# Model 394
# GPI Interface

## User Guide

Issue 1, March 2026

This User Guide is applicable for serial numbers:

M394-00151 and later with
Application Firmware (.stm) version 1.03 and later
STcontroller version 4.05.01 (Windows®) and later
STcontroller version 4.05.02 (macOS®) and later

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# Revision History

### Issue 1, March 2026:

- Initial release.

# Introduction

The Model 394 GPI Interface allows two contact closures associated with a piece of electronic equipment, or the status of two pushbutton switches, to be extended over an Ethernet network. The unit uses in-band 20 kHz sine wave audio tones and the Dante® audio-over-Ethernet protocol to transport the status of its two GPI functions. Installation is simple and confirmation is easy using the STcontroller software application. The compact, lightweight unit uses the Power over Ethernet (PoE) protocol for its operation power.




**Model 394 GPI Interface front and back views**

## Applications

The Model 394 is designed for a variety of applications where the status of a contact closure or user-operated switch needs to be transported within a facility or over an Ethernet network. The contact will often originate from an electromechanical or solid-state relay associated with a piece of electronic equipment. It may also be provided by a mechanical switch that changes state in response to a particular situation or user action.

The Model 394's GPI functions can be used for broadcast, theater, and aerospace applications where an "on air" or "event in progress" status indication needs to be transported or distributed. It can also find use in industrial applications where the state of a contact closure needs to be transported within a geographically dispersed facility. As a Dante audio-over-Ethernet device, the status of a contact closure will be distributed over an entire associated Ethernet data network. This means that the state of the GPI functions will be available, whether in the same room or on the opposite sides of a university or business campus. There is certainly no reason the Model 394's two audio channels can't be transported literally around the world using audio transport facilities. (Conversion from Dante to the specific type of audio transport would, of course, be required.)

## Features

The Model 394 allows two contact closure inputs to be connected. Two pushbutton switches, located on the unit's front panel, can also be used to control the state of the GPI functions. Bi-color LEDs are provided within the pushbutton switches to indicate the real-time status of the GPI functions. The STcontroller application supports configuration, monitoring, and control of a Model 394 using a personal computer running the Windows or macOS operating systems.

A unique Model 394 feature is its ability to pass Dante audio from input-to-output with the 20 kHz GPI status tones added as applicable. Multiple LEDs provide an indication of the unit's operating status. The unit's Ethernet connection is used to provide both data and power by way of the Power over Ethernet (PoE) standard. The unit utilizes an extruded-aluminum enclosure that is both lightweight and extremely rugged.

## Dante Audio-over-Ethernet

The Model 394 GPI Interface utilizes the capabilities of Dante audio-over-Ethernet media networking technology to transport status indications over standard Ethernet networks. As a Dante-compliant device, the Model 394's two Dante transmitter (output) channels can be assigned (routed) to destination devices using the Dante Controller software application.

The Model 394 transmits the status of GPI signals using 20 kHz sine wave audio tones that have a sample rate of 48 kHz and a bit depth of up to 24. These tones are "in-band" (carried within the Dante audio path) and are routed (Dante subscribed) to Dante-compliant receiving devices using the Dante Controller application. In many applications, a Studio Technologies Model 395 GPO Interface will be used to receive these 20 kHz tones and convert them to contact closures. Other products from Studio Technologies are also compatible. For example, the Model 391 Dante Alerting Unit can receive a 20 kHz tone and trigger both audible and visual indicators. The Model 392 Visual Alerting Unit mounts in standard electrical boxes and will light its visual display in response to a 20 kHz tone signal.

Other products, such as the Studio Technologies Model 348 Intercom Station or selected units from the Model 370-Series of intercom beltpacks, can have their call light functions triggered by reception of 20 kHz tones. Dante-compatible devices from other manufacturers should also interconnect successfully.

The Model 394 also provides a special pass-through function. This allows full-bandwidth audio signals that arrive via Dante receiver (input) channels to pass through (directly routed at unity gain) to the unit's Dante transmitter (output) channels. The GPI function's 20 kHz sine wave tones are summed (added or combined) with the audio input signals, within the digital domain, then output by way of the unit's Dante transmitter (output) channels.

## Ethernet Data and PoE

The Model 394 connects to an Ethernet network using a 100 Mb/s twisted-pair (UTP) Ethernet interface. As with all Dante devices, the Model 394 is compatible with standard Ethernet networking equipment. The unit's physical network interconnection is made by way of an RJ45 jack that supports Auto MDI/MDI-X. Two LEDs, associated with the RJ45 jack, display the status of the network connection.

The Model 394's operating power is provided by way of the Ethernet interface using the IEEE® 802.3af Power over Ethernet (PoE) standard. This allows fast and efficient interconnection with an associated data network. To support PoE power management, the Model 394's PoE interface reports to the power sourcing equipment (PSE) that it's a class 2 (low power) device. If a PoE-enabled Ethernet port can't be provided by the associated Ethernet switch, a low-cost PoE midspan power injector can be utilized.

## Setup, Configuration, and Operation

Setup, configuration, and operation of the Model 394 are simple. An RJ45 jack, located on the unit's back panel, is used to interconnect, by way of a standard Ethernet patch cable, to a port on a PoE-enabled network switch. This connection provides both network data and power. Two contact closures can be connected to the Model 394's GPI inputs using a 4-position detachable screw terminal block. The two inputs are pulled up to 3.3 volts DC and respond to a closure (short) being present.

The STcontroller personal computer software application is used to configure several Model 394 operating parameters. STcontroller, with versions available that are compatible with the Windows and macOS operating systems, provides a fast and simple means of observing and revising the unit's operating parameters. In addition, STcontroller allows the status of the GPI inputs to be monitored using virtual LEDs. Two software-controlled pushbutton switches, provided by STcontroller, allow the status of the GPI functions to be controlled.

In many applications, external control closures will be connected by way of the unit's GPI inputs. However, two pushbutton switches, located on the front panel, also allow control of the GPI functions. These switches can be useful during installation and troubleshooting situations. They can also be utilized in selected applications, allowing operators to directly control the status of GPI functions. LEDs within the pushbutton switches provide status indications of the GPI functions, whether controlled by external contact closures, the front-panel pushbutton switches, or STcontroller. Other LEDs display the status of the network connection and operating power.

### Future Capabilities and Firmware Updating

The Model 394 was designed so that its capabilities and performance can be enhanced in the future. A USB connector, located on the unit's back panel, allows the application firmware (embedded software) to be updated using a USB flash drive. To implement its Dante capability the Model 394 uses Audinate's UltimoX2™ integrated circuit. The firmware in this integrated circuit can be updated by way of the unit's Ethernet connection, helping to ensure that its Dante capabilities remain up to date.

## Getting Started

### What's Included

Included in the shipping carton are a Model 394 GPI Interface and instructions on how to obtain an electronic copy of this guide. As a device that is Power over Ethernet (PoE) powered, no external power source is provided. In most applications, an Ethernet switch with PoE capability will be utilized. If that's not available, a PoE midspan power injector can be used. A 4-position detachable terminal block will be included. (The terminal block is Studio Technologies part number 01434.) It will be inserted into the Model 394's 4-position header connector. The dimension between the connector pins ("centers") is 0.150 inches (3.81 millimeters), which is an industry standard.

### Connections

Signal interconnections will be made using two connectors that are located on the back of the Model 394's enclosure. An Ethernet data connection with Power over Ethernet (PoE) capability will be made using a standard RJ45 patch cable that terminates with an RJ45 plug. One or two contact closures will be connected by way of the 4-position detachable terminal block.

#### Ethernet Connection with PoE

A 100BASE-TX Ethernet connection that supports Power over Ethernet (PoE) is required for Model 394 operation. This one connection will provide both Ethernet data and power for the Model 394's circuitry. A 10BASE-T connection is not sufficient, and a 1000BASE-T (GbE) connection is not supported unless it can automatically fall back to 100BASE-TX operation. The Model 394 supports Ethernet switch power management, enumerating itself as a PoE class 2 device.

The Ethernet connection is made by way of an RJ45 jack, located on the back of the Model 394's enclosure. This allows connection by way of a standard cable-mounted RJ45 plug. The Model 394's Ethernet interface supports Auto MDI/MDI-X so that a crossover or reversing cable will never be required.

#### Ethernet Connection without PoE

As previously discussed, the Model 394 was designed such that the Ethernet connection will provide both data and power via Power over Ethernet (PoE). There may be situations where the associated Ethernet switch does not provide PoE power. In such cases, an external PoE midspan power injector can be used. If the selected midspan power injector is 802.3af-compatible, it should function correctly. Midspan units are available from a variety of sources, including many online retailers.

## GPI Inputs

A 4-position detachable terminal block is used to interface one or two external contacts with the Model 394's GPI circuitry. From the factory, the Model 394's terminal block will be mated with the unit's header connector which can be temporarily removed if desired during the installation process. The terminal block will remain mated with the header connector strictly using friction; there is no other mechanical locking method utilized.

The terminal block allows interconnecting wires to be clamped to each terminal by tightening a flat-blade screw. An Xcelite® "greenie" flat-blade screwdriver (Xcelite R3323) is an excellent tool for this task. The blade of this screwdriver has a width of approximately 0.095 inches (2.4 millimeters) and a tip thickness of approximately 0.020 inches (0.6 millimeters). Wires in the range of 16 to 28 AWG are compatible. The insulation strip length is recommended to be 0.25 inches (6.35 millimeters) with a recommended tightening torque of 2.2 pound-inches (0.25 newton-meters).

Each of the Model 394's two GPI (general-purpose) inputs has a common connection (labeled –) and a DC-voltage-biased active (labeled +) connection. The latter is 3.3 volts DC supplied by way of a 1k ohm (1000 ohm) resistor. This provides a pull-up current of 3.3 milliamperes. In most cases, a normally open (not shorted) contact will be connected to the + and – terminals of a GPI input. This will cause the Model 394 to recognize an active GPI when a contact closure is present between the + (DC-biased) lead and the – (common) lead. By default, both GPI inputs are configured for momentary operation. In this way, whenever a GPI input's + lead is connected to its – lead the unit will recognize it as an active GPI input. A configuration selection allows each GPI input to be independently configured for latching operation. If this mode is selected, a Model 394 GPI input will change state each time a + lead is connected to its – lead.

Note that it's certainly acceptable for a normally closed (shorted) contact to be connected to a GPI input. Configuring the GPI mode to be momentary would be required, and in this case, the Model 394 will recognize an active GPI all the time except when the contact changes to its open state. A configuration choice to recognize a normally closed (shorted) contact as the normal condition is not provided.

## Locating the Unit

Once the Ethernet and GPI connections have been made, the Model 394 can be placed in its final location. This will typically be a shelf or other flat surface, often within a rack enclosure. The Model 394 unit has a weight of 0.55 pounds (0.25 kg), making it suitable for vertical mounting with adhesive-backed hook-and-loop fastener material.

# Dante Configuration

Correct Model 394 operation requires that one or more Dante-related parameters be correctly configured. The configuration settings will be stored in non-volatile memory within the Model 394's circuitry. Configuration will typically be done with the Dante Controller software application which is available for download free of charge at getdante.com. Versions of Dante Controller are available to support the Windows and macOS operating systems. The Model 394 uses the UltimoX2 integrated circuit to implement its Dante architecture. The Model 394's Dante interface is compatible with the Dante Domain Manager™ (DDM) software application. Refer to the DDM documentation, available from Audinate, for details on which Model 394 and related parameters may have to be configured.

## Audio Routing

The Model 394 has two Dante transmitter (output) and two Dante receiver (input) channels that are associated with the unit's Dante interface. The Dante transmitter (output) channels would contain the 20 kHz sine wave signals that are active when the Model 394's GPI inputs are active. These Dante transmitter (output) channels would be subscribed (routed) using the Dante Controller application to the receiver (input) channels on other devices that would utilize the 20 kHz signals. Often this would be the Dante receiver (input) channels on Studio Technologies Model 395 GPO Interface units. Other uses might include interfacing with digital signal-processor (DSP) units that include Dante support.

In some cases, one or two transmitter (output) channels on a designated Dante device will be subscribed (routed) to the Model 394's Dante receiver (input) channels. These transmitter channels would typically be used to supply the Model 394 with audio signals that need to be re-transmitted (repeated) using the Model 394's Dante transmitter (output) channels. In this case, the audio signals from the Dante receiver (input) channels would be combined (mixed or summed) with the 20 kHz sine wave signals and output by way of the Dante transmitter (output) channels.

Note that the Dante Controller application may use the term "subscription" to describe the routing of a transmitter flow (a group of up to four output channels) to a receiver flow (a group of up to four input channels).

## Unit and Channel Names

The Model 394 has a default Dante device name of **ST-M394-** and a unique suffix. The suffix identifies the specific Model 394 that is being configured. The suffix's actual alpha or numeric characters, or both, relate to the MAC address of the unit's UltimoX2 integrated circuit. The unit's Dante transmitter (output) channels have default names of **Ch1** and **Ch2**. The unit's Dante receiver (input) channels have default names of **Ch1** and **Ch2**. Using the Dante Controller application, the default device name and channel names can be revised as appropriate for a specific application.

## Device Configuration

The Model 394 supports an audio sample rate of 48 kHz with no pull-up/pull-down options available. The unit's digital audio input and output data is in the form of pulse-code modulation (PCM) samples. The encoding choice is fixed to be PCM 24. Clocking and device latency parameters can be adjusted within the Dante Controller application if required, but the default values are typically correct.

#### Network Configuration – IP Address

By default, the Model 394's Dante IP address and related network parameters will be determined automatically using DHCP or, if not available, the link-local network protocol. If desired, the Dante Controller application allows the IP address and related network parameters to be manually set to a fixed (static) configuration. While this is a more-involved process than simply letting DHCP or link-local do their thing, if fixed addressing is necessary, this capability is available. In this case, it's highly recommended that a unit be physically marked with its specific IP address—for example, using a permanent marker or console tape. If knowledge of a Model 394's IP address has been misplaced, there is no configuration reset button or other method to easily restore the unit to a default IP setting.

#### AES67 Configuration – AES67 Mode

The Model 394 can be configured for AES67 operation. This requires that the AES67 Mode in the Dante Controller application be set for *Enabled*. By default, AES67 mode is set for *Disabled*.

### Model 394 Clocking Source

While technically the Model 394 can serve as a Leader Clock for a Dante network (as can every Dante-enabled device), in virtually all cases, the unit will be configured to receive its timing reference (sync) from another Dante device. As such, Dante Controller's check box for the Preferred Leader that is associated with the Model 394 would typically not be enabled.

## Model 394 Configuration

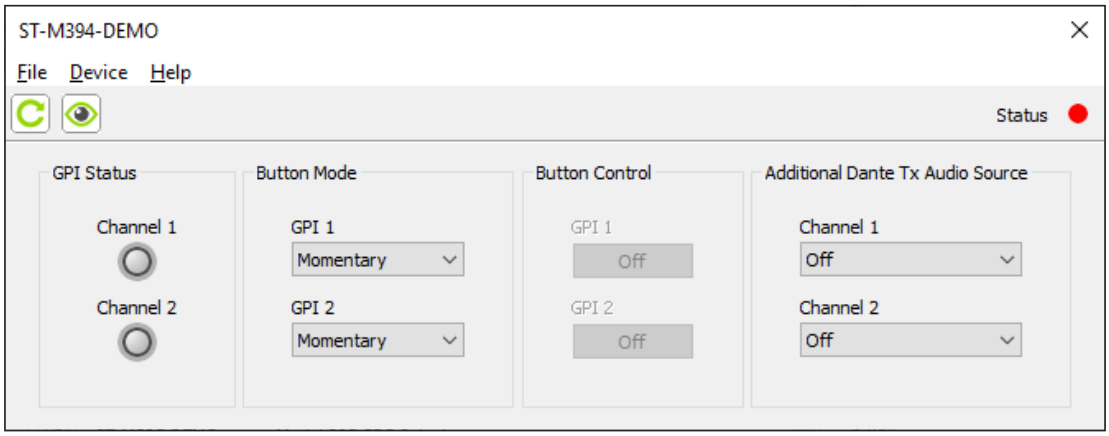
The STcontroller software application is used to configure the way in which the Model 394 functions. No DIP switch settings or other local actions are used to configure the unit. This makes it imperative that the STcontroller application be available for convenient use on a personal computer that's connected to the related LAN.

### Installing STcontroller

The STcontroller software application is available free of charge on the Studio Technologies website (studio-tech.com). Versions are available that are compatible with personal computers running the Windows and macOS operating systems. If required, download and install STcontroller onto the designated personal computer. The network connection of this personal computer must be on the same local area network (LAN) and subnet as the Model 394 unit that is going to be configured. Upon startup, STcontroller will locate all Studio Technologies devices it can control. The one or more Model 394 units to be configured will appear in the device list. Use the *Identify* command to allow easy recognition of a specific Model 394 unit. Double-clicking on a device name will cause the associated configuration menu to appear. Review the current configuration and make any changes that are desired.

Changes made using the STcontroller application will be immediately reflected in the unit's operation; no Model 394 reboot is required. Each time a Model 394 configuration change is made, the unit's front-panel pushbutton switches will flash orange twice in a distinctive pattern. This provides a clear indication that a command from STcontroller has been received and acted upon.

## Configuration




### GPI Status – Channel 1 and Channel 2

STcontroller includes two virtual "LED" indicators that can be viewed within the application to determine the active or inactive status of the Model 394's two GPI functions. They are updated in real time. A virtual LED will be gray when its respective GPI function is in its off (inactive) state. It will be yellow or green when its respective GPI function is in its on (active) state.

### Button Mode – GPI 1 and GPI 2

Choices are *Disabled*, *Momentary*, and *Latching*.

Two pushbutton switches are located on the front of the Model 394. The operation of each button, individually, can be configured from among three choices. If *Disabled* is selected, pressing the pushbutton switch will cause no action to take place. If *Momentary* is selected, pressing the pushbutton switch will cause the associated GPI function to become active. It will remain active until the pushbutton switch is released. If *Latching* is selected, momentarily pressing (tapping) the pushbutton switch will cause the associated GPI function to change state, either off-to-on or on-to-off.

### Button Control – GPI 1 and GPI 2

The button control section provides two virtual pushbutton switches. They are labeled GPI 1 and GPI 2. They allow software control of the Model 394's GPI functions when the button mode configuration has been selected for *Latching*. If the button mode has been selected for *Disabled* or *Momentary*, the button will be grayed out and not available for use. The mouse or keyboard associated with a personal computer can be used to change the GPI function's status from off-to-on or on-to-off. This can prove especially useful during installation and testing of the Model 394.

### Additional Dante Tx Audio Source – Channel 1 and Channel 2

Choices are *Off*, *Rx Ch1*, and *Rx Ch2*.

When a GPI function is active, a 20 kHz sine wave tone is sent out its associated Dante transmitter (output) channel. If desired, this tone can be combined (mixed) with an audio signal that enters the Model 394 by way of one of the Model 394's two Dante receiver (input) channels. A configuration selection for each channel allows a signal source to be selected. The selected audio source will be routed, at unity gain (no gain or attenuation) to the Dante transmitter (output) channel continually. Only when a GPI function is active will the 20 kHz sine wave tone be added (combined) with the selected source.

# Operation

At this point, the Model 394 should have been placed in the desired physical location. All connections and configuration steps should have been completed and everything should be ready for Model 394 operation to commence. An Ethernet connection with Power over Ethernet (PoE) capability should have been made. Alternatively, a midspan power injector, in series with the Ethernet connection, should have been put into place. One or two contact closures should be connected to the GPI inputs by way of the 4-position detachable screw terminal block.

Using the Studio Technologies STcontroller software application the unit's configuration should have been set to meet the needs of the specific application. The Model 394's Dante configuration settings should have been selected using the Dante Controller software application. In this way, either or both of the unit's two GPI channels (Dante transmitter (output) channels) should have been routed, by way of Dante "subscriptions," to Dante receiver (input) channels on associated Dante-enabled equipment.

## Initial Operation

The Model 394 will start to function as soon as a Power over Ethernet (PoE) power source is connected. However, it may take 20 to 30 seconds for full operation to commence. Upon initial power up, the green LED labeled FIRMWARE UPDATE, located on the unit's back panel, will light for a few seconds. The two network status LEDs, labeled LINK and ACT, are also located on the unit's back panel below the RJ45 jack. They will begin to light as network connections are established. On the front panel, the power LED and the LEDs contained within the pushbutton switches will light in a test sequence. The power LED will first light green, then red, then again green to indicate that power is present. The pushbutton switches will first light green, then orange. Afterwards, they will follow the status of the GPI inputs, the pushbutton switches, and the virtual (software-created) buttons in STcontroller.

## How to Identify a Specific Model 394

Functions within the Dante Controller and STcontroller software applications allow a specific Model 394 unit to be identified. Each application provides an "eyeball" icon that when clicked will activate the *Identify* function. When *Identify* is selected, it will send a command to a specific Model 394 unit. On that unit, LEDs within the two pushbutton switches will flash orange in a unique pattern four times. After the identification pattern ceases, normal Model 394 LED operation will resume.

## Ethernet Status LEDs

Two Ethernet network status LEDs are located below the RJ45 jack on the Model 394's back panel. The LED on the lower left, labeled LINK, provides a link status function. It will light yellow when a valid connection to an Ethernet network has been established. The LED on the lower right, labeled ACT, serves as a data activity indication, flashing green in response to Ethernet data packet activity.

## External Contact Closures

One or two contact closures can be connected to the Model 394's GPI inputs. When a contact connected to GPI 1 closes (shorts), the LED indicator in the pushbutton switch labeled GPI 1 will light orange. This is provided for confirmation during installation, testing, operation, maintenance, and repair. As expected, closing (shorting) the contact connected to GPI 2 will cause the orange LED in pushbutton switch GPI 2 to light.

### Pushbutton Switch Operation

Two pushbutton switches are located on the front panel of the Model 394. They are available for use during installation, maintenance, and normal unit operation. How the pushbutton switches function is determined by configuration settings made using the STcontroller application. Pressing a pushbutton switch that has been configured for disabled will have its LED flash green five times to indicate that it has been disabled. In this case, no GPI action will take place. Pressing a pushbutton switch that has been configured for momentary will cause the function to be enabled during the time the button is pressed. The button's LED will light green when it is pressed. If the pushbutton switch has been configured for latching, momentarily pressing (tapping) the pushbutton switch will cause the function to either go from off-to-on or on-to-off. The pushbutton switch's LED will light green when the function is active.

### STcontroller Activation of GPI Functions

If a pushbutton switch has been configured for latching operation, a virtual (software-created) pushbutton switch is provided in the STcontroller application. A computer mouse or key stroke can be used to activate the GPI function. The LED associated with the unit's pushbutton switch, and the virtual LED on STcontroller, will light to indicate that the function is active. The virtual pushbutton switch will also indicate, in real time, the status of the associated GPI function.

### Simultaneous Use of External Control Closures, Pushbutton Switches, and Virtual Pushbutton Switches

The contact closure input, the pushbutton switch on the front panel, and the virtual pushbutton switch provided by STcontroller for each GPI function will function at the same time, performing a logical "OR" function. The GPI function will be active if the external contact is closed (shorted), the pushbutton switch is active, the virtual pushbutton switch is active, or if any combination of the three is in its active state. The pushbutton switch's LED will light orange if only the contact input is closed (shorted). It will light green if the pushbutton switch or virtual pushbutton switch is active, whether or not the contact input is closed (shorted).

### STcontroller Virtual GPI Status LEDs

The STcontroller application can be utilized to monitor the status of the GPI functions. Two virtual (software-created) indicators are provided, one for each GPI function. A virtual LED will be gray in color when its associated GPI function is not active. It will be yellow when the GPI function is active due to a contact closure being present on the unit's GPI input. The virtual LED will be green when the pushbutton switch on the Model 394 is active. It will also be green if the virtual (software-created) pushbutton switch on STcontroller is active.

## Technical Notes

### IP Address Assignment

By default, the Model 394's Ethernet interface will attempt to automatically obtain an IP address and associated settings using DHCP (Dynamic Host Configuration Protocol). If a DHCP server is not detected, an IP address will automatically be assigned using the link-local protocol. This protocol is known in the Microsoft® world as Automatic Private IP Addressing (Auto-IP or APIPA). Link-local will randomly assign a unique IP address in the IPv4 range of 169.254.0.0 to 169.254.255.255. In this way, multiple Dante-en-

abled devices can be connected together and automatically function, whether or not a DHCP server is active on the LAN.

An exception does arise when trying to directly interconnect two Dante-enabled devices that use UltimoX2 integrated circuits to implement Dante. The Model 394 uses UltimoX2 and, as such, a direct one-to-one interconnection to another UltimoX2-based product is not supported. An Ethernet switch linking the two units is required to successfully interconnect two UltimoX2-based devices. The technical reason that a switch is required relates to the need for a slight latency (delay) in the data flow; an Ethernet switch will provide this.

As previously discussed, the Model 394's Dante IP address and related network parameters can be manually selected using the Dante Controller software application. This is also referred to as selecting a static or fixed IP address. In the unfortunate event that a specific Model 394's IP address is not known by users, there are several techniques that may prove useful. It's possible the Address Resolution Protocol (ARP) networking command can be used to probe devices on a network for the lost information. For example, in Windows OS the **arp -a** command can be used to display a list of LAN information that includes MAC addresses and corresponding IP addresses. (Within this list should be the Model 394's manually assigned Dante IP address.) This diagnostic method is most effective with a LAN that uses unmanaged Ethernet switches. Contemporary LANs that utilize managed switches may limit the ARP command's effectiveness.

In general, the simplest means of identifying an unknown IP address is to create a mini LAN with an unmanaged PoE-enabled Ethernet switch. Then by using the appropriate ARP command, the required clues can be obtained.

## Optimizing Network Performance

For best Dante audio-over-Ethernet performance, a network that supports VoIP Quality of Service (QoS) capability is recommended. This would apply to the Model 394 as the unit generates audio tones that are transported within the Dante transmitter (output) paths. QoS can typically be implemented on virtually all contemporary managed Ethernet switches. There are even specialized switches that are optimized for entertainment-associated applications. These switches implement QoS and related capabilities with only a single management selection required. Refer to the Audinate website for details on optimizing networks for Dante applications.

## Application Firmware Version Display

A selection in the STcontroller software application allows the Model 394's application firmware version to be identified. This can be useful when working with factory personnel on application support and troubleshooting. To identify a Model 394's firmware version, begin by connecting the Model 394 unit to the network (via Ethernet with PoE) and wait until the unit starts to function. Then, after starting STcontroller, review the list of identified devices and select the specific Model 394 for which you want to determine its application firmware version. Then select **Version and Information** under the **Device** tab. A page will then display the version number of the application firmware as well as additional details on the Dante interface firmware.

## Application Firmware Update Procedure

Updated versions of the application firmware (embedded software) that are utilized by the Model 394's microcontroller (MCU) integrated circuit may be released to add features or correct issues. Refer to

the Studio Technologies website for the latest application firmware file. The unit has the ability to load a revised file into its MCU's non-volatile memory. The Model 394 implements a USB host function that directly supports connection of a USB flash drive. The Model 394's MCU updates its firmware using a file named **M394v*X*r*XX*.stm** where the *X*s are the decimal digits that represent the application's version number.

The update process begins by preparing a USB flash drive. The flash drive doesn't have to be empty (blank), but must be in the personal-computer-standard FAT32 format. The MCU in the Model 394 is compatible with USB 2.0-, USB 3.0-, and USB 3.1-compliant flash drives. Save the new firmware file in the root folder with a name of **M394v*X*r*XX*.stm** where *X*r*XX* is the actual version number. Studio Technologies will supply the application firmware file inside a .zip archive file. While the firmware file inside of the zip file will adhere to the naming convention required by the Model 394, the name of the zip file itself will include the file's version number. For example, a file named **M394v1r03MCU.zip** would indicate that version 1.03 of the application firmware (**M394v1r03.stm**) is contained within this zip file along with a readme (.txt) text file.

Once the USB flash drive is inserted into the USB receptacle, located on the back panel of the Model 394, the unit must be powered off and again powered on. At this point, the file will automatically load. The precise steps required will be highlighted in the next paragraphs.

To install the application firmware file, follow these steps:

1. Disconnect PoE power from the Model 394. This will entail removing the Ethernet connection that is made to the RJ45 jack on the back panel.
2. Locate the USB receptacle on the back of the unit. Insert the prepared USB flash drive into it.
3. Apply PoE power to the Model 394 by connecting an Ethernet signal that has Power over Ethernet (PoE) present to the RJ45 jack.
4. After a few seconds, the Model 394 will run a boot-loader program that will automatically load the new application firmware file (**M394v*X*r*XX*.stm**). This loading process will only take a few seconds. During this time period, an LED, located adjacent to the USB receptacle, will slowly flash green. Once the entire loading process is over, taking approximately 10 seconds, the Model 394 will restart using the newly loaded application firmware.
5. At this time, the Model 394 is functioning with the newly loaded application firmware and the USB flash drive can be removed. To minimize risk of data corruption, remove PoE power first, then remove the USB flash drive. Reconnect the Ethernet signal to restart the unit.
6. Using the STcontroller software application, confirm that the desired Model 394 application firmware version has been correctly loaded.

Note that upon PoE power being applied to the Model 394, if a connected USB flash drive doesn't have the correct application firmware file (**M394v*X*r*XX*.stm**) in its root folder, no harm will occur. Upon power up, the LED adjacent to the USB receptacle will rapidly flash green for a few seconds to indicate this error condition. Normal operation using the unit's existing application firmware will then begin.

## Ultimo Firmware Update

As previously discussed, the Model 394 implements Dante connectivity using the UltimoX2 integrated circuit from Audinate. The Dante Controller software application can be used to determine the version number of the firmware (embedded software) that resides in this integrated circuit. The STcontroller software

application can also be used to identify the firmware version. (Use the Version and Information selection under the Device tab.) The firmware (embedded software) residing in the UltimoX2 can be updated using the Model 394's Ethernet port. Performing the update process is easily accomplished using an automated method called Dante Updater which is included as part of the Dante Controller software application. This software application is available, free of charge, from the Audinate website (getdante).

The latest Model 394 Dante firmware file, with a name in the form of **M394v*X*r*X*r*X*.dnt**, is always available on the Studio Technologies website, as well as being part of Audinate's product library database. The latter allows the Dante Updater software application that is included with Dante Controller to automatically query and, if required, update the Model 394's Dante interface.

## Restoring Factory Defaults

A command in the STcontroller software application allows the Model 394's default settings to be reset to their factory values. From STcontroller select the specific Model 394 that you wish to restore to the factory default values. From there, select the **Device** tab, then the **Factory Defaults** selection. Then click on the **OK** box. Refer to Appendix A for a list of the Model 394's factory defaults.

# Specifications

**Applications:**

Purposes: transport of contact closure indication in broadcast, theater, industrial, and aerospace applications

Technology: utilizes Dante audio-over-Ethernet technology

**Network Audio Technology:**

Type: Dante audio-over-Ethernet

AES67-2018 Support: yes, selectable on/off

Dante Domain Manager (DDM) Support: yes

Bit Depth: up to 24 bits

Sample Rate: 48 kHz

Pull-Up/Down Support: no

Dante Channels: 2 receiver (input) and 2 transmitter (output)

Dante Flows: 2 receiver (input) and 2 transmitter (output)

Nominal Input and Output Level: –20 dBFS

**Network Interface:**

Type: 100BASE-TX, Fast Ethernet per IEEE 802.3u (10BASE-T and 1000BASE-T (GbE) not supported)

Power over Ethernet (PoE): per IEEE 802.3af

Data Rate: 100 Mb/s (10 Mb/s and 1000 Mb/s not supported)

**Pass-Through Inputs:** 2

Applications: can be configured to digitally sum Dante receiver (input) channel data with 20 kHz sine wave tones on Dante transmitter (output) channels

Type: unity gain, Dante receiver (input) to Dante transmitter (output)

Frequency Response: full Dante bandwidth

**Tone Output – In-Band:** 2

Type: contained within the Dante transmitter (output) channels

Frequency and Type: 20 kHz, sine wave

Frequency Accuracy: <10 ppm

Distortion: <0.0001%

Level: –20 dBFS

**Function Activation – GPI Inputs:** 2

Type: active low, 3.3 mA maximum, input pulled up to 3.3 volts DC via 1.0 k (1000) ohm resistor

**Function Activation – UDP Commands:**

Source: network commands received via Ethernet interface (a separate UDP command guide is available)

**Connectors:**

GPI Inputs: 4-pin detachable terminal block (0.150-inch/3.81 mm centers)

Ethernet: RJ45 jack

Firmware Update: USB Type-A receptacle

**Power Source:**

Power over Ethernet (PoE): class 2 (low power, ≤6.49 watts) per IEEE 802.3af

**Configuration:** requires Studio Technologies STcontroller personal computer application

**Firmware Updating:** USB flash drive supports updating of main firmware (embedded software); Dante interface firmware updated via Ethernet interface

**Environment:**

Operating Temperature: 32 to 122 degrees F (0 to 50 degrees C)

Storage Temperature: –40 to 158 degrees F (–40 to 70 degrees C)

Humidity: 5 to 95%, non-condensing

Altitude: not characterized

**Dimensions (Overall):**

4.1 inches wide (10.4 cm)
1.2 inches high (3.1 cm)
4.9 inches deep (12.5 cm)

**Mounting Options:** intended for tabletop applications

**Weight:** 0.55 pounds (0.25 kg)

Specifications and information contained in this User Guide subject to change without notice.

# Appendix A – Model 394 STcontroller Default Configuration Values

Button Mode – GPI 1: Momentary

Button Mode – GPI 2: Momentary

Button Control – GPI 1: Off

Button Control – GPI 2: Off

Additional Dante Tx Audio Source – Channel 1: Off

Additional Dante Tx Audio Source – Channel 2: Off