

16-Channel Audio Logger



User's Guide

Product Features

- The logger records up to 16 phones, outside lines, handsets, microphones or radios simultaneously. Software supports multiple loggers.
- Plug and Play USB simplifies installation.
- Recordings can be searched by time, date Caller-ID (CID) or Touch Tone DTMF signaling.
- Flexible recording level settings include: 47dBm fixed gain adjustment range, 20dBm gain boost, and Auto-Level setting.
- Long recordings can be automatically split into easily manipulated smaller files.
- Audio files include signatures with time, date, and recording details. Utilities are available to embed NG-911 data.
- Storage limits can be controlled on a line-by-line basis to conserve disk space.
- 64kbps G.711 recording is supported for commercial and E-911 uses.
- Windows utilities help locate recordings, producing call lists and evidentiary recordings rapidly.
- Real-time player utility allows live remote monitoring over LAN/WAN.

Host PC Requirements

- Modern versions of Windows, Server 2008/10/12, W7, 8, 10 or later are supported. Windows 9x and ME are not supported. XP and 2003 may work but are not recommended.
- A free USB 2.0 480Mbps or USB 3.0 port is required. Slower 11Mbps USB 2.0 ports are not supported.
- A separate dedicated local SSD or disk array is highly recommended for call storage. Many NAS, USB, and remote shared drives don't offer the performance required for real-time audio streaming. Using a dedicated SSD for call recordings improves streaming performance.
- A dedicated PC or server with 4GB RAM is recommended.

Installation Summary

1. Visit **windowsupdate.microsoft.com** to ensure you have the latest USB drivers available from Microsoft.
2. Connect inputs 1-16 via the Amphenol connector. Each line uses a single twisted pair of wires. Confirm connections. Check wiring.
3. Power-up the logger. Use the buttons on the right to select each line. Make a test call on each line. Use the speaker to monitor while adjusting the recording level using the buttons on the left. The slider controls speaker volume only. Adjust recording levels using the keypad arrows. Confirm sound quality. Peak levels should measure below +3dBm. Excessively high input levels cause distortion.
4. Power up the PC. Insert the CD to install the logging application as described below. Don't connect the USB cable quite yet.
5. After the recording application is loaded, attach the USB cable. Connect directly to a primary 480Mbps USB 2.0 or 3.0 port, not to a hub. Once attached, the USB configuration on this PC should not be changed. Windows will load drivers and the application will need to be restarted if the logger is moved to a different USB port. *Note:* A 480Mbps+ port is required. Long cables and USB extenders are not recommended. 11Mbps USB 1.1/2.0 ports won't work.
6. Select a target SSD or disk array to store recordings. Confirm available disk space. Map a network drive on the workstations used for playback. Use Windows permissions to limit access to authorized users.
7. Determine if you're connected to "wet loops" or dry lines. See below for more information. Select a separate recording trigger mode, either VOX or LOOPSTART for each type of line. In VOX mode, set a trigger level for each line.
8. Install accessory software. Load **Call Investigator** or **Evidence Builder** call cataloging utilities as required on playback workstations. Install **Real Time Player** for remote monitoring. Install **Call Detail Recorder** to record SMDR, ANI, or ALI from RS-232 sources.

Included Hardware

The hardware installation kit includes:



F16W USB Capture Unit



USB "A" to USB "B" cable



IEC Power Cord

Optional Installation Accessories

Telephone wiring accessories are available from DLI at (408) 330-5599 as well as from telecom distributors such as Graybar.

Octopus Cables



Patch Panels



“Y” Connectors



Punchdown Blocks



AMP Cables



“Goof Plugs”



Breakout Panels



Record Tone Generator



Handset & Line Cords



Additional wiring accessories: digital-loggers.com/accessories.pdf

Power and USB Connections

Verify the input voltage is 90-240VAC. Plug the IEC power cord in to power up the logger. Use the internal monitoring speaker as an aid to identifying and connecting inputs, but don't connect the USB cable until – *after*– software installation is completed.

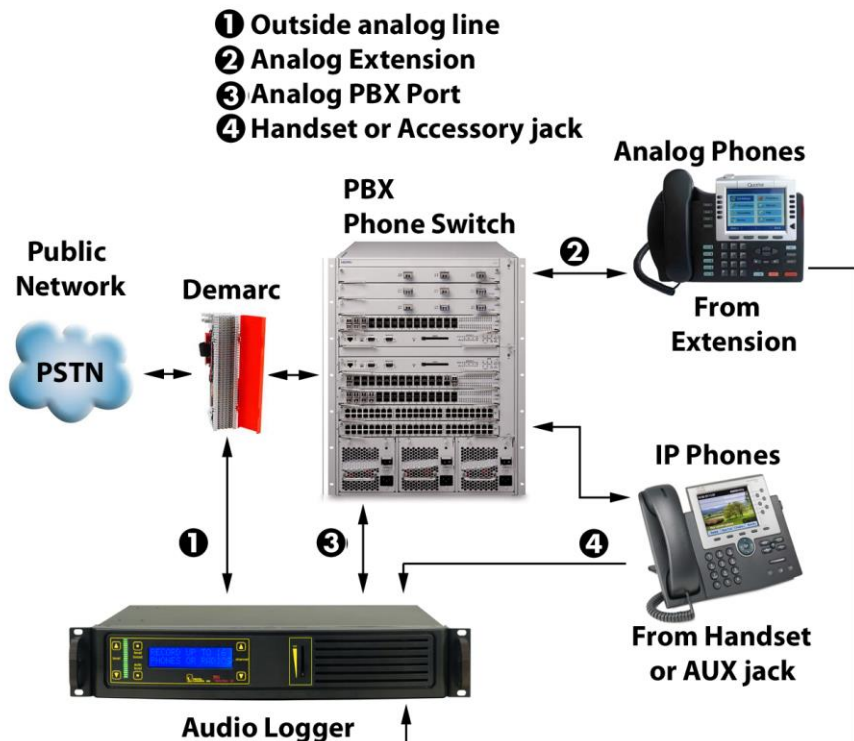
Front Panel Operation



Adjusting recording levels using the front panel is very important. Recording quality depends on proper level settings. Excessive gain causes "clipping" distortion. Switching **Auto Level** on does not preclude level adjustment because the programmable gain amplifier and level booster are connected before the ALC. The **Level Boost** and manual level settings work in unison. If levels are set too high, distortion will occur, even with **Auto Level** enabled.

Level Boost should be enabled only for handsets and microphones with very low input levels (ie. below -20dBm). To reset all level settings to defaults, press and hold the up/ down channel buttons simultaneously.

Audio Logger Connection Points



You can record from...

1. an outside analog line.
2. an analog port on a PBX (such as a voicemail port).
3. an analog extension or speakerphone.
4. any handset, headset, or analog accessory jack
5. microphones or other analog audio sources

To record VoIP phones, tap an outside analog line, handset, or analog accessory jack on the back of the phone. ISDN and Ethernet are not analog audio signals. To record proprietary formats like Nortel ISDN extensions, you can use D/A converter designed specifically for your PBX. DLI carries T1/PRI loggers for direct digital recording of outside lines. PRI loggers are often used in VoIP systems with PRI connections.

Wet Loops vs. Dry Lines

A voltmeter is helpful in determining if your inputs are “wet loops” or dry lines. Wet loops typically carry -48V DC when measured off-hook. Wet loops are used to connect to your telecom provider, to your PBX, or to analog phone extensions. Dry lines such as headsets, radios, microphones and speakers carry audio, but no DC signaling voltage.

After you’ve determined a line type (either wet-loop or dry line), select a recording trigger: either Loop Start or VOX. Outside wet loops and inside analog extensions normally use Loop Start signaling. All dry lines use VOX signaling to trigger recording.

VOX Recording for Dry Lines

To bridge a dry line using Voice Operated Switch (VOX):

- Note: VOX mode is used for dry lines (lines that do not carry signaling voltage). Examples are handset connections, headsets, radios, microphones and speakers.
- Use a punch-down block, handset Y connector, breakout box, or RJ-11 octopus cable to connect each line (two twisted wires) to the logger. Each of the logger inputs connects in “bridge” fashion across the existing wiring.
- Verify that the line audio level is within telecom specifications. Peak level should not exceed +3dBm. Gain controls should be set so that recording levels do not exceed 0dBm. Use **Level Boost** only if the input level is below -20dBm. If the VU meter peaks, the line level is too high. Reduce it using the manual gain controls, turn off **Level Boost**, and/or switch **Auto Level** on.
- Use **Level Boost** for handsets, microphones, and low-level signals only.
- Rename the line label by clicking on the line name. Type the new name and press Enter. For example, a handset tap or analog extension connected to LINE 01 might be renamed “Support Desk.”
- Set the line configuration mode to VOX by clicking on the line mode.

- Set the VOX trigger threshold to a level slightly above the noise floor (background noise level) of each line.

Loop Start Recording for Wet Loops

To bridge a wet loop line using Loop Start (LPS):

- Note: Loop Start mode is used only for “wet loop” analog lines, such as analog extensions and outside POTS lines. Measure the idle DC voltage on the line to confirm that 48VDC is present on a wet loop.
- Verify that audio input levels are within standard telecom specifications. Peak level should not exceed +3dBm. Gain controls should be set so that recording levels do not exceed 0dBm. Disable **Level Boost** for wet loops.
- Using a punch-down block, breakout box, or octopus cable to connect each outside line to the logger. Each line is a two wire pair. Each of the logger inputs connects in “bridge” fashion across the existing wiring.
- Verify audio quality using the speaker on the logger. If the audio sounds distorted, the recording level may be set too high. Turn it down or select **Auto Level**.
- Rename the line label by clicking on the line name. Type the new name and press Enter. For example, an outside wet line connected to “LINE 01” might be renamed “(408) 330-5599”.
- Set the line mode to **LPS** by clicking on the line mode.

Connecting Radios

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 +3dBm. Levels higher than that will cause clipping distortion. If you are bridging a loudspeaker, turn the level down or add a series resistor to attenuate the signal. 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 radio 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. DLI builds custom military intercom and radio loggers as well as specialized recorders for military and E-911/P25 applications.

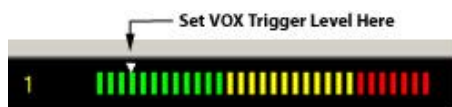
Setting the Record Level

Recording levels can be controlled from the front panel using a membrane keypad: Use the up/down arrows to select a channel, then use the arrows on the left side to the logger to adjust the recording level. The slider-bar and speaker help verify audio quality.

It's important to set the recording level correctly. Low levels are hard to hear. High levels cause distortion in the recordings, making it difficult or impossible to decode Caller-ID or DTMF. This distortion is known as "clipping". Set each line so the VU meter never quite reaches the red peak bars during normal recording. If you're unsure, start by setting the gain to **0dBm**, turn **Level Boost** off and select **Auto Level**.

To reset all level settings to defaults, press and hold both the up and down channel selection buttons simultaneously.

Setting VOX Trigger Level and Timeout



To use VOX mode, first adjust the recording level to avoid clipping as described above. Once the recording level is set correctly, hang up the line and adjust the VOX trigger level about 6dB above the noise floor. 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. On a line with background noise, you'll need a higher trigger level.

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, and then adjust the timeout 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 into multiple recording files during periods of silence.

The VOX trigger level is adjusted by sliding the white arrowhead above the VU meter bar graph.

VOX trigger level settings do not apply to lines operating in the LOOPSTART, Continuous, or Complex modes.

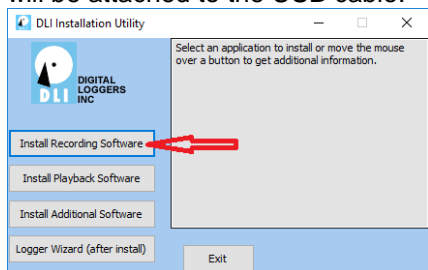
When operating the logger in VOX mode, two settings are vital: VOX TIMEOUT and VOX TRIGGER LEVEL. Set the VOX trigger level slightly above the noise floor (ambient noise) on the line when the phone is on-hook. *If you change the recording level using the keypad on the front of the logger, you may need to readjust the VOX trigger level in the app.*

Unused Lines

Logger inputs are sensitive. Unused lines may record noise coupled from adjacent wiring, or produce feedback or hum in the speaker when Level Boost is enabled. Set unused lines OFF in the application, turn the gain down on unused lines, or terminate the wiring. A ground lug is provided on the rear panel of the logger. You may wire this to a good ground connection to prevent noise from entering via the power cord.

Software Setup and Installation

Inserting the driver CD and allowing setup.exe permission will spawn an installer shell. Start by installing recording software on the machine that will be attached to the USB cable.

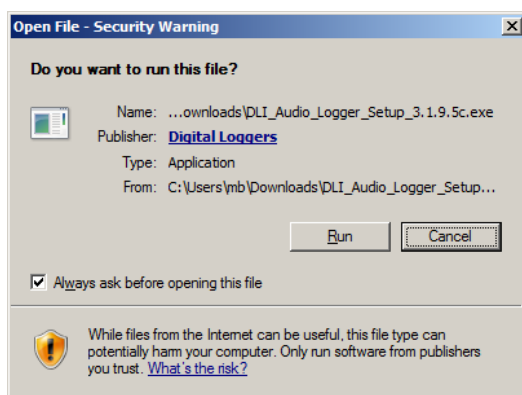


Click on the photo of the logger and click **Install Selected...** to begin installation. The USB cable should still be disconnected at this point.

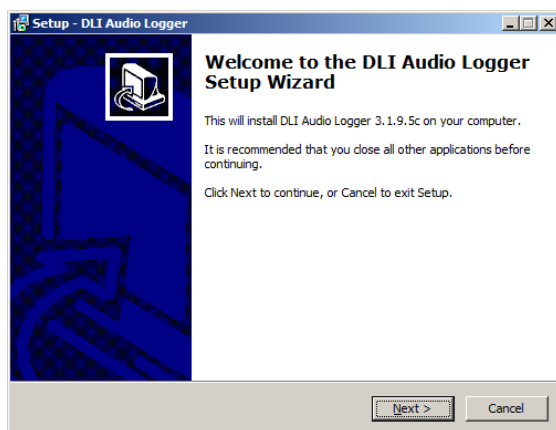


If you haven't updated Windows recently, we recommend a visit to windowsupdate.microsoft.com to obtain the latest USB *host* drivers before installing the logging software. If you're running automatic updates, you should be OK. After updating, insert the logger installation CD into your CD-ROM drive. For a smooth installation, don't connect the logger USB cable until you have completed installing the software drivers.

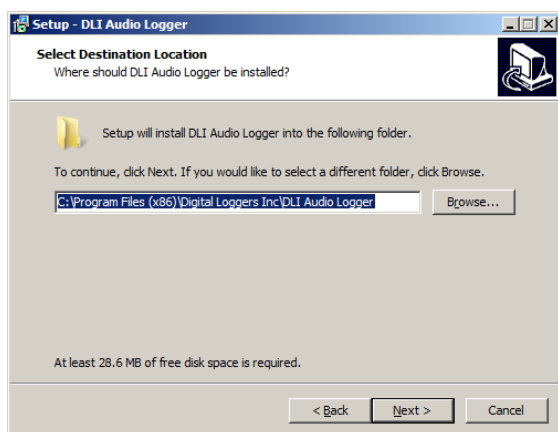
Initial setup starts after you grant permission:



Select RUN, Continue, then select an installation directory and shortcut name.



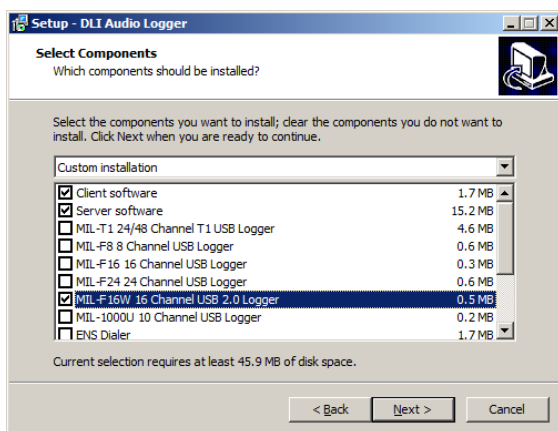
Select an installation destination:



Next, ensure that:

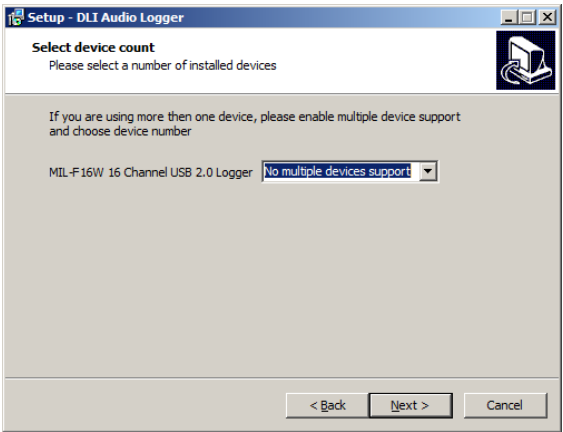
- ☒ Client Software
- ☒ Server Software
- ☒ MIL-16W 16 Channel USB 2.0 Logger

are checked. NB: The MIL-16 USB Logger uses different drivers which are not compatible with this product. Make sure you have selected **F16W** as shown:



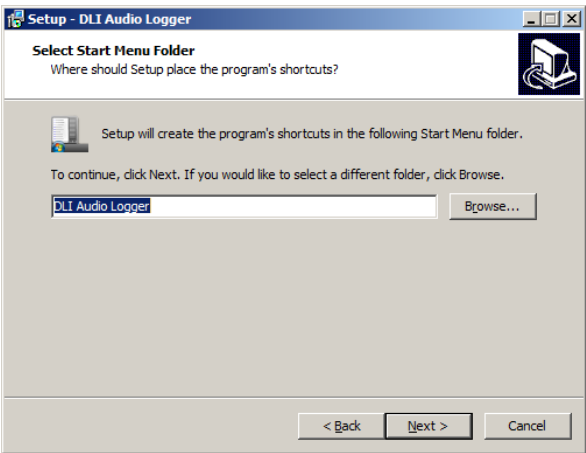
Later, after the server software is installed, client software can also be installed on an unlimited number of workstations connected to your

logger. DLI has no “per user” or “per seat” licensing gimmicks. Feel free to install as many copies as you need.

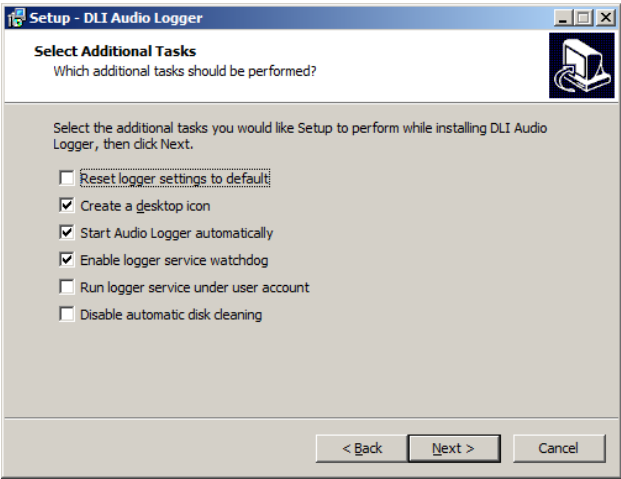


Save time and reduce complexity by only installing multiple device support if you have more than one physical logger installed on this computer. Select “No Multiple Devices...” if you are only installing one physical 16-channel logger.

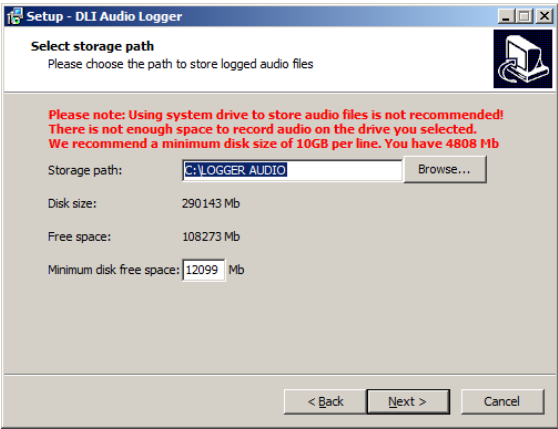
Next, select a start menu for program shortcuts:



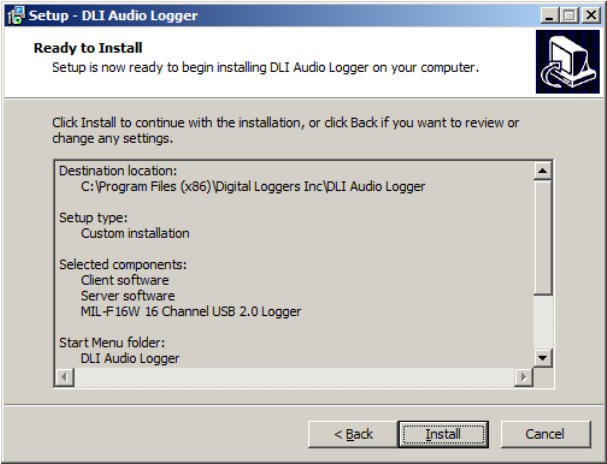
There are a few optional tasks. If this is a re-installation, you can select “Reset logger settings to default”. You have the option of adding desktop icon.



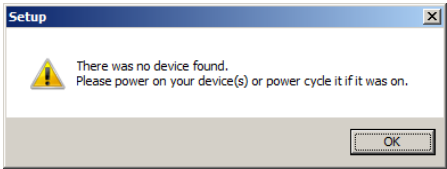
To record automatically after login, check ‘Start Logging Automatically’. If a machine is left unattended, this ensures uninterrupted operation in the event of a power failure and subsequent reboot. The logger service watchdog will automatically restart the logger if it is closed for any reason. You can also disable automatic disk cleaning (file deletion) here.



Storage path is the final selection. We recommend you use a separate hard disk or disk array for file storage. Keeping your audio files on a separate drive will increase performance and reliability. If the disk selected doesn't have adequate space, a warning message appears.

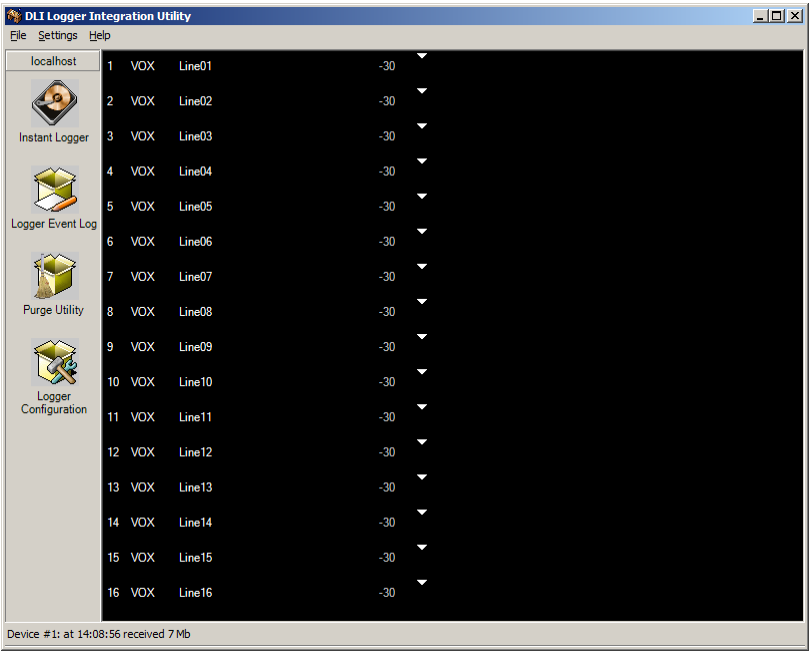


At this point, you're ready to start the installation... If you receive subsequent security warnings from Windows, allow the system to install drivers. After the installation is completed, it's finally time connect the USB cable to the logger. Power-up and attach the logger. Make sure the factory USB cable is used. Connect directly to the host computer, not through a USB hub.



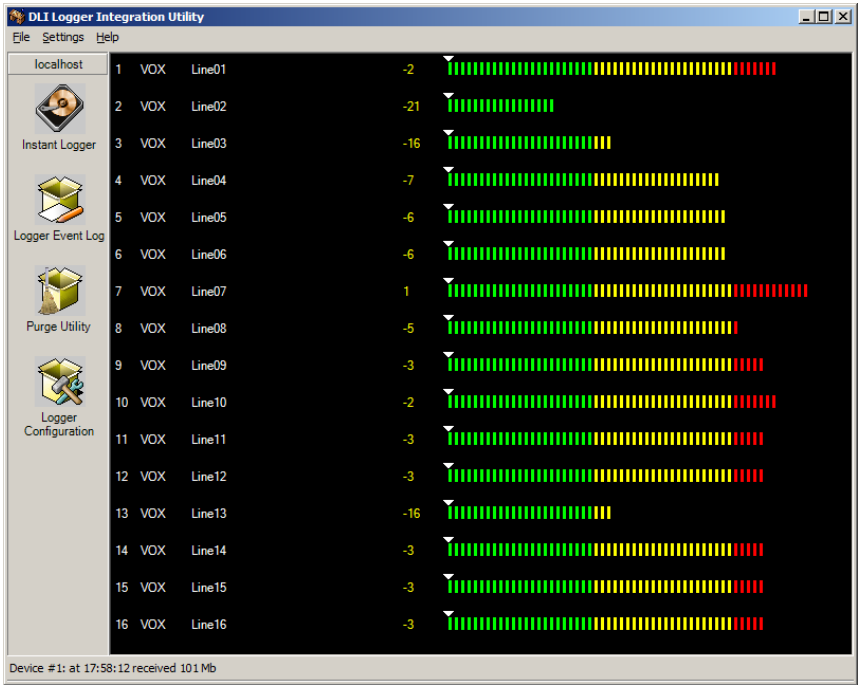
If the recording application couldn't detect the logger, this warning appears. Check power and USB cabling. Power-up and attach the logger. Make sure the factory USB cable is attached.

Once the application and drivers are properly loaded and the logger is recognized, this screen appears:



Note that the level meters are low and uncolored. The application is not recording at this point. When recording is not triggered, the VU meter bars appear “grayed out”. While recording, the bars indicate the VU level recorded in the file.

When lines are active (recording), the audio level is displayed in color on a bar graph like this:

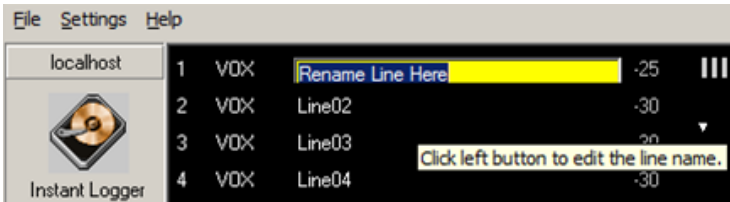


This is the main user-interface screen which includes a graphical VU meter and several other elements. There are several mouse shortcuts on this screen. The most important are:

Clicking on Line Number

Clicking the line number spawns a window displaying the recording files for that line. Files are organized in daily directories. Click on the file to play it. This is a simple shortcut to play files.

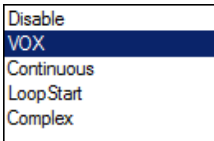
Left Clicking on Line Name



Clicking on the line name allows you to change it. The recording directory name will also change. Press Enter to commit the change.

Right-Clicking on Line Mode

Clicking on line mode, ie. VOX allows you to select one of the five recording modes described below:



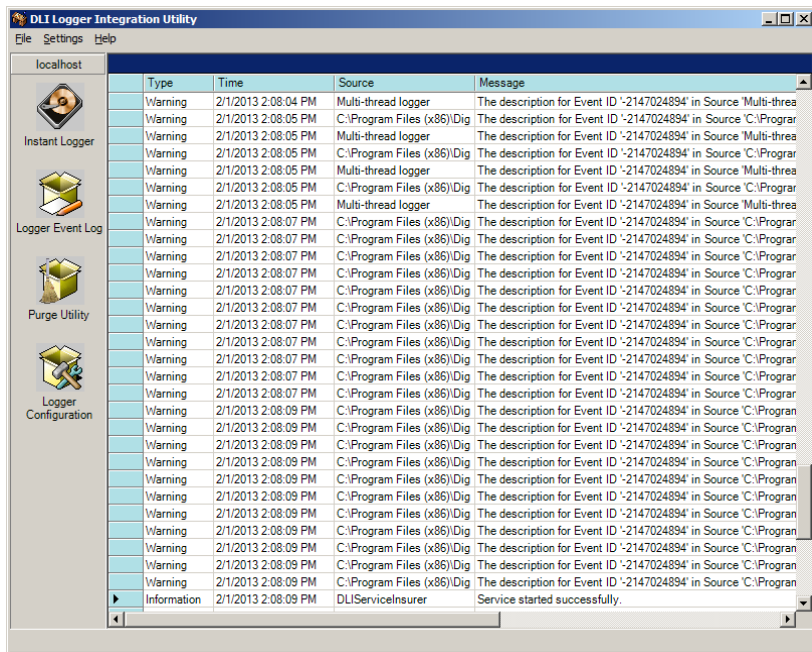
Sliding (dragging) the VOX Trigger Level



The VOX trigger level is the minimum sound level that will start recording in the Voice Operated Switch (VOX) recording mode. To adjust this level in real-time, slide the arrowhead on the VU meter located to the right of the line name. The VU meter is colored gray when recording is stopped. When recording is started, the VU meter is colorized. To properly adjust this level, hang up all phones and turn off all input sources. Check the VU meter level. The level shown with phones “on hook” is called the noise floor. Start with the VU trigger level about 10dBm above the noise floor. Make test recordings. Adjust the level higher or lower as necessary. The period of silence after which recording is terminated is called the VOX timeout. This time value may be adjusted on the line settings page.

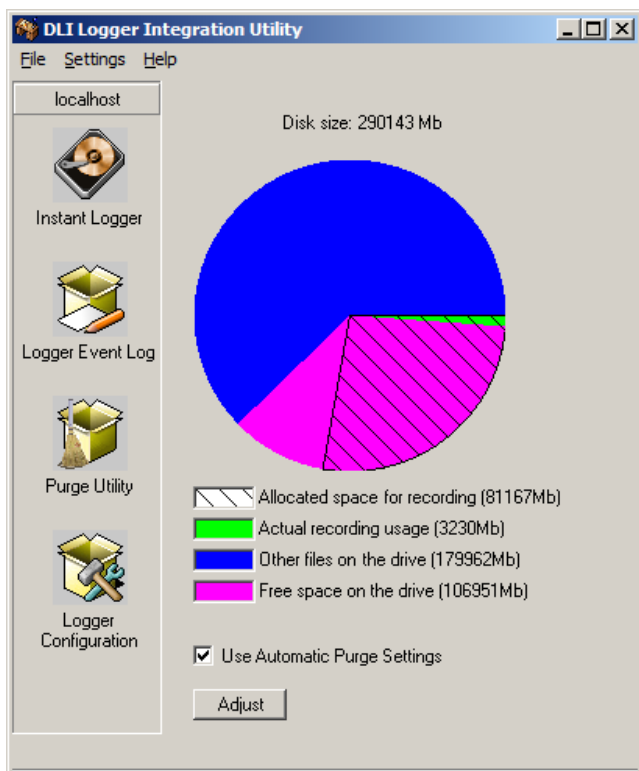
Logger Event Log

A detailed event log can be reviewed by clicking the Event Log icon:



Purge Utility

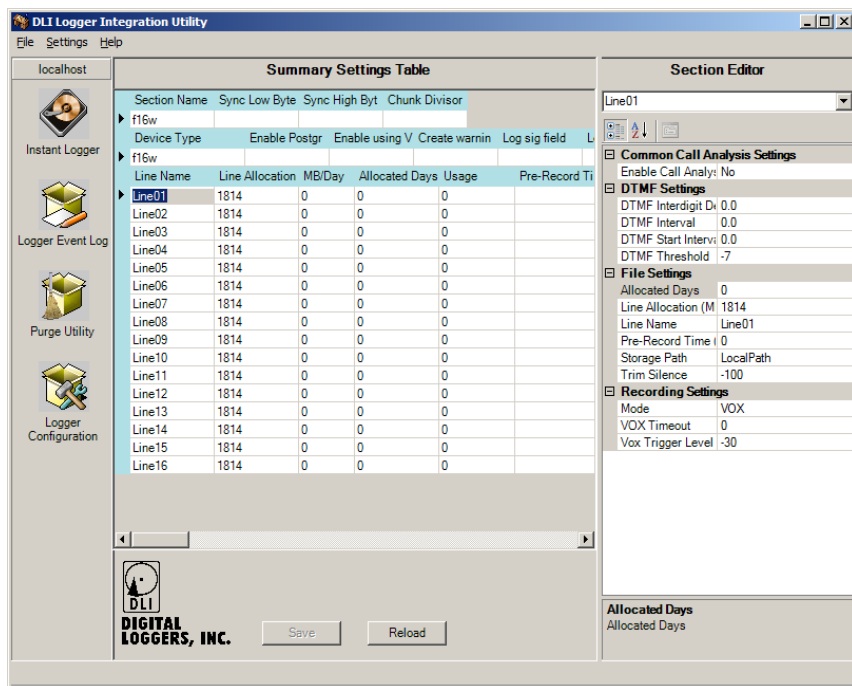
Clicking the Purge Utility Icon brings you to this page.



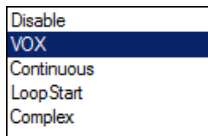
A pie chart displays the used and allocated recording space. When the disk space used for recordings exceeds the preset limits, older recordings are automatically deleted to conserve space. With a large disk, many customers never need to delete old calls. Best audio streaming performance can be obtained using a separate disk for audio files or a disk array for critical applications.

Logger Configuration Page

Clicking the Logger Configuration icon brings you to this page:



To adjust the settings for each line, first click on the line name. The settings for that line appear in the right window pane. The default settings are good for most installations, but the recording trigger mode often needs to be adjusted. Five modes are available:



Disable

Prevents recording for this line. Select this for unused lines.

VOX

Starts and stops recordings automatically based on the sound level on that line. Use this setting for all dry lines, such as radios and handsets. In VOX mode, you will need to adjust the VOX Trigger Level to start recording at a trigger level specified in dBm.

Continuous

Use this always-recording setting to record a line 24x7.

LoopStart

Select loop start for wet lines. This mode monitors the DC voltage on the line to determine if a phone is off-hook.

Complex

Complex mode is used for wet lines and will “pre-record” when sound is detected prior to a phone going “off hook”. It’s useful for catching caller-ID on wet lines. Caller ID is normally transmitted between the first and second ring.

Pre-Record Time

Selecting a pre-recording time will include audio before the VOX or Loop Start trigger was detected. This is useful for recording Caller ID (CID).

Trim Silence

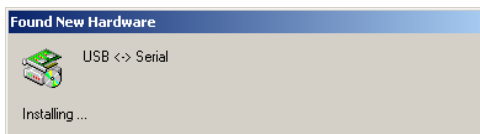
By definition, a VOX controlled recorder will not stop recording until a period of silence occurs. To trim this silence data from the end of a recording file, select a trim level in dBm using the **Trim Silence** setting.

DTMF Settings

DTMF settings do not normally need to be changed if input levels are set correctly. If you must increase recording gain to the point at which clipping distortion occurs, these settings will need to be reduced.

Most other settings are self-explanatory. Be sure to click the “SAVE” button to commit changes. Feel free to contact us at (408) 330-5599 with questions and suggestions.

USB Serial Driver Installation



If you have successfully installed the recording application before connecting the logger, skip this section. If you connected the USB cable –before– installing the software, 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, but here is the procedure for manual installation:



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. This process may repeat up to two times for each logger attached.

Important Configuration Settings

Each of the 16 input channels corresponds to one recording directory. Within each channel directory, the logger creates a subdirectory for each day of recordings.

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.

DLI Logger Integration Utility

File Settings Help

localhost

Instant Logger

Logger Event Log

Purge Utility

Logger Configuration

Summary Settings Table

Section Name	Sync Low Byte	Sync High Byte	Chunk Divisor		
f16w					
f16w					
Line Name	Line Allocation	MB/Day	Allocated Days	Usage	Pre-Record Time
Line01	1814	0	0	0	
Line02	1814	0	0	0	
Line03	1814	0	0	0	
Line04	1814	0	0	0	
Line05	1814	0	0	0	
Line06	1814	0	0	0	
Line07	1814	0	0	0	
Line08	1814	0	0	0	
Line09	1814	0	0	0	
Line10	1814	0	0	0	
Line11	1814	0	0	0	
Line12	1814	0	0	0	
Line13	1814	0	0	0	
Line14	1814	0	0	0	
Line15	1814	0	0	0	
Line16	1814	0	0	0	

Section Editor

Line01

Common Call Analysis Settings

Enable Call Analy: No

DTMF Settings

DTMF Interdigit D: 0.0

DTMF Interval: 0.0

DTMF Start Interv: 0.0

DTMF Threshold: -7

File Settings

Allocated Days: 0

Line Allocation (M): 1814

Line Name: Line01

Pre-Record Time: 0

Storage Path: LocalPath

Trim Silence: -100

Recording Settings

Mode: VOX

VOX Timeout: 0

Vox Trigger Level: -30

Allocated Days

Allocated Days

DIGITAL LOGGERS, INC.

Save Reload

The most important settings are:

Record Trigger Mode

Set this to **VOX** for normal operation. Choose **LOOPSTART (LPS)** for line voltage sensing, or **COMPLEX** for VOX operated pre-recording on Loop Start Lines.

Line Name

Choose “PSAP Desk 1” or a similar useful extension 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

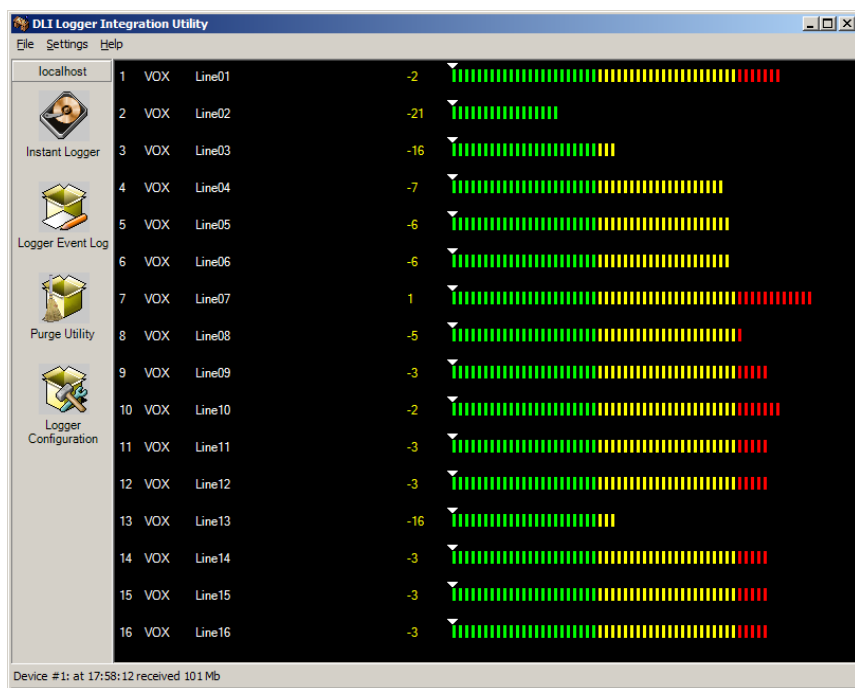
The logger can automatically delete old calls to conserve the amount of disk space used by each channel. This setting controls the maximum amount of disk space used by each channel. When disk space is low and this threshold setting is reached, oldest calls are automatically deleted to free disk space. 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, and then evaluate the usage on a line-by-line basis.

Enable Call Analysis

If Caller-ID (CID) and touch tone dialing (DTMF) tones are present in the recordings, the logger can analyze the audio to extract this information. Having the number dialed makes it easier to organize and find calls. CID is a paid subscription service in most areas. CID is not available on a handset connection, or if a phone is answered before the second ring. Enable analysis to decode these tones.

Using the Logging Application

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



The recording mode for each line, ie VOX, LOOPSTART (abbreviated LPS) or OFF is displayed to the left of the line name. The recording level for each line appears decimal and color bar graph format 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.

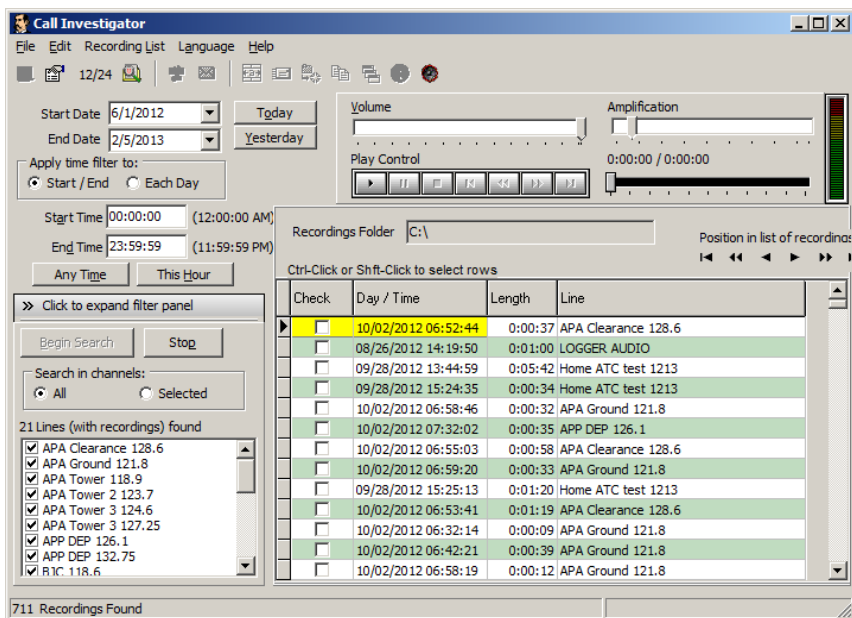
Click on the line name to explore the recordings for that line.

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. Although clicking on the file is often the easiest way to play individual recordings, several applications are available to manage, sort, and locate recordings.

Call Investigator Playback App

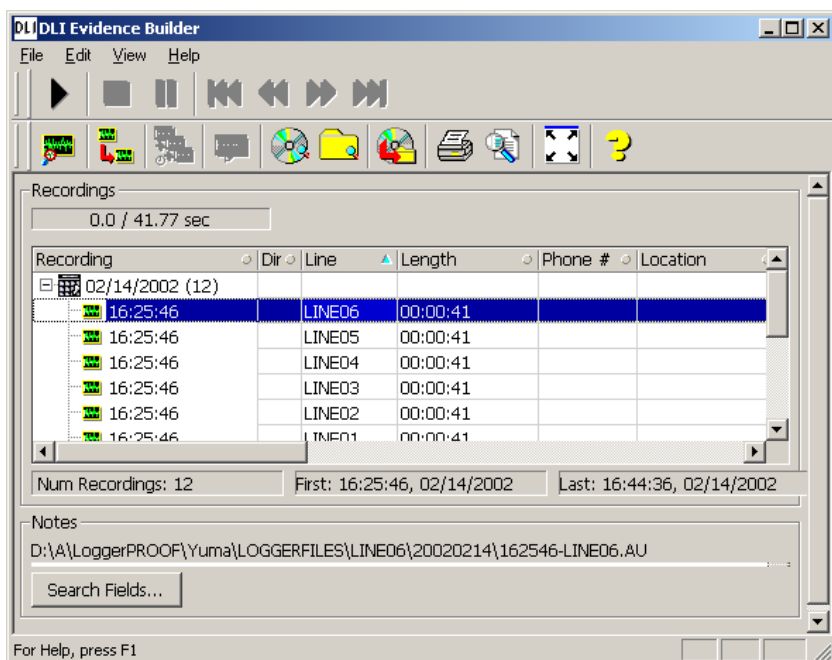


Call Investigator is an efficient, easy-to-use utility for selecting, playing and exporting audio files. Find it on the CD under “Install Playback Software”

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. Click **Help** link for more detailed usage.

Call Investigator can be found on the installation CD. Earlier versions can be automatically updated over the web.

Evidence Builder Playback App

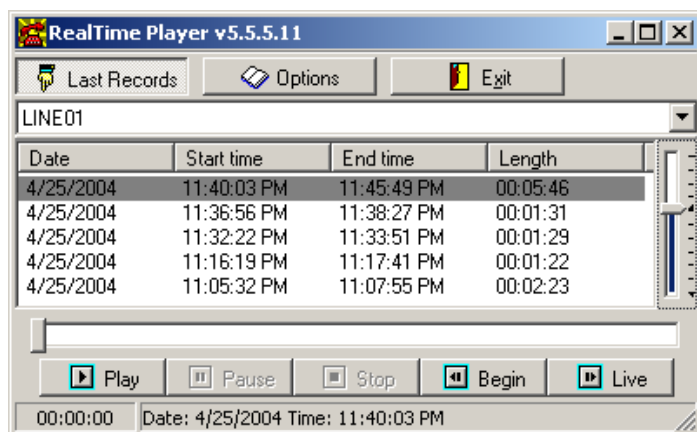


Evidence Builder Software is a powerful program used to locate and analyze recordings. Load this on a workstation and point it at the recording directories to analyze incoming calls, create call lists, sort calls, and search by DTMF or Caller-ID. It also has unique abilities like spreadsheet export, and the ability to add spoken audio time and date stamps to recording files. You can easily concatenate multiple files and launch audio editing programs from Evidence Builder.

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 *top* recording directory. The screen display can be customized by in the **Preferences** menu. Click **Help** link for more detailed usage.

Network Real Time Player



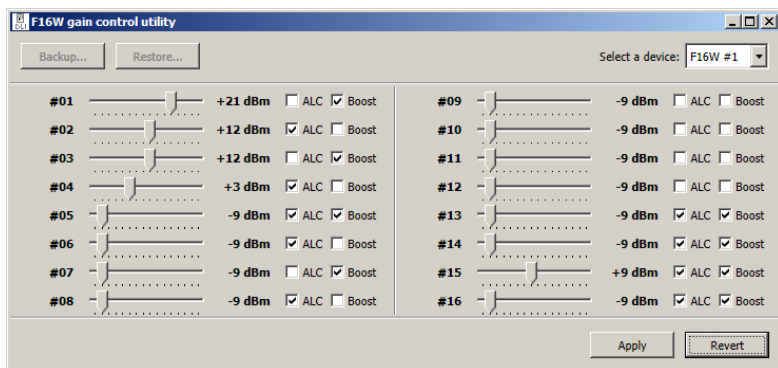
To play a call recording, simply click on the recording file. This plays a recording, but not in real time.

Remote users with access privileges may prefer to monitor calls in real time via LAN or WAN connections using this application.

A Real Time Player application is provided on the distribution CD. It's downloadable from: digital-loggers.com/RTP.exe

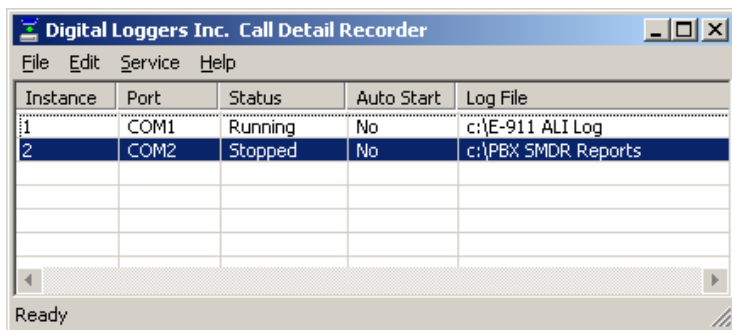
To remotely monitor calls, load the Real Time Player application on a workstation. Click **Options**. Use the browse button to select a source directory with archived or incoming calls. Live calls are highlighted. Select a call and press **Play**, or press **Live** to continuously monitor calls as they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

Remote Level Adjustment



For remote maintenance, a level adjustment utility is provided. Select either ALC (Automatic Level Control) which is equivalent to pressing Auto Level on the front panel, or use the slider for a fixed gain level. Press **Apply** to commit changes. Level settings are stored in the logger itself.

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 CDR from: digital-loggers.com/CDR.exe

FAQs, Wiring Tips and Jack Pinouts

These pinouts and FAQs are included to assist in common installations. A complete telecom wiring reference is beyond the scope of this guide, so feel free to contact us at (408) 330-5599 or support@digital-loggers.com for additional help. Please send your suggestions on improving this manual to engineering@digital-loggers.com

How do I connect the logger to a PBX?

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

Record from incoming lines.

This method records from the outside party's perspective. The recording will follow the caller as he is transferred through the PBX. Incoming lines are commonly recorded for quality assurance. For agent analysis or 911 call center recording, a console output or handset tap is usually a better connection point. 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, or enable **Auto Level**.

Tap the handsets, AUX jack, dispatch console, or analog station sets.

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 listen-in from the dispatcher's perspective. Recordings made from these connections will typically include the phone conversation, radio dispatch, etc. You will record everything the agent or dispatcher hears. Most consoles have a dedicated recording output. Handset taps may be connected to any phone, including VoIP extensions. When recording from a handset, Caller-ID won't be included in the audio stream, but it may be logged using SMDR.

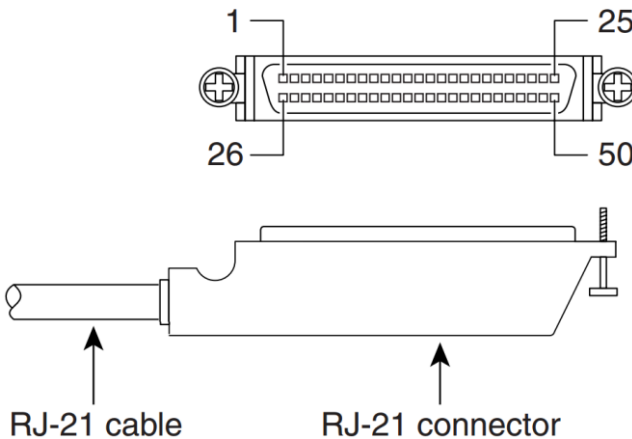
Connect to a PBX port.

This is a 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 familiarity with PBX programming.

Logger Input and RJ-21X Connection / Color Codes



Typical RJ-21 Audio Logger Mating Connector



An RJ-21 cable is a standardized phone cable 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 "demarc" or attachment point for telcom equipment. The "demarc" 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 "AMP" type. These are very common connectors used on PBX, KSU, PBC, and distribution frames.

The connector itself is sometimes called an "AMP", "CHAMP", "blue ribbon", or "gray phone" connector. RJ-21 connectors are polarized (male and female) to prevent an installer from accidentally connecting an internal extension to outside lines (or vice versa). Although the keying is designed to prevent inverted installation, it is possible to force a plastic connector on in reverse.

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. The logger can be directly connected to most RJ-21x jacks via an Amphenol cable.

RJ-21 Color Code



RJ-21 cables follow the color code standard used in all telecom wiring: Line 1 is the blue & white pair, Line 2 is orange & white pair, etc. as shown.

The logger pinout complies with this telecom standard, but *pins 17-24 and pins 42-49 (lines 17 to 24) are not connected.*

The 25th pair provides an earth ground connection.

When mounted correctly, a KT-66 block will have line 1 on the uppermost pair, and line 25 on the bottom of the block.

Logger Input Connector Wiring

Line	Signal	RJ-21 Pin
1	Ring	1
	Tip	26
2	Ring	2
	Tip	27
3	Ring	3
	Tip	28
4	Ring	4
	Tip	29
5	Ring	5
	Tip	30
6	Ring	6
	Tip	31
7	Ring	7
	Tip	32
8	Ring	8
	Tip	33

Line	Signal	RJ-21 Pin
9	Ring	9
	Tip	34
10	Ring	10
	Tip	35
11	Ring	11
	Tip	36
12	Ring	12
	Tip	37
13	Ring	13
	Tip	18
14	Ring	14
	Tip	39
15	Ring	15
	Tip	40
16	Ring	16
	Tip	41
	GROUND	25,50

RJ-21 Taps and Adapters

To connect 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. Another useful connector is an RJ-21 "Tap" or "Y" cable. These optional parts and cables are available directly from DLI and through telecom dealers.

RJ-12 Handset Jack and AUX jack Connection

A handset jack is a small 4 pin connector which carries the speaker and microphone signals between a telephone and handset. Many phones including most Cisco VoIP phones have an AUX connector which provides analog audio output to a headset or logger. This is a good place to bridge an audio logger, since both incoming calls and intercom conversations for a single extension may be recorded at this point. The default VOX and ALC settings will work fine with the typical handset level with the Gain Boost setting enabled. To record from a handset, "backhaul" the audio to the logger via either a "Y" connector, and AUX jack, or make the connection within the phone itself. This can be done with an unused pair on an existing cable. *Smaller handset jacks won't make a reliable connection in larger RJ-11 jacks.* Y connectors for the smaller handset RJ-12 plugs, and cables with RJ-11 to RJ-12 jacks are available from DLI.

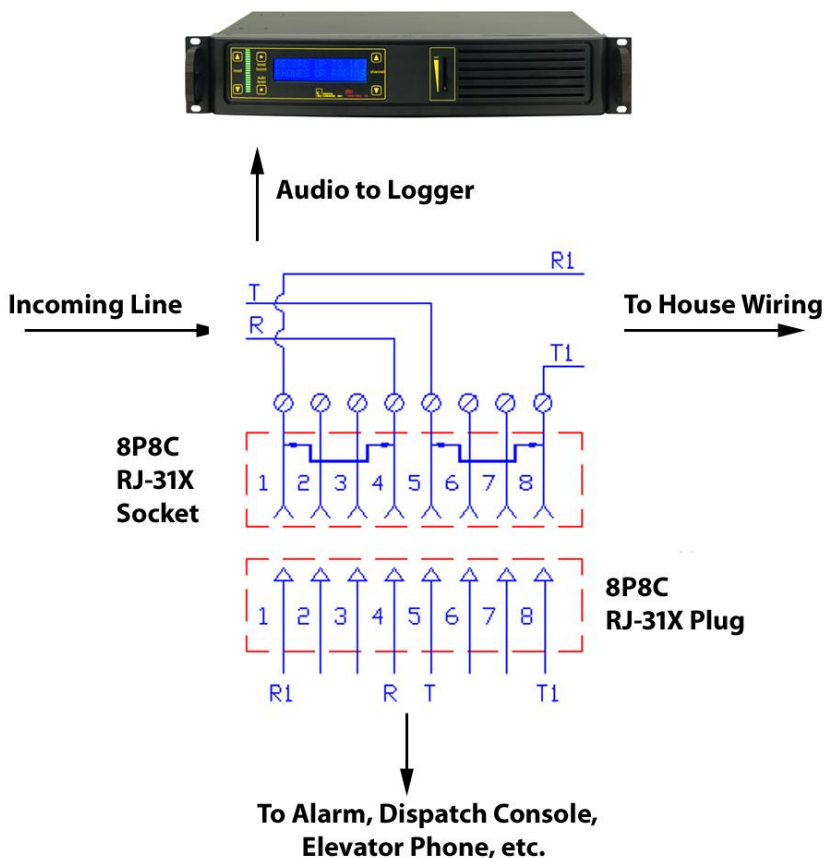
RJ-25 Jack Connection

An RJ-25 jack is a standard 6 pin, 3 pair telephone jack. Each colored pair carries one analog signal.



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

Correct RJ-31x Logger Wiring



Alarm and security companies 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 with an internal switch. Similar wiring may be done on KT-66 or W110 punch down blocks with bridging clips. Each 66 block handles 3 lines of 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 commercial alarm installations, fire alarms, elevators, and 911 dispatch consoles. RJ-31X jacks are required for

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 911 installations, a dispatch console will be rerouted to a backup console by connecting the backup console to the "house phone" connections on pins 1 and 8. **Always connect the logger to the OUTSIDE (Socket Side) of the FIRST jack socket, pins 4 & 5.**

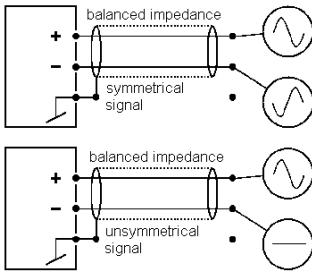
Some technicians may install a "shortcut" or de-populated four-terminal version of the dialer jack. In the shortcut dialer jack, the jumpered terminals (which supervise the presence of the plug) are missing. This "shortcut" jack can't detect the presence of the modular plug. It is best to install a fully 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.

RJ-45, RJ-61 and T568 Jack Connection

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. Although originally designed for analog audio, RJ-45 jacks are now most commonly used in Ethernet applications. Eight pin jacks can carry four analog circuits. An Ethernet jack can't be connected to an analog input. Listed below are the correct color codes for 8-pin telecom and Ethernet jacks.

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

Balanced vs. Unbalanced Lines



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

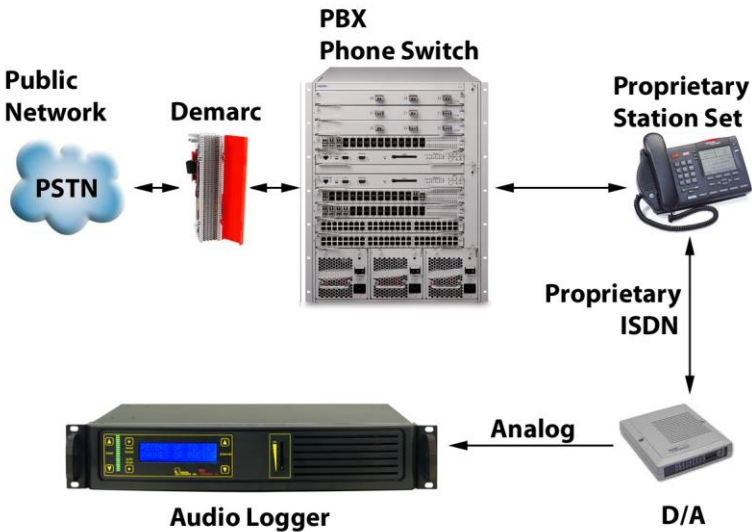
line, or a bad connection. The problem is often worse in the winter, when outside lines are wet and leakage to ground occurs along the line.

Audio is transmitted down relatively short 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. In other words, either of the logger input lines (known as Ring and Tip) can be grounded.

D/A Converters

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.

Using a D/A converter to Record Proprietary Extension Formats



Since there is no "standard" for proprietary digital station set interconnects and line formats, D/A converters are best purchased from the manufacturer of the PBX. PBX manufacturers often call these “recording adapters”.

Multi-channel D/A converters are available as stand-alone units or PCI cards. These cards are sold by Dialogic (now Intel), Algo, and others. Every proprietary phone switch uses a unique non-standard format, so

there are hundreds of D/A converters available. Be sure to purchase one that matches your station sets. DLI carries some Algo products.

Recording Consent and Warning Tones

Many states require the consent of two parties prior to recording. In locations where there is “no reasonable expectation of privacy”, such as 911 PSAPs and prisons, consent is not normally required. Most PBXs can be easily set up to provide a warning such as, “Your call may be monitored and recorded for quality assurance...” DLI manufactures optional record tone generators which inject a periodic warning tone on outside analog POTS lines or extensions. DLI can’t offer legal advice or information on admissibility of recordings, so check with your attorney to confirm compliance with state and local laws prior to recording.

Recording File Format

Audio files are recorded using the industry standard μ -law (pronounced “mew-law”) format. Files are grouped in directories, with each channel and date corresponding to a single directory. The line name corresponds to the recording directory name, and can be changed. File names are sorted by start time in ascending order. All time values are standard 24-hour military time. A separate subdirectory is created for each day. The following example shows how the time and date stamps are directly coded into the file names:

Channel Directory	Day Subdirectory	File Name
LINE01	20130403	212450da.au

Path: Recording_Directory/LINE01/20130403/212450da.au

In this example, a call arriving on line one, on April 3rd, 2013 was recorded, starting at 21 hours, 24 minutes, and 50 seconds (9:24:50PM). μ -law files are recorded at a 64kbps=8KBps data rate, so there is no audio quality loss due to compression. The length of each file is directly proportional to the length of the call. Windows Media Player displays the exact elapsed recording time.

Recording header files also contain human-readable .XML tags with call information. These fields may be used to create third-party applications.

Related Products

DLI manufactures these related products:

Record Tone Generator



Single and Multi-Channel Military Loggers



T1 / PRI Logger



T1 and DS3 Taps



Learn more: digital-loggers.com

Support

Please visit 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 email support@digital-loggers.com

loggers.com. We'll be glad to help. Suggestions for product improvements including manual corrections are welcome:
engineering@digital-loggers.com

Manual Updates

Download an updated manual:



Digital-Loggers.com/F16WMan.pdf

Specifications

Enclosure material	CRS steel powder coated
Frequency Response	300-3400Hz +/- 2dB
Input impedance	>10K ohms DC Blocked, fully balanced
Input isolation	2000V min 30s test to ground
Line surge suppressors	600W SIDAC
LCD	2x16 Backlit with powersave
Operating temperature	-20° to 120°F, -28° to 49°C
Power cord	C13 18AWG stranded, UL SJT FX3CVW1
Power requirement	90-240VAC 50-400Hz autosense 8W nom.
Weight	Bare unit 11.2 lbs, Ship wt. 12.4 lbs
Recording Rate	u-Law G.711 64kbps, 8kBps
REN	0.1
Size	19" RETMA rack. 17" width with ears removed. 1-U 3.50" height, 6.25" depth
USB Data Rate	480Mbps required

Index

1

11Mbps ports · 3

2

24-hour military time · 44

4

480Mbps USB 2.0 · 3
-48V DC · 8

8

8KBps data rate · 44

A

ALC · 34
Algo · 43
ALI · 34
AMP · 37
Amphenol cable · 37
Amphenol connector · 3
Analog accessory jack · 7
analog extension · 7
analog port · 7
ANI · 34
Audio files · 44
Auto Level · 35
Automatic Level Control · 34
AUX jack Connection · 39

B

Balanced vs. Unbalanced Lines · 42
bar graph · 19

C

Call Investigator · 31
Caller-ID · 10
CHAMP · 37
Channel Configuration Settings · 27
Color Codes · 36
Complex mode · 24
Continuous · 24

D

D/A converters · 43
D/A Converters · 43
DC signaling · 8
Digital station set · 43
Directories · 44
Disk space · 3
Distortion · 3
Dry lines · 8
DTMF Settings · 24

E

Elapsed recording time · 44
Evidence Builder · 32
Explore Calls · 30

F

File names · 44

G

Gain controls · 8

I

Included Hardware · 4
Input Connector Wiring · 38
Input impedance · 46
Installation Summary · 3
ISDN · 7

L

Line Mode · 20
Line Name · 20, 28
Logger Configuration · 23
Logger Event Log · 21
logger service watchdog · 16
Logging Application · 29
LoopStart · 24
LOOPSTART · 3

M

Manual Updates · 46
Maximum Megabytes · 28
Military Loggers · 45
Multiple device support · 15

N

Network drive · 3

Nortel / Avaya ISDN · 7

O

Outside analog line · 7

P

Package Contents · 2
Power-up · 3
Pre-Record Time · 24
Purge Utility · 22

R

Real Time Player · 33
record automatically · 16
Record Tone Generator · 45
Record Trigger Mode · 27
Recording Consent · 44
Recording File Format · 44
Recording levels · 3
Recording Rate · 46
Related Products · 45
Remote Level Adjustment · 34
REN · 46
RJ-12 Handset Jack · 38, 39
RJ-21 cable · 36
RJ-21 Color Code · 37
RJ-21X Connection · 36
RJ-25 Jack · 39
RJ-31x · 40
RJ-45, RJ-61 and T568 Jack · 41

S

Setting the Record Level · 10
SMDR · 34
Software Setup and Installation · 11

Speakerphone · 7
Specifications · 46
Storage path · 17
Suggestions · 46
Support · 45

T

T1 / PRI Logger · 45
Test call · 3
Timeout setting · 11
Trim Silence · 24
Twisted pair · 3

U

u-law · 44
Unused lines · 11, 24
Updated manual · 46
USB Data Rate · 46

USB drivers · 3
USB Serial Driver Installation · 25

V

VOX · 3, 24
VOX TIMEOUT · 11
VOX Trigger Level · 20
VOX TRIGGER LEVEL · 11
VU meter · 10

W

Warning Tones · 44
Warranty · 50
Wet loops · 8
Windows Media Player · 44
Windows permissions · 3
Wiring accessories · 5

Limited One Year Warranty

The terms of this warranty may be legally binding. If you do not agree to the terms listed below, return the product immediately in original unopened condition for a full refund. This product is designed for indoor use only. Exposure to moisture will void the warranty. The purchaser assumes the entire risk as to the results and performance of the unit. No agency, country, or local certifications are included with this unit. It is the responsibility of the user to obtain such certifications if they are necessary for the customer's application. DLI's entire liability and exclusive remedy as to defective hardware shall be, at DLI's option, either (a) return of the purchase price or (b) replacement or repair of hardware that does not meet DLI's quality control standards, when said hardware has been returned through proper RMA procedure. DLI's liability for repair or replacement is to DLI's customer ONLY. Warranty service does not include hardware upgrades. No warranty service will be provided without an original invoice from DLI and an RMA number provided by tech support. RMAs must be shipped prepaid. RMA numbers are valid for 15 days. Warranty does not cover products modified, subjected to rough handling, or used in applications for which they were not originally intended. Physical damage caused by customer or in transit to DLI is not covered under warranty. No oral advice or verbal warranties made by DLI's employees, dealers, or distributors shall in any way increase the scope of this warranty. DLI makes no warranty as to merchantability or fitness for any particular purpose. DLI assumes no liability for incidental or consequential damages arising from the use-of or inability-to-use this product. This warranty gives you specific legal rights. You may have other rights that vary from state to state. Some states do not allow the exclusion of liability for consequential damages, so some limitations may not apply.



**DIGITAL
LOGGERS, INC.**

2695 Walsh Avenue
Santa Clara, CA 95051
Digital-Loggers.com



©1996-2018 Digital Loggers Inc. Rev 3.2.4.0