

Getting Started with DSP Conductor™

1. Introduction

DSP Conductor™ is a software development kit (SDK) for audio digital signal processing (DSP) applications. Audio processing is defined in terms of code elements. Elements have inputs, outputs, controls and indicators. Elements are “wired” together and their controls adjusted within the DSP Conductor environment to produce the desired audio processing results within the DSP code that is generated.

DSP Conductor generates the signal processing instructions (code) but the actual audio processing is performed by a Cirrus Logic DSP chip. The CS4961xx CobraNet™-enabled network audio processor is the first of these DSP devices to be supported by DSP Conductor.

2. Hardware

DSP Conductor runs on Windows-based PCs and communicates with the target CobraNet DSP system via an Ethernet connection. A typical development environment is shown below. The EV-2 is the CobraNet evaluation module. It features a CS4961xx network processor, Ethernet circuitry, a microcontroller, and digital and analog audio interfaces.

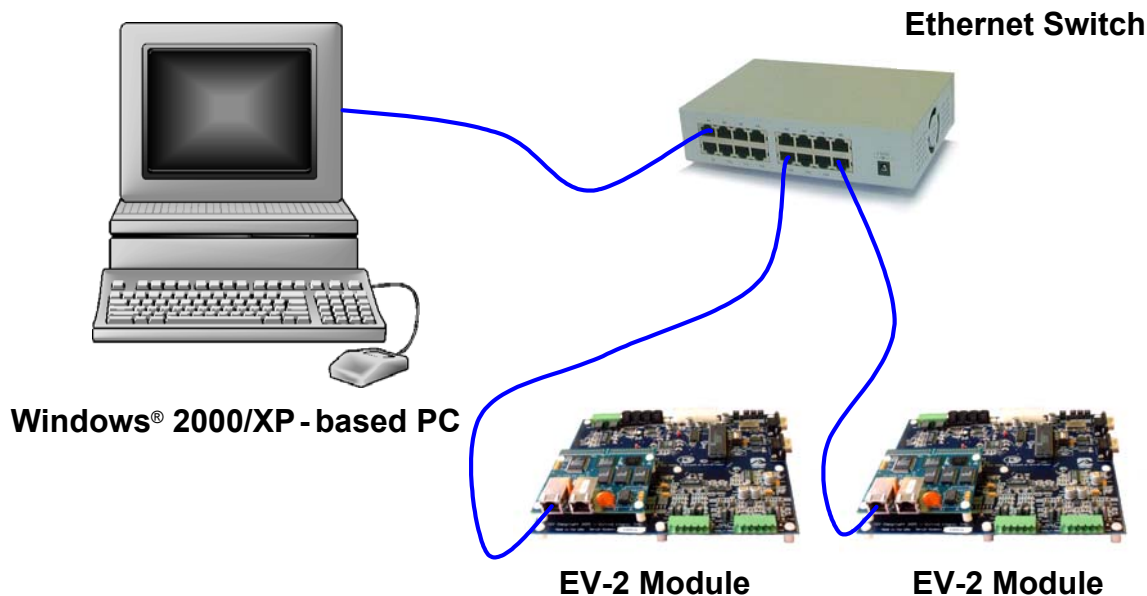


Figure 1. Typical CobraNet Development Environment

3. Hardware & System Requirements

3.1 Hardware

A CobraNet evaluation kit purchased from Cirrus Logic consists of the following:

- Two EV-2 Modules
- Category 5 Ethernet Crossover Cable
- Phoenix-style Audio Connectors
- This Document
- EV-2 Development System Manual

In order to set up the kit, the user must supply the following:

- Two Standard ATX Computer Power Supplies
- Appropriate Audio Cables (use with Phoenix-style connectors supplied w/ kit to provide audio input/output)
- Audio Source (CD player, etc.)
- Audio Monitor (powered speakers, etc.)

The CobraNet evaluation kit is sufficient to evaluate CobraNet functionality. However, to create a fully functional DSP Conductor development environment, the following are required in addition to the evaluation kit & the user-supplied hardware:

- Windows® 2000/XP-based PC with Standard Ethernet Interface
- Ethernet Switch
- Ethernet Patch Cables (Crossover cable supplied w/ kit is for module-to-module communication.)

3.2 System

The CobraNet SDK software only functions on Windows 2000/XP-based computers. In general, system requirements are the same as the minimum system requirements for the Windows operating system. The SDK requires approximately 25 MB of free hard disk space.

4. Registration and Update

In order to provide you with the latest versions of our firmware and software development kit (SDK), we use web-based distribution for our updates. To register your EV-2 boards and get access to the firmware and SDK updates, please go to www.cirrus.com/cobranetsoftware. At this page, follow the instructions to register your EV-2 kit. Upon completion of the required data fields and verification of the EV-2 modules' serial numbers, you may proceed to download the CS4961xx firmware and a self-installing SDK.

5. Software Installation

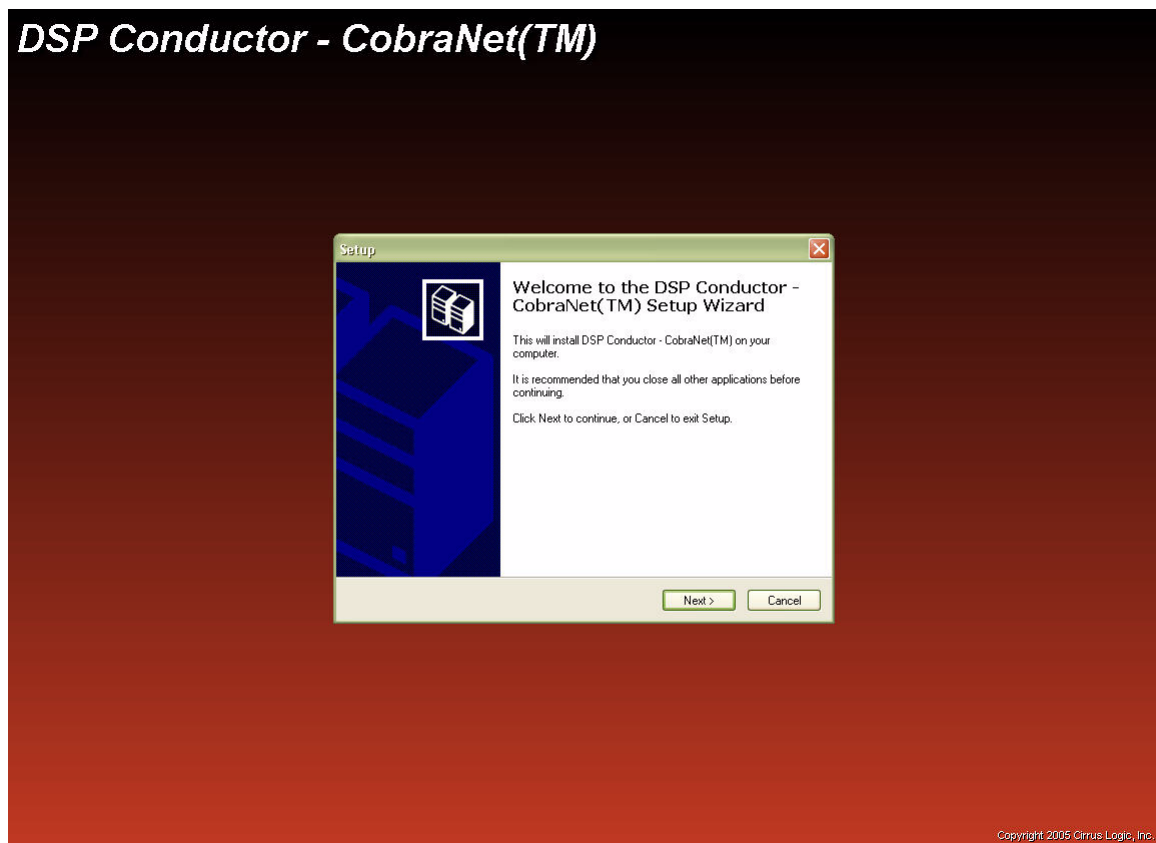
5.1 Downloading from the Cirrus Logic Website

Downloading and installing from our web server will ensure that you are using the most up-to-date software and documentation.

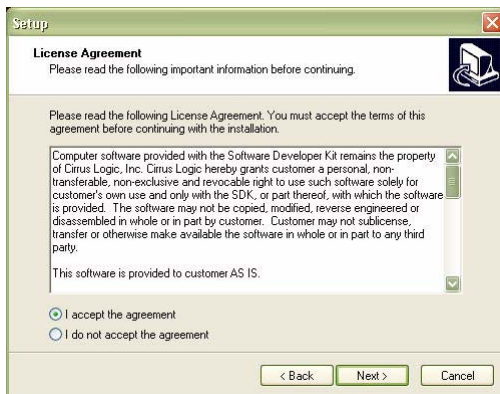
Go to www.cirrus.com/cobranetsoftware and follow the instructions to register your EV-2 kit. Upon completion of the registration, you can proceed to download the DSP Conductor install executable.

Download and run the `sdk_cobra_setup.exe` file.

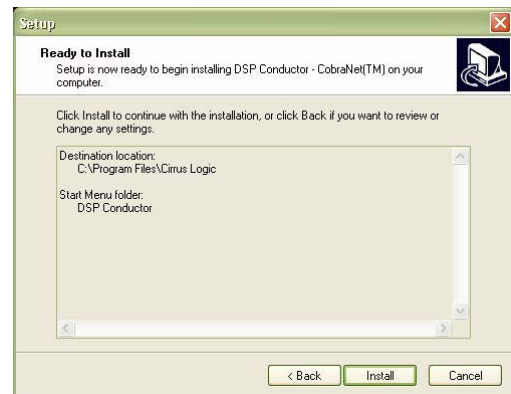
The DSP Conductor setup wizard will guide you through the installation.



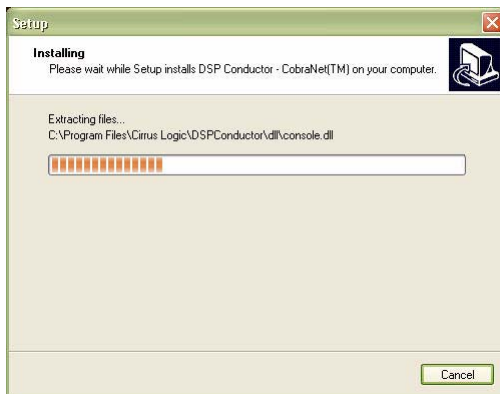
Click *Next*.



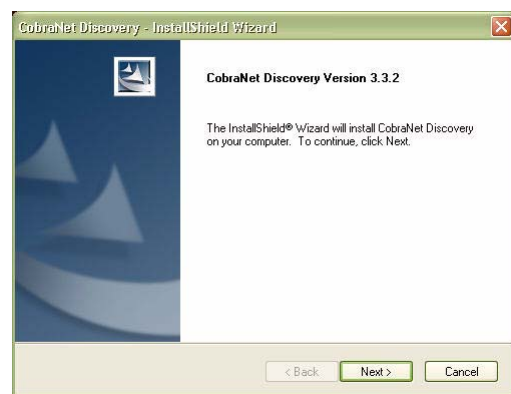
1. Accept the SDK licensing agreement.



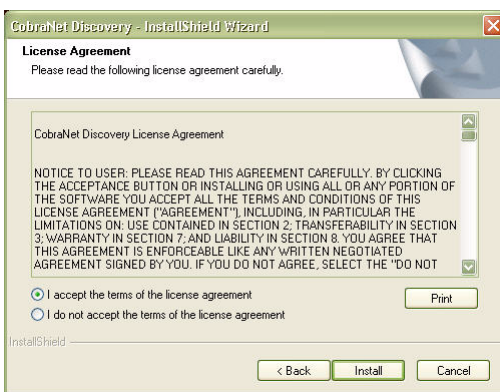
2. Click *Install* to install DSP Conductor in the location shown in the dialog box.



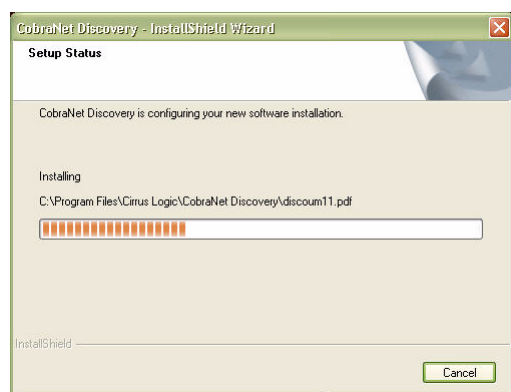
3. The setup wizard installs the DSP Conductor software and files.



4. The CobraNet Discovery (*Disco*) installation wizard appears. Click *Next*.



5. Accept the CobraNet Discovery application licensing agreement. Click *Install*.



6. The CobraNet Discovery application is installed.



7. Click *Finish* to complete the CobraNet Discovery application installation.



8. Click *Finish* to complete the DSP Conductor installation.

6. Hardware Setup

This section will help the user get the CobraNet development environment up-and-running in as little time as possible. However, for more detailed explanations of EV-2 connectors/jumpers, signals, etc. please refer to the *EV-2 Development System Manual* included in the EV-2 kit.

6.1 Audio Connections

Using the Phoenix-style connectors supplied with the EV-2 kit, build audio input & output cables that are appropriate to your application.

6.1.1 Analog Audio

For analog input/output select an appropriate cable (stereo RCA, $\frac{1}{8}$ " mini stereo, etc.) and attach to the Phoenix-style connectors according to the following example. Connections are identical for input and output. Use J300 on the EV-2 module for analog audio input, J401 for analog audio output. Two Phoenix-style connectors are required for one stereo analog input and one stereo analog output.

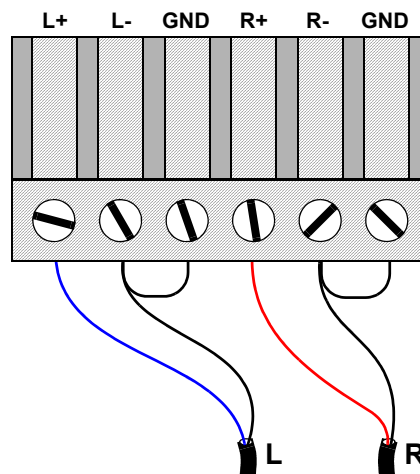
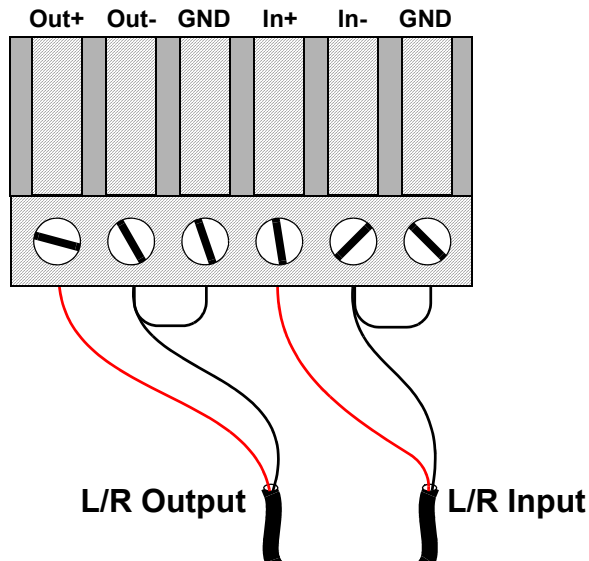


Figure 2. Example Stereo Analog Input/Output Connector Hookup

6.1.2 Digital Audio

Digital audio is received and transmitted from the EV-2 module according to the AES/EBU (AES3) specification. The EV-2 supports one stereo pair of digital audio input and one stereo pair of digital audio output. Use J700 on the EV-2 module for digital audio input/output. The following example shows the digital audio connector hookup.

75-ohm Unbalanced Coaxial



110-ohm Balanced STP

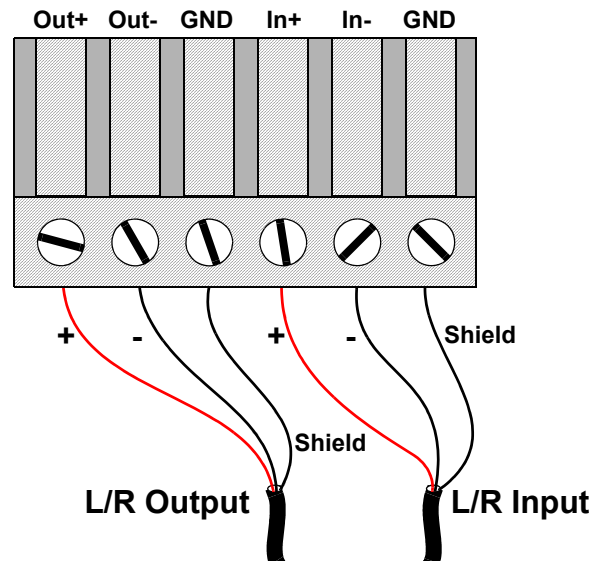


Figure 3. Example Stereo Digital Input/Output Connector Hookup

6.2 Ethernet Connection

The Ethernet crossover cable supplied with the EV-2 kit is intended for module-to-module communication in a stand-alone manner. For most applications, the Cobranet modules will be attached to a switched network using standard Ethernet patch cables.

In order to create a fully functional DSP Conductor development environment, the following are required in addition to the evaluation kit & the user-supplied hardware:

- Windows 2000/XP-based PC with 100-Mbit Ethernet Interface
- Ethernet Switch
- Ethernet Patch Cables

NOTE: The crossover cable supplied w/ kit is for direct module-to-module communication only and cannot be used for module-to-switch communication.

Connect the PC and the two EV-2 modules as shown in the following diagram.

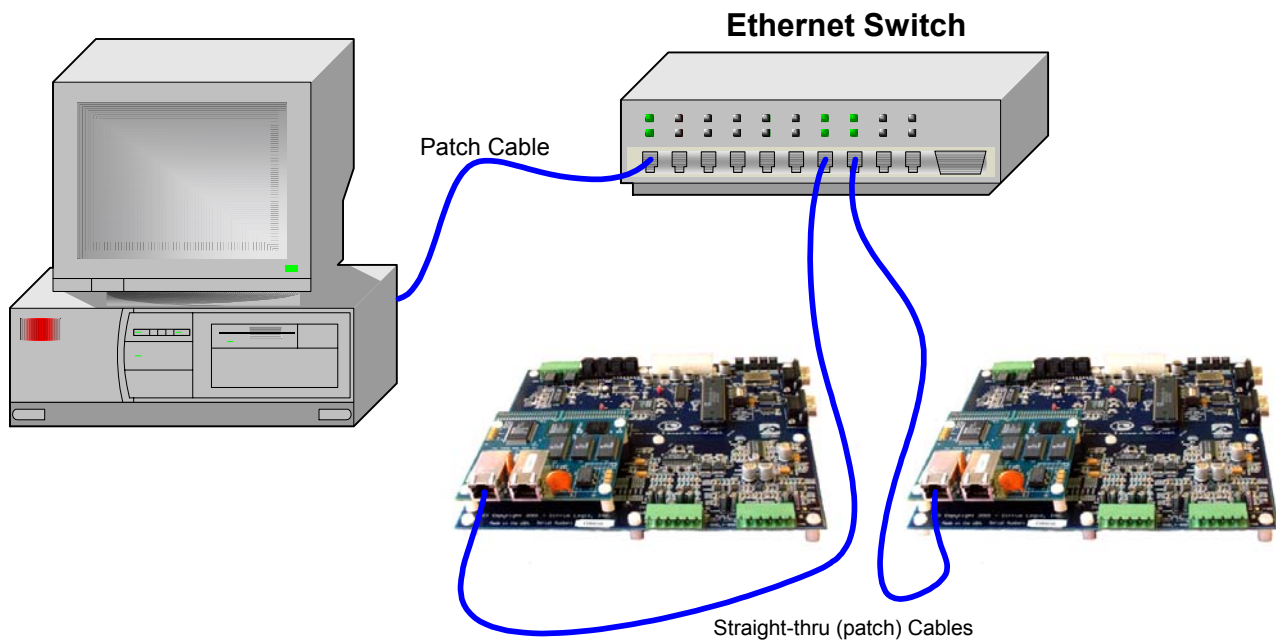


Figure 4. CobraNet Development Environment Using an Ethernet Switch

7. Software Setup

7.1 CobraNet Discovery Utility (*Disco*)

Through a connection to a CobraNet network using a standard Ethernet network interface card (NIC), the utility discovers and monitors CobraNet devices on the network. Disco can optionally assign IP addresses to devices that do not already have address assignments. A firmware upgrade feature can load firmware updates on devices if necessary. Please refer to the *CobraNet Discovery User's Manual* for complete information on features and operation of Discovery.

The CobraNet Discovery utility runs on a Windows 2000/XP-based PC. Operation on older versions of Windows has not been thoroughly tested, and is at the user's risk. For complete information regarding the Disco utility, refer to the *CobraNet Discovery User's Manual*, which is installed with the SDK.

7.1.1 IP Address Assignment

Network adapters on most PCs are configured to obtain IP addresses automatically from the network to which they are connected. However, most purpose-built CobraNet networks do not have an automatic address assignment capability. On these networks, the network adapter should manually assign an IP address.

Cirrus Logic recommends the following address ranges for devices on the CobraNet network:

IP Address Range	Devices
192.168.100.1 thru 192.168.100.199	CobraNet Devices (Default IP address assigned by Disco)
192.168.100.200 thru 192.168.100.219	Network switches and infrastructure
192.168.100.220 thru 192.168.100.254	Computers

7.1.2 Manual IP Address Assignment

Follow the procedure below to manually assign an IP address to your network adapter.

- 1) From the Windows Control Panel, open *Network Connections*.
- 2) Right-click on the Ethernet adapter you will be using for the connection to the CobraNet network. Select *Properties*.
- 3) Select *Internet Protocol (TCP/IP)* from the list. Click the *Properties* button.
- 4) Select the *Use the following IP address* radio button.
- 5) In the *IP Address:* field, enter the desired IP address.
- 6) In the *Subnet Mask* field, enter *255.255.255.0*.
- 7) Leave the *Default Gateway* field blank.
- 8) Settings for *Preferred DNS server* and *Alternate DNS server* are unimportant for Disco operation and can be left blank.
- 9) Click *OK* to close the *TCP/IP Properties* dialog.
- 10) Click *OK* to close the *Properties* dialog for the NIC.

NOTE: An *Open Adapter* error when launching Disco most likely indicates the user account from which you are running has insufficient privileges to install and run the device driver Disco needs to send and receive CobraNet packets. Please refer to the *CobraNet Discovery User's Manual* included with the Disco utility for details on the corrective actions necessary to run CobraNet Discovery.

7.1.3 The Discovery Window

The Discovery Window is a dynamic display of devices the utility finds on the network. If a network device is removed from the network or powered down, its status will change to Off line but will remain in the list until it is manually reset.

Columns may be resized by dragging their boundaries. They may be reordered by clicking and dragging within the text area in the column heading.

Standard columns are *S* (Status), *MAC Address*, & *IP Address*. Information in these columns is obtained by passively monitoring the CobraNet network. Therefore, if these are the only columns present, Disco will not generate any additional network traffic. This is useful for diagnosing repeater-based networks.

SNMP information can be displayed for network devices by using the *Column Chooser* dialog to add the *SNMP* column. Please refer to the *CobraNet Discovery User's Manual* descriptions of the SNMP variables available for monitoring in a default Disco installation.

7.1.4 Proper Indication in Disco Main Window

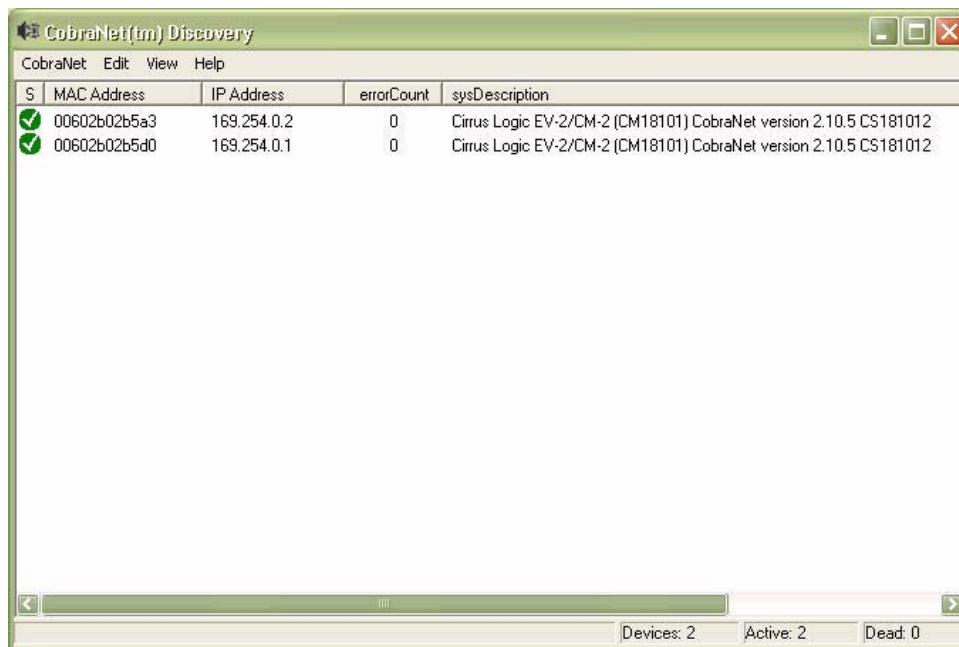


Figure 5. Disco Utility Main Window

Figure 5 shows the approximate expected Disco main window contents for the network shown in figure 4. The two entries in the window correspond to the two EV-2s on this network. A green checkmark icon to the left of an entry indicates the device is actively communicating with the Discovery application. Note also that both devices have been assigned IP addresses in the range recommended in section 6.4.1. Textual information about each device is correctly displayed.

7.1.5 Troubleshooting

Nothing Displayed in Disco Window

No CobraNet devices showing in the main window likely indicates a problem with the network connection to the PC.

Check the link indicator on the switch port and on the PC (if present). Absence of link indication can be caused by using a crossover cable instead of a standard patch cable or connecting to an uplink type port on the switch instead of a standard port (uplink ports are used to make connections to other switches using a straight-through cable).

If your computer has multiple network adapters (i.e. wireless, wired, built-in, PC card), Disco may need to be configured to use the appropriate adapter. Adapter selection is accomplished in the Disco *Options* dialog. It is sometimes necessary to use a trial-and-error approach to adapter selection as the system-supplied description of adapters is often cryptic. It is not necessary to restart Disco to check your results. Once you have selected the correct adapter and dismissed the *Options* dialog, the CobraNet devices will appear immediately in the main window.

No CobraNet devices showing in the main window can also indicate a problem with all CobraNet devices on the network. If you have checked your computer's connection to the network as described above and still do not see any devices, please read through the following section on missing devices.

Missing Devices

A missing device likely indicates a problem with the CobraNet device or the device's connection to the network.

We recommend first checking the indicators built into the Ethernet connectors on the CobraNet devices. Note that the EV-2s each have two Ethernet connections. The dual connections are for fault tolerant applications. Either connection may be used.

All devices should show a flashing green indicator on the right side of the connected jack. This indicates the device has power and a valid Ethernet link. One of the devices may also show an amber indication on the left side of the jack.

If there is no indication, check the power to the device and check the Ethernet cabling. The corresponding Ethernet switch port on the other side of the patch cable for each device should show a link indication.

Red 'X' Icon

A red X icon on the left side of a device entry indicates that the device has stopped communicating with the CobraNet Discovery application. This is a variation of the Missing devices scenario described above. In the *red X* case, the device is missing on intermittent basis. The troubleshooting instructions in the *Missing Devices* discussion apply to the *red X* icon situation.

No IP Address Assignment

When properly configured, CobraNet Discovery will assign Internet protocol (IP) addresses to any CobraNet devices it discovers on the network. An IP address is required for controlling and monitoring the device, performing firmware upgrades, and all functions associated with DSP Conductor. (No IP address is required to transfer audio over the network.)

Success in the IP assignment is indicated by the presence of a valid IP address in the *IP Address* column for the device in the Disco main window.

If *IP Address* is blank, there is likely a problem with IP address assignment settings. IP assignment is configured in the *Options* dialog accessed through the *View* menu. A reasonable range of IP addresses should be specified and the *Enable auto-assignment* option should be enabled. Once you have made these changes and dismissed the *Options* dialog, IP address will be assigned to your devices.

"Request timeout"

Request timeout messages in any of the columns in the Disco main window indicate a problem communicating with the device using the IP-based simple network management protocol (SNMP). First check that the affected device shows an address in its *IP Address* column. If it does not, please read the previous section on IP address assignment.

Another common impediment to IP communications is improper IP addressing caused by a mismatch between the form of the IP address of the PC's network adaptor and the IP addresses assigned to the CobraNet devices by Disco. In most demonstration situations, manual IP addressing is used. Please review your network adaptor IP address settings as described in sections 6.4.1 and 6.4.2 of this document. Next revisit the Disco Options dialog, temporarily disable *Enable auto assignment*, press the "Use current" button to update the IP address ranges, re-activate *Enable auto assignment*, and dismiss the *Options* dialog. Finally, power-cycle the CobraNet devices so that they may receive updated IP addresses and establish communications.

7.1.6 Firmware Upgrade

DSP Conductor is supported on CS4961xx based CobraNet interfaces running version 2.11.0 firmware or higher. Before attempting to use DSP Conductor, we recommend you check the firmware of your target devices and upgrade if necessary.

Determining Current Firmware Version

Information about your CobraNet devices hardware and firmware is reported in the *sysDescription* column of the Disco main window. It may be necessary to widen the column to view the complete description. The width of a column may be adjusted by dragging the column separator at the upper-right corner of the column.

A typical *sysDescription* for an EV-2 may be *Cirrus Logic EV-2/CM-2 (CM18101) CobraNet version 2.10.6 CS181012*. However, the 2.10.6 firmware running on this device does not support DSP Conductor. You must obtain a firmware update and download it to the device.

Obtaining Firmware

Firmware is downloadable from <http://www.cirrus.com/cobranetfirmware>. Firmware is delivered in a ZIP archive file with a name of the form *cs2110bin.zip* (the "2110" portion of the name indicates that this is revision 2.11.0 firmware). The contents of this must be extracted to the *firmware* sub-directory of your Disco installation at *c:\Program Files\Cirrus Logic\CobraNet Discovery\firmware*.

Upgrading Firmware

Firmware is kept in non-volatile storage on the CobraNet device. Disco is capable of upgrading firmware. Firmware upgrade is done over the Ethernet connection. No special hardware connection is required.

Follow these steps to upgrade firmware:

- 1) Select the target device in the Disco main window.
- 2) From the *CobraNet* menu choose *Update Firmware...*
- 3) Disco will perform an upload step to verify the current firmware and hardware type of the device.
- 4) The *Select Firmware Version* dialog is displayed. Select the new firmware version to download to the device and click the *Update* button.
- 5) Depending on the version of firmware currently loaded on the device, Disco may warn you about the dangers of updating the boot code. If this warning appears, please verify that power and Ethernet connections are secure and accept this warning by clicking *OK*.
- 6) Disco will perform a download step and remind you that the device needs to be reset or power-cycled to run the updated firmware.
- 7) Reset or power-cycle the device. Verify that the expected version appears in the *sysDescription* column.

7.2 DSP Conductor Setup and Use

DSP Conductor presents a user interface for defining signal processing paths. DSP Conductor generates DSP code and downloads it to the target device. DSP Conductor presents a user interface for adjusting parameters of the DSP and monitoring the processing elements.

7.2.1 Setup

DSP Conductor communicates with a single target device. You enter the IP address of the target device in the *Download* dialog that pops up automatically after you have clicked *Go* and the compile has succeeded. IP addresses may be read from the IP Address column in the Disco utility. We recommend that you run Disco concurrently with DSP Conductor.

7.2.2 Example Design File

From the *File* menu, open *example.cpa*. This simple example passes audio from the analog inputs to the analog outputs.

Click the *Go!* button and DSP Conductor will generate DSP Code, download it to the target, and run it.

Double-click a *Gain* block to expose controls and adjust audio levels.

Double-click a *Meter* block to expose indicators and controls and show the audio level in the signal path.

7.2.3 *Creating Your Own Design File*

Once you have successfully passed audio through the example design file, please refer to the *DSP Conductor User's Guide* to learn how to create your own DSP Configuration.

Contacting Cirrus Logic Support

For all product questions and inquiries contact a Cirrus Logic Sales Representative.

To find the one nearest to you go to www.cirrus.com

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