EchoBridge

Radio-over-IP Linking Appliance

MANUAL

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Table of Contents

Warranty iii

Intended Audience. iii

Quick Start 1

Introduction 1

About EchoLink. 3

- EchoLink Terminology 3

Conferences. 4

Getting Started. 4

- Firewall Setup 5

Hardware Description 5

Network Setup 6

USB Connection 7

Initial Setup. 8

- Tuning 9

Web Interface. 11

- Status Icons 12
- Managing Conference Participants 12
- Using the EchoLink Directory 13
- Favorites 13

Settings 14

- Conference Settings 14
- Radio Settings. 16
- Network Settings 19
- Device Info 21

DTMF Command Reference. . 22

Restoring Default Settings . . 23

Firmware Updates 24

Network Dependencies 25

Revision History 26

Acknowledgements 27

Warranty

If this product fails due to defects in materials or workmanship during the period of one year from the date of purchase, Argent Data Systems will repair or replace the device, at our option.

This warranty covers defects in manufacturing discovered while using the product as recommended by the manufacturer. The warranty does not cover loss or theft, nor does coverage extend to damage caused by misuse, abuse, unauthorized modification, improper storage conditions, lightning, or natural disasters.

Should the product fail, your sole recourse shall be repair or replacement, as described in the preceding paragraphs. We will not be held liable to you or any other party for any damages that result from the failure of this product. Damages excluded include, but are not limited to, the following: lost profits, lost savings, lost data, damage to other equipment, and incidental or consequential damages arising from the use, or inability to use this product. In no event will Argent Data Systems be liable for more than the amount of your purchase price, not to exceed the current list price of the product, and excluding tax, shipping and handling charges.

Argent Data Systems disclaims any other warranties, expressed or implied. By installing or using the product, the user accepts all terms described herein.

To obtain service under this warranty, contact us at **support@argentdata.com** or at **1-800-274-4076**.

Intended Audience

The EchoBridge device and this manual are intended for amateur and commercial radio operators seeking to establish an EchoLink node or create a private radio-over-IP linking network. A basic level of familiarity with radio technology and IP networking concepts is assumed.

Quick Start

While we recommend at least skimming over this manual, we realize that experienced EchoLink users may be eager to get started right away. Assuming you have a suitable radio interface cable already and don't have any special network setup requirements, here are the steps to get your node on the air:

- Plug in the radio cable, network cable, and USB C power cable
- Connect the USB cable to a suitable power source
- Visit http://find.argentdata.com to locate your device
- Alternatively, open the file StartHere.html on the EchoBridge's drive
- Enter your EchoLink login information in Settings | Conference
- Check radio settings under Settings | Radio, particularly HT PTT
- If needed, allow UDP ports 5198-5199 and TCP port 5200 through your firewall

Once successfully logged in, the antenna icon in the upper right of the browser will turn from red to white. The device is now online and ready to accept or initiate connections. Be sure to check under Settings | Device Info for firmware updates.

To test your setup, use a radio other than the one connected to the EchoBridge and enter '9999' on the keypad to connect to the ECHOTEST service, which will replay your transmissions to check your audio. Enter '#' to disconnect.

Introduction

The Argent Data Systems EchoBridge is a dedicated network linking appliance for 2-way radios, with an emphasis on compatibility with the EchoLink™ network. The EchoBridge uses voice-over-IP (VoIP) technology to provide a conduit for audio between distant radio networks. It can operate independently, connecting EchoBridge devices to each other without the need for a directory service, or it can connect to the EchoLink directory service to participate in a worldwide network of thousands of amateur radio stations and repeaters.

In typical usage, the EchoBridge is connected to a power supply via a USB type C connector, to a 10/100 Ethernet network, and to a radio (handheld, mobile, or base station) using the front panel RJ45 connector. The radio connector provides audio in and out, push-to-talk (PTT) signaling, which may be combined with the mic audio line for some types of handheld radios, and an optional squelch / carrier operated relay (COR) input. The COR input, typically only provided by mobile and base station radios, indicates when the radio is receiving a signal, whether audio is present or not. Handheld radios are generally limited to using voice activated (VOX) mode to detect receive activity.

Because the EchoBridge operates entirely on the audio side of the radio, it is completely agnostic with regards to the band, power, and modulation format of the radio - it will function just as well with an analog FM radio as with a DMR radio, so long as the required signals are provided by the radio.

Once connected to a radio, inbound and outbound connections may be made to and from the EchoBridge. Inbound connections, initiated by remote stations over the network, may optionally be restricted to registered EchoLink users, to specific stations or IP addresses, or by password.

Once a remote station has connected to the EchoBridge, it will receive any audio the EchoBridge's connected radio receives, and any audio sent by the remote station will be transmitted over the EchoBridge's radio.

Outbound connections may be initiated locally, using the EchoBridge's web interface or command console, or by DTMF (Touch-tone) command over the air. DTMF commands may also be used to trigger macros that can, for example, connect or disconnect multiple preset stations.

About EchoLink

EchoLink was originally developed by Jonathan Taylor, K1RFD, in 2002. It began as a Windows application designed to be compatible with the earlier iLINK application by Graeme Barnes, M0CSH. Today EchoLink comprises a collection of applications and services, including the Windows client, an Android app, the directory servers that provide a centralized listing of EchoLink stations and help facilitate connections between stations, and proxy and relay systems to assist with connections for users behind firewalls and network address translation (NAT) gateways.

Participation in EchoLink is restricted to licensed amateur radio operators. Prospective users must provide proof of their identity and license status (via the website at https://www.echolink.org/validation/) to complete registration with the system.

Traditionally, EchoLink nodes have been implemented as Windows PCs with attached radio interfaces. The EchoBridge takes the place of both the PC and the radio interface, reducing complexity while requiring a tiny fraction of the electrical power of a typical PC.

EchoLink Terminology

EchoLink-connected devices are referred to as 'nodes' and have a node number permanently assigned by the directory service. EchoLink distinguishes between four types of nodes: repeaters, links, users, and conferences. Repeater nodes provide a link to a VHF or UHF radio repeater, and are denoted by a -R callsign suffix. Link nodes provide a link to a simplex channel and have a -L suffix. Individual user nodes have no suffix. Conference nodes serve as virtual meeting rooms and are identified by *asterisks* around their callsign.

Functionally, there is no difference between -R repeater nodes and -L link nodes. Both provide access to a radio channel; the naming convention simply helps to convey the purpose of the node. Individual user nodes typically represent one user's PC or mobile device, and while they can usually accept inbound connections they do not normally have a radio link of their own. Conference nodes are also usually without a radio link of their own, serving only as hubs to connect other nodes, but again the naming convention is merely for convenience.

In this manual, we use the terms ‘station’ and ‘node’ more or less interchangeably. We use ‘local station’ to indicate a user accessing the EchoBridge via radio, and ‘remote station’ for nodes connected via the network.

Conferences

An important concept in EchoLink and in the EchoBridge’s operation is that of the conference. VoIP connections are normally one-to-one, like a phone call. A conference server acts as a reflector, relaying the audio from the currently speaking participant to all other participants in the conference. Text messages are relayed as well.

The EchoBridge hosts a single conference of up to ten stations. The conference can be thought of as a room where remote stations gather and listen to, or talk through, the EchoBridge’s radio. When a station begins talking, their audio is sent to the other stations in the conference and to the radio. Only one station may talk at a time.

Conference participants may have their audio restricted by the EchoBridge operator in two ways - with the ‘mute’ option, and the ‘lurk’ option. When a station is set to ‘mute’ mode, their transmitted audio is ignored and is not passed to other conference participants or the radio link. They can listen, but not speak.

The ‘lurk’ option does the opposite and ensures that the remote station does not receive any audio from the conference or radio link, but their transmitted audio is still heard. This is typically used in situations where the EchoBridge operator wants to monitor one or more remote conferences or radio links without disturbing them.

Conference participants may exchange short text chat messages. Those running a suitable client will also see a status display provided by the EchoBridge that includes a user-defined welcome message and a list of conference participants, with an indicator to show who is talking.

Getting Started

A few tasks need to be accomplished before the EchoBridge can be used. The first is to make all necessary power, network, and radio connections. All of these are described below.

Once connected, the device must be configured. The bare minimum settings needed include audio levels, PTT mode, and squelch mode for the radio interface, and EchoLink login information if EchoLink is to be used.

Configuration may be done via the web interface or through a command shell accessed via the USB interface.

Firewall Setup

EchoLink uses UDP ports 5198 and 5199 for VoIP data, as well as TCP port 5200 for the connection to the directory server. The directory server helps mediate connections and often no special firewall setup is required, but if you find that inbound connections to the EchoBridge fail, you may need to access your router's configuration and set up port forwarding so that UDP ports 5198-5199 are forwarded to the EchoBridge's IP address.

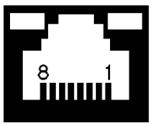
The EchoBridge does not have a general-purpose operating system and executes code from flash memory, which makes it immune to the kinds of worms and malware that might infect unprotected Windows or Linux systems, but network attacks could still cause a denial of service and it's a good idea to keep the device firewalled from the public internet.

Hardware Description

The EchoBridge measures 3.4" by 2.3" by 1.1" (86mm by 58mm by 28 mm). Its front panel has an RJ45 jack for all radio connections. Two LEDs (one red and one green) on the RJ45 jack indicate activity. The rear panel has a 100Base-T Ethernet jack with link and activity lights, and a USB type C jack for power and optional connection to a PC. Power may also be supplied via the RJ45 radio jack. Any standard 500 mA USB power source is sufficient to power the EchoBridge and its typical draw is under 150 mA.

Radio Interfacing

The RJ45 jack on the front panel provides all radio interface connections. Looking into the front of the connector, the pin functions, from left to right, are as follows:



8	Alternate power input	**4**	Ground
7	Unused	**3**	Audio out (to radio's microphone input)
6	Audio in (from radio's speaker output)	**2**	Ground
5	Push-to-talk output	**1**	Squelch / COR input

The squelch / COR input is optional. When this signal is available from the radio (usually from an accessory or data connector) it allows the repeater to be operated without the VOX delay. The alternate power input can be used to supply power to the device without using the USB connector. Some mobile or base station radios provide power (typically 8V) on the microphone jack, but care must be taken to check the current rating of this source before using it to power the EchoBridge.

Note that both ground pins are connected internally.

The PTT mode must be set appropriately for the radio being used. Most base station and mobile radios use a separate PTT input. Many handheld radios, with the notable exception of most Kenwood and Baofeng models, combine the microphone and PTT signals. For combined PTT models, the HT PTT setting must be enabled. All other radios should have the setting disabled.

Some Motorola handheld models and their relatives require a higher current level to trigger PTT. For these, you will need to short the solder jumper marked "MOTO PTT" on the EchoBridge's main circuit board.

Network Setup

The EchoBridge is configured by default to obtain an IP address via DHCP. Simply plug the device in to an available Ethernet jack and the amber LED should illuminate solid and the green LED will

blink with activity. To find the device on your network, from a computer or mobile device on the same network, visit http://find.argentdata.com and any devices registered from your network within the past 24 hours will be shown by serial number. Clicking on the serial number will take you to the EchoBridge's web interface.

Alternatively, you can connect the EchoBridge to a computer and it will appear as a removable drive. If the network has been successfully configured, a file called 'StartHere.html' will exist on the drive. Open the file with a browser and it will direct the browser to the web interface. Another option is to use the USB command console described below.

USB Connection

Connection to a computer is not required for normal operation of the EchoBridge, but it can be helpful for configuration and troubleshooting. When connected to a computer, the EchoBridge will enumerate as a composite device, appearing as both a small removable drive and a virtual serial port. Windows 10 and above, and all Linux and OS X versions, should not require drivers for the serial function. Earlier Windows versions may ask for a driver. The .inf file provided on the device's drive will cover versions back to Windows XP.

Under Windows, the device will be assigned a COM port number, which can be found by opening device manager and checking under 'Ports (COM & LPT)'. For Linux and OS X, the serial port will appear under /dev, typically with a name like /dev/tty.usbmodem.

Once the port assignment is known, you can connect to the device and access the command console using a terminal emulator like PuTTY (available for free from putty.org) or OS X's built-in 'screen' command.

The command console is described in more detail later in this manual. A list of commands is available by typing 'help' or '?' at the prompt. The 'netstat' command will show the current IP address, and 'set ip_address', 'set netmask', 'set gateway', and 'set use_dhcp off' commands may be used to manually configure the network settings. Be sure to use the 'save' command to save your changes.

Initial Setup

Before using the EchoBridge for the first time, you will need to set a few configuration options. All of the settings can be found under the Settings (⚙) menu item. For help with a particular setting, you can click on the blue question mark (?) icon next to the setting. Settings are not applied until you click the 'Save' button at the bottom of the corresponding form.

The 'Conference' settings page contains all of the VoIP-related settings, including EchoLink and non-EchoLink options. At a minimum, the callsign must be configured. For EchoLink users, this is the callsign you have registered with the EchoLink network, including the -R or -L suffix if operating a repeater or link node. Note that this does not need to be the same as the callsign that the device uses to identify itself on the air - that can be configured independently in the 'Radio' section.

For EchoLink operation, the EchoLink password must also be set. If you haven't already registered with the EchoLink network, after entering your callsign and password, visit http://echolink.org/validation and follow the directions there to validate your account.

The other EchoLink settings are optional. The default directory server selection is fine for most users. The EchoLink QTH can be set to your location (typically city and state) but may contain any text you would like displayed next to your callsign in the directory. The Echolink User Name is typically your given name and will show up in some EchoLink clients when your node is sending audio.

The other critical settings are located in the 'Radio' settings page. The most critical of these are the signal levels and the PTT mode. If you know the proper settings for your radio, you can enter them here. If you're not sure of the proper levels, you can continue to the 'Tuning' (⌨) page to set them using the oscilloscope view.

The squelch mode setting must also be set appropriately. If you're not using a mobile or base station radio with a squelch or COR output, leave this set to VOX mode.

Tuning

The ‘Tuning’ view (📟) provides an oscilloscope display that lets you monitor audio received by the radio and adjust your levels appropriately. To use the scope view, audio monitoring must be enabled. Click the ‘🔇‘ icon in the upper right of the screen and it will change to ‘🔊‘, and received audio will be played through the browser and plotted on the scope. Make a test transmission using another radio, and adjust the volume level on the EchoBridge’s radio until the peaks occupy nearly the full height of the scope.

The default full-scale RX level is 1 volt peak-to-peak (1000 mV). If your radio has a fixed output level or can't achieve 1 Vp-p, you can use the 'RX Level' knob to set the audio level expected by the EchoBridge. If you're setting the level using a volume knob, you can also watch the RX LED on the EchoBridge's front panel. The LED will start to flicker out if the level is too high.

The 'TX Level' setting controls the EchoBridge's output audio level. To test this, click the 'TX Test' button and the device will key the radio and begin transmitting a test count using its synthesized voice. Listen with another radio and use the 'TX Level' knob to adjust the level until the received audio is sufficiently loud without clipping or distortion.

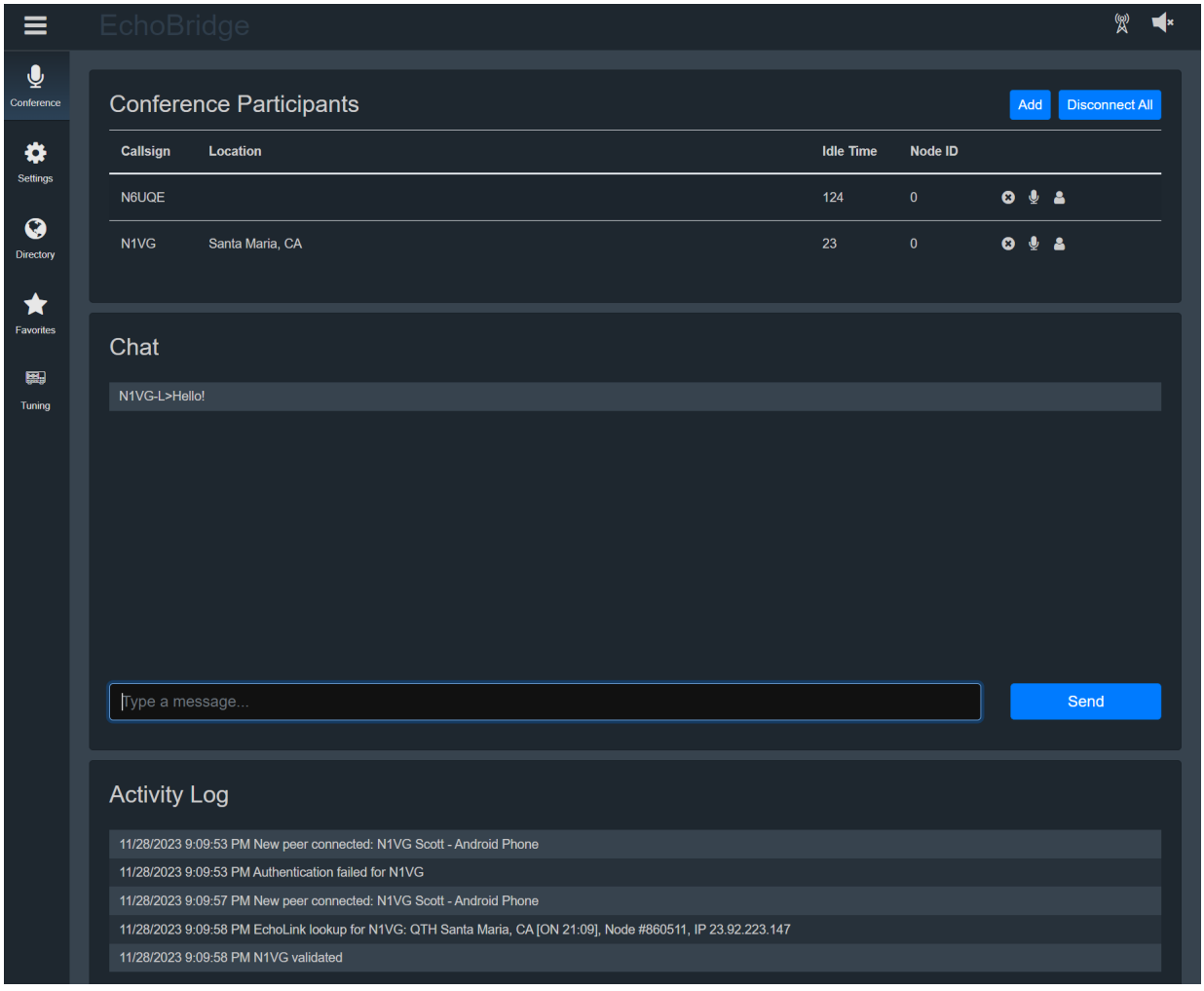
The 'VOX Level' knob sets the threshold, in percent of full scale, for the voice activation feature. This setting is ignored when using a COR/squelch input. The VOX threshold is shown on the scope as a yellow horizontal line. If using VOX, set this level so that it stays above any background noise present while the radio is idle. The default setting will be fine for more users.

If you have changed settings from the 'Tuning' page, click the 'Save' button to save them to the device's non-volatile memory.

Web Interface

The most convenient way to configure and interact with the EchoBridge is through its web interface. The interface requires a modern browser with HTML 5 support and has been tested with current versions of Google Chrome, Mozilla Firefox, Microsoft Edge, and Apple Safari.

The web interface starts out in the 'Conference Participants' view. This is where you can monitor conference activity, including connected stations and chat messages, and add or remove stations from the conference. The other views are accessible using the menu items along the left edge. When using a device with a small screen, you can tap the ☰ icon in the upper left to hide the menu bar.



Status Icons

A few status icons will appear in the upper right corner of the page. The '‘ icon indicates that the browser is not monitoring audio from the EchoBridge. To hear conference audio, click this icon and it will change to '‘.

If EchoLink operation is enabled, the '‘ icon will appear. The icon will be red if there is a problem connecting to the directory server, or white for normal operation.

A green [RX] indicator will light when the radio is receiving, and a red [TX] indicator will light when the radio is transmitting.

Managing Conference Participants

The most direct way to add a node to the EchoBridge's conference from the web interface is to simply click the 'Add' button. You'll be prompted to enter a callsign or node number, and you can choose to connect in 'lurk' mode using the 'Listen Only' checkbox.

Once a connection is made, the node's callsign, location, and node ID will appear in the conference list. The 'idle time' field gives the time in minutes and second since audio was last heard from that node. At the far right, a set of action icons will appear.

The '‘ icon indicates the the node is not muted. Clicking on this icon changes it to '‘ and mutes the node, so their audio will not be heard by the conference. Clicking it again unmutes the node.

The '‘ icon indicates that the node is not set to lurk mode - that is, the node will receive all conference audio. Clicking on this icon changes it to '‘ to indicate the node is now in lurk mode. Clicking it again disables lurk mode.

Clicking the '‘ icon will disconnect the node. Additionally, you can disconnect all nodes in the conference using the 'Disconnect All' button.

The chat panel will show any chat messages sent or received. To send a chat message to all conference participants, simply type a message in the text box below and click 'Send'. The activity panel at the bottom of the page shows a running log of events, including nodes connecting and disconnecting from the conference.

Using the EchoLink Directory

The '🌐' directory icon will take you to the worldwide EchoLink directory showing all nodes currently connected to the network. Note that this listing does not automatically refresh; to update it, click the 'Refresh' button in the upper right.

The node status can be ON if the node is active and able to accept connections, or BUSY if it can't accept more connections.

Clicking on a node will give you the option to connect and add it to the conference immediately, or add it to your favorites list.

Favorites

The EchoBridge can store up to 20 nodes in its favorites list, accessed through the '★' menu icon. Each entry has a 2-digit number, from 01 to 20. Local stations can connect to one of these favorites by simply entering the number from their keypad. From the web interface, clicking on the number will add the node to the conference.

Nodes may be of two types - 'EchoLink' or 'Direct'. If 'EchoLink' is selected, the favorite entry stores only the node's callsign and a lookup is done against the directory server for every connection. Selecting 'Direct' adds an IP address field. Direct stations do not use the EchoLink directory service. Without the assistance of the directory server, it's important to make sure your router's port forwarding is set appropriately so the router knows to route incoming VoIP data to the EchoBridge.

Clicking the mic icon '🎤' for a favorite changes it to '🎤' to indicate that the favorite node will be connected to in listen-only (lurk) mode.

Settings

This section covers all of the EchoBridge's settings. These settings are accessible both through the web interface and through the serial console. The serial console is described in more detail in its own section. The setting names given here are used with the shell 'set' and 'show' commands.

Conference Settings

Banner Text (conf_banner) - This text is displayed in the conference status text for users connecting with the EchoLink client and usually contains a welcome message.

Welcome Message - This is an audio message played to all stations connecting over the network. You can upload a WAV file through the web interface and preview the message using the audio player controls. Alternatively, you can place a WAV file on the device via USB, but a file provided that way must be in 8-bit unsigned format at 16000 samples/second and must be named 'welcome.wav'. When using the web interface, the file format is converted automatically.

Max Users (max_users) - Sets the maximum number of stations allowed in the conference. The minimum is 1, and the maximum is 10.

Enable DTMF Commands (enable_dtmf) - This option controls whether the device responds to DTMF commands received on the radio link. Enabled by default.

DTMF Prefix (dtmf_prefix) - The device will ignore all DTMF commands that do not begin with this sequence. The prefix may be up to five characters long, and may include all DTMF symbols - that is, digits 0-9, A, B, C, D, *, and #. The main purpose of this setting is to avoid interference with repeater controllers and other devices sharing the frequency that may have their own DTMF command sets. It may also be used to provide a minimal level of access control by obfuscating the codes used to control the device. This setting is blank by default.

Enable Beep Status (enable_conf_beeps) - When this option is enabled, the device will transmit notification beeps over the radio when remote stations connect or disconnect. Turn this option off to allow remote stations to connect and disconnect silently.

Enable Voice Status (voice_status) - This option causes the device to announce connecting and

disconnecting stations over the radio using its synthesized voice.

Say Callsigns (say_callsigns) - This option modifies the behavior of the voice status option. If this option is disabled, the device only announces that a repeater, link, conference, or station has connected or disconnected. If this option is enabled, the status message includes the callsign of the station, spelled out letter by letter.

Courtesy Tone (conf_courtesy_tone) - This option selects a courtesy tone, sometimes called a roger beep, to be added to the end of conference transmissions. One of five tone styles may be selected, or the feature can be disabled. A separate courtesy tone setting is provided in the radio settings that is applied to non-VoIP transmissions.

Audio Timeout (rtp_rx_timeout) - This sets the time, in milliseconds, that a VoIP audio stream must be idle before the device considers the stream to have ended. The default is 250 ms. For a slow or unreliable network connection, this may need to be set higher to avoid dropouts.

Use EchoLink (use_echolink) - If this option is enabled, the device will register itself with the EchoLink directory service using the provided credentials and will use EchoLink to find nodes by callsign or node name. This option is enabled by default. You may disable this option if you intend to use direct connections only.

Validate EchoLink Connections (echolink_validate) - When enabled, the device will validate all inbound EchoLink connection attempts using the EchoLink directory service. If the connecting node's callsign and IP address do not match those returned by the directory service, the connection attempt will be rejected. This option is enabled by default. Disable this option at your own risk - without validation, your radio link could potentially be used by unlicensed users. This option does not affect connections explicitly allowed by IP address as configured in the 'Favorites' section.

EchoLink Directory Server (echolink_server) - Several EchoLink servers exist around the world. Normally it is not necessary to select one manually, but this setting provides that option. Some common options are provided in the web interface.

EchoLink Callsign (echolink_callsign) - This is the callsign by which this device will be known on the network, and it must be set even for non-EchoLink operation. For EchoLink nodes, this

will typically be the operator's callsign. By convention, simplex links should have a -L suffix and repeater links should have a -R suffix.

EchoLink Password (echolink_password) - Enter the password associated with the EchoLink callsign provided above. This setting is not case-sensitive.

EchoLink QTH (echolink_qth) - By convention, this is usually the station's location, including city, state, and optionally country, but it may be any text you would like to appear alongside your station's callsign in the EchoLink directory.

EchoLink User Name (echolink_name) - This is the name that will be shown to users of some EchoLink clients when your station is actively sending audio. This should not be confused with the EchoLink callsign, which is used for authentication. The name setting is typically the user's given name, or the name of the link or conference. It is used for display purposes only.

Radio Settings

The radio settings are divided into a 'Transmitter Settings' section and a 'Receiver Settings' section. Note that each section has its own 'Save' button to save those settings.

The setting names used by the command shell start with 'rx1_' and 'tx1_' and settings are shown in the web interface for 'Transmitter 1' and 'Receiver 1' because the EchoBridge's software is designed to support multiple radios, though the current hardware only has a single radio port.

Transmitter Settings

Signal Level (tx1_level) - This sets the full-scale audio output level in millivolts peak-to-peak. This should be set as described in the 'Tuning' section of this manual.

Transmit Delay (tx1_tx_delay) - This setting controls the delay between PTT and the start of transmitted audio, in milliseconds. The default is 150 ms, meaning that after the device signals the transmitter to begin transmitting by asserting the PTT signal, it will wait 150 ms before transmitting any audio.

For audio originating with the device itself, such as identification messages and voice announcements, generation of the audio will be delayed until the specified time has elapsed. For audio coming in over the network from a remote station, the signal can only be delayed by a few hundred milliseconds due to limited buffer space. If a delay setting larger than the buffer size is used, the begging of the transmission will be dropped.

Use HT PTT (tx1_ht_ptt) - Many handheld radios (HTs) do not have a separate push-to-talk (PTT) signal on their speaker/mic connections, and instead detect current flow in the mic audio line to trigger PTT. Enable this option if your HT does not transmit as expected.

Transmit Timeout (tx1_ptt_timeout) - This setting, expressed in seconds, gives the maximum continuous time that the transmitter will be allowed to transmit. This is both to protect the transmitter from overheating and to give radio users a chance to break in and control the EchoBridge remotely in the event that a network station doesn't stop sending. If this timeout is exceeded, the device will make no more transmissions until the cooldown timer has expired.

Cool-down Time (tx1_cooldown) - This setting, in seconds, determines how long the device will wait for the transmitter to cool down before allowing more transmissions if the transmit timeout is exceeded.

Hang Time (tx1_hang_time) - When all sources of transmitted audio have finished, including remote network audio, IDs, and courtesy tones, the device will wait this length of time, given in milliseconds, before dropping PTT and ending the transmission. If another audio source starts in this delay time, the timer is reset and the transmission continues.

Enable CW ID (cw_id_on) - This option enables the CW identification feature. When this is enabled, the device will periodically transmit a Morse code identifier as configured below.

Cleanup ID Only (cleanup) - If this option is enabled, the device will send a CW ID only if it has transmitted anything since the last ID. With this option disabled, the device will transmit the ID periodically regardless of activity.

CW ID Interval (cw_time) - This sets the time, in seconds, between CW ID transmissions.

Courtesy Tone (local_courtesy_tone) - This option selects the courtesy tone (roger beep) sent for

transmissions other than VoIP audio, including voice announcements.

Receiver Settings

Signal Level (rx1_level) - This sets the full-scale audio level, in millivolts peak-to-peak, expected by the device. This should be configured as described in the tuning section.

VOX Threshold (rx1_vox_threshold) - When using VOX (voice activation) mode, this sets the audio level, in percent of full scale, that will activate the VOX trigger. Setting this too low will cause false activations from noise. Setting it too high may cause the start of transmissions to be cut off and will tend to cause drop-outs, particularly if a user is too quiet. This option can be set visually using the scope display.

VOX Delay (rx1_vox_delay) - Some radios are prone to short squelch 'pops', even in the absence of a signal. This setting, in milliseconds, sets the time from the first VOX trigger that an incoming signal must be active before it is considered a valid signal. It should be set high enough to not cause spurious activations, but setting it too high will cause the first part of incoming transmissions to be dropped.

Squelch Mode (rx1_cor_mode) - The options for this setting are VOX (0), active high (1), and active low (2). Nearly all handheld radios will use VOX (voice activation), and VOX may be used with any squelched receiver. The main limitation of VOX is that the device cannot distinguish between a transmission that has ended and one where the user has simply stopped talking but is still transmitting.

Many mobile radios and base stations provide a squelch signal variously called 'carrier operated relay (COR)', 'carrier operated switch (COS)', or (in a reversed sense) 'standby'. When available, this signal should be connected to the EchoBridge's squelch input to allow more reliable carrier detection. The COR signal's high level must be at least 2 volts and not more than 30 volts. The EchoBridge normally pulls the COR line to 3.3 volts through a 100k ohm resistor, which is suitable for use with most radios. If your radio has an active high squelch signal that exceeds 5 volts, open the EchoBridge and cut the trace between the pads marked COR P-U to disable this.

CW Speed (cw_speed) - This option sets the rate at which the Morse code ID is sent, in words per

minute. A faster ID will take up less time but will be harder to interpret. A maximum legal speed may exist depending on the radio service and jurisdiction. Default is 20 WPM.

CW Pitch (cw_pitch) - This option sets the frequency of the tone used to generate a Morse code ID, in hertz. Default is 1200 Hz.

Network Settings

Many users will not need to modify any settings in this section at all. The most common reason for changing settings here is to set a static IP address, which may be necessary if manual firewall and NAT configuration is required.

Host Name (name) - This is the name the device will use to identify itself on the network. Future software updates will allow this to be used for multicast DNS (mDNS) discovery, but in the current version its primary use is to identify the source of syslog messages.

Use DHCP (use_dhcp) - When this option is enabled, the device will attempt to obtain its IP address and other network configuration settings automatically. If this option is disabled, the IP address, netmask, default gateway, and DNS server must all be configured manually.

IP Address (ip_address) - For manual network configuration, sets the device's IP address in standard dotted notation.

Netmask (netmask) - For manual network configuration, sets the subnet mask using standard dotted notation.

Default Gateway (gateway) - For manual network configuration, sets the IP address of the default gateway (router).

DNS Server (dns_server) - For manual network configuration, sets the IP address of the domain name server to be used for DNS lookups.

Enable telnet server (enable_telnet) - This option enables the device's telnet server. Telnet is used to provide remote access to the command shell and is optionally protected by a password. Only one telnet connection at a time is supported.

Require telnet password (require_telnet_password) - Enable this option to have the telnet server prompt for a password before allowing access. The password is set in the 'remote access password' setting. This option should only be disabled if the device is behind a firewall or otherwise inaccessible to the outside world.

Require web password (use_http_password) - Enable this option to require a password for access to the web interface. The password is set in the 'remote access password' setting. This option uses the standard 'basic authentication' scheme. Note that the username is ignored - only the password is checked. This option is initially disabled to allow easy setup but should be enabled if the device is on a network where unauthorized access is a concern.

Remote access password (password) - This is the password used for both telnet and web access, if those controls are enabled. If the password is forgotten, it may be reset through the command shell via local USB connection.

Syslog server (syslog_server) - The EchoBridge supports the standard syslog protocol for remote logging. To enable syslog, enter the server name here, with optional port number (e.g., 'syslog.example.com:1234'). The default port is 514.

Syslog log level (remote_log_level) - This setting determines which syslog messages will be sent to the remote server. All messages at or above this severity will be sent. The default is 'Notice'.

Automatic NTP Time Sync (ntp_sync) - This option, enabled by default, causes the device to attempt to synchronize its real-time clock with a time server at startup and at intervals thereafter. The default server is tick.usno.navy.mil, operated by the US Naval Observatory. Because the EchoBridge does not have a battery-backed clock, it is recommended to leave this option enabled so it has accurate time and date information. Note that even if this option is disabled, if the device doesn't already have its clock set, connecting to the web interface will cause the device to set its current time to that reported by the browser.

NTP Time Server (ntp_server) - To use a time server other than the default, specify one here.

Privacy mode (privacy_mode) - Enabling this option prevents the device from registering with the Argent Data Systems discovery service and prevents certain other network accesses. See the 'Network Dependencies' section of this manual for more information.

Device Info

This page provides various pieces of useful information, diagnostic messages, and controls for managing settings and firmware updates. This includes the hostname, serial number, uptime since last reboot, current IP address (with link for telnet access to the command shell), current firmware version, latest available firmware version, and a link to the firmware release notes on the Argent Data Systems server.

Note that the available firmware version is only checked when the web interface is started. Refresh your browser to check for new updates. If an update is available, the 'Update Firmware' button will be enabled. To update to the latest version, simply click this button and wait for the progress bar to complete. The device will restart automatically and your browser will refresh. Do not remove power while the device is updating.

The 'Identify' button (corresponding to the 'ident' shell command) flashes the front panel lights on the device. This is used to identify the device being controlled when multiple devices are present.

The 'Reboot' button causes the device to reboot after a confirmation. The reboot process takes a couple of seconds, but with DHCP the device may take several seconds to reconnect to the network.

Clicking 'Download Config' downloads the entire device configuration as a JSON file. Use this to back up your settings. You can upload the settings file again by using the 'Upload Config' button or by dragging and dropping the file onto this page. Note that when uploading a configuration file, the settings are not automatically saved to the device; they are loaded into the web interface for review first.

You can review them in the 'Settings' sections and save each section individually, or you can click the 'Save All Settings' button to write all of the settings to the device at once.

The 'Diagnostic Messages' window provides a way to get detailed diagnostic information from the device for troubleshooting purposes.

DTMF Command Reference

The EchoBridge is controlled over the air using DTMF (Touch-Tone) tones. To avoid interfering with the control codes of repeaters or other devices sharing the RF channel, or to provide a basic level of protection from unauthorized use, a prefix may be configured. This option is found in the radio configuration section of the web interface and may be set using 'set dtmf_prefix' from the command console.

When a prefix is configured, every command entered must be immediately preceeded by this prefix. All DTMF codes received that don't include the prefix will be ignored.

If you make a mistake while entering a DTMF command, simply press the * key and end the transmission. The device will discard the command.

 # - Disconnect most recently connected station

Pressing '#' will disconnect the most recently connected station.

– Disconnect all connected stations

This command immediately disconnects all connected stations.

*** – Report system status**

The device responds to this command by listing all stations currently connected, if any.

**** – Report device information**

This command triggers a voice response with the EchoBridge firmware version number.

nnnn - nnnnnn – Call by node number

Entering four to six digits tells the EchoBridge to attempt a connection to an EchoLink node by node number. The device will perform a directory lookup, and if voice status is enabled will report the node's callsign before making the connection.

01-20 – Call by favorite number

Entering a two digit number between 1 and 20 will initiate an outbound connection to a predefined favorite station. Favorite stations may be EchoLink nodes or they may be specified in the favorites configuration by IP address.

nnn#nnn#nnn#nnn – Call by IP address

A connection can be made to a specific IP address by entering the IP address in dotted notation, with the dots replaced with #. For example, enter 192#168#1#100 to connect to 192.168.1.100.

***<node number> – Check status of an EchoLink node by node number**

Entering * followed by a 4-6 digit node number will cause the EchoBridge to perform an EchoLink directory lookup for the given node. It will report the node's callsign and busy status by synthesized voice.

#<macro> – Executes a macro file

Entering any DTMF command starting with # (except for # and ## alone) will execute a corresponding macro with the name "macro_<command>.cmd" if it exists. For example, "#123A" will execute "macro_123a.cmd". Macro names may be up to 20 characters long and can contain digits, letters A-D, and '#', but not '*'.

Macro files are shell batch commands. They must be placed in the root directory of the device's file system. They may be edited using the 'edit' command from the console, or using your PC's text editor. A browser-based editor is planned for a later release.

Any shell command may be used from a macro, but use caution – starting an audio level test, for example, will cause the system to transmit until the transmitter times out, with no opportunity to send a 'cancel' command.

A simple use of a macro would be to configure a conference automatically by using the "call" command to add stations to the conference, or the "kick" command to remove stations from the conference.

Restoring Default Settings

A few different methods are provided to reset the EchoBridge to its factory default settings. If you are able to access the command shell (via USB or telnet), you can simply enter 'reset defaults'.

Alternatively, you can power cycle the device five times in quick succession. Plug the power cable in and wait just long enough for the LEDs to finish flashing and then unplug it again. On the fifth power-up cycle, leave power connected and the device should reset within three seconds.

If neither of these methods work, the final option is to open the device and locate solder jumper SJ4, marked "CFG RST" on the main circuit board. It may be located underneath the Ethernet daughter board. Short these two pads together, for example with a pair of metal tweezers, while plugging in the power cable. Each of these methods should indicate a successful reset by flashing both front panel LEDs.

Firmware Updates

Free firmware updates with feature enhancements and bug fixes are released periodically and may be installed through the automatic update process or by manually downloading and installing an update file.

To check for firmware updates using the web interface, navigate to the 'Device Info' page under the 'Settings' menu option. The currently intsalled firmware version will be shown, along with the most recent available version if the update server is reachable. A link to the firmware release notes is also provided. To upgrade, simply click the 'Update Firmware' button. A progress bar will appear and track the progress of the process. Do not power off the device during the update process.

To check for updates from the command console, simply enter the command 'update'. The device will check for updates and install the most recent version if a newer version is available.

After an update completes, the device will automatically reset and should be back to normal operation within several seconds.

To apply a firmware update manually, use the 'loadfw' command followed by the filename. Note that this manual process will load the specified firmware file regardless of whether the version being loaded is newer or older than the current version. This can be used to roll back the device to a previous version.

Network Dependencies

At Argent Data Systems we strive to build our network-capable devices with minimal dependence on outside services, and we believe you have a right to know what your devices are doing on the network. In this section you'll find information on everything your EchoBridge device may access on its own and features that would be affected by the loss of a cloud-hosted service. This does not include user-initiated actions such as configuring a syslog server.

NTP server

The Network Time Protocol provides accurate clock synchronization. While this is not critical to the device's operation, it is used for logging and when communicating with the EchoLink directory servers. The default NTP server is `tick.usno.navy.mil` and this can be overridden with the `ntp_server` setting.

Argent Data Systems device registration service

By default, when the EchoBridge connects to a network it will send a brief message via HTTP POST to a server controlled by Argent Data Systems. This message includes the device serial number, local IP address, device type, and firmware version number. This information is used by the device discovery service that lets you more easily find your device on the network. It may also be used to gather statistics about the number and types of Argent devices in use. To disable this function, set the `privacy_mode` option to true. Note that while accessing the device discovery service will provide you with a link back to the device on your own network, it does not open up any path for remote access to the device - the address simply points to the device by its local network address and the link will be useless for anyone not on your network.

Argent Data Systems firmware update service

Firmware updates may be loaded from an Argent Data Systems server using the 'update' command from the console or from the device information menu in the web interface. This feature contacts the Argent server to request available version information and to fetch updates. Additionally, the web interface will attempt to check for available updates by having your browser make a request from an Argent server. You may disable this functionality by setting the `privacy_mode` option to true. If the firmware update server is unavailable, updates may

still be applied by manually copying an update file to the device's file system and using the appropriate load command.

EchoLink directory servers

If EchoLink features are used, the device must by necessity register itself with an EchoLink directory server. The server used is configurable in the EchoLink settings. The web interface will also contact the webserver at echolink.org via your browser to populate the directory listing. If EchoLink servers are not reachable, EchoLink features will not work.

Revision History

- Build 90 - Initial public release

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EchoBridge
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