16-Channel USB Audio Logger

Installation Guide

DIGITAL LOGGERS, INC.

Logger Features

- 16 channels of high fidelity μ-law companded digital recording
- All recordings are made at the legally required 64Kbps rate, using compression only when necessary, making this logger ideal for both commercial and E-911 applications.
- 60dB variable gain control on all channels for direct connection to phone lines, handsets, microphones and speakers
- Digital signatures with the time, date, and recording details are included in audio files.
- Easy Plug and Play USB configuration under Windows 2000, 2003, and XP
- Maximum recording length is adjustable so large files are split into easily manipulated sections.
- Disk usage can be controlled on a line-by-line basis to conserve disk space
- Evidence Builder software produces evidentiary recordings rapidly
- Recordings can be searched by time, date, or by CID or DTMF signaling

Server Requirements

- A **dedicated** PC is recommended, due to the high CPU usage required for real-time audio.
- A 1-GHz or faster processor with 512MB or more of RAM.
- Windows 2000, 2003, or XP. Due to the performance required, Windows 9x and ME aren't supported.
- A free, dedicated USB 2.0 port. Slower USB 1.1 ports are not recommended.

Quick Installation

1. Run windows update from **windowsupdate.microsoft.com** to ensure you have the latest USB drivers available from Microsoft. This is essential under Windows 2000.
2. Confirm that all line input levels are below +10dBm.
3. Connect inputs 1-16 via the Amphenol connector.
4. Attach the USB cable to a dedicated PC. Connect directly to a primary USB 2.0 port on a *dedicated server*, not to a hub. We recommend that the logger is the only external USB device attached to your PC. Once attached, the USB configuration on this PC should not be changed. *Note: Although this recorder uses an 11Mbps transfer rate, older USB 1.1 ports may not be compatible. Long cables and USB extenders are not recommended.*
5. Switch power OFF to the logger. Switch power on to the PC.
6. *Do not connect the USB cable yet.* After boot, insert the distribution CD and install the logging application.
7. Start the logging application.
8. Adjust the gain controls for each line. Levels should never reach the maximum of 0dBm to avoid distortion.
9. Select either VOX or LOOPSTART mode for each line. When using VOX mode, set the trigger level for each line.
10. Map a network drive to the workstations used for playback. Use Windows file system security to limit access to authorized individuals.

11. Install "Evidence Builder" software on playback workstations. This program allows you to scan recordings and catalog calls by DTMF and Caller-ID.
12. Install "Real Time Player" as needed for remote monitoring.
13. Install "Call Detail Recorder" if desired for SMDR, ANI, or ALI recording from RS-232 sources.

Included Hardware

The hardware installation kit includes:

- Qty 1 – F16 USB Capture Unit
- Qty 1 – High Speed USB "A" to USB "B" cable.
- Qty 1 – Power Cord

Installation Accessories

Accessories are available from DLI at (408) 330-5599:

- Octopus cables and other adapters
- Patch Panels
- "Y" connectors – RJ-11, RJ-45, and Handset
- "T" cables with Amphenol connectors
- Phone tools, connectors, cables, and test and measurement equipment.

Power and USB Connections

Power

Verify the input voltage is 110-120VAC, and plug the IEC power cord into the wall outlet. Follow the power-up sequence described above in "quick start installation".

USB to PC connection

The USB cable provided has a rectangular "Type A" plug on one end and a square "Type B" connector on the other. The square connector is the only connector that can be plugged into the logger. Connect the USB cable between the PC and the logger.

Phone Line Connections

You can easily record from phone lines in three different ways: from the handset, from an outside analog phone line, or from an analog port on the PBX. If you are using a digital PBX, you may connect either to the handsets, to outside analog lines, or to an analog port, but not directly to the digital station set extensions. To record from digital set extensions, you'll need a D/A converter which is specifically designed for your PBX.

Outside analog lines may be bridge connected in two ways – VOX or Loop Start.

To bridge an outside line in VOX mode:

- Verify that the line audio levels are within standard telecom specifications. Peak levels should not exceed +10dBm. Gain controls should be set so that recording levels do not exceed 0dBm.
- Use a punch-down block or RJ-11 octopus cable to connect each line to the logger.
- Set the line configuration mode to VOX using the Logger Config Utility.
- Set the VOX trigger threshold to a level slightly above the noise floor (background noise level) of each line.

To bridge an outside line in Loop Start mode:

- Measure the idle voltage on the line to confirm that 48VDC is present.
- Verify that the line audio levels are within standard telecom specifications. Peak levels should not exceed +3dBm. Gain controls should be set so that recording levels do not exceed 0dBm.
- Use a punch-down block or RJ-11 octopus cable to connect each outside line to the logger.
- Set the line configuration mode to LOOPSTART using the Logger Config utility.

Radio Connections

Manufacturers use a wide variety of radio connectors, so you'll first need to locate a mating connector. After that, it's a simple two-wire connection from the receiver to the logger. You can directly bridge across the speaker, headset, or ear bud at levels up to +10dBm. Connect to a pair of input pins on the logger. A punch down block is usually the most convenient way to mix radio and phone lines.

If you're connecting a transceiver, and you'd like to record both the transmitted and received audio in the same recording file, you'll need a 4-wire to 2-wire converter.

Level Controls

It's important to set the level control for each line correctly. Low levels are hard to hear. High levels cause distortion in the recordings and make it difficult to decode Caller-ID or DTMF. Set each line so the VU meter never quite reaches the right side of the screen.

VOX Trigger Level

Two settings are required for each line which operates in VOX mode. First, adjust the audio level to avoid clipping as described above. Then, set the VOX trigger level above the noise floor on the line. The VOX trigger level is the threshold at which recording will begin. In other words, when the logger "hears" a sound louder than the VOX trigger level, it will start to record. Recording will continue until silence is detected for a period of time. This period of time is called the VOX timeout. Start with a timeout of 30 seconds for phone calls, and 10 seconds for radios. Listen to the recordings, then adjust this value to your liking. An excessively long timeout setting will combine multiple calls into a single file. An excessively short setting will cause calls to break apart during periods of silence.

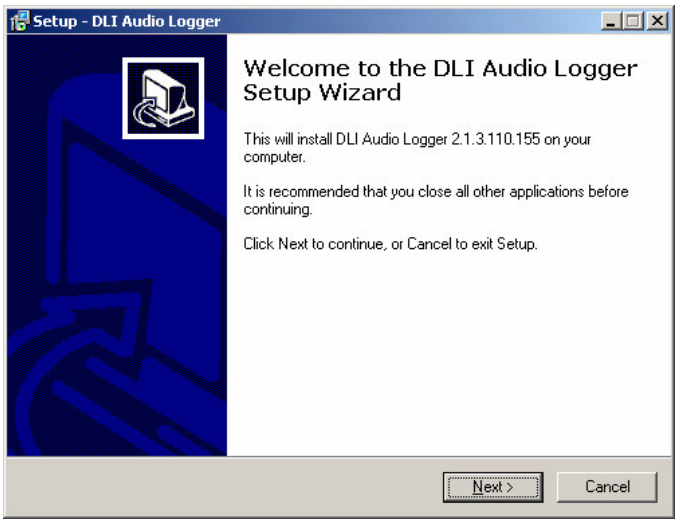
These settings do not apply to lines operating in the LOOPSTART mode.

When operating the logger in VOX mode, two settings are vital: VOX TIMEOUT and VOX TRIGGER LEVEL. Set the VOX trigger level slightly above the noise floor (ambient noise) on the line when the phone is on-hook. If you change the manual level control on the front of the logger, you'll need to re-set the VOX trigger level accordingly.

Software Setup and Installation

We highly recommend running a Microsoft Windows update before software installation. Visit windowsupdate.microsoft.com to upgrade. Microsoft has made several improvements in Windows USB drivers recently. Updating your PC improves operation with all USB devices. This is essential for Windows 2000 users.

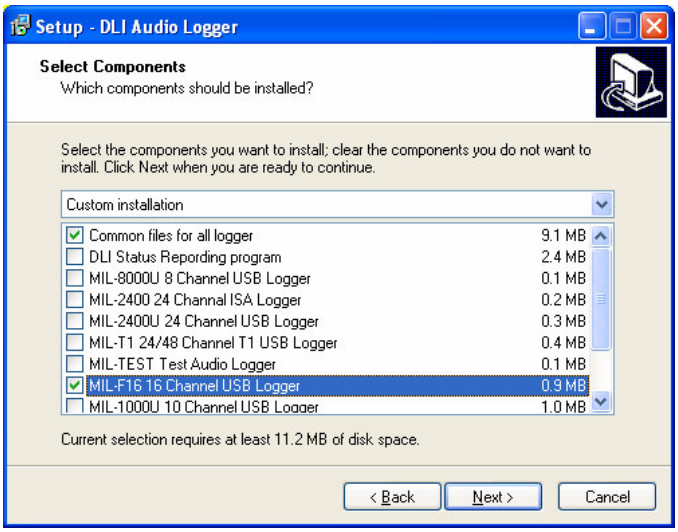
Now is a good time to check with your PC vendor (ie. Dell) for motherboard chipset driver updates. In many cases, these driver updates can improve USB operation.



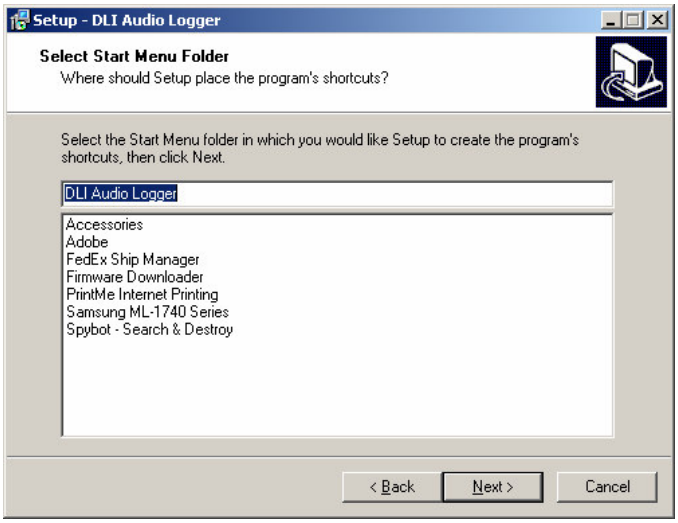
After updating, insert the logger installation CD into your CD-ROM drive.

Do not connect the logger USB cable until you have completed installing the software drivers.

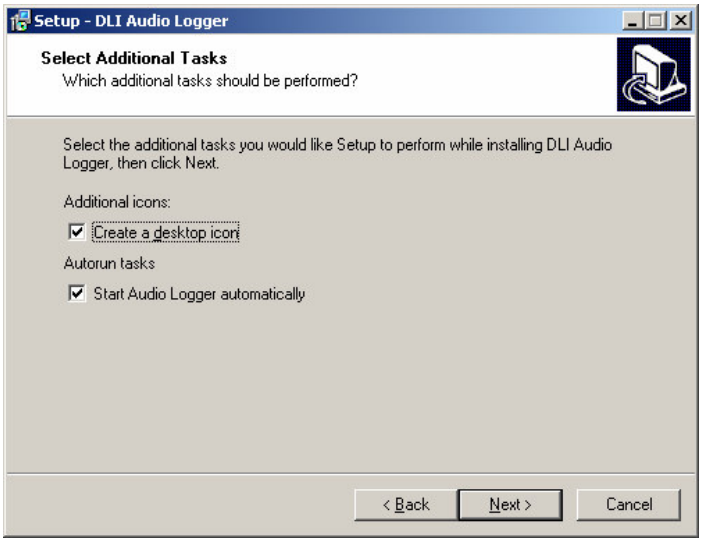
Installation starts automatically. Select the installation directory and shortcut name.



The components "MIL-F16 16 Channel USB Logger" and "Common Files" should be checked. Click "Next".



Next, select a folder for the program shortcuts.

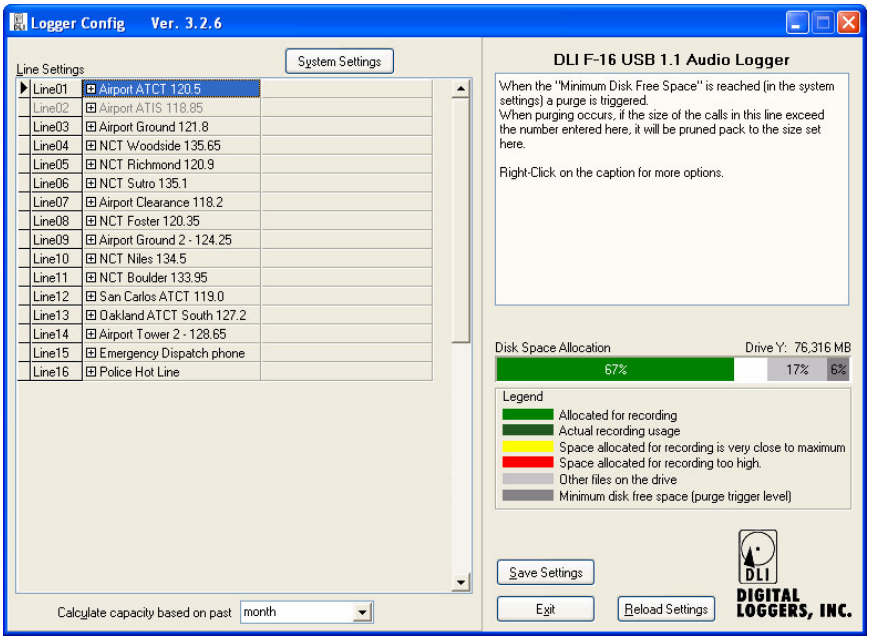


To record automatically after login, check 'Start Logging Automatically". If a machine is left unattended, this ensures uninterrupted operation in the event of a power failure and subsequent reboot.

Click "Next" and setup will complete automatically. Click "Finish".

Now connect the USB cable and start the setup application.

Channel Configuration - Logger Config Utility



To start the configuration utility, click:

Start / Programs / DLI Audio Logger / DLI Logger Config

Each channel corresponds to one recording directory. Within each channel directory, the logger creates a subdirectory for each day.

To change settings for a particular channel, click the small + symbol to the left of the line name. The settings for that channel are displayed.

The most important settings are:

Record Trigger Mode

Set this to **VOX** for normal operation. Choose **LOOPSTART** for line voltage sensing.

Line Name

Choose "PSAP Desk 1" or a similar name if you have a channel assigned to a single speech path in your PBX. If you have a particular phone number assigned to that timeslot, it may be useful to include the number in the line name, such as "DLI Main Hunt Group (408) 330-5599". If you are recording from an outside trunk, a separate program will allow you to search by Caller-ID or DTMF signaling after recording. *Since this Line Name will be used as a recording directory, be careful not to include disallowed characters, such as "/" "," or "\".*

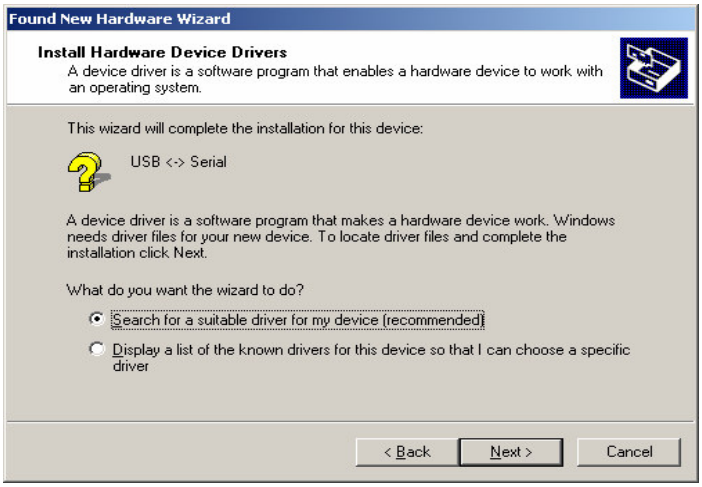
Maximum Megabytes

The logger can automatically delete old calls to conserve the amount of disk space used by each channel. This setting controls the maximum amount of disk space used by each channel. When disk space is low and this threshold setting is reached, oldest calls are automatically deleted to free disk space. To turn this feature off, set this field to "0". If you specify a maximum, the logger will check disk space periodically. If recording size exceeds your setting, the logger will automatically delete files starting with the oldest day. The logger will continue deleting calls until disk usage reaches the setting. It's important to set this so that the total space used does not exceed the available disk space. You may want to run the logger for a few days, then evaluate the usage on a line-by-line basis before setting this threshold.

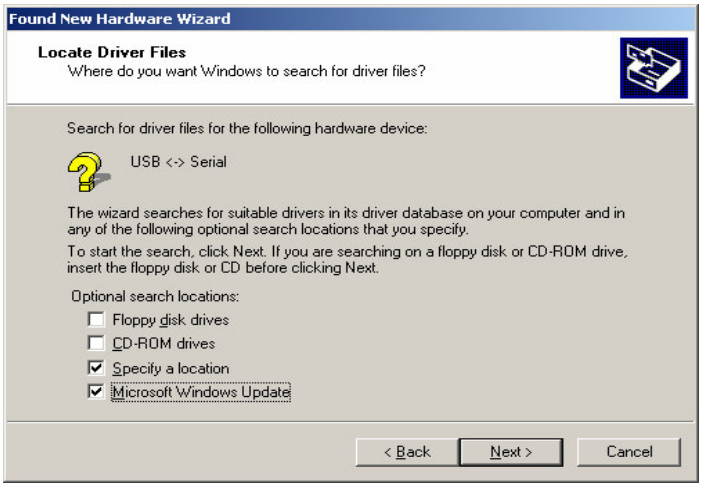
USB Serial Driver Installation

If you installed the drivers first before connecting the logger, skip this section.

If you connected the USB logger *before* installing the drivers, Windows will guide you through a USB serial driver installation process. We suggest you cancel this process, disconnect the logger and install the driver CD.



If you have already started the process, you'll need an internet connection to load the driver. Choose the Search option first.



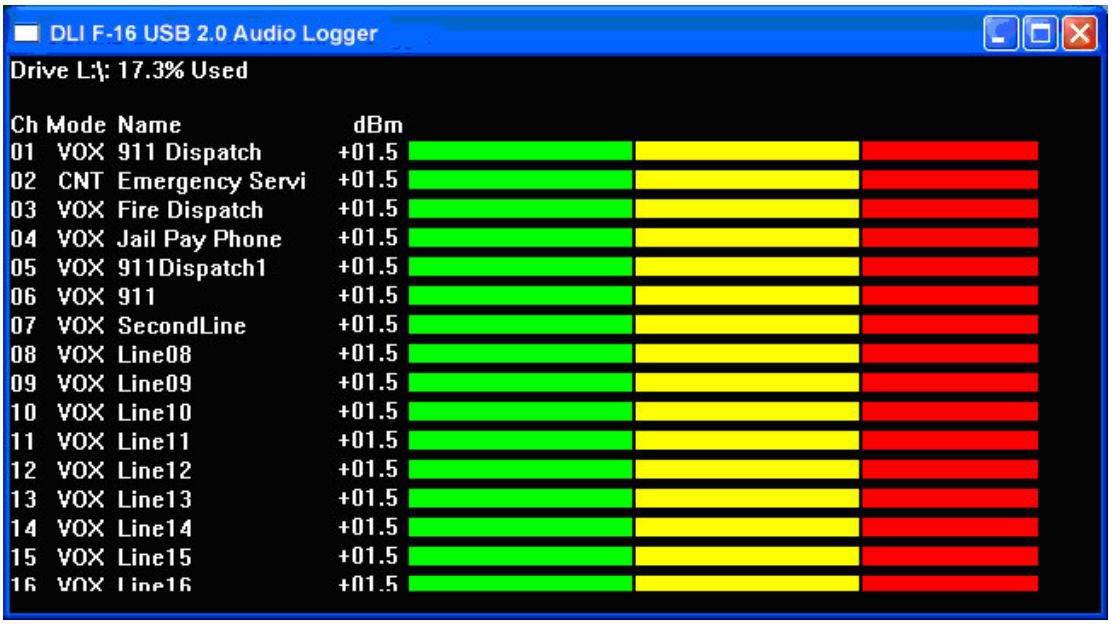
Next, choose "Windows Update" to download the latest driver.

Click "Next" to finish.

Install the logging application as described above.

Using the Logger

Click on the DLI Audio Logger icon to start the application. The main screen appears:



The recording mode for each line (for example VOX, LOOPSTART or OFF) is displayed to the left of the line name. The recording level for each line appears in color when that line is recording.

Adjust the gain controls so that the highest levels (ie. dialing) peak at around 0dBm. Setting the level too high will cause distortion and prevent touch tones and Caller-ID from being properly decoded.

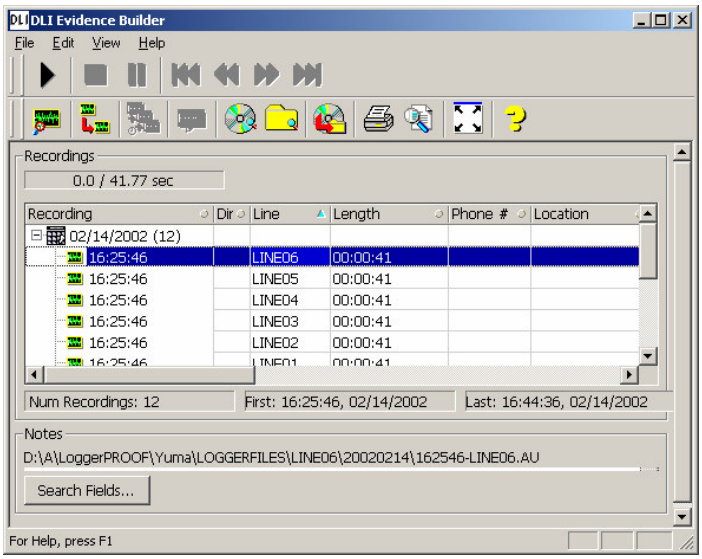
Click on the line name to explore the recordings for that line.

The top of the screen shows the percentage used on the target disk. Errors appear on the bottom of the screen.

The 'Explore Calls' Function

Click on the line name to explore the recording directory for that line. Each line is stored in a separate folder, and each day is stored in a subfolder. The file names correspond to the recording start time. From here, you can edit, copy, or transfer files using Windows Explorer by clicking the right mouse button.

Evidence Builder Call Analysis Software

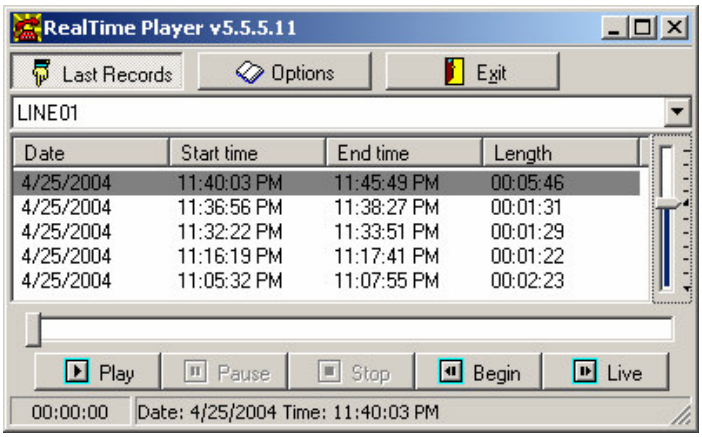


Evidence Builder Software is a powerful program used to locate and analyze recordings. It is provided on the workstation CD. Load this on a workstation and point it at the recording directories to analyze incoming calls, create call lists, sort calls, and search by DTMF or Caller-ID.

To catalog files on a remote server, first create a path to the shared recording directory. Be sure to use proper security. Map this to a drive letter on your workstation.

Next, choose the "Catalog Files From Hard Drive" button and select the recording directory. The screen display can be customized by in the "preferences" menu.

Remote Monitoring of Live Audio

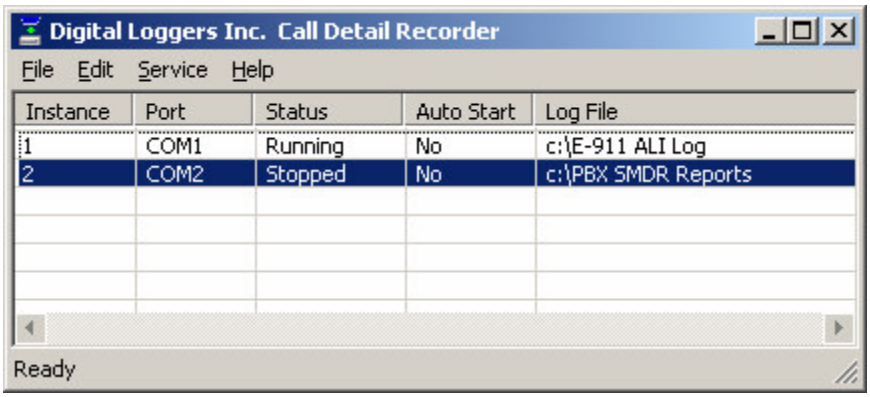


Remote users with access privileges to the recording server may monitor calls in real time via LAN or WAN connections.

A Real Time Player application is provided on the workstation CD. It's downloadable at: www.digital-loggers.com/rtp.exe

To remotely monitor calls, load the Real Time Player application on a workstation. Click on "options". Use the browse button to select a source directory with archived or incoming calls. Live calls are highlighted. Select a call and press "play", or press "live" to continuously monitor calls. Windows security may be used to selectively control access to specific lines.

Recording SMDR, ANI, and ALI Streams



ANI, ALI, or SMDR data streams may be logged using our call detail recorder utility. This utility logs up to 8 RS-232 serial ports simultaneously.

Download the latest version from www.digital-loggers.com/cdr.exe

Frequently Asked Questions

How do I connect the logger to a PBX?

There are three easy ways to link your logger to the outside world:

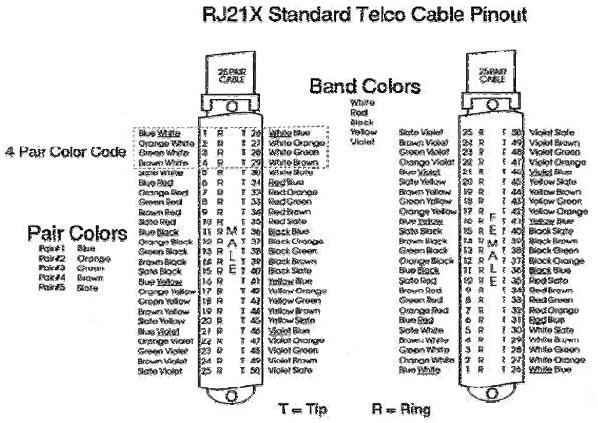
1. ***Record from incoming lines***.
   This lets you hear the recording from the outside party's perspective. It is commonly used for quality assurance recording. This type of connection is not commonly used in agent analysis or 911 call center recording. Most of these applications use a console output or handset tap (below). When recording from incoming lines, the level of the calling and answering voices may differ. For a more balanced recording level, use a handset connection or console output.

2. ***Tap the handsets, dispatch console, or analog station sets directly***.
   This method allows you to hear the recording from the agent's perspective. If you are recording in an E-911 dispatch environment, this connection will record things from the dispatcher's perspective, and the recording will typically include the phone conversation, radio dispatch, etc. Essentially, you will hear everything the dispatcher hears in the recording. Handset taps may be connected to the analog output of the phone, or run through a Digital to Analog (D/A) converter. They may also be connected by a digital tap card, such as those sold by Intel. When recording from a handset, Caller-ID will not be stored in the recording files.

3. ***Connect to a PBX port.***
   This is the most common method of connecting a logger in large installations (100+ channels). One advantage of this connection scheme is that the PBX can be used to switch the recorder to a large number of lines. Another is that the logger can be switched to any recorder outside trunk or inside extension. Think of this method as "conferencing in" the logger with either an outside caller or an inside extension. This method requires complex PBX programming by an installer familiar with your PBX.

What's a handset jack? How do I connect a logger to it?

A handset jack is a small 4 pin connector which carries the speaker and microphone signals from your telephone to your handset. This is a good place to bridge an audio logger, since all incoming and intercom conversations may be recorded at this point. The default VOX and ALC settings will work fine with the typical handset level of -20dBm. To record from a handset, "backhaul" the audio to the logger via either a "Y" connector or make the connection within the phone itself. This is commonly done with an unused pair on an existing cable.



What's an octopus cable?

What's the RJ-21X color code?

If you are connecting an RJ-21X to an RJ-11 jack, you can use either a rack mount patch panel with 24 RJ-11 jacks, or a "harmonica" or "octopus". An Octopus cord has a single 50 pin AMP connector (RJ-21X type) on one end, and 24 RJ-11 type plugs on the other end. These optional cords are available directly from DLI.

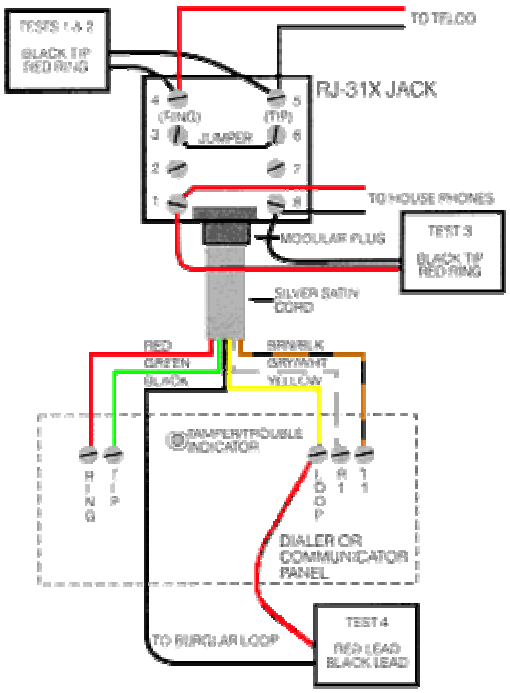
What's an RJ-25 jack? How do I connect a logger to it?

*A*n RJ-25 jack is a standard 6 pin, 3 pair telephone jack. It's wired as shown:

Jack Positions	USOC RJ25
1	wht/grn
2	wht/org
3	blue/wht
4	wht/blue
5	org/wht
6	grn/wht

What's an RJ-31x "Alarm Jack"? How do I connect to it? How do I test it?

Many security lines use a special type of jack, called an RJ-31x. It is an "exclusion type" dialer jack. It is typically a Leviton style 8 pin jack, but similar wiring may be done on KT-66 or W110 punch down blocks. Each 66 block handles 3 lines in the RJ-31x wiring configuration, and all the pin order matches the order of the RJ-31x jack pins. The first jack connects to pins 1-8, the second to pins 9-16, and the third to pins 17-24. This type of wiring is commonly encountered in 911 call centers and in most commercial alarm installations. RJ-31X jacks are required for many security and fire alarm systems that provide exchange to alarm reporting devices. In an RJ-31x installation, the phone line is wired in series through the RJ-31X; from there, tip and ring pass through the dialer. A normally closed relay opens if the alarm is activated, seizing the circuit for alarm use, while temporarily disconnecting lower priority equipment (such as a house phone) to prevent disruption of the dialing sequence.



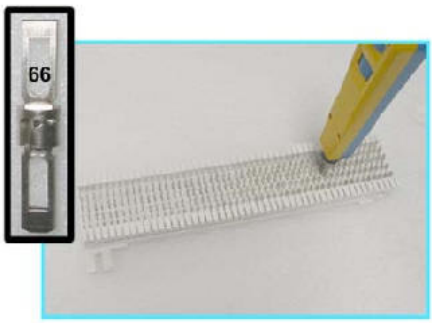
The most common RJ-31x installation is an 8-position, non-keyed miniature jack with shorting bars across terminals 1-4 and 5-8. Inserting the modular plug lifts the contact wires away from the shorting bars, extending the tip and ring circuit to the series leads going into the alarm device. The audio logger connects to pins 4 and 5 of the jack in a "bridging" configuration. When the plug is removed from the jack, metal tabs inside the RJ-31X provide direct connection of tip and ring back to the other locations, bypassing the alarm device. This design lets the dialer control the line for exclusive use when in alarm mode. It also helps isolate defective or improperly wired equipment by disconnecting the RJ-31x plug to route tip and ring directly to lower priority equipment. In some installations, a 911 dispatch console will be rerouted to a backup console by connecting the backup console to the "house phone" connections on pins 1 and 8.

Some technicians may install a "shortcut" or de-populated four-terminal version of the dialer jack. In the shortcut dialer jack, the jumpered terminals which supervise the presence of the plug are missing. This "shortcut" jack can't detect the presence of the modular plug. It is best to install a fully populated RJ-31X jack, and properly connect all terminals. All RJ-31 X jacks should be installed in front of any other jacks in the system so that when an alarm occurs, automatic dialing will take priority and seize the line, leaving all other phones disconnected.

What is an RJ-21X, how do I connect to it?

An RJ-21X is a standard telephone interface which uses 50 wires to transmit up to 25 channels of digital or analog data. It is called an RJ-21x when it is used as a "demark" or attachment point for telcom equipment. The "demark" attachment point is commonly referred to as a "Network Interface Device". An RJ-21X can be attached to a standard KT-66 or 110 type punchdown block, and is typically installed by the phone company. In many installations, the customer is responsible for all wiring **after** the RJ-21X, and the phone company is responsible for all wiring **before** the RJ-21x. The circuits on an RJ-21x are provided on numbered tip and ring positions on a miniature 50 pin connector of the "Amphenol" or "telco" type. These are very common connectors on PBX, KSU, PBC, and distribution mainframes. The connector itself is sometimes called a "blue ribbon", or "grey L" connector, depending on the type of cable it's connected two. The connectors are polarized (male and female) to prevent an installer from accidentally connecting an internal extension to outside lines (or vice versa). Here's the pinout:

Pins 1 (ring) and 26 (tip) are considered position 1. Pins 2 (ring) and 27 (tip) are position 2 on thru twenty five pairs. Typically, only 24 pairs are used (48 wires). Your 16 channel logger uses only the first 16 pairs (32 wires). The last pair on pins 25 and 50 (slate-violet and violet-slate color) should be left as a spare pair. The spare pair keeps you from having to run a whole new cable if a single pair fails elsewhere. DLI Loggers use this pair as an earth ground connection. *Watch your polarity when wiring these cables.* Most modern phone equipment is polarity insensitive, but you can ruin a whole installation by reversing one pair of wires. There's also a single line version of the RJ-21X described above. It's called an RJ-31x.

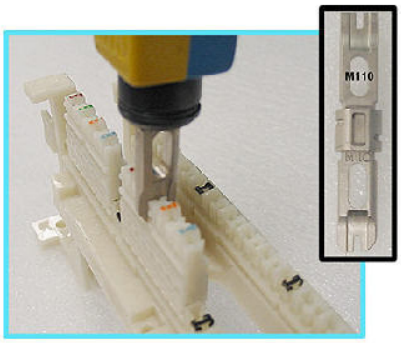


What's a KT-66 Block? How do I connect to it?

The KT-66 block has been a standard "punch down" connector for telephone interconnects since 1958. It uses 200 bladed split contacts to make reliable connections on 28 gauge solid copper wire. It's one of the most common interconnects used in the telecom industry, and is often used to terminate an RJ-21x. KT-66 blocks, AKA "66 Blocks" use a plastic snap-on frame to mount on backboards or racks. They are "indoor only" interconnects which will fail if exposed to moisture.

KT-66 blocks come in several styles. Some are "split blocks" in which the two spade terminals on each end of the block are connected together, but the connection is "split" down the center of the block. Other KT-66 blocks may have 50 pin AMP connectors on either side of the block.

To make a reliable connection to a punch down block, you'll need a "punch down tool" as pictured below. Be sure to use the correct "66" style blade to make the connection. One side of the blade cuts the wire, the other is for "loop through" wiring.



What's a 110 Block? How do I connect to it?

The 110 block has been a standard "punch down" connector for telephone interconnects since 1971. It was intended to be a high density replacement for the KT-66. It uses a plastic frame to which a series of 4 pin connectors may be attached. Up to 50 of these connectors may be attached to the block. With 110 blocks, connection density is 50% higher than connections made on a 66 frame. KT-66 blocks, AKA "66 Blocks" use a plastic snap-on frame to mount on backboards or racks. Like the "66 Block", a 110 block is "indoor only" and should not be exposed to moisture. You must use the right tool with the right blade to make a reliable connection on a 110 block.

Jack Positions	USOC RJ61	T568A	T568B (AT&T)	100BT (LAN)
1	wht/brn	wht/grn	wht/org	wht/blue
2	wht/grn	grn/wht	org/wht	blue/wht
3	wht/org	wht/org	wht/grn	wht/org
4	blue/wht	blue/wht	blue/wht	
5	wht/blue	wht/blue	wht/blue	
6	Org/wht	org/wht	grn/wht	org/wht
7	Grn/wht	wht/brn	wht/brn	
8	Brn/wht	brn/wht	brn/wht	

What is an RJ-45 jack? Which wire connects to each pin?

Although it's not technically correct, the term "RJ-45" is now used to refer to any standard 8 pin jack in telephony or networking applications. RJ-45 jacks are most commonly used in Ethernet applications. Eight pin jacks are often used to carry four analog circuits.

What is a “Balanced Line”? What is an “Unbalanced Line”? How can I connect to them?

Balanced lines are lines use to cancel noise. In balanced phone lines, two wires are twisted together so that each wire picks up the same amount of noise. At the receiving end, the noise is subtracted, and the resulting output is the sent audio, minus the noise. A balanced line becomes "unbalanced" when unintentional leakage to ground occurs. Unbalancing a phone line causes noise. This can be a result of poor insulation somewhere along the line, or a bad connection. The problem is often worse in the winter, when outside lines are wet and leakage to ground occurs along the line.

Audio is usually sent down shorter unbalanced lines using Coaxial shielding. This shielding prevents electromagnetic noise from affecting a single wire. The inputs to all DLI loggers are balanced lines. These inputs may be connected directly to unbalanced (ie. Coaxial) lines, and the ground may be connected to either side of the logger input.

What is a D/A Converter? How do I connect it?

D/A stands for Digital-to-Analog. D/A converters or “DACs” install between digital lines (usually station sets) and an audio logger. D/A converters work by converting the signal stream from a

digital station set into the standard analog format used in an audio logger. They are available in single and multi-channel versions.

Since there is no "standard" for digital station set interconnects and line formats, single channel D/A converters are usually best purchased from the manufacturer of the PBX and station sets to which you are connecting.

Multi-channel D/A converters are available as stand-alone units or PCI cards. These cards are sold by Dialogic (now Intel) and others. Another common type is built into the base of a KT-66 punchdown block. Again, every phone system has a different format, so there are hundreds of D/A converters available. Make sure you are purchasing the right one for your PBX and station sets.

Support

Please visit www.digital-loggers.com for more frequently asked questions, free driver updates, manuals and accessories. If we haven't answered your questions here, please call (408) 330-5599 or send an email to support@digital-loggers.com. We'll be glad to help.