24-Channel USB Logger

Installation Guide

DIGITAL LOGGERS, INC.

Logger Features

- 24 channels of μ-law companded digital recording, with level indicators and live monitoring give crystal-clear audio.
- Mix mode allows selected channels to be mixed and recorded into the 24th channel.
- All recordings are made at the legally required 64Kbps rate, using compression only when necessary, making this logger ideal for E-911 applications.
- Selectable automatic level control (ALC) or manual slide VU control on all channels.
- Digital signatures with the time, date, and recording details are included in audio files.
- Flexible audio inputs provide easy installation. Channels are independently configured for VOX, dry contact, loopstart voltage sensing, or continuous (manual) recording. No external adapters are required for line voltage sensing.
- USB High speed connection for expandability, performance, and field serviceability.
- Quality audio amplifier and speaker for local monitoring.
- Easily accessible hardware gain controls for each channel.
- Easy Plug and Play USB configuration under Windows 2000, 2003, and XP .
- Maximum recording length is adjustable to split large files 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.
- Real time player allows live remote monitoring via LAN or WAN.

Server Requirements

- A **dedicated** PC is recommended, due to the high CPU usage required for real-time audio.
- A 2-GHz or faster processor with 2GB or more of RAM.
- Windows 2003, .NET, W7, Vista or XP. Due to the performance required, Windows 9x and ME aren't supported.
- A free *480Mbps* USB 2.0 High Speed 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 +3dBm.
3. Connect audio inputs via Amphenol connectors.
4. Switch power on temporarily without the PC connected. Use the speaker or headphones to verify audio quality on all lines. Switch power off.
5. Attach the USB cable to a dedicated PC. Connect directly to a primary USB *Root* 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.
6. Switch power OFF to the logger. Switch power on to the PC.
7. After boot, insert the distribution CD and completely install the logging application.
8. Restart the PC. Switch power ON to the logger. Follow the prompts to install drivers.
9. Start the logging application.
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 – 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
- Patch Panels
- "Y" connectors – RJ-11, RJ-45, and Handset
- "T" cables with Amphenol connectors
- Tools, connectors, cables, and test and measurement equipment.

OCTOPUS CABLE

Power and USB Connections

Power
Verify the input voltage is correct, and plug the IEC power cord into the wall outlet. Follow the power-up sequence described below 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. This cable should be marked USB 2.0. "USB Extenders" are not recommended.

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.

Because the off-hook monitoring circuitry senses voltage, not current, any type of line connected to the logger may be bridged. Loop-through connections are not needed.

To bridge an outside line in Voice Activated (VOX) or Loopstart (LPS) mode:

- Verify that the line audio levels are within standard telecom specifications. Peak levels should not exceed +3dBm.
- Measure the idle voltage on the line to confirm that 48VDC is present. If 48V is present, you are working with a "wet line". Use the loopstart **(LPS)** setting on wet lines. If no DC voltage is present, you are working with a "dry line". Use the voice activated **(VOX)** recording trigger on dry lines.
- Use a punch-down block, harmonica, or octopus cable to connect each audio input line to the 50 pin, 25 pair Amphenol connector on the back of the logger.
- Set the recording trigger mode for each to **VOX** or **LPS** line by right-clicking on the line mode on the Instant Logger screen, or by clicking on the logger configuration icon.

To bridge an outside line in contact closure (CNT) mode:

- Any audio input source, ie: speaker, microphone, telephone line, headset, radio, etc. may be used in contact closure **(CNT)** mode.
- To use remote dry contact recording triggers, wire a pair of trigger wires to the DB-25 option jack on the rear of the logger. Pins 1-24 of the connector trigger recording on the corresponding line numbers. Pin 25 is the common connection.
- Set the recording trigger mode for each line to **CNT** by right-clicking on the line mode on the Instant Logger screen, or by clicking on the logger configuration icon.

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. 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, or you can use the MIX mode described below.

DLI builds adapters for military radios with U-229 audio connectors, such as SINCGARS. These adapters link between the COTS USB interface and most modern military radios.

Using Automatic Level Control (ALC)

The logger incorporates a powerful 40dB automatic level control system. This system can be switched on to compensate for varying input levels. In some cases, the ALC system will prohibit VOX triggering since it will increase the level the ambient noise as well as the audio signal. To switch into VOX mode, move the ALC switch up for that channel. The VU meter will indicate an automatic adjustment in level. ALC is normally not used on radio receivers which have their own ALC.

VU Meter and Status LEDs.

A separate 20 segment, 10 step VU meter with 2.5dB steps is provided for each channel. When ALC is enabled, this meter indicates the recording level –after- ALC. The meter changes from a moving dot to a solid bar when recording has started. The VU meter will flash from between dot and bar mode during the VOX timeout period.

Live Monitoring with a Headset or Speakers

A live monitor with speakers is provided for ease of installation. Slide the monitor switches upwards to select line(s) of interest. This audio may be recorded using the MIX feature. Connecting a headphone mutes the internal speaker.

Using the MIX Mode

The MIX mode provides a single audio source which comes from a variety of user-selected channels. To use the mix mode, first select the channels of interest using the monitor switches. Then slide the MIX switch to the left. Mixed audio will be fed to the 24th recording channel. External audio inputs from the 24th channel are not recorded when MIX mode is selected.

Dry Contact Inputs

An optional DB-25 female connector can be provided for dry contact start/stop control. This connector provides 5VDC on pin 25. Normally open contacts (close to record) can be connected to pins 1-24 to control operation from dispatch consoles or other dry contact sources. Wire one side of the contact to the pin number corresponding to the audio channel. Wire the other side of the contact to pin 25. Set the line mode to **EXT** using the logger configuration tool. These inputs are optically isolated.

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. After updating, insert the logger installation CD into your CD-ROM drive. *Disconnect or turn power off to the logger during the software installation process.* Installation starts automatically on most machines.

Insert the CD. A multi-installer will appear:

Loggerapp is the main recording application used on the host PC. Installing this one program is all that is necessary in many applications.

If you are operating in a networked environment, RealTime Player is a remote access utility which will stream recorded audio with minimum latency over a high speed LAN or WAN connection.

Under "Install Playback Software, you will find Evidence Builder and Call Investigator. Evidence Builder is a cataloging utility which is useful for locating, editing, and transferring recordings. Call Investigator has a simplified user interface with time/date filtering.

Ensure that hard disk space is available for recording. Each second of recording uses 8Kbytes of disk space. Each gigabyte stores 34 hours of recordings.


If this window appears, press Cancel and disconnect the logger until all the supporting software is installed.
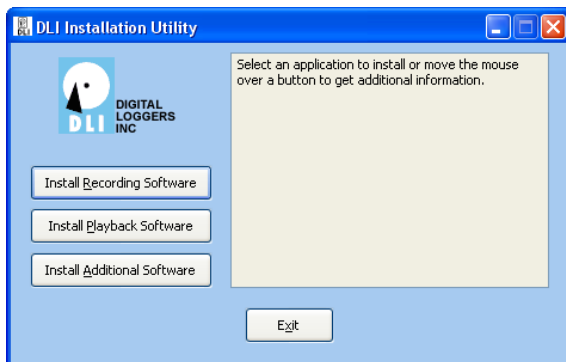
Click the first button to install the Recording Software first. If you plan to use the logger over a LAN, Install the Playback Software on the workstations you plan to use to access the recordings.
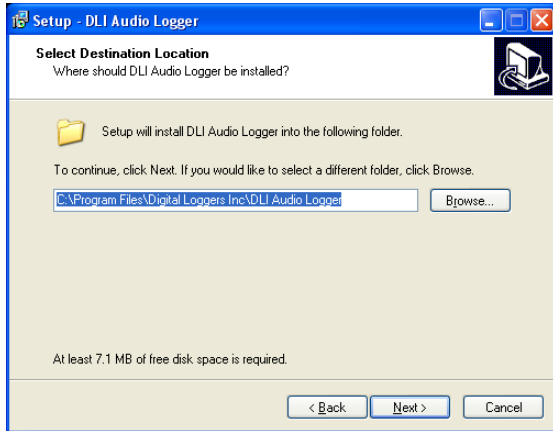
Select the installation directory for program files and the shortcut name. This is not the location for audio files, so a relatively small amount of disk space is required.
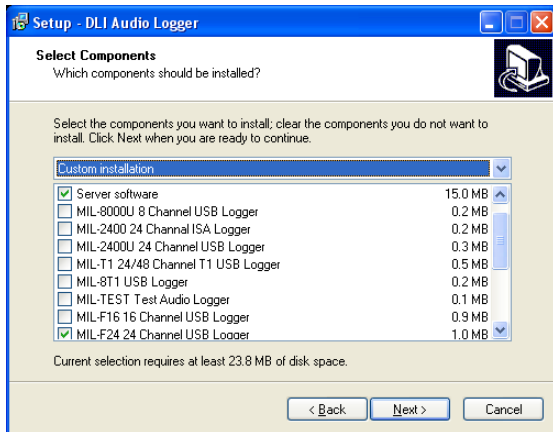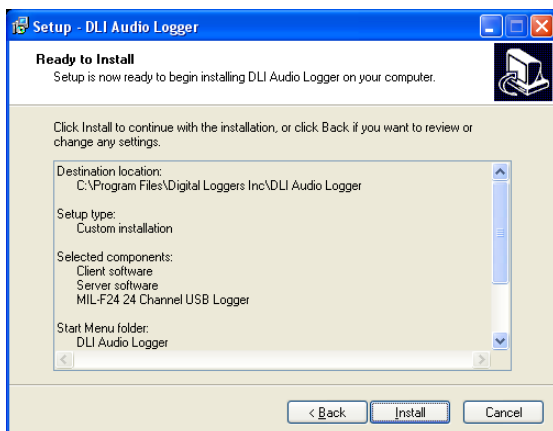
Next, select the components to install. Three components are critical: Server Software, Client Software, and the MIL-F24 USB Logger.

Scroll down using the slider bar and check the F24 driver. Ensure that all three options are checked, then click "Next".
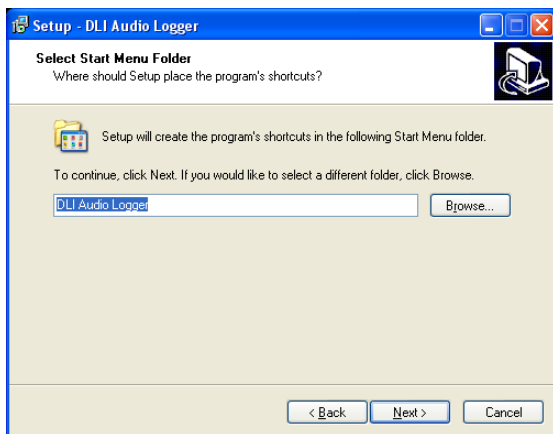
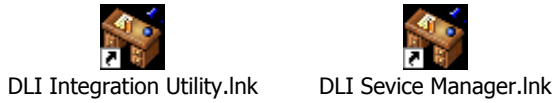Select a shortcut directory and click Next>

Confirm your selections, and then click Install to proceed.

After installation completes power up the logger and reboot. The logging service can be set to start automatically.

Starting the Integration Utility

After installation completes, two desktop icons appear:

DLI Integration Utility.lnk   DLI Sevice Manager.lnk

The service manager can be used to monitor the status of and to start and stop the logging software components.
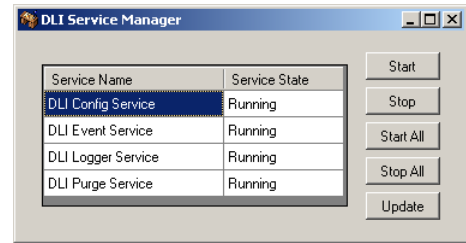
The Integration Utility lets you monitor recording and set channel modes. Click on the Integration Utility icon to set up your logger. Click on the logger configuration toolbox icon on the lower left side. A screen similar to this appears:
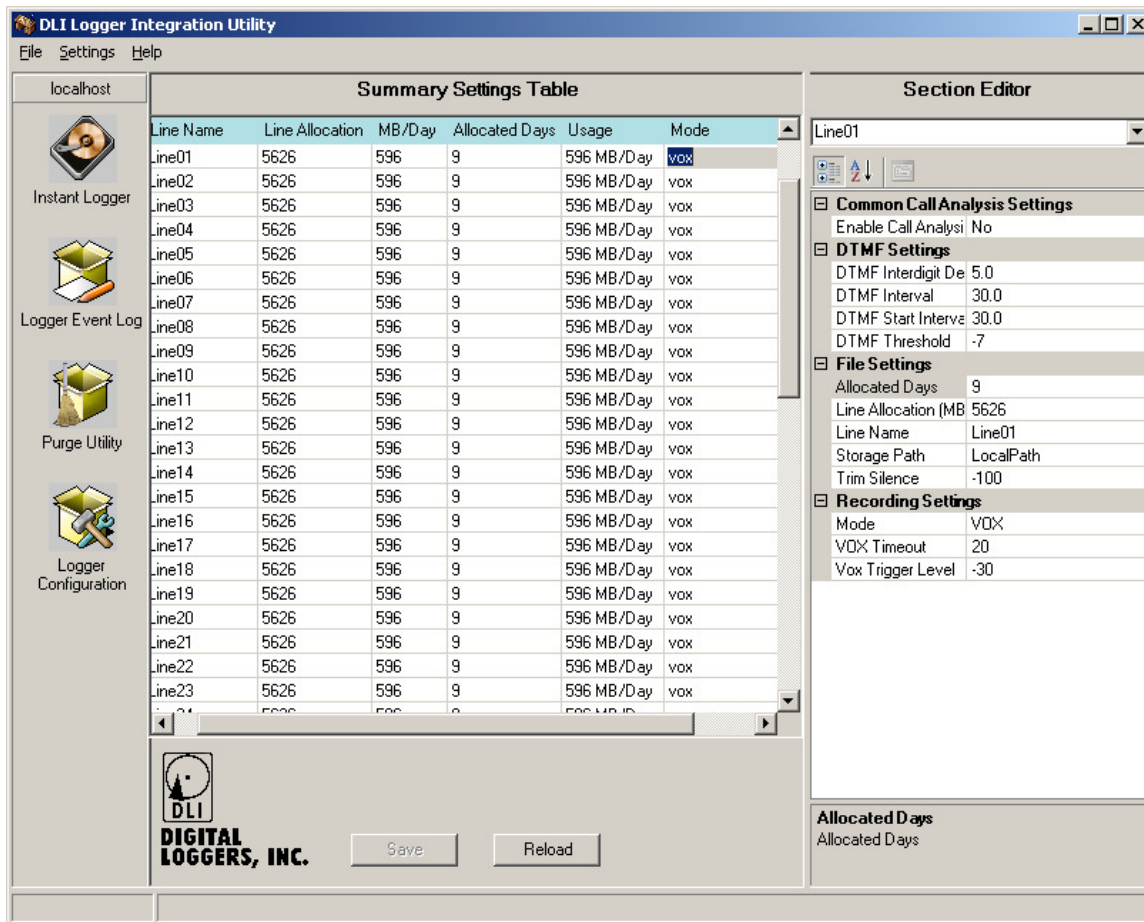
To make changes to the settings for a particular line, first click on that line name, then edit the settings on the right side of the screen.

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 recording settings are:

Mode

Set this to **VOX** for normal operation. Choose **LPS** for loopstart line voltage sensing on wet lines, or **EXT** to use the remote dry contact switch inputs. Choosing **CNT** will record continuously, and you may turn the line **OFF** to stop recording. To copy mode settings from one line to several others, right click on the settings.

Voice Activated Recording (VOX) Trigger Level

If you are connected to dry lines, you'll be using either VOX or contact closure control. When using voice activated recording, it's important to set the VOX trigger level and timeout values correctly. Start by setting the input level to the logger so no clipping occurs during recording. You can verify this by looking at the digital files with an editor, or by checking that the VU meter does not reach the top bars. Allow yourself a few dB of "headroom" to prevent clipping distortion. Once the input level is set, you can set the VOX trigger level. Click the Instant Logger icon. While the phone or recording source is on-hook (silent), use the on-screen VU meter to slide the small triangular arrowhead over the meter. A setting of about 10dBm over the noise floor typically works well. Note that if you change the input level, you will need to reset the VOX trigger level. Try a VOX timeout of 30 seconds for telephone audio and 10 seconds for radio, then adjust it to your liking. Short timeout values will cause recordings to be broken into separate file segments. Excessively long timeout values may cause unrelated recordings to become concatenated.

Line Name

Choose "PSAP Desk 1" or a similar name to describe the line. If you have a particular phone number assigned to that timeslot or channel, 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 characters disallowed in file names, such as "/" ";" or "\".*
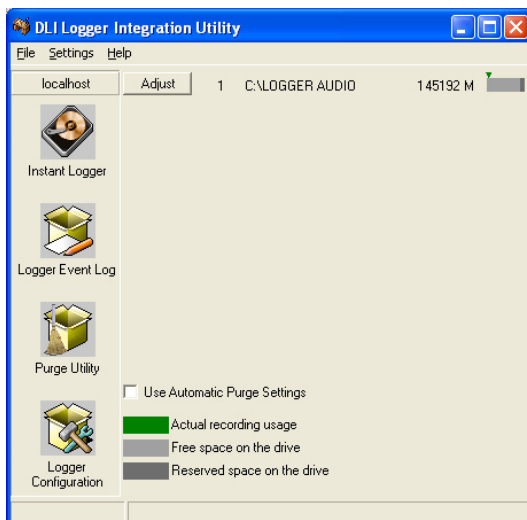
Recording Space and Automatic Deletion

The logger can automatically delete old calls to conserve the amount of disk space used on each channel. Click on the Purge Utility icon to enable this and adjust the maximum amount of disk space used by each channel. Oldest calls are automatically deleted to free disk space.

To turn this feature on, click the "Use Automatic Purge Settings" checkbox. A bar graph shows the amount of

space used. When enabled, 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.

Enable Call Analysis

The logger can automatically scan the audio in each recording to decode Caller-ID or DTMF dialed digits. First listen to the audio using the monitor. You will hear a modem tone between the first and second rings if Caller-ID is available. Touch tones should sound clear and undistorted. If the level is set too high, tones will be distorted and unrecognizable to the software. The recording level for touch tones should be below the peak level. Choose Yes to enable this feature.

DTMF Settings

Leave these settings at default values unless you experience errors in decoding DTMF tones. If you experience errors in decoding tones on an outside line, first verify that the audio files are not clipping. Set the level a few bars below peak on the VU meter when a touch-tone dialing key is depressed. If you need to decode * DNIS *, Japanese DTMF, or other uncommon signaling format, you can adjust these settings from their defaults to allow decoding.

Using Instant Logger
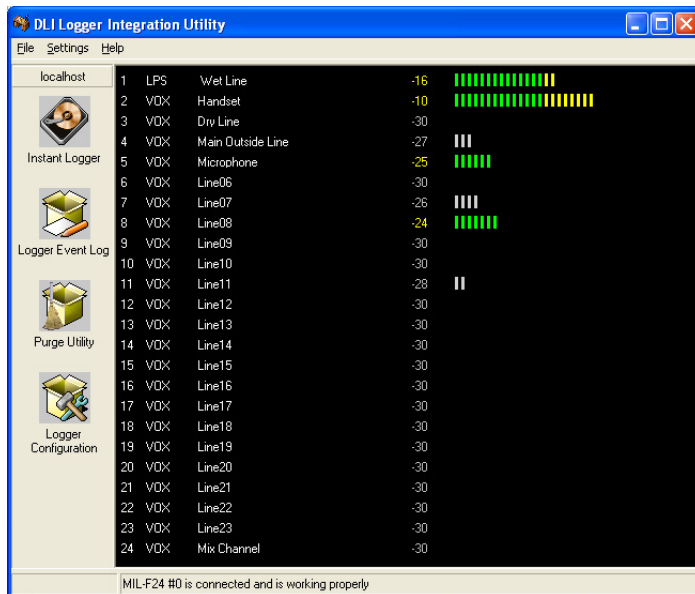
Click on the instant logger disk icon to monitor the status of the logger. This main screen appears.

The recording mode for each line (for example VOX, LPS, CNT or OFF) is displayed to the left of the line name. Right click to change the line mode setting.

Click on the purge utility icon to control automatic deletion.

Click on the Logger Configuration icon to change either global settings or the configuration of a particular line.

The 'Explore Calls' Function

Click on the VU meter 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.
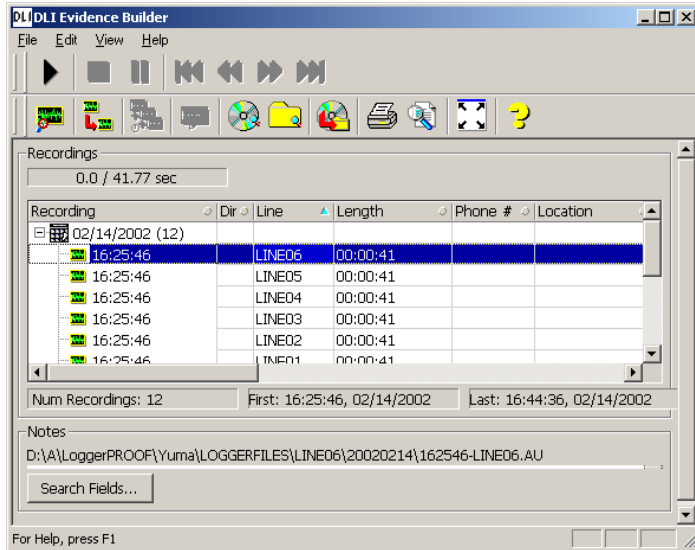
Evidence Builder Call Analysis Software

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 DID.

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.

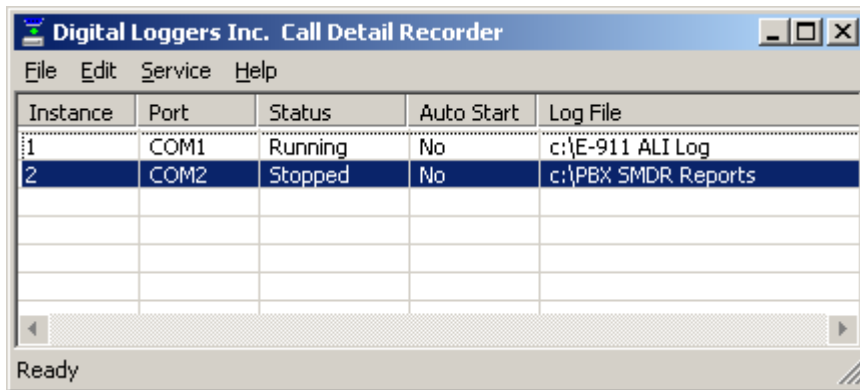# Remote Monitoring of Live Audio
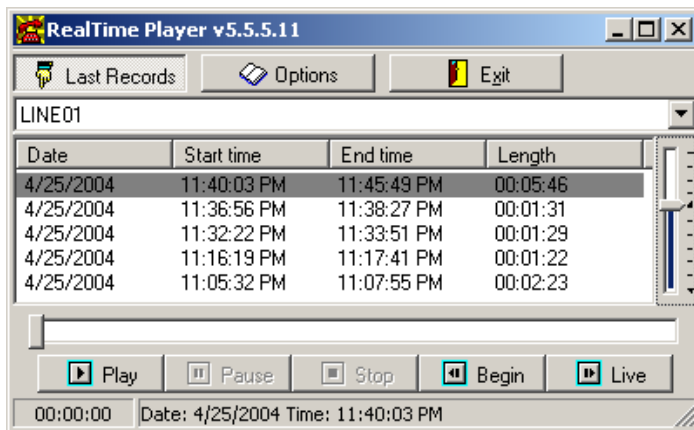
Remote users with access privileges to the recording server may monitor calls in real time via LAN or WAN connections.

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

Where do I connect the logger inputs?

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 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?

An Octopus cable is an adapter cable with an Amphenol 50 pin, 25 pair jack on one end and either 24 RJ-11 plugs, 12 RJ-12 plugs, or 6 RJ-45 plugs on the other end. The "female" equivalent is called a "harmonica", and it has sockets instead of plugs.

If you are connecting an RJ-21X to an RJ-11 jack, you can use either a rack mount patch panel with jacks, an octopus cable, or a harmonica.

RJ21X Standard Telco Cable Pinout

T = Tip   R = Ring

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" cord pictured on the right. 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.
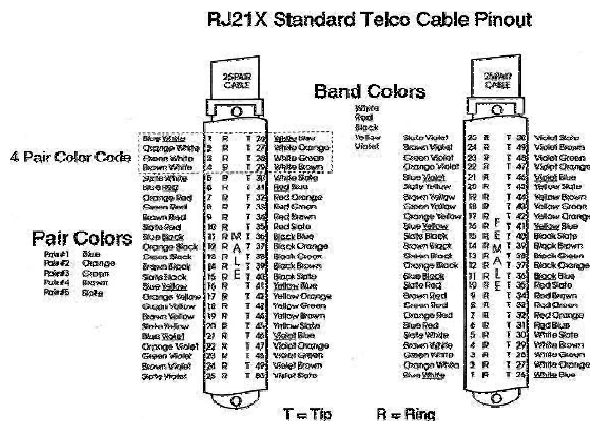
What is an RJ-21X, how do I connect to it?

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). 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.
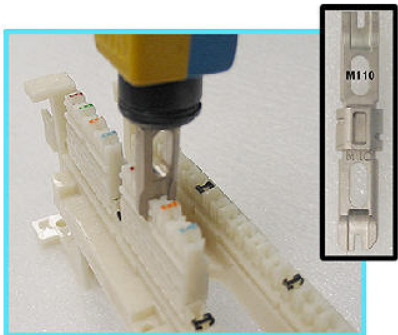
What's a KT-66 Block? How do I connect to it?
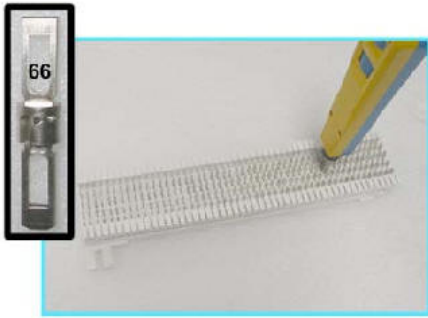
The KT-66 block has been a standard "punch down" connector for telephone interconnects since 1958. It uses 200 bladed split contacts to make reliable connections on 28 gauge solid copper wire. It's one of the most common interconnects used in the telcom industry, and is often used to terminate an RJ-21x.   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.

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.

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 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. A D/A converter is installed 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.

DLI DIGITAL LOGGERS, INC.