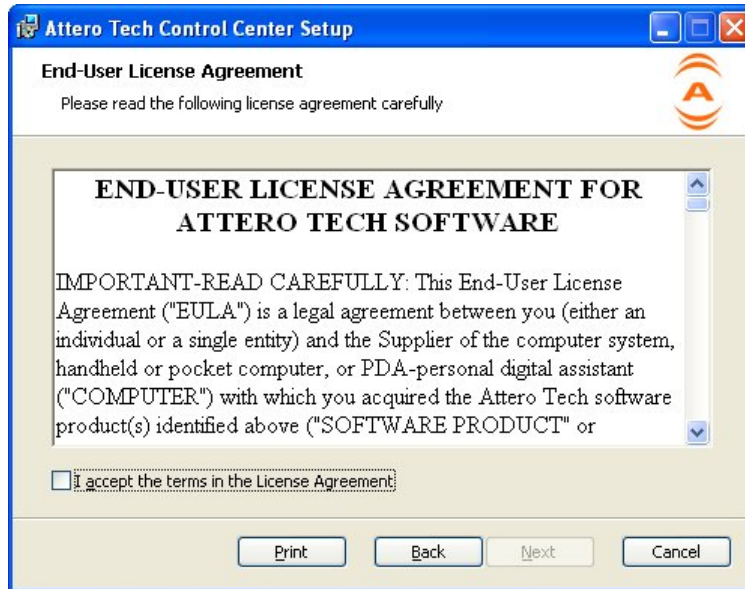
The software is distributed as an MSI (Microsoft Installer) file from the Attero Tech website. Start the installation by locating the MSI file and running it by double clicking on it.

Note: There is no requirement to remove any previous versions before installing the new one. Previous versions should be detected by the installer and removed before the new files are installed.

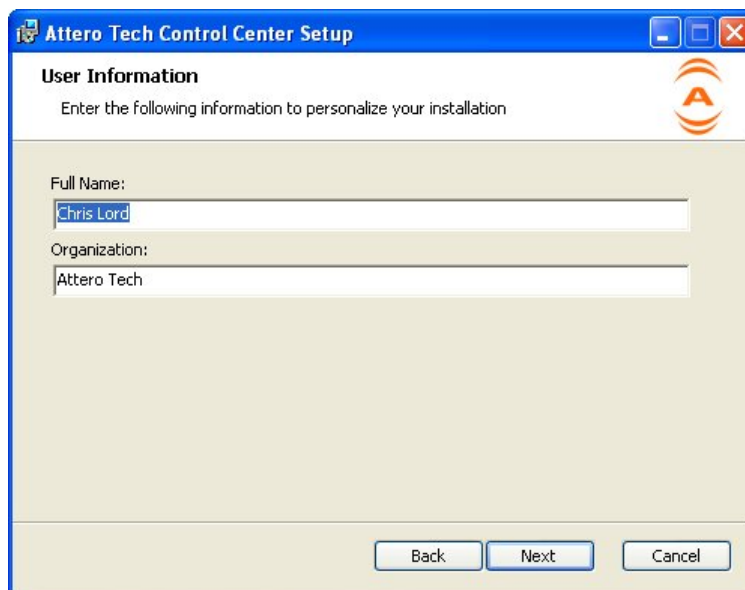
Once the installation has started, the routine to install the software is exactly the same. At any point during this installation prior to actually installing the files, the installation may be stopped by clicking on the “Cancel” button.



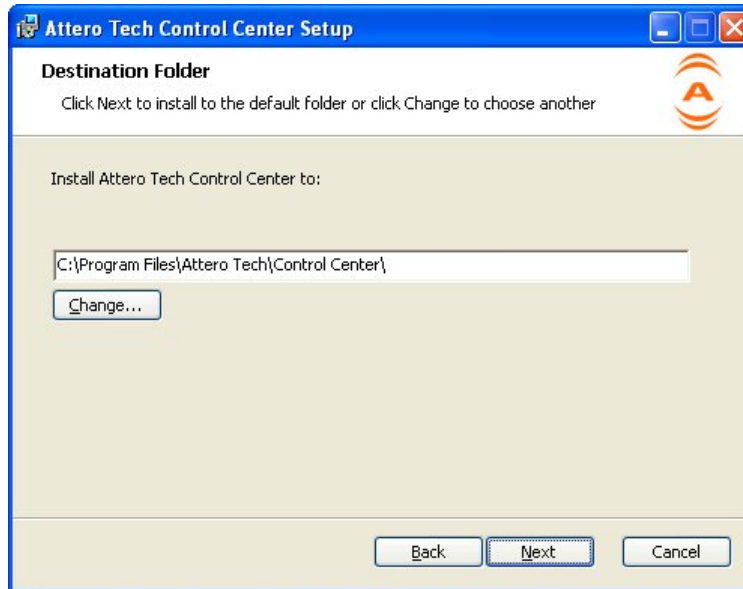
Click “Next” to proceed through the installation.



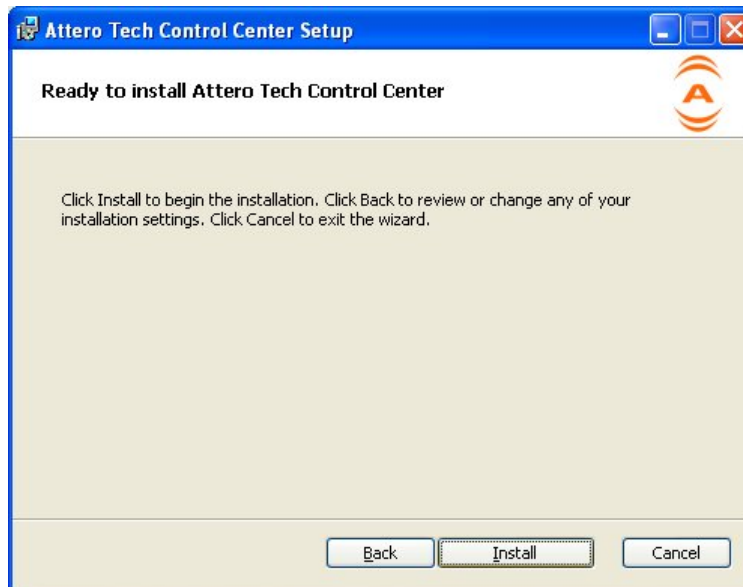
Read the license agreement and if you agree, check the "I accept..." option and click "Next".



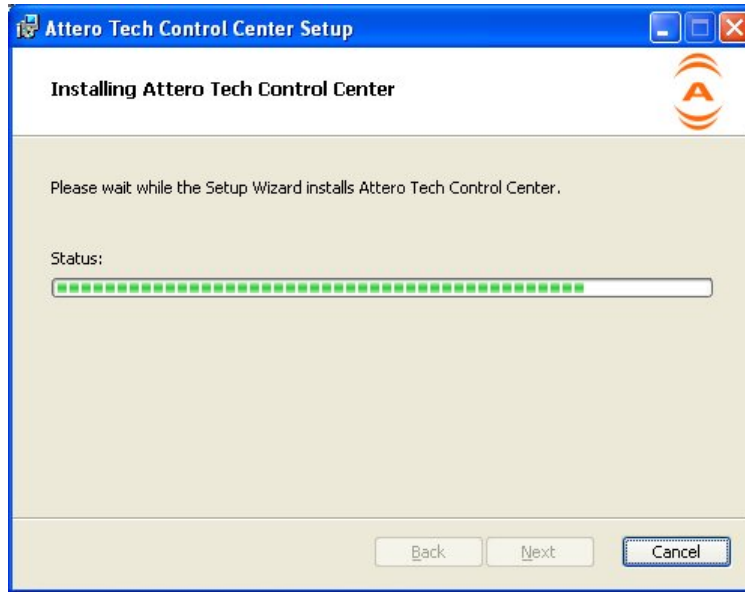
Fill in your User Name and Organization. Select the type of installation and click "Next" to proceed.



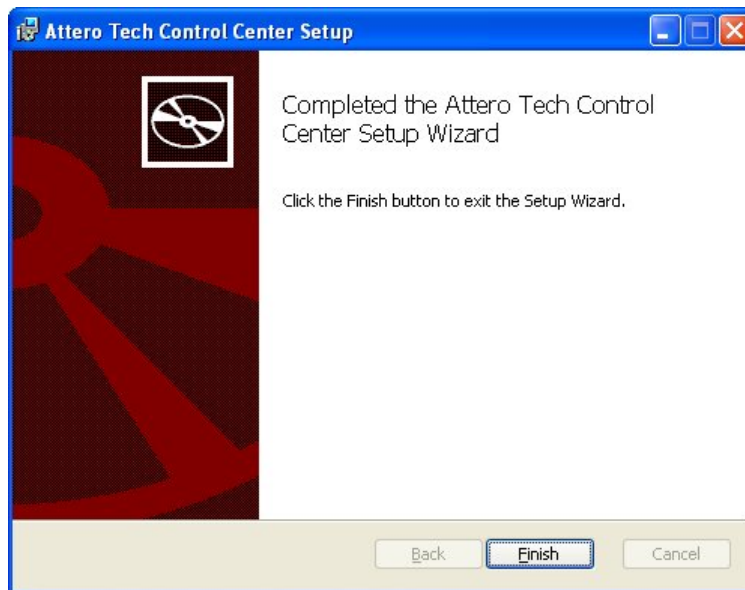
A default location is provided for the files but this can be altered. Use Change to select a new folder, type in a new destination or just click "Next" to accept the default location.



This is the last screen before installation. If any previous settings need changing, click "Back". Otherwise click "Install" to begin the file transfer.



The installer will then begin copying files and display the progress of the installation.



After this process is successfully completed, click "Finish".

The installation will create a program group and various shortcuts including one to run the program. All of the icons are located under Start Menu -> All Programs ->Attero Tech -> Attero Tech Control Center.

3 – Running the Application

Before running the application, it is worth mentioning how CobraNet performs device discovery and implements IP address allocation.

Assignment of IP addresses to devices in a CobraNet system is facilitated by using BOOTP and RARP as CobraNet does not currently support DHCP. The Attero Tech Control Center software provides the IP assignment features necessary to communicate with each CobraNet device on the network. Any network hardware or software acting as a DHCP server should be disabled to prevent other network devices from being allocated the same IP address as a CobraNet node. Otherwise, network problems may be encountered.

As a result, the network card in the PC running the Attero Tech Control Center software that is connected to the CobraNet system must be assigned a static IP address in order to operate correctly.

3.1 – Starting the Application

After clicking on the program icon to start the application, a brief splash screen is shown before the main window appears. The main window initially looks like Figure 1.

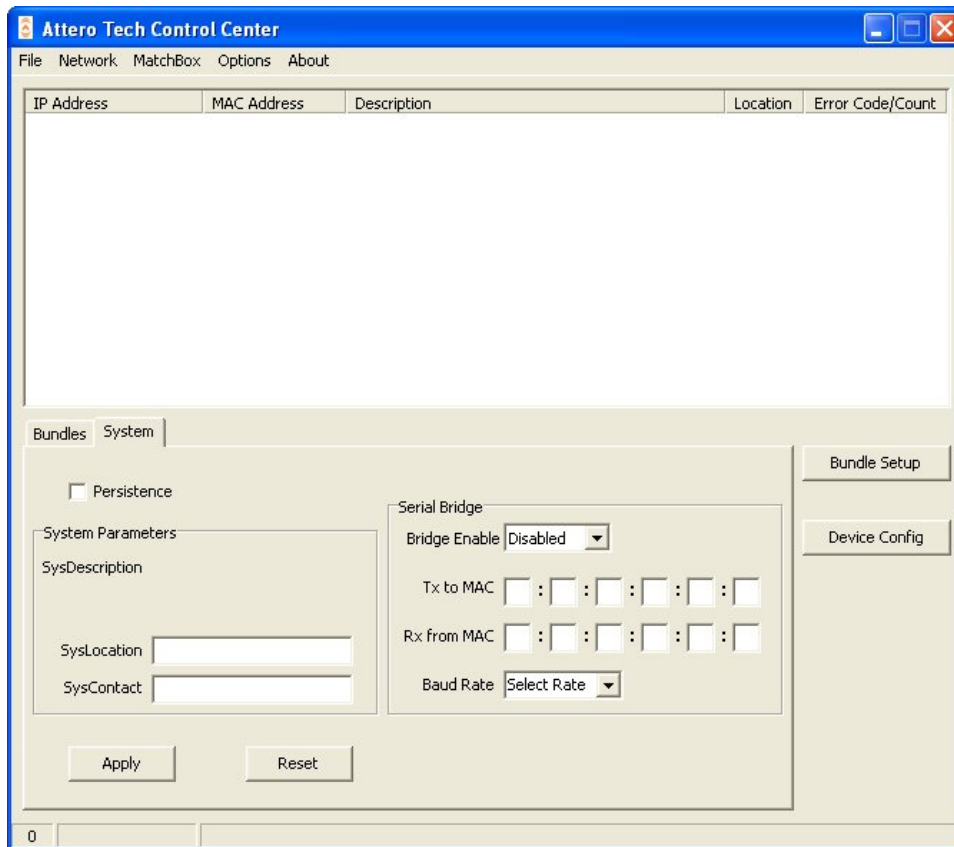


Figure 1 - Initial Main Window

Note: The available software functions will be restricted until a suitable network card is chosen, CobraNet devices have been located on that network, and one of those devices has been selected.

3.2 – Selecting a Network Card

In order to communicate with the CobraNet devices, the application needs to know which network interface card (NIC) to use. During normal operation, the application will attempt to use the NIC that was in use the last time the application was running. However, when running the application for the first time, no NIC is selected.

To view the current NIC being used, click Network -> Select Adapter to show the network adapter form.

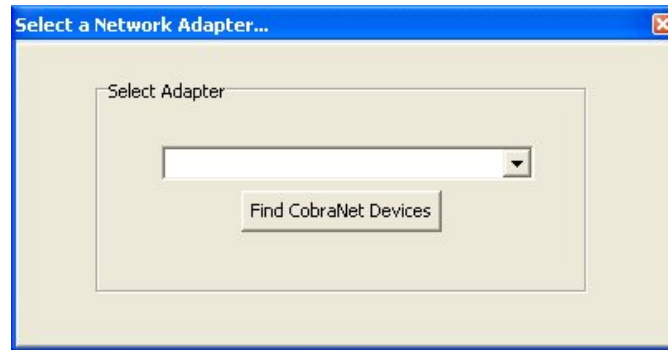


Figure 2 - Select a Network Adapter Form

The name of the NIC currently in use will appear in the text box. This will be blank (as shown in Figure 2) if no network card is selected.

Note: CobraNet specifications require a wired network card to be used.

To select a new or different card, click on the small arrow to show the drop-down list of usable adapters. Click on the NIC that the application should use from the list. Once chosen, click the “Find CobraNet Devices” button. This action closes the window and starts the device discovery process. If the current NIC does not need to be altered, the window can be closed.

Note: The details of the network card are retained from session to session. If, at startup, the NIC to be used is not detected, the application will erase the selection and start with no NIC. No CobraNet devices will appear in the device list and a different NIC must be selected for proper operation to continue.

3.3 – Selecting a Device

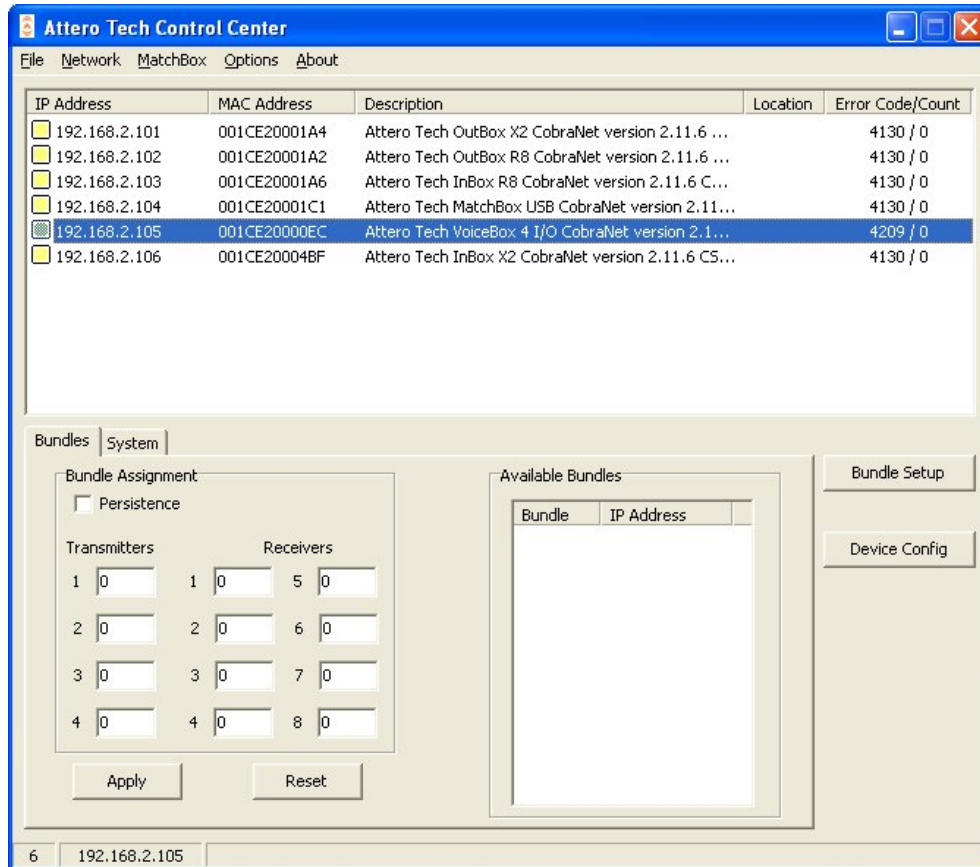


Figure 3 - Main Window with Devices

As CobraNet devices are found, they will begin appearing in the device list which occupies the upper part of the main window (see Figure 3). As the device list populates, values may also begin to appear in the Available Bundles list. The number of devices the software currently actually detects is shown in the left hand field of the status bar at the bottom of the form (it displays “4” in this example). In the majority of cases, this number will match the number of devices in the device list. It should be noted there is a delay between device detection and the device appearing on the device list. This delay may be several seconds. However, if the device count shows more devices than are shown in the device list for 30 seconds or more, consult the troubleshooting guide.

Once devices appear in the device list, they may be selected. Only one device may be selected at any one time. To select a device, click on it in the device list. This will highlight the device in the list and populate the values on the lower portion of the form with all the settings from that particular device. The IP address of the selected device will also appear in the status bar at the bottom of the window. This can be seen in Figure 3.

Once a device is selected, clicking on the Bundle tab will show the device bundle number setup. Clicking on the System tab will show the *sysContact* and *sysLocation* parameters as well as serial bridge configuration. It should be noted that each tab also has an Apply and a Reset button.

Changes to any of the settings on the main form are not automatically sent to the selected device. They must be applied. This is done by clicking the Apply button. Clicking the Reset button will cause the system parameters to be reset back to the settings the device has stored. Any on-screen changes can thus be undone by clicking the Reset button as long as the changes have not been already applied.

Note: The Apply and Reset buttons only apply to the parameters on the tab they are on. The system values will not be applied or reset if the Apply and Reset buttons on the Bundle tab are pressed. Similarly, the Apply and Reset buttons on the System tab do not affect the parameters on the Bundle tab.

Caution: Any changes not applied will be overwritten if the Reset button is clicked. Changes to parameters will also be lost if a different device is selected before any changes are applied.

3.4 – Configuring System Parameters

The System tab allows modification of various CobraNet system parameters on the selected device.

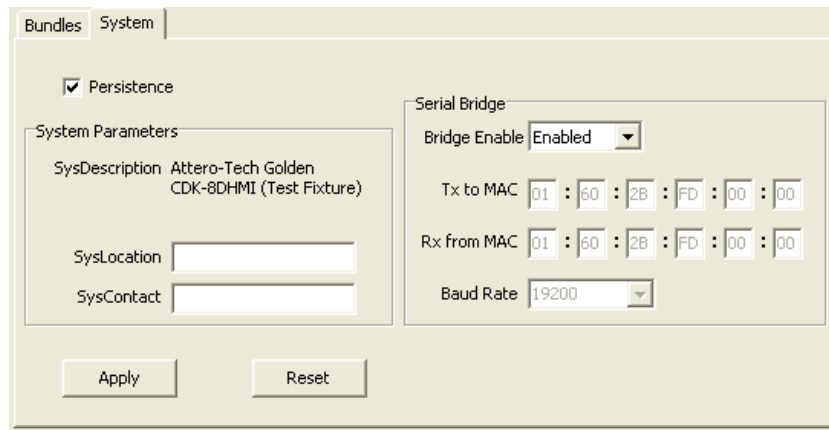


Figure 4 - Main Form System Tab

The Persistence check box shows if the device has persistence enabled or not. With this setting checked, the device will remember any changes to the settings that are applied. With the check box clear, any changes are lost as soon as the device is powered down and the unit will return to the defaults stored in its firmware. This same setting is also shown on the Bundle tab.

Note: Changes to the persistence parameter only take affect when applied. If persistence is activated, it may take some time for the device to process the persistence for all parameters. The device should not be turned off directly after persistence is set as parameters may be lost.

The *SysDescription* field is read only. The *SysContact* and *SysLocation* fields are string fields and have no operational affect on the device and are used for operator information only. The *SysLocation* field is the same as appears in the location column of the device list.

3.5 – Configuring the Serial Bridge

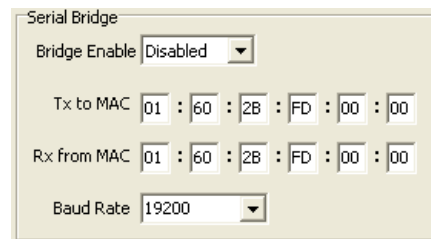


Figure 5 - Serial Bridge Parameters

The Serial Bridge parameters are shown on the System tab as well. The MAC addresses for receiving and transmitting are entered as six separate 2-digit hexadecimal numbers. This can be the address of a specific device or a multicast address. The Baud Rate can also be altered. Possible rates are 2400, 9600, 19200, 38400, 57600 and 115200.

Note: The Tx to MAC, Rx from MAC, and Baud Rate parameters can only be altered while the serial bridge is disabled. To alter these settings if the Serial Bridge is enabled, the Bridge Enable parameter must be set to “Disabled” and then the Apply button must be clicked. The parameters will then become active and can be changed.

Click the Apply button to apply any changes to the selected device. The Tx to MAC, RX from MAC, and Baud Rate parameters will all be disabled if changes applied include enabling the Serial Bridge.

Note: For more information on the Serial Bridge feature of CobraNet including Multicast MAC address values, see the relevant section in the CobraNet Programmers Guide.

4 – Bundle Settings

Bundles are the method by which audio is routed around a CobraNet network. More information on audio routing and bundles can be found in the Introduction to CobraNet in Appendix A and the reference documents in Appendix B.

The Control Center application has two methods to view and alter the bundle parameters. The first and simplest is via the Bundle tab of the main form. This method allows viewing and setting of bundle numbers only. The second and more advanced method is via the Bundle Setup form. This not only allows viewing and setting of bundle numbers, but also the configuration of various other audio routing parameters.

On the main form, the Bundle tab shows the bundle numbers for both transmit and receive bundle numbers.

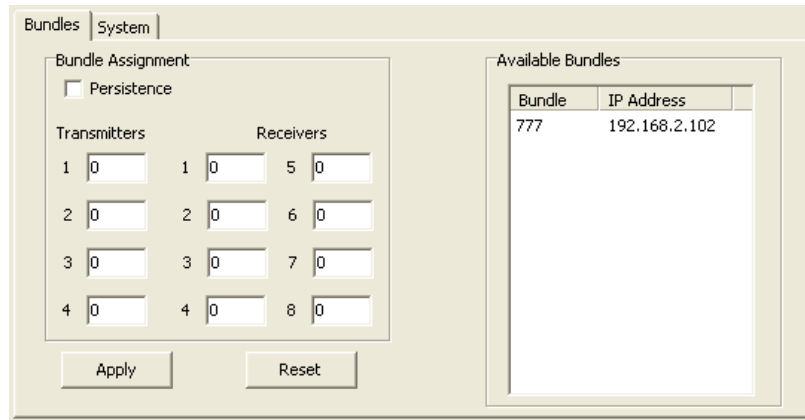


Figure 6 - Bundle Setup on Main Form

The Available Bundles list shows the transmit bundles of all detected devices sorted in bundle number order. This makes it easy to see if a bundle number is available for use or not. The list may be larger than the available space, in which case a scroll bar will appear to allow viewing of the bundle numbers further down the list.

To assign a bundle number to a transmitter, type the number into the relevant Transmitter box and apply it. The transmitter bundle should then appear in the Available Bundles list.

There are two ways to set up a device to receive a bundle. Firstly, type the bundle number into the relevant receiver box. Alternately, click and drag the required bundle number in the Available Bundles list over to the required receiver box and drop it.

Notes:

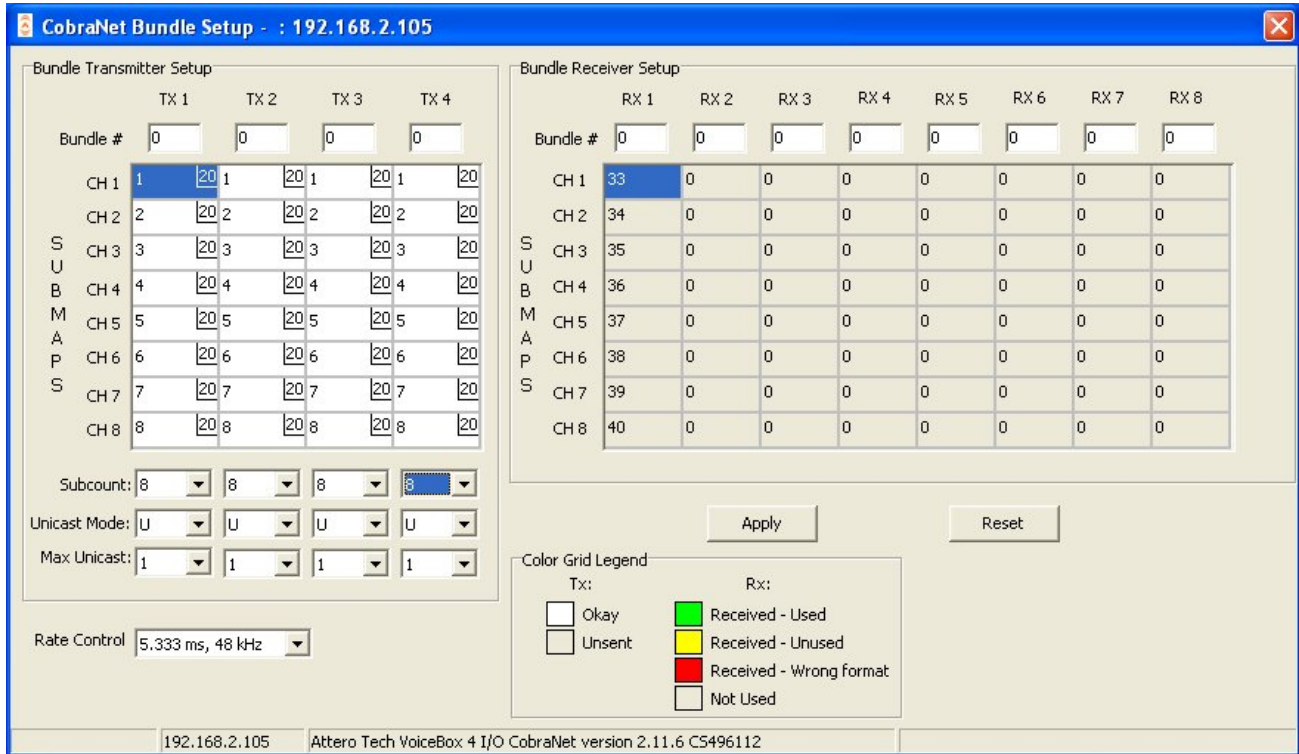
- Any new bundle assignment will only take place on the device when the change is applied.
- Two devices cannot transmit a bundle with the same bundle number simultaneously.
- A device cannot transmit and receive the same bundle.

4.1 – Advanced Bundle Setup

The main form allows for simple audio routing to be set up. However, more advanced parameters are available by using the Bundle Setup form.

Each device may only open a single Bundle Setup form but two different devices may each have a form open at the same time.

To open a single Bundle Setup form, select the device in the device list and click the Bundle Setup button. If a second Bundle Setup form for another device needs to be opened at the same time, move the first Bundle Setup form window so the main form can be seen. Click on the main form to bring it to the front and select the second device from the device list. Then click the Bundle Setup button to bring up the second form.



CobraNet Bundle Setup - : 192.168.2.105

Bundle Transmitter Setup

	TX 1	TX 2	TX 3	TX 4
Bundle #	0	0	0	0
CH 1	1 20	1 20	1 20	1 20
CH 2	2 20	2 20	2 20	2 20
CH 3	3 20	3 20	3 20	3 20
CH 4	4 20	4 20	4 20	4 20
CH 5	5 20	5 20	5 20	5 20
CH 6	6 20	6 20	6 20	6 20
CH 7	7 20	7 20	7 20	7 20
CH 8	8 20	8 20	8 20	8 20

Subcount: 8 | 8 | 8 | 8

Unicast Mode: U | U | U | U

Max Unicast: 1 | 1 | 1 | 1

Rate Control: 5.333 ms, 48 kHz

Bundle Receiver Setup

	RX 1	RX 2	RX 3	RX 4	RX 5	RX 6	RX 7	RX 8
Bundle #	0	0	0	0	0	0	0	0
CH 1	33	0	0	0	0	0	0	0
CH 2	34	0	0	0	0	0	0	0
CH 3	35	0	0	0	0	0	0	0
CH 4	36	0	0	0	0	0	0	0
CH 5	37	0	0	0	0	0	0	0
CH 6	38	0	0	0	0	0	0	0
CH 7	39	0	0	0	0	0	0	0
CH 8	40	0	0	0	0	0	0	0

Apply | Reset

Color Grid Legend

Tx: Okay Unsent

Rx: Received - Used Received - Unused Received - Wrong format Not Used

192.168.2.105 | Atterotech VoiceBox 4 I/O CobraNet version 2.11.6 C5496112

Figure 7 - Bundle Setup Form

The Bundle Setup form contains everything that is needed to set up both transmitting and receiving bundles.

Note: Alterations to any settings on this form have to be applied for them to take affect on the unit. Like the main form, unapplied changes can be reset back to the device’s current values by using the Reset button.

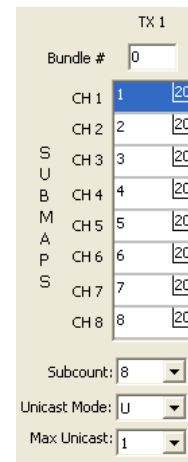
4.1.1 – Transmitter Setup

The Transmitter Submap Setup to the left of the form (see Figure 7) contains all the parameters to set up the four possible bundle transmitters.

Edit boxes containing the bundle number used for each bundle transmitter is shown at the top. Below these, the submap grid shows which audio channels are allocated to a bundle. The number in the top right hand corner of each cell is the sample bit depth. Below the submap grid, drop down boxes for setting the Subcount, Unicast Mode, and Max Unicast parameters are given.

Clicking on a bundle edit box or on a cell in the submap grid will select the item so it can be edited. The bundle number accepts values from 0 to 65535. For the submap, valid values are from 0 to 32¹ with a zero meaning no audio.

To alter the bit-depth in the submap grid, right click anywhere within the desired cell. This will display a pop up menu showing the possible options for the bit-depth. The current selection will be ticked. Click on an alternate value or click anywhere except the menu to keep the current one.



TX 1

Bundle # 0

CH 1	1 20
CH 2	2 20
CH 3	3 20
CH 4	4 20
CH 5	5 20
CH 6	6 20
CH 7	7 20
CH 8	8 20

Subcount: 8

Unicast Mode: U

Max Unicast: 1

Figure 8 - Tx1 Setup

¹ Whilst 0 to 32 are valid numbers, the actual usable channels will depend on the device being set up. Some devices have capabilities for up to 32 channels and others are only capable of 2. Refer to the device’s manual for information on the channels available.

Other settings available for each transmitter are

- **Subcount** - This drop down list configures the bundle to only use the specified number of audio channels. The cells in the grid above are colored based on this setting. Channels that are being used have a white background and channels which are not being used have a grey background (see Figure 8). However, the colors shown relate to the value in the device not the value on the form. If this parameter is changed on the form, it must be applied for the colors in the grid to update.
- **Unicast Mode** - This drop down menu specifies the transmission mode. It works in conjunction with the Max Unicast value. The table below describes the operation of each mode.

Mode	Actual Value	Description
M	0	Multicast always.
M-U 1	1	Unicast a single channel. Multicast if more.
M-U 2	2	Unicast up to 2 channels. Multicast if more.
M-U 3	3	Unicast up to 3 channels. Multicast if more.
M-U 4	4	Unicast up to 4 channels. Multicast if more.
U	0x7FFFFFFF	Unicast only. The device can still send to multiple channels using multi-unicast.

- **Max Unicast** - This drop down menu specifies the maximum number of unicast destinations supported simultaneously by the transmitter². It can be set between 1 and 4. Its actual affect is dependant on the setting on Unicast Mode. If Max Unicast is greater than or equal to Unicast Mode, the bundle will switch to Multicasting before the limitation on unicasts set by this parameter is reached. In this case, Max Unicast has no effect. If Max Unicast is less than Unicast Mode and the number of receivers exceeds Max Unicast, the receivers will not receive audio. However, if the number of receivers exceeds the Unicast Mode value, the bundle switches to Multicasting and this parameter then has no effect. This parameter is ignored if Unicast Mode is set to Multicast only.

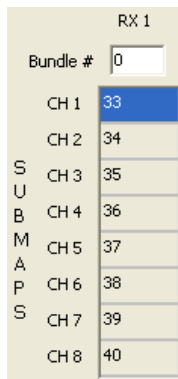
Note: There can be bandwidth-related consequences and added congestion when adding Multicast traffic to the network³.

² A transmitter can service up to four unicast receivers. The number of unicast destinations transmitted to will never exceed this internal capacity limitation.

³ See Bundle Assignment White Paper at http://www.cobranet.info/en/support/cobranet/design/bundle_assignments.html.

4.1.2 – Receiver Setup

The right hand side of the Bundle Setup form contains the receiver setup. Like the transmitter side, Bundle Edit Boxes for each bundle receiver is given above the submap grid. The submap grid is used to set up the receiver submaps. Clicking on a bundle edit box or on a cell in the submap grid will select the item so it can be edited. The bundle edit box accepts values from 0 to 65535. For the submap, valid values will be numbers 33 to 64⁴ or 0, with a zero meaning no audio.



RX 1	
Bundle #	0
CH 1	33
CH 2	34
CH 3	35
CH 4	36
CH 5	37
CH 6	38
CH 7	39
CH 8	40

Figure 9 - Receiver Submap

When a bundle is being successfully received, the background color of the cells will represent the receiving state.

Cell Color	Description
Blue	Cell selected
Green	Active audio is being received and used
Yellow	Active audio not being used
Red	Received audio is in an unusable format (Latency and/or sample rate do not match the devices latency and sample rate)
Grey	Audio not being received

Notes:

- The form contains a legend for quick reference with details of the grid colors for both the transmit grid and the receive grid.
- The receiver grid color is constantly monitored in the background. However, the grid coloring is only done against known values from the device. The cell color of the RxGrid will not update until any changes made have been applied to the device.

4.1.3 – Mode Rate Control

The Mode Rate Control drop down is below the bundle transmitter setup. The value it contains determines both the sample rate and latency of the device but from a single value. Sample rates of 48 kHz or 96 kHz can be selected with latencies of 1.333ms, 2.666ms, or 5.333ms.

Caution:

Great caution should be taken before altering this parameter for a device. This is especially true as the value controls two separate variables: sample rate and latency.

For Attero Tech products, any latency value can be used provided the sample rate value remains the same. Products such as VoiceBox, InBox, and OutBox contain DSP processing that is linked to a sample rate of 48 kHz. Changing the sample rate (regardless of what latency used) for these devices will be detrimental to the device in question and may cause the device to cease functioning.

For non-Attero Tech devices, consult the manual of the device you wish to alter the sample rate of to verify that the sample rate is supported and it is safe to change. If in doubt, do not change this value. Attero Tech takes no responsibility for the incorrect operation of a non-Attero Tech device if this software is used to alter the device's ModeRateControl parameter.

⁴ Whilst 0 to 32 are valid numbers, the actual usable channels will depend on the device being set up. Some devices have capabilities for up to 32 channels and others are only capable of 2. Refer to the device's manual for information on the channels available.

5 – MatchBox Controls

MatchBox control is also part of Control Center. Two MatchBox features are available. They are the MatchBox Device Configuration tool and the MatchBox Monitor tool. Both tools are accessed through the MatchBox Menu and are only useful if a MatchBox is plugged into a USB port on the machine running Control Center. Detailed instructions on their use are available in the MatchBox User Manual but notes are included here for completeness.

5.1 – MatchBox Device Configuration

The MatchBox Device Configuration tool allows the user to alter the configuration of devices/channels in a MatchBox, selecting whether they are inputs to the PC or outputs from the PC.

5.2 – MatchBox Monitor

The MatchBox Monitor is a tool that allows live audio from a microphone or line input to be placed onto the CobraNet network via the MatchBox. It also can route CobraNet audio via the MatchBox to a local sound card for local monitoring.

6 – Device Setup for Attero Tech Devices

Certain CobraNet devices from Attero Tech, such as the VoiceBox 4 I/OP and the InBox and OutBox products, utilize on-board DSP processing capabilities and contain additional configurable parameters not covered so far in this manual. Other devices such as the BoomBox NA4 and NA8 and the SquawkBox, don't have any DSP but have specific controls unique to them.

The Control Center application contains interfaces that allow the DSP processing parameters to be viewed and configured. Each type of device has its own interface. To gain access to these parameters and settings, either

- a) Right click on the device in the device list and click the Device Setup option from the pop-up menu
- b) Left click on the device in the device list and click the Device Setup button.

Details of the settings for each individual unit is included in the devices own user manual.

7 – Troubleshooting

Ensure your software is the latest version. The latest released version can be obtained from the Control Center Download section of the Atterotech website (www.atterotech.com).

7.1 – Network Setup

Before beginning troubleshooting devices and software, it is worth first checking that the CobraNet Network is correctly constructed and connected.

- If only two devices are used, a simple crossover cable can be used. A normal patch cable will not work.
- Where multiple CobraNet devices are used, the CobraNet network must be built using Ethernet Switches. Ethernet Hubs must not be used.
- The use of 10 Mbit/s connections should be avoided.
- The use of wireless connections must be avoided.
- CobraNet is not routable so the use of routers should be avoided (using CobraNet through the embedded switch of a residential type of router is OK as long as audio and control data is not required on the WAN side of the router).
- CobraNet devices all run at 100 Mbits/s so connections from the CobraNet device to the network must be capable of running at 100 Mbits/s.
- Connections between individual infrastructure devices (switch to switch, etc.) can run at 100 Mbits/s or above.

Also be wary of having multiple instances of Control Center running on different machines but connected to the same CobraNet network. If both try and access the same device, particularly using the DSP interface with metering enabled, both machines will send multiple refreshes for the metering and will bog the device down under a barrage of SNMP messages.

7.2 – Possible Issues

No devices are detected (status bar device count shows 0)

- If running under Vista, check the version. Only version 1.1.0.30 or later are Vista-compatible
- If running under Windows 7, check the version. Only version 1.2.0.58 or later are Windows 7 compatible
- If running Control Center V1.1.0.30 or later, check that other CobraNet software (such as CobraNet Discovery) is not running at the same time
- If running Control Center V1.1.0.30 or later and the PC running Control Center hibernates⁵ while Control Center was active, all devices will seem to disappear when the PC is reactivated. The only known way to get the devices to re-appear is to close the software and run it again.
- Check the CobraNet devices are powered up and correctly connected
- Check to ensure the PC is correctly connected to the CobraNet network
- Ensure the PC has a correctly assigned IP address
- Ensure the correct network card has been selected that is connected to the CobraNet network

No network cards are available to be selected

- Check the PC has network cards installed
- Check the operating system and if running under Vista, ensure V1.1.0.30 or later is being used.
- Check the operating system and if running under Windows 7, ensure V1.2.0.58 or later is being used.

Devices detected (status bar device count greater than 0) but none show in the device list.

- If static IP addresses have been assigned to the CobraNet devices, ensure the PC network card IP address and subnet mask are set correctly so the PC can communicate with them.
- Check for other PCs running Control Center or other CobraNet software (such as CobraNet Discovery). They may have allocated devices a temporary IP address that is not usable with the IP/subnet mask combination of this PC running Control Center. Close any other such software and then cycle power on the device to reset any temporary IP address it may have been given previously.

“SNMP update Failed” message appears in the status bar

- Check the device is still connected to the network. If it is, change the settings again and retry.
- Ensure another PC is not attempting to access the same device with metering enabled.

Devices do not remember any updated values

- Ensure that after making changes, the apply button is clicked.
- If the device forgets the settings during a power off, ensure that persistence is on.
- If the settings are DSP-related from one of the Device Setup forms, ensure the Save as Default button is pressed to save the default values to flash.

⁵ Hibernation mode is where the PC is essentially turned off but keeps its memory active. Many PCs indicate this mode using the power LED by flashing it. The PC is not in hibernation if the PC runs a screen saver or it turns off the monitor to save energy.

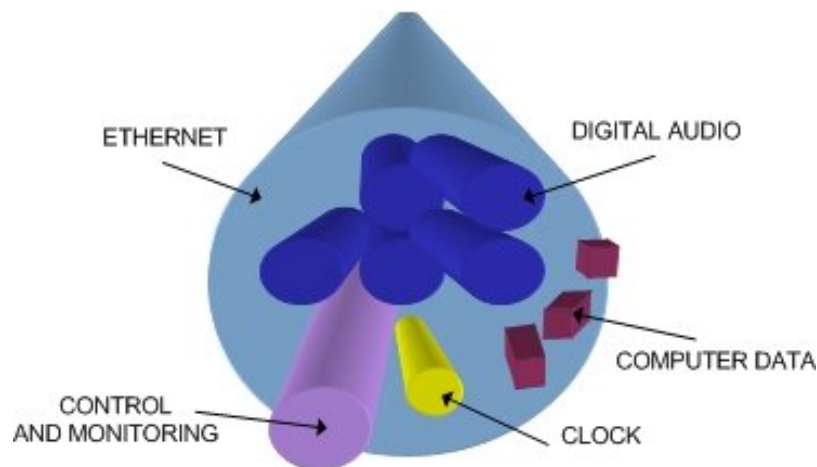
APPENDIX A – Introduction to CobraNet

CobraNet is an audio networking technology for delivery and distribution of real-time, high quality, uncompressed digital audio using a standard Ethernet network. It is implemented using a combination of hardware, firmware, and the CobraNet protocol.

Unlike other audio networking or distribution technologies, CobraNet is a true network and exists on standard Ethernet networks using standard Ethernet hardware. Since it is a true network, audio routing is highly flexible between network nodes and can be used in a variety of audio distribution applications.

In addition to the high degree of routing flexibility that CobraNet provides, the technology also incorporates the ability to monitor and control CobraNet devices remotely. This is a key feature that is highly important in fixed installation applications where the audio distribution equipment may not be readily accessible. All CobraNet devices on the network can be controlled and monitored from a central location by sending control commands and monitoring device specific parameters.

CobraNet provides this capability by implementing Simple Network Management Protocol (SNMP). SNMP is a standard protocol typically used for monitoring network devices such as Ethernet switches. In the case of CobraNet, it allows users to communicate with any CobraNet device using standard SNMP tools or a customized user interface designed specifically for CobraNet, such as Attero Tech's Control Center application.



The figure above represents the types of data that coexist on a CobraNet network.

Before a CobraNet system can be configured, it is important to first understand how CobraNet distributes audio between devices.

Audio is sent in "bundles" on a CobraNet system. Each bundle is capable of holding up to 8 logical audio channels. Every CobraNet device has a number of bundle transmitters and bundle receivers. These transmitters and receivers are the mechanism used to send and receive bundles between devices.

For a transmitted bundle, audio may be sourced either directly from the local audio inputs of the device or from internal audio via the on-board DSP⁶, but not both simultaneously. Internal audio from the onboard DSP could have originally been sourced from the local device inputs, sent from another CobraNet device or even generated by the DSP itself. Combinations of the local or internal audio may exist within a bundle in any order. Additionally, a single audio source in a device may be used multiple times in a single transmitter bundle or across multiple transmitter bundles.

For a received bundle, the received network audio may be routed directly to the device's local outputs, the internal DSP⁶ or simply ignored.

Once the contents of a bundle have been decided, the next step is to pass the bundle to another CobraNet device. To do this, every CobraNet device has up to 4 bundle transmitters. Each bundle transmitter has a transmit mode that must first be selected. This affects how many devices may receive that particular bundle at a time.

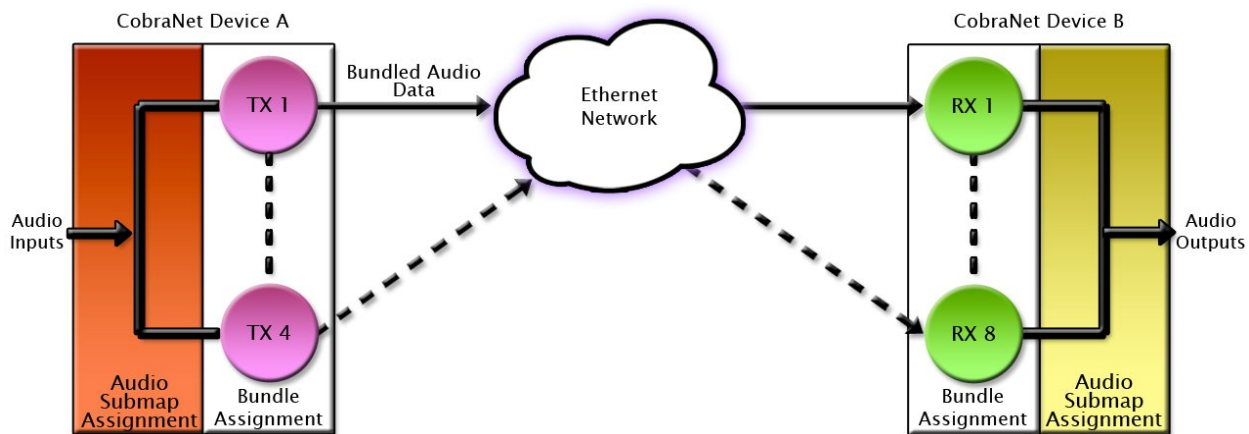
⁶ Not available on all devices – CS496xxx devices only

The modes are as follows:

- Unicast – Used for one-to-one connections. In this mode, only one receiver at a time can receive this bundle. Once a link is established from this transmitted bundle to a receiver, any future requests for that bundle from other potential receivers will fail.
- Multicast – Used for one-to-many connections. This mode broadcasts its contents over the entire network. There is no restriction on the number of receivers. However, the downside is that CobraNet packets are distributed to all nodes on the network, whether they need them or not thus creating possible network bandwidth issues.
- Multi-unicasts – Another one-to-many mode. Whilst this is the most efficient method for getting a bundle to multiple receivers in terms of network bandwidth, it requires more processing power on the CobraNet device so in this mode there is a maximum limit of four receiver connections (this can be reduced if required). If more connections are required than the limit, the node can be configured to automatically switches to multicast.

Note: When a bundle must be transmitted to multiple receivers, multi-unicast transmissions should be used where possible.

Once the mode is selected, to enable a device to transmit the bundle, simply allocate the particular transmitter bundle a non-zero number. Since this number identifies all the network packets sent out by that transmitter, each transmit bundle number must be unique on a network⁷.



- Now that the transmitter is set up, it is time to set up the receivers. In order to receive bundles, each CobraNet device has up to eight bundle receivers. To enable a device to receive a bundle, simply allocate one of that device's bundle receivers the same bundle number as a transmitted bundle. By doing so, a virtual link is created and audio should now be passed from one device to the other. It should be noted that no knowledge of a device's network topology or connection is thus required in order to configure audio connections. The only restriction to this is that a device cannot be set up to receive a bundle it is also transmitting.

The above case creates a simple, one-to-one, unidirectional link. If more devices are required to receive that bundle, allocate the same transmitted bundle number to a bundle receiver on the other CobraNet devices.

It is also important to note that CobraNet supports simultaneous bidirectional audio distribution in each device. Not only could audio be sent from Device A to Device B but at the same time, should it be needed, audio could also be sent from Device B to Device A. The exact bundle and routing configuration will be determined by the needs of each individual installation. An installation may have multiple units transmitting multiple bundles. The only restriction is the bandwidth available on the network to transfer the audio.

CobraNet does more than just transfer audio data. It can be used to pass serial information as well. A feature called serial bridging has been incorporated that allows the passage of serial data between nodes. Each node can pass serial data to a specific node or multicast the data to multiple nodes. A node can also receive data from either a single source or multiple sources. Baud rates, data bits, stop bits, parity, and so on are all configurable. There is also support for multi-drop serial buses as well.

Finally, CobraNet has the capability to alter all of the above options in real time making the whole system completely dynamic. By use of control software, all of the bundle assignment parameters can be configured with no need to change cables, switch out connectors, or pull new wiring. Most importantly, this control capability can be implemented from a single location!

⁷ Bundle numbers range from 1 through 65535. A value of 0 represents an inactive bundle. Numbers 1-255 are reserved for multicast mode transmissions only.

APPENDIX B – Reference Documents

The following table lists the relevant reference documents.

Document Title
CobraNet Programmer's Reference (Cirrus Logic)
http://www.cobranet.info/en/support/cobranet/design/bundle_assignments.html
Attero Tech MatchBox User Manual
Attero Tech VoiceBox User Manual
Attero Tech InBox/OutBox User Manual
Attero Tech BoomBox NA4/BoomBox NA8 User Manual
Attero Tech SquawkBox User Manual