

USER GUIDE



RS-422 64-Port Active Data Patchbay Models 422A32 and 422A32-D



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1. Introduction

Congratulations on your purchase of the new Bittree RS422 64-Port Active Data Patchbay. You have purchased the latest innovation in data patchbays, which will help you accomplish your RS422 patching with unprecedented speed and reliability. Please read this User Guide end-to-end to familiarize yourself with all of your patchbay's features, and to ensure you will use it safely and effectively.

1.1 Overview of the Patchbay

The new Bittree RS422 Active Data Patchbay delivers the most significant improvement in RS422 patching since its inception, making it easier to route, manage, verify and diagnose RS422 data connections.

The key innovation lies in the patchbay's auto-sensing transceivers that receive, interpret and re-transmit perfectly regenerated RS422 signals, eliminating inductive and capacitive signal distortion frequently imposed by traditional passive switches. The patchbay also provides a powerful diagnostic tool that easily verifies the connection status between controllers and remote devices (e.g., VTRs). The color-coded Indicator LEDs on the front panel display the transmitting and receiving status of each device connected to the patchbay, providing you with a reliable way to manage, verify and diagnose RS422 signals, as well as determine which devices are set to "Master" and which to "Remote."

The RS422 Active Data Patchbay enhances the mechanical and electrical reliability of your RS422 connections. Mechanically, your system will be more reliable because it uses standard, robust bantam (TT) audio jacks and corresponding bantam audio patchcords, as opposed to the more fragile "card edge" patchcords used by competing 2 x 32 patchbays that can cost twice as much. Electrically, your system will be more reliable because the patchbay transmits regenerated, pristine RS422 signals.

In addition to the signal-enhancement, diagnostic capabilities and increased reliability described above, the form-factor of the new RS422 64-Port Data Patchbay is more efficient than that of competing models, thanks to its 2 x 32 port configuration that perfectly matches standard routers.

To ensure uninterruptible operation and unmatched reliability, Model 422A32-D features dual, redundant power supplies and automatic internal power switching in case of anomalous events. Dual power indicator lights on the front panel provide complete status information on both power supplies and the patchbay's power bus. Model 422A32 features a single power supply.

The RS422 Active Data Patchbay is ideal for multiple edit bays and machine rooms in post-production, broadcast and duplication houses. And because the patchbay also serves as a repeater, it excels in today's larger networked installations, helping to provide RS422 cable runs of up to 8,000 feet, depending on the termination gear.

Front and rear views of the Bittree RS422 Active Data Patchbay, with annotations, are shown in Figure 1 below.

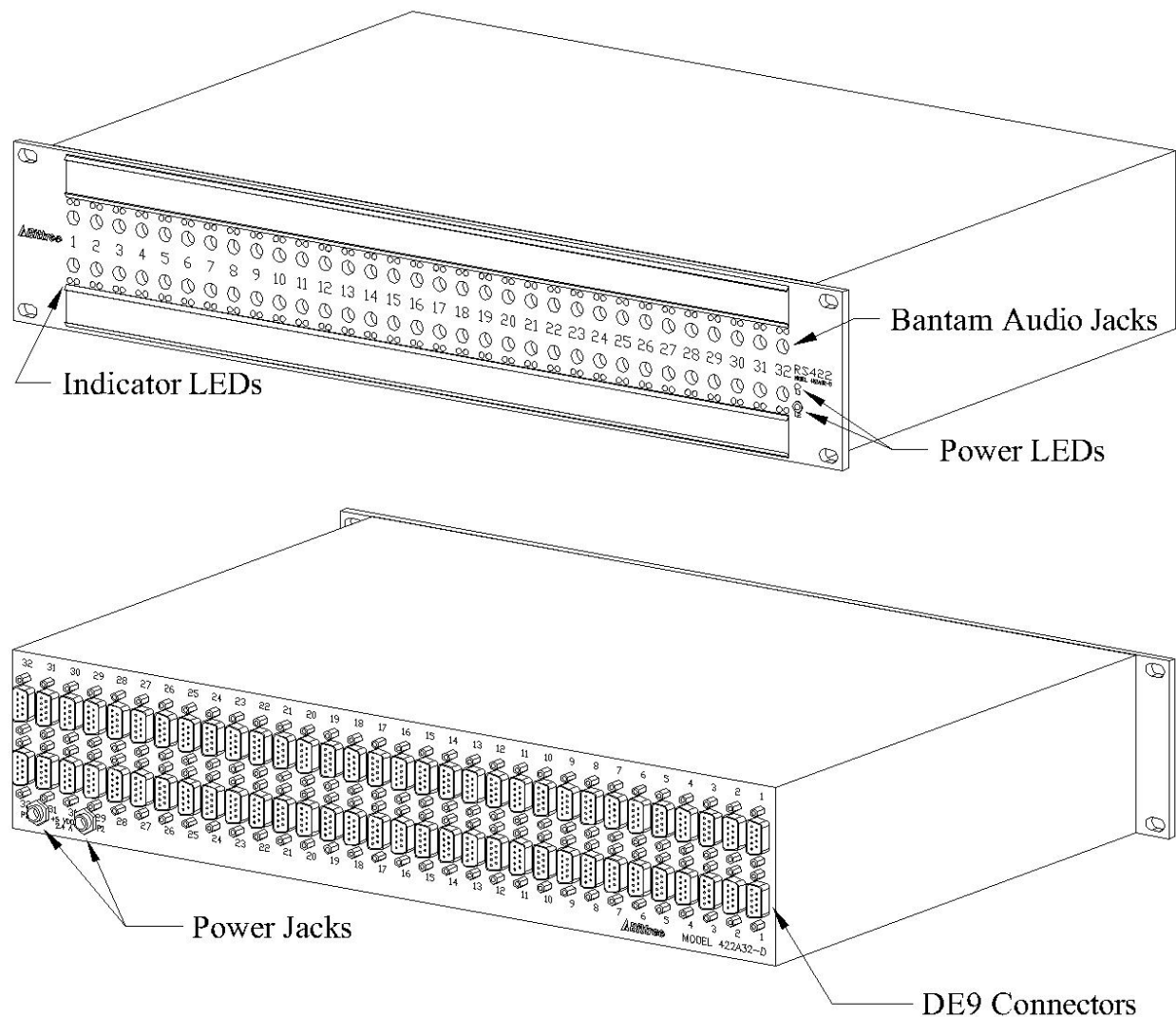


Figure 1 – Front and rear views of the RS422 Active Data Patchbay

Two rows of 32 bantam audio jacks and two rows of 128 indicator LEDs, one green and one yellow per jack, are mounted on the front panel of the patchbay. Two rows of 32 9-pin female subminiature-D (DE9) connectors are mounted on the rear panel of the patchbay. A bantam audio patchcord inserted in any pair of front panel jacks completes a data connection between a controller and a remote device connected to the corresponding rear panel DE9 connectors.

Model 422A32-D, with dual, redundant power supplies, features two power indicator LEDs mounted on the front panel of the patchbay and two “long” 2.0 mm power jacks mounted on the rear. Meanwhile, Model 422A32A with a single power supply, features a power indicator LED mounted on the front panel of the patchbay and one “long” 2.0 mm power jack mounted on the rear.

1.2 Key Features of the Patchbay

- Electronic transceivers clean-up and re-generate RS422 signals, for cable runs up to 8,000 feet (total distance, from controller to remote)
- 2 x 32 ports, 2 RU, 12" deep chassis
- Easy-to-read connection-status indicator lights
- Uses standard, low-cost, ultra-reliable bantam audio patchcords
- Port auto-sensing/auto-configuring (master or remote)
- Designed for the Sony Remote Delegation Protocol (*“Protocol of Remote 9-Pin Connector”*)
- EIA RS-422-A (RS422) standard compliant
- Normal I/O paired ports
- DE9 female rear interface
- Patchbay power indicator lights
- Dual/redundant or single high-quality power supplies
- Jacks rated to 30,000 minimum insertions
- Rugged nickel-plated, cold-rolled steel box-frame jack construction
- Copper-nickel-silver alloy leaf springs with gold-alloy crossbar switching contacts and nickel-plated sleeve bushings
- Panels made from 3/16" solid aluminum with black durable powder-coat finish
- Extra-wide designation strips

1.3 Powering the Patchbay

Depending on the Model, the Bittree RS422 Active Data Patchbay is shipped with either one or two power supplies. There are specific grounding and current handling requirements that the power supplies must meet. Although you could power your patchbay with any power supply that meets the requirements detailed in the *Specifications* section (section 4) of this document, Bittree strongly recommends that you use only Bittree-supplied power supplies to power your patchbay.

To ensure uninterrupted operation and unmatched reliability, Model 422A32-D features dual, redundant power supplies and automatic internal power switching in case of anomalous events. Dual power indicator lights on the front panel provide complete status information on both power supplies and the patchbay’s power bus. Under normal circumstances, when both power supplies are in good operational condition and powered-up, the patchbay draws its power from the primary supply, “P1,” which is the supply plugged into the rightmost power jack on the rear-panel. If for some reason the primary supply stops supplying power, the patchbay automatically

and seamlessly switches over to the secondary supply, “P2,” which is plugged into the second power jack. The switch-over operation is transparent to the user; continuous operation of the patchbay is maintained.

Table 1 below describes the possible the states and meanings of the two power indicator LEDs, “L1” and “L2,” which are mounted on the front panel.

Top LED (L1) (Clear when Off)	Bottom LED (L2) (Green when Off)	Meaning
Yellow	Green	All clear. Both power supplies are operational.
Yellow	Off	The primary power supply has failed. Repair or replace as soon as possible. Patchbay is powered from the secondary power supply, but power redundancy no longer exists.
Red	Green	The secondary power supply has failed. Repair or replace as soon as possible. Patchbay is powered from the primary power supply, but power redundancy no longer exists.

Table 1 – Explanation of the states of the two power indicator LEDs

NOTE: If you experience a power indicator LED color combination that is not listed in Table 2, then the patchbay may possibly be exhibiting an internal fault. Please call Bittree Customer Service for further assistance.

If you ordered Model 422A32 with the single power supply, your patchbay will still function but will not have the benefit of a redundant power supply. Continue reading for information and instructions pertaining to patchbays with either dual or single power supplies.

The DC power plug of the power supply(s) is equipped with a threaded cowling to ensure that, once installed, it will stay securely plugged in – even if the power supply cable is accidentally tugged. After plugging the DC power plug into the DC power jack on the rear panel of the patchbay, screw the threaded cowling clockwise until finger-tight.

*TECHNICAL NOTE: This patchbay employs a special “long” power jack, specifically designed for use with a 2.0 mm inner-diameter, 12 mm long power plug with a locking threaded cowling. Standard length 2.1 mm power plugs **will not** make good contact with this power jack.*

The 120 Volt AC power plug of the power supply is a three-prong AC power plug that includes an earth-ground terminal. Bittree recommends that this AC power plug only be plugged into AC outlets that have been tested and proven to have a true earth-ground connection. Furthermore, if you are planning to interconnect and patch between more than one RS422 Active Data Patchbays, please ensure that all the patchbays are connected to a common earth-ground circuit (e.g., by plugging them all into the same power strip). This ensures that a common ground potential is established between the different patchbays and the signals are interpreted correctly.

After inserting the AC power plug of the power supply into a grounded 120 Volt AC power outlet, the green power indicator LED on the front panel of the patchbay, shown in Figure 1, should light, confirming that the patchbay is powered up. If this does not happen, try a different AC power outlet. Also please ensure that the DC power plug is properly and completely inserted into the power jack on the rear panel of the patchbay, and that its threaded cowling is completely screwed in. If all the above is verified, and the green power indicator LED on the front panel fails to light-up, please contact Bittree Customer Service.

2. Connecting the Patchbay

2.1 Rear Panel DE9 Connections

Once the Bittree RS422 Active Data Patchbay is powered up, and the green power indicator LED on the front panel is lit, you are ready to connect controllers and remote devices to it.

Use DE9 male-to-male patch cables to connect controllers and remote devices to the female DE9 connectors on the rear panel of the patchbay. *NOTE: Only devices that conform to the Sony "Protocol of Remote 9-Pin Connector" communications protocol should be connected to this data patchbay.*

This patchbay is designed to mount in a standard rack, which limits the width of its chassis to 17.5 inches. On the other hand, the patchbay is designed to accommodate the industry-standard two rows of 32 connections. Therefore, the resulting small distance between adjacent DE9 connectors on the rear panel may preclude the use of cables with standard-size DE9 connector hoods. For this reason, Bittree has designed a special narrow connector hood, the DE9 Slim Hood shown in Figure 2, which allows users to fit up to 32 connectors in each row and take advantage of all 64 patchbay ports. The DE9 Slim Hood is easy to assemble, comes with a rugged tie-wrap strain relief to ensure solid connections, and features slotted thumb screws for maximum convenience.



Figure 2 – The DE9 Slim Hood Plug

TECHNICAL NOTES: For standard, one-to-one controller to remote device connections, your DE9 cables must interconnect all pins of the DE9 plugs at each end, in a "straight-through" configuration (i.e., they must connect all corresponding pins of the two DE9 end plugs). The pins that are absolutely required to complete a proper bi-directional connection between a device and the patchbay are pins 2, 3, 4, 6, 7 and 8. In addition, the patchbay also routes pin 5 of the DE9 connectors, which carries the PRIORITY signal on some Sony devices. **Please do not use a null modem cable, or any other cable that "crosses pins" from one side to the other.**

If you would like to daisy-chain devices through the Bittree RS422 Active Data Patchbay, you may have to use special DE9 cables, with pins 2 and 7 disconnected, to connect the output remote DE9 ports of the remote devices. This is because certain popular devices, such as the Sony DVW-M2000 Digital Videocassette Recorder, internally connect drivers at both differential pairs of pins (pins 3-8 and pins 7-2) of their second, output remote DE9 connector, which is commonly used to daisy-chain devices in broadcast mode, so that multiple remote devices can be controlled by a single controller. This practice is in breach of the RS422 protocol, to which the Bittree patchbay conforms. Therefore, to make the system work correctly, connections between the second, output remote DE9 connector (labeled REMOTE IN/OUT in the Sony DVW-M2000) of one of these devices and the patchbay must be accomplished with these special DE9 cables that do not connect pins 2 and 7 of the end DE9 plugs.

2.2 Front Panel Patchcord Connections

This data patchbay is a “normaling” patchbay. Therefore, devices connected to vertically aligned DE9 connectors are connected to each other by default, in the absence of a patchcord.

Use standard 3-conductor bantam audio patchcords to connect pairs of jacks on the front panel. Connecting jacks on the front panel completes data connections between devices connected to the corresponding DE9 connectors on the rear panel. When a patchcord is inserted into a front panel jack, the default normaling connection of that jack is broken, and the data is rerouted through the patchcord.

3. Verifying and Diagnosing Connectivity

The Bittree RS422 Active Data Patchbay includes circuitry to sense and appropriately auto-configure its rear panel DE9 ports, according to whether a controller or a remote device is connected. The auto-configuration process relies on signals that exist at the DE9 connectors of the connected devices, so these devices must be powered up and configured in the correct remote mode (“Master” or “Remote”). After the devices connected to the patchbay are correctly configured, the auto-configuration process is accomplished almost instantaneously, in human time scale (completed in under one tenth of a second).

3.1 Verifying Connectivity

The Bittree RS422 Active Data Patchbay includes connection-status indicator LEDs designed to help you verify connectivity or even diagnose connectivity problems, in the unlikely event that they occur. Two indicator LEDs, one green and one yellow, are mounted above or below each bantam audio jack on the front panel. A simplified schematic circuit diagram of a vertical slice of the patchbay (side view), including two front panel jacks and two rear panel DE9 connectors, is shown in Figure 3.

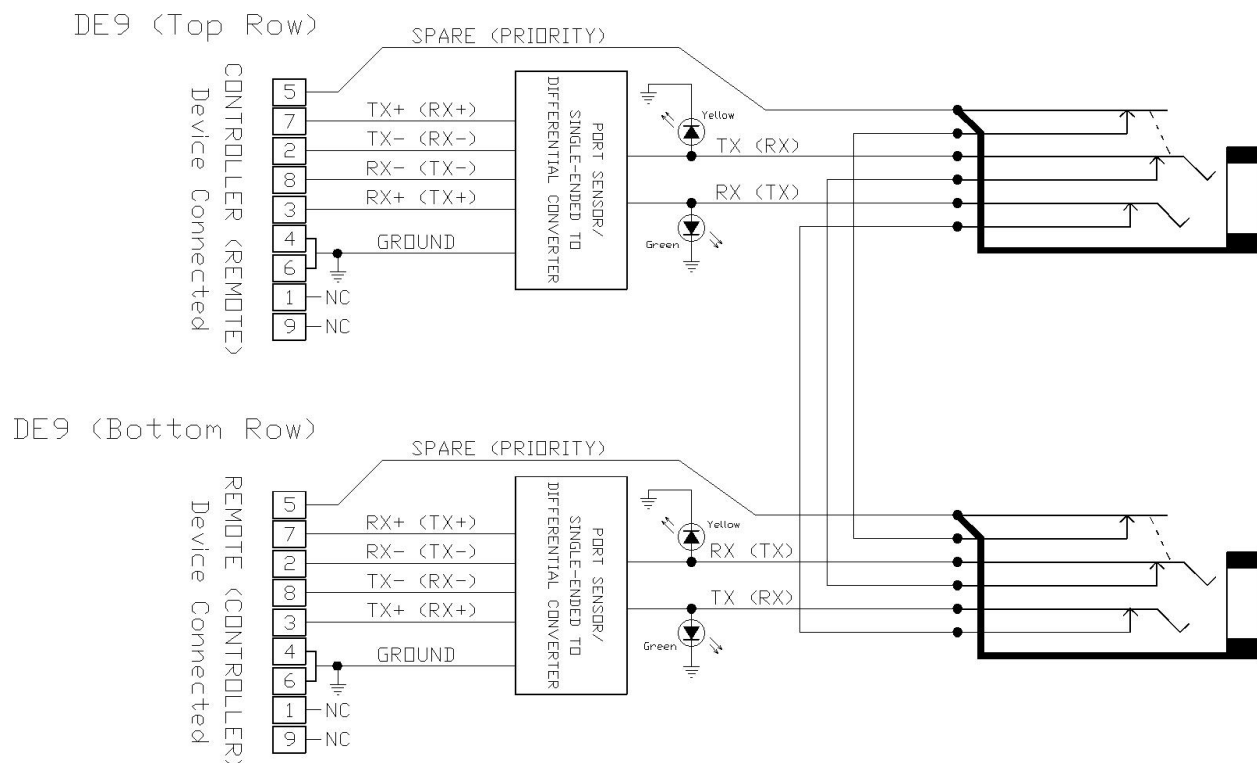


Figure 3 – Schematic circuit diagram of a vertical slice of the patchbay

As shown in Figure 3, the green LED of each jack is connected to the signal line driven by pins 3 and 8 of the corresponding rear panel DE9 connector. On these pins a controller sends its periodic hailing command when searching for a connected remote device. Therefore, when a controller is connected to a DE9 port, the green LED of the corresponding jack on the front panel starts flashing, indicating that the controller has been successfully connected and is searching for a remote device. Simultaneously, the green LED of the other jack, located vertically above or below the first jack, will start flashing if there is no patchcord plugged into the first jack. This is because the internal normalizing connection carries the controller's commands to the second jack. If the first jack had been connected to a different jack with a patchcord, then the green LED of that jack would flash, verifying that the controller's commands are reaching that jack, and therefore also the rear panel DE9 connector corresponding to that jack.

The yellow LED of each jack is connected to the signal line driven by pins 2 and 7 of the corresponding rear panel DE9 connector. A remote device responds to the controller's commands on these pins. A remote device, however, will not send any data on these pins until it recognizes an incoming command on pins 3 and 8. Therefore, when connecting a remote device to a DE9 connector of the patchbay that is not patched to a controller (either by an internal normalizing connection or by a patchcord), the yellow LED of the corresponding jack will not flash. It will only start flashing when a controller is patched to that remote device, indicating that the remote device is receiving the controller's commands and is responding to them. At that time, the yellow LED of the jack that the remote device is connected to and the yellow LED of

the jack the controller is connected to will both start flashing, verifying that the remote device's responses are reaching the controller.

Therefore, after a bi-directional connection has been successfully established, four LEDs will continuously flash while the data connection is active: a green and a yellow one at the jack corresponding to the DE9 connector that the controller is connected to, and a green and a yellow one at the jack corresponding to the DE9 connector that the remote device is connected to.

In addition to the DE9 connector pins required by the Sony *Protocol of Remote 9-Pin Connector* and the RS422 Protocol, the Bittree RS422 Active Data Patchbay also switches and routes pin 5 of the rear panel DE9 connectors, as shown in Figure 3. This pin is designated as “spare” by the Sony Remote Delegation protocol, but is used in some installations for priority signal routing.

3.2 Diagnosing Connectivity

Table 2 below summarizes some possible abnormal conditions, potential causes, and suggested actions. A controller is assumed connected to Port 1 and a remote device is assumed connected to Port 2. It is assumed that both the controller and the remote device are powered-up, configured and connected to DE9 connectors on the rear panel of the patchbay. The two jacks that correspond to those DE9 connectors are assumed patched together, either via an internal normalizing connection (i.e., they are vertically aligned) or through an external patchcord. Please ensure that there are no “hanging” patchcords (i.e., patchcords with only one of the two ends connected) between the jacks in question.

NOTE: If you experience an LED flashing/off combination that is not listed in Table 2 below, then the patchbay may possibly be exhibiting an internal fault. Please call Bittree Customer Service for further assistance.

Port 1 (Controller)		Port 2 (Remote)		Diagnosis / Possible Causes / Actions
Green LED	Yellow LED	Green LED	Yellow LED	
Off	Off	Off	Off	<ul style="list-style-type: none"> • Are the Power Indicator LEDs of the patchbay lit and indicating proper power? If not, the patchbay is not powered up. • Are both the controller and the remote device turned on, powered up and plugged into the rear panel DE9 connectors? • Is the controller set in “master” mode? • The controller may be not be operating correctly. • Is the controller successfully controlling the remote device? If so, the patchbay may be exhibiting an internal fault. Call Bittree Customer Service. • Is the circuit connected directly to the back of another active RS-422 Patchbay? The rear interfaces of two Active RS-422 Patchbays cannot be directly connected to each other (i.e., no tie-lines).
Flashing	Off	Off	Off	<ul style="list-style-type: none"> • Is there is a patchcord connected only to Jack 2? If so, plug its other side into Jack 1. • Is there is a patchcord connected to both Jack 1 and Jack 2? If so, the patchcord may be broken, or the bantam audio jacks and/or plugs may not be making good contact. Test the continuity of the patchcord. Clean the plugs of the patchcord and try inserting and removing them a few times. <i>NOTE: Bittree strongly discourages the use of cleaning sprays or abrasive cleaning tools on the bantam audio jacks.</i> • Is there no patchcord connected to either Jack 1 or Jack 2? If so, the patchbay may be exhibiting an internal fault. Call Bittree Customer Service. • Is the controller successfully controlling the remote device? If so, the patchbay may be exhibiting an internal fault. Call Bittree Customer Service.

Port 1 (Controller)		Port 2 (Remote)		Diagnosis / Possible Causes / Actions
Green LED	Yellow LED	Green LED	Yellow LED	
Flashing	Off	Flashing	Off	<ul style="list-style-type: none"> Is the remote device turned on, powered up and plugged into the rear panel DE9 connectors? Is the remote device in “remote” (“slave”) mode? The remote device may be receiving the controller’s commands, but is not responding (operating) properly. Is the controller successfully controlling the remote device? If so, the patchbay may be exhibiting an internal fault. Call Bittree Customer Service.
Flashing	Off	Flashing	Flashing	<ul style="list-style-type: none"> Is there is a patchcord connected to both Jack 1 and Jack 2? If so, the patchcord may be broken, or the bantam audio jacks and/or plugs may not be making good contact. Test the continuity of the patchcord. Clean the plugs of the patchcord and try inserting and removing them a few times. <i>NOTE: Bittree strongly discourages the use of cleaning sprays or abrasive cleaning tools on the bantam audio jacks.</i> Is there no patchcord connected to either Jack 1 or Jack 2? If so, the patchbay may be exhibiting an internal fault. Call Bittree Customer Service. Is the controller successfully controlling the remote device? If so, the patchbay may be exhibiting an internal fault. Call Bittree Customer Service.

Table 2 – Abnormal conditions and related diagnostic information

4. Specifications

- **Power Requirements:**

Dual Supply, 5 ± 0.1 Volts DC Regulated; 2.4 Amperes maximum

Power Connector Type: Dual 2.0 mm Locking Mini Power Jack, Long Version (12.0 mm) – L722A

- **Power Supply:**

Input: 100-120V AC, 47-63 Hz; 0.75 Amperes

Grounding: 3 prong outlet with true earth ground required. Earth ground should be connected to DC ground return.

Power Connector Type: 2.0 mm Locking Mini Power Plug, Long Version (12.0 mm) – S761K

- **Signal Timing:**

Data rate: 38.4 kbps nominal, 500 kbps maximum

Maximum Propagation Delay (DE9 connector to DE9 connector): 1.3 microseconds

- **Rear Interface:**

Connector Type: DE9 Female

Life Cycle: 10,000 Insertions minimum

Electrical Interface Protocol: EIA RS-422-A

Differential Input Impedance (Receiver): 1,000 Ohms

Maximum Number of Standard (4,000 Ohms Input Impedance) RS422 Receivers per Driver (assuming a 100 Ohm termination on one side of the bus): 52

Maximum RS422 Connection Distance (one-way, assuming 100 Ohm bus termination): 1220 m (4003 ft.)

- **Front Interface:**

Connector Type: Bantam (TT) Audio Jacks

Life Cycle: 30,000 Insertions minimum

Patchcord: Standard Bantam (TT) Audio (3 conductor)

- **Environmental:**

Operating Temperature: 0°C to 70°C

Storage Temperature: –55°C to 85°C

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Bittree Product Warranty

Patchbays

BITTREE warrants to the original purchaser that for a period of five years from your date of purchase, your BITTREE patchbay product will be free from defects in materials and workmanship under normal use and with reasonable maintenance. The warranties covering the BITTREE product do not cover damage to the product resulting from improper use, improper maintenance, neglect of care or unauthorized repair. BITTREE will at its option, repair or replace without charge any components of the BITTREE product that it finds defective in materials or workmanship. To obtain warranty service, you must deliver your BITTREE product together with proof of purchase to the BITTREE Factory Service Center located at 600 West Elk Avenue, Glendale, California 91204. If you deliver your BITTREE product using a postal carrier, you must pay the shipping charges to the factory. ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO ONE YEAR FROM YOUR DATE OF PURCHASE. BITTREE SHALL NOT BE LIABLE OR RESPONSIBLE IN ANY MANNER FOR LOSS OF USE OF THE PRODUCT OR ANY INCIDENTAL, CONSEQUENTIAL OR INDIRECT COSTS, EXPENSES OR DAMAGES INCURRED. No salesperson, dealer or representative is authorized to make any modifications to this warranty or to make additional warranties. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

Patchcords

BITTREE warrants to the original purchaser that for a period of one year from your date of purchase, your BITTREE patchcord product will be free from defects in materials and workmanship under normal use and with reasonable maintenance. The warranties covering the BITTREE product do not cover damage to the product resulting from improper use, improper maintenance, neglect of care or unauthorized repair. BITTREE will at its option, repair or replace without charge any components of the BITTREE product that it finds defective in materials or workmanship. To obtain warranty service, you must deliver your BITTREE product together with proof of purchase to the BITTREE Factory Service Center located at 600 West Elk Avenue, Glendale, California 91204. If you deliver your BITTREE product using a postal carrier, you must pay the shipping charges to the factory. ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO ONE YEAR FROM YOUR DATE OF PURCHASE. BITTREE SHALL NOT BE LIABLE OR RESPONSIBLE IN ANY MANNER FOR LOSS OF USE OF THE PRODUCT OR ANY INCIDENTAL, CONSEQUENTIAL OR INDIRECT COSTS, EXPENSES OR DAMAGES INCURRED. No salesperson, dealer or representative is authorized to make any modifications to this warranty or to make additional warranties. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

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