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BavSonic™
Universal Telephone Audio
Installation and Service Manual
REV5

BavSonic™ Universal Telephone Audio

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Important Safety Instructions

1. READ THESE INSTRUCTIONS

2. KEEP THESE INSTRUCTIONS

3. HEED ALL WARNINGS

4. FOLLOW ALL INSTRUCTIONS

5. DO <u>NOT</u> USE THIS APPARATUS NEAR WATER

6. CLEAN ONLY WITH A DRY CLOTH

7. DO NOT BLOCK ANY VENTILATION OPENINGS. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS

8. DO <u>NOT</u> INSTALL NEAR ANY HEAT SOURCES SUCH AS RADIATORS, HEAT REGISTERS, STOVES OR OTHER APPARATUS (INCLUDING AMPLIFIERS) THAT PRODUCE HEAT

9. PROTECT THE POWER CORD FROM BEING WALKED ON OR PINCHED PARTICULARY AT PLUGS, CONVENIENCE RECEPTACLES AND THE POINT WHERE THEY EXIT THE APPARATUS

10. ONLY USE ATTACHMENTS/ ACCESSORIES SPECIFIED BY THE MANUFACTURER

11. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL. SERVICING IS

REQUIRED WHEN THE APPARATUS HAS BEEN DAMAGED IN ANY WAY, SUCH AS

POWER-SUPPLY CORD OR PLUG IS DAMAGED, LIQUID HAS BEEN SPILLED OR

OBJECTS FALLEN INTO THE APPARATUS, THE APPARATUS HAS BEEN EXPOSED

TO RAIN OR MOISTURE, DOES NOT OPERATE NORMALLY OR HAS BEEN DROPPED.

Additional Safety Instructions

WARNING – TO REDUCE THE RISK OF FIRE OR ELECTRONIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

BavSonic™ Universal Telephone Audio Features

The BavSonic™ Universal telephone intercom interface module connects the intercom system of the two outside remote drive-thru lanes to the telephone system. This is a full duplex audio system for maximum intelligibility. The incoming audio levels are adjustable by the end user at each telephone station.

The customers at the remote-drive-thru locations can call the inside by depressing the CALL BUTTON on either lane. This initiates a call to the telephones in the building that are programmed to receive them. The employees can access each remote lane from the telephones that are given access. If a customer presses the call button and the call is not answered in approximately one minute the call is terminated for 10 seconds then another attempt is made. This will happen five times at which point the interface will reset itself awaiting the next activation of the call button.

Telephone Interface Power and Site Requirements

Power is supplied to the interface through a 110v power cord and is protected by a 1 amp breaker. The customer will supply the 110v power outlet as well as the connections from the telephone system to an area under the counter adjacent to the drive-thru window.

Telephone system requires a standard loop start CO line for each lane, and the phone system to be programed to connect to the interface. This also is the customer's responsibility.

These items should be in place, and the phone system programed, before installing the BavSonic™ Universal Telephone Interface.

NOTE: For VoIP phone systems, additional equipment may be required.

Mounting the Interface Assembly

There are two "Keyhole" slots in the base of the assembly's housing, (See page 11). These are to be used to secure the assembly to the wall, cabinet or counter work to prevent damage to the unit and for a "Cleaner" looking installation.

Intercom Connections

There are intercom boards located in both the window lane and remote lane. These boards are connected to the telephone interface via standard CAT 5 wiring. The termination is a type 568B. The connectors for the red cable are RJ45. The blue cable is connected to the screw terminals of the green Phoenix connector. Red cabling designates lane one. Blue cabling designates lane two. Each remote intercom board has a LED, which indicates that it is receiving power.

The outgoing audio levels are adjusted at the intercom audio board. The intercom audio board for the window will be near the transaction drawer. The intercom audio board for the TransTrax is located on the customer speaker panel, inside a weatherproof enclosure, of the customer unit located on the outside island. After adjustments are made, be careful not to pinch any wires during the reassembly of the weatherproof enclosure.

Plug J1 is for the speaker connection. The connector is a 3-position with positions 1 & 3 being the speaker. For the outside board, plug J2 is an 8-position Microfit, for the inside board, plug J2 is an 8-position RJ45. Plug J3 is for the call button connections. The connector is a 4-position with positions 2 & 3 being the button. Note that positions 1 & 4 are 19vdc power with position 4 being positive. Plug J4 is for the microphone connection. This connector is a 2-position.

Please see page 8 for an overall wiring diagram of the intercom section. Note that the wire tie on the case is for a strain relief of the Lane 2 connecting cable.

It is recommended to install the RJ45 connector directly onto the end of the CAT5 cable for the window lane (lane 1), and to strip and install the wires for the remote (lane 2) directly into the screw terminals of the green Phoenix connector. For situations where tooling is not available to attach the RJ45 to the end of the CAT5 cable for the window lane, we have included a wiring pigtail, (P/N 22066011, see page 9) that can be spliced onto the cable with the crimp connectors provided. For situations where it is preferable not to remove the RJ45 from the Remote lane's cable we have provided a RJ45 to Terminal Barrier Adapter harness, (P/N 22209591, see page 9), that can be plugged onto the RJ45 connector of the Cat5 cable and then, after removing the green terminal barrier shipped on the Interface box, plugged directly into the box.

Installation with KSU type Telephone System

The Universal Telephone Audio Interface can be used in conjunction with most KSU type telephone systems. The following information is generic for most systems. If additional information is needed please consult the factory.

The telephone connections on the Universal Telephone Audio Interface are standard RJ11 jacks. There are two two-wire telephone cords that are provided with the interface that should be used to connect the Universal Telephone Audio Interface to the RJ45 connection of the telephone system. One cord is for the WINDOW lane the other for the REMOTE lane.

The CO port should be programmed for loop start. If there is a programmable delay between off hook and connection of the audio path it should be adjusted to the minimum.

Troubleshooting

The Universal Telephone Audio Interface uses a Subscriber Line Interface Circuit (SLIC) to provide a Central Office (CO) line output. The CO line output is a standard two-wire tip ring connection with loop start. This CO line output can be connected to a telecom test set, standard telephone or Key Service Unit (KSU) for testing.

There are three states that CO line output can be in. Note that these are voltages that would normally appear on digital multi-meter, and are to be made at the center two pins of the "Telephone" connection. Values will differ if measured on an oscilloscope.

1) With or without the CO line connected and the receiver on hook, the supervisory voltage should be approximately 26Vdc. Note that a flashing RED LED indicates that the system is running.
2) With the CO line connected and the receiver off hook, the voltage should be approximately 6.5Vdc. Note that a separate YELLOW LED labeled OFF HOOK is provided for each channel to monitor this condition.
3) With the CO line connected, the receiver on hook or without the CO line connected and the YELLOW LED labeled RINGING illuminated, the voltage should be approximately 55Vac at 20 Hz.
4) Without a CO connected and shorting pins 2 & 3 together will cause the OFF HOOK LED to illuminate. Note that if the intercom is connected the audio will most likely squeal due to feedback.

If any of these voltages are not present please consult the factory for assistance.

Adjusting the Incoming Audio Level

When using the Bavis Universal (loop start) Telephone Audio Interface in a VoIP environment the audio levels are vitally important for the audio to have usable performance. The constraints of G711 encoding (8bit sampling at 8kHz) used in VoIP systems require that the analog audio signals be perfectly matched with the inputs. VoIP systems have inherent delays between when the microphones pick up speech, until that sound comes out of the speakers. When the microphone picks up this sound and rebroadcasts it back to the person talking with delay it is known as echo. Even small amounts of echo destroy the intelligibility of the spoken word. All VoIP systems incorporate echo cancellation systems. Unfortunately the purpose of these echo cancellation systems is line echo cancellation. Line echo cancellation in the VoIP telephone system will function as a rudimentary acoustic echo canceller, however, they are not very good at it. Telephony industry requires that all endpoints in a VoIP system have their own acoustic cancellation systems regardless if they are SIP or analog. The Bavis Universal Telephone Audio Interface does not have acoustic echo cancellation.

The standard operation for echo cancellation systems is to converge on a solution to digitally remove all sounds that come out of the outside speaker from the signal coming back from the outside microphone. There are many things that hamper the echo cancellation system efforts at doing this. Three important areas are: 1) Distortion in the audio signal from worn speakers or microphones. 2) Speakers turned up too high. (Note that most integral echo cancellation systems require the coupling of sound from the outside speaker to the outside microphone be minus 6dB. In a good drive-thru audio system we see a gain of 6dB.) 3) High amounts of background noise from traffic or wind. When the line echo cancellation systems cannot converge on a solution to remove the echo it takes the following steps in an attempt to find a solution. The first step is attenuate gain, basically it lowers the volume levels. If that does not work the echo canceller changes to half duplex operation. In this mode the system attempts to determine which side is talking only allowing one side to communicate at a time. The difficulty is determining which side is actually talking, (Is that sound talk, or background noise?). All of these actions are bad for drive-thru audio communication.

We added the ability to adjust the incoming audio signal in order to improve the signal going into the telephone system. These adjustments are under ¼" snap in holes plugs near the status LEDs for each channel. The adjusters are white, located in a blue body. A very small screwdriver is required to make this adjustment. The adjusters are ¾ turn.
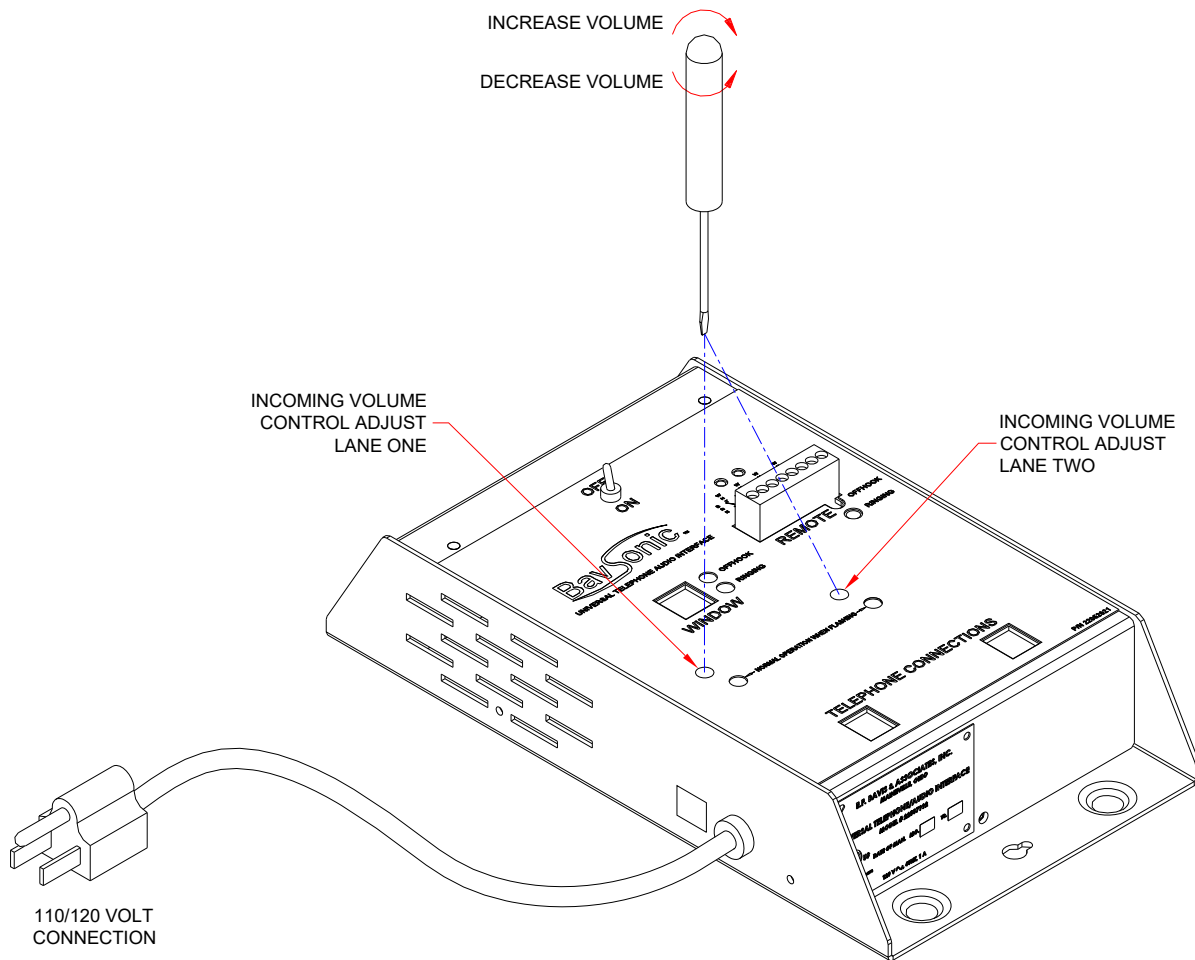
The adjustment procedure is to have someone in a running vehicle in the drive-thru talking to the technician on the telephone. In small increments turn the incoming audio level down. Normally there will not be any appreciable reduction in the sound level at the handset coming from the drive-thru lane. The AGC (automatic gain system) of telephone system is automatically reducing the signal to an acceptable level. When the incoming sound level does decrease, increase the level slightly until the sound comes back up to the normal level. This setting will allow the echo cancellation system maximum range to function before going into the half duplex mode.

If the audio cannot be improved to a performance level that is satisfactory, Bavis has two options. The first option is the optional analog echo cancellation system BEAM (Bavis
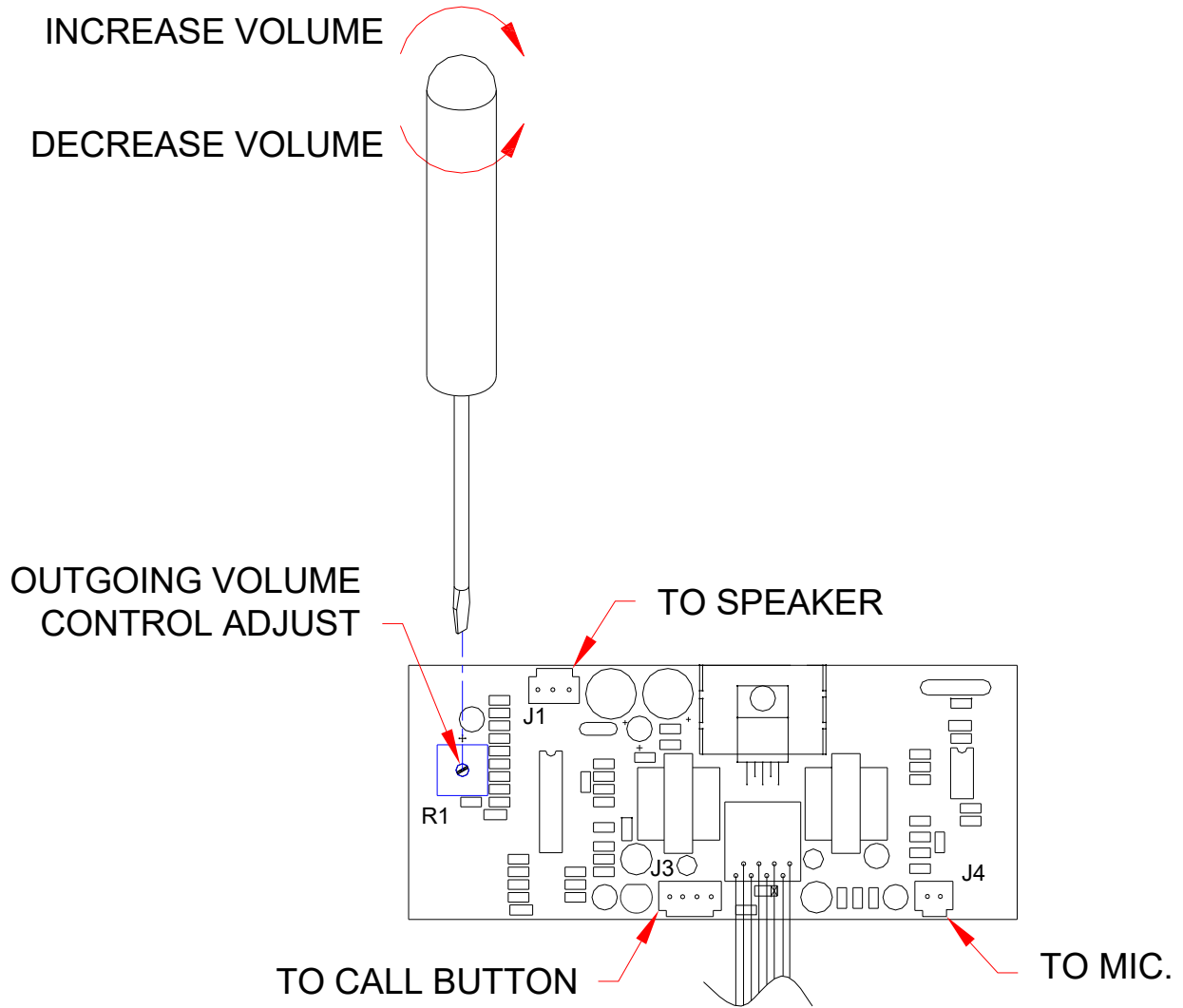
Enhanced Audio Module) that can be plugged in between the customer audio components and the interface. This system is a powerful acoustic echo cancellation system that also includes voice processing. The voice processing system recognizes stationary (background) sounds and reduces them as much as 15dB while increasing speech as much. This system automatically adapts to changing conditions in the drive-thru.

The second option is a SIP telephone audio interface. This system connects the drive-thru audio system to a VoIP system as SIP endpoint via an Ethernet connection. This system features the same echo cancellation and voice processing of the BEAM system.

Adjusting Incoming Audio Level Diagram

INCREASE VOLUME

DECREASE VOLUME

INCOMING VOLUME
CONTROL ADJUST
LANE ONE

INCOMING VOLUME
CONTROL ADJUST
LANE TWO

110/120 VOLT
CONNECTION

Adjusting Outgoing Audio Level Diagram

INCREASE VOLUME

DECREASE VOLUME

OUTGOING VOLUME
CONTROL ADJUST

TO SPEAKER

J1

R1

J3

J4

TO CALL BUTTON

TO MIC.

Intercom Wiring Diagram

8 POS MICROFIT

AUDIO TO OUTSIDE SPEAKER   CALL BUTTON
GREEN
WHITE/GREEN
BLUE
WHITE/BLUE
ORANGE
WHITE/ORANGE
BROWN
WHITE/BROWN
-19 VDC
+19 VDC
AUDIO FROM OUTSIDE MIC

8 POS RJ45 TYP (WIRED 568B)
WHT/ORG
ORANGE
WHT/GREEN
BLUE
WHT/BLUE
GREEN
WHT/BROWN
BROWN

LANE 2 REMOTE
TO MIC.
TO SPEAKER
OUTGOING VOLUME CONTROL ADJUSTED
TO CALL BUTTON

LANE 1 WINDOW
TO MIC.
TO SPEAKER
OUTGOING VOLUME CONTROL ADJUSTED
TO CALL BUTTON

RJ45
BLUE CAT5
RED CAT5 - 14' LONG
RJ11
RJ11
RJ45
TELEPHONE CONNECTIONS
REMOTE
WINDOW

INTERCOM CONNECTIONS MADE AT TERMINAL BARRIER

GREY 14' LONG
RJ45
GREY 14' LONG
RJ45

110/120 VOLT CONNECTION

8

Interface Label Diagram

OFF

ON

Bav Sonic ™

UNIVERSAL TELEPHONE AUDIO INTERFACE

W
H
BRN   T
      B
      R
      N

W
H
ORG   T
      O
      R
      G

W
H
GRN   T
      G
      R
      N

W
H
BLU   T
      B
      L
      U

OFFHOOK

RINGING

REMOTE

OFFHOOK

RINGING

WINDOW

INCOMING AUDIO GAIN
ADJUSTMENT
(WHITE DUAL LANE
INTERFACE ONLY)

◄— NORMAL OPERATION WHEN FLASHING —►

TELEPHONE CONNECTIONS

P/N 22052021

9
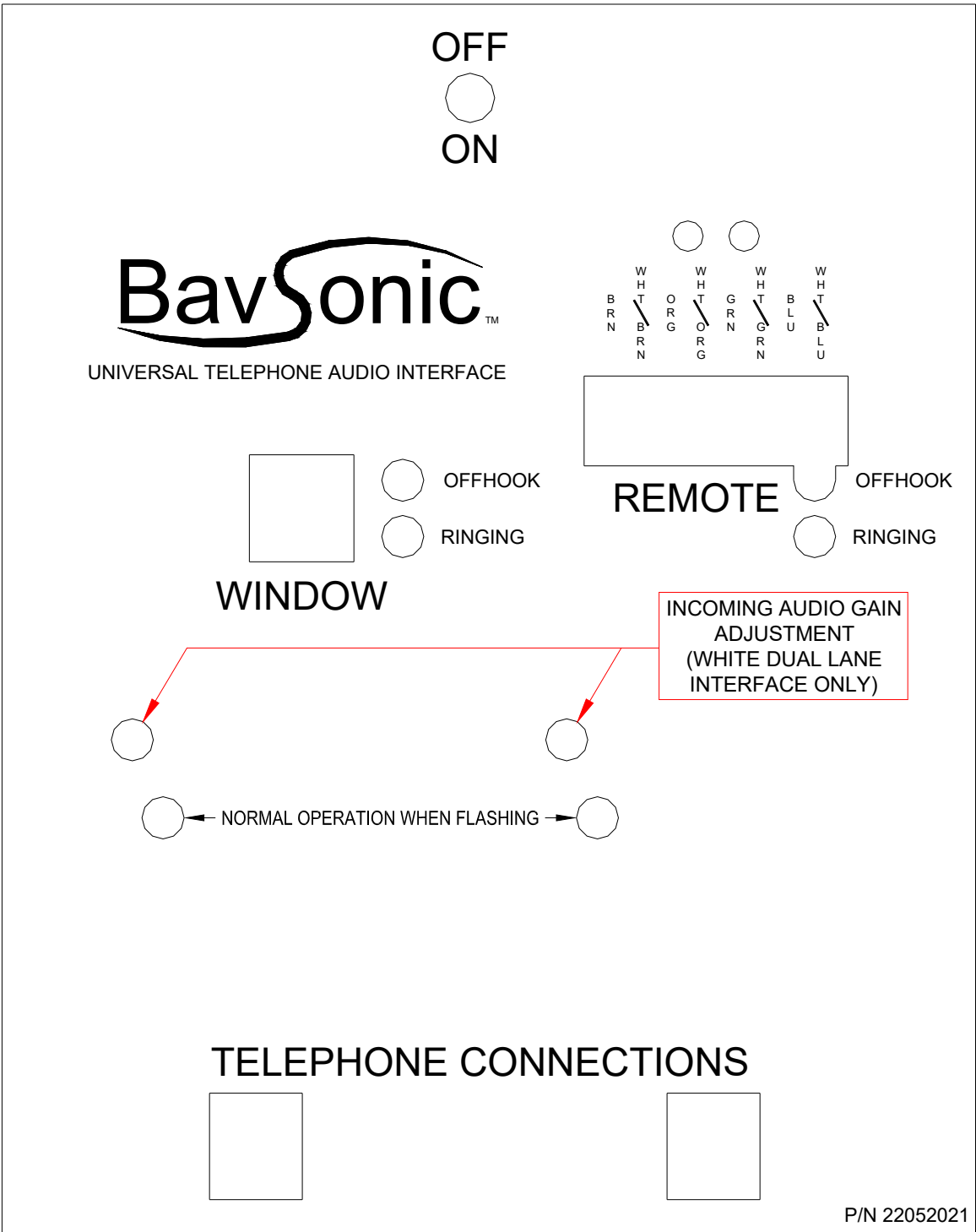
Adapter Harnesses

RJ45 PIGTAIL
P.N. 22066011

RJ45 PLUG

BROWN
WHITE/BROWN
GREEN
WHITE/BLUE
BLUE
WHITE/GREEN
ORANGE
WHITE/ORANGE

6" STRANDED CAT 5 CABLE
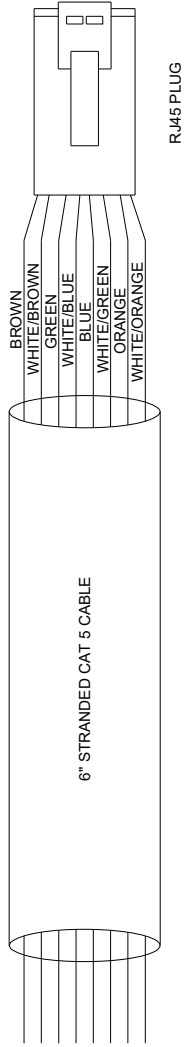
RJ45/TERMINAL BARRIER ADAPTER
P.N. 22209591
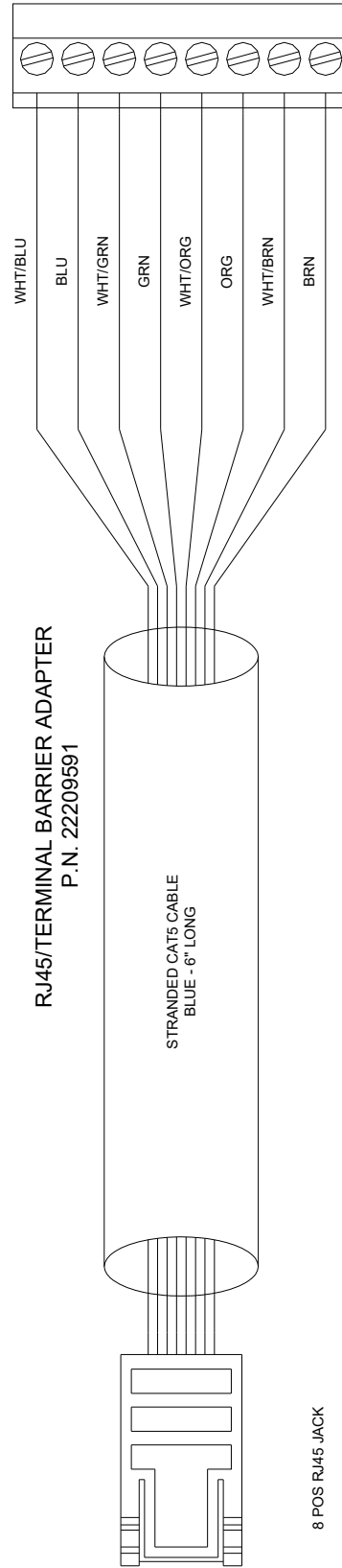
8 POS PHOENIX TERMINAL BARRIER

WHT/BLU
BLU
WHT/GRN
GRN
WHT/ORG
ORG
WHT/BRN
BRN

STRANDED CAT5 CABLE
BLUE - 6" LONG

8 POS RJ45 JACK

10

Mounting Hole Locations

MOUNTING "KEYHOLE"

OFF
ON

Bav Sonic ™

UNIVERSAL TELEPHONE AUDIO INTERFACE

BRN
WHT/BRN
ORG
WHT/ORG
GRN
WHT/GRN
BLU
WHT/BLU

OFFHOOK
RINGING

WINDOW

REMOTE   OFFHOOK
           RINGING

NORMAL OPERATION WHEN FLASHING

TELEPHONE CONNECTIONS

P/N 22052021
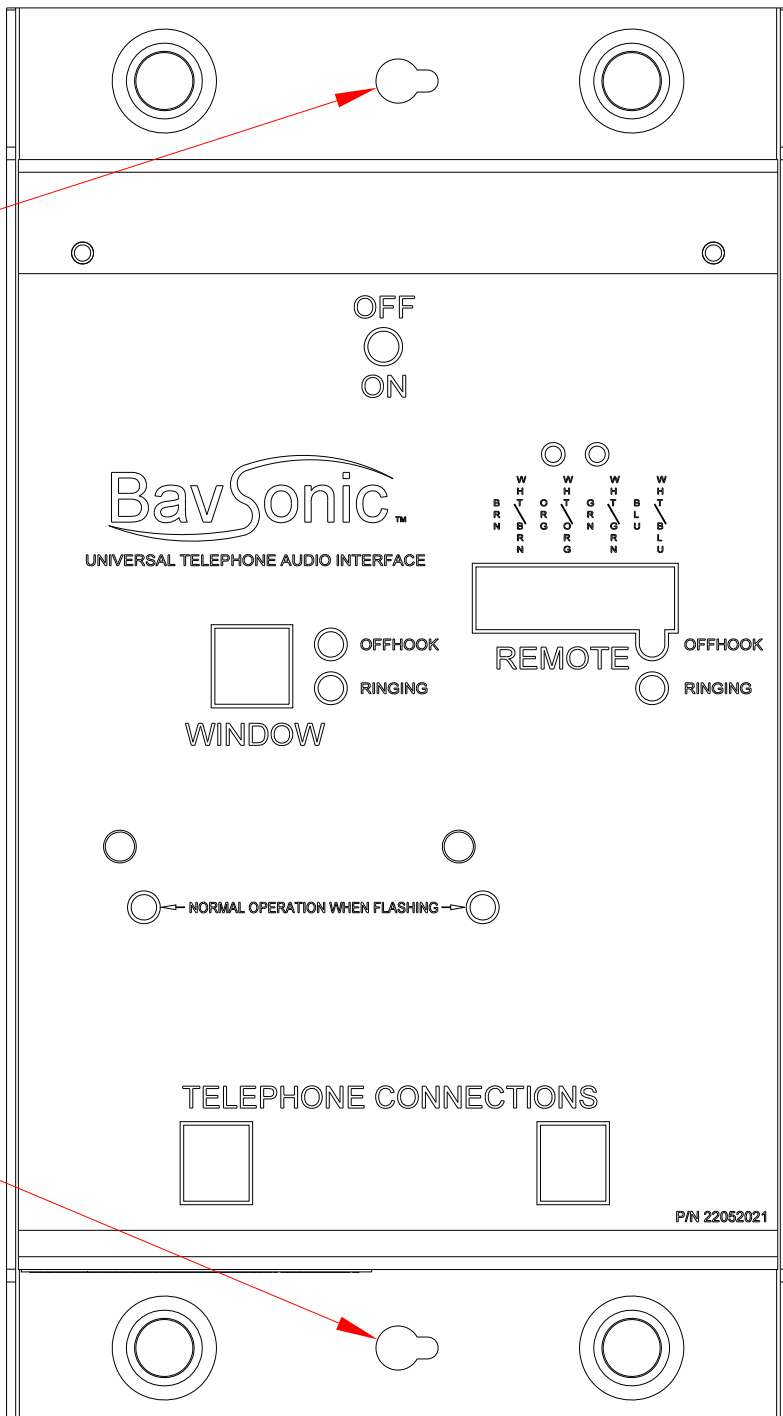
MOUNTING "KEYHOLE"

Installation and Service Tool List for Audio

1/8" And 3/8" Flathead Screwdrivers
#0 And #2 Phillips Screwdrivers
1/16" And 3/32" Allen Wrenches
1/2" Open-End Wrench
1/4", 5/16", 11/32", 3/8", And 1/2" Nut Drivers
Wire Cutters
Wire Strippers
Wire Crimpers
RJ45 Connector Crimpers & Connectors
Volt Meter
Electric Drill
Drill Bits
Level
7/8" Unibit
Fish Tape
Loctite