ZETRON®

Telephone Radio Headset Interface
Product Manual

025-9553C

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

The Ringer Equivalence Number (REN) for this terminal equipment is 0.1. The REN assigned to each terminal equipment provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the RENs of all the devices does not exceed 5.0.

Information on Disposal of Old Electrical and Electronic Equipment and Batteries (applicable for EU countries that have adopted separate waste collection systems)

Products and batteries with the symbol (crossed-out wheeled bin) cannot be disposed as household waste. Old electrical and electronic equipment and batteries should be recycled at a facility capable of handling these items and their waste byproducts.

Contact your local authority for details in locating a recycle facility nearest to you.

Proper recycling and waste disposal will help conserve resources whilst preventing detrimental effects on our health and the environment.

Notice: The sign "Pb" below the symbol for batteries indicates that this battery contains lead.

Safety Summary

STOP **Warning!**   For your safety and the protection of the equipment, observe these precautions when installing or servicing Zetron equipment:

- Follow all warnings and instructions marked on the equipment or included in documentation.
- Only technically qualified service personnel are permitted to install or service the equipment.
- Be aware of and avoid contact with areas subject to high voltage or amperage. Because some components can store dangerous charges even after power is disconnected, always discharge components before touching.
- Never insert objects of any kind through openings in the equipment. Conductive foreign objects could produce a short circuit that could cause fire, electrical shock, or equipment damage.
- Remove rings, watches, and other metallic objects from your body before opening equipment. These could be electrical shock or burn hazards.
- Ensure that a proper electrostatic discharge device is used, to prevent damage to electronic components.
- Do not attempt internal service of equipment unless another person, capable of rendering aid and resuscitation, is present.
- Do not work near rotating fans unless absolutely necessary. Exercise caution to prevent fans from taking in foreign objects, including hair, clothing, and loose objects.
- Use care when moving equipment, especially rack-mounted modules, which could become unstable. Certain items may be heavy. Use proper care when lifting.

Change List for Rev C, 7 March 2011

- Updated *Secondary Headset Jackbox Jumper Settings* on page 24 with correction to JP6-B and other improvements.

Installation

Overview

The Telephone Radio Headset Interface (TRHI) (P/N 950-9439) is a headset, hardware interface device that allows a single 4- or 6-wire headset to be shared between a radio console and external telephone equipment. The TRHI allows an operator to use a single headset for both the radio console and a separate telephone instrument.

> **Note**   The TRHI should not be confused with the headset jackbox, which provides a jack connection to a console. A headset jackbox is not required if a TRHI is used, but it can be used in conjunction with a TRHI to provide an additional headset connection.

Figure 1: Front and Rear View of TRHI

The TRHI is equipped with a dual-prong jack and two control knobs for adjusting the volume of the radio and telephone separately. An "xmit" indicator light shows when the radio is transmitting (Figure 1).

The TRHI has a low profile and is typically mounted under the writing surface of an operator's station. Installation requires mounting the TRHI hardware case, selecting the interface operation through the jumpers, wiring the interface to the telephone instrument, and wiring the interface to the radio console.

Main Topics

The main topics in this chapter are:

- *Jumper Settings* on page 9
- *Connector Signaling* on page 11
- *Connecting the TRHI to Model 4010 and Series 4000 Consoles* on page 15
- *Connecting the TRHI to Series 3200 Phones* on page 16
- *Connecting the TRHI to Third Party Equipment* on page 18
- *Audio Level Adjustments* on page 22
- *Mounting* on page 22
- *Secondary Headset Jackbox* on page 23

Jumper Settings

The interface circuit board is equipped with jumpers that allows the operation of the interface to be tailored to the installation. Figure 2 shows the TRHI circuit board with the jumper locations; Table 3 lists the available jumper options and their functions. Use these jumpers to adjust and configure the TRHI according to Table 1. See *Appendix B - TRHI Block Diagram/Schematic* on page 35 for a full block diagram of the TRHI.

Figure 2: Circuit Board Showing Jumper Locations
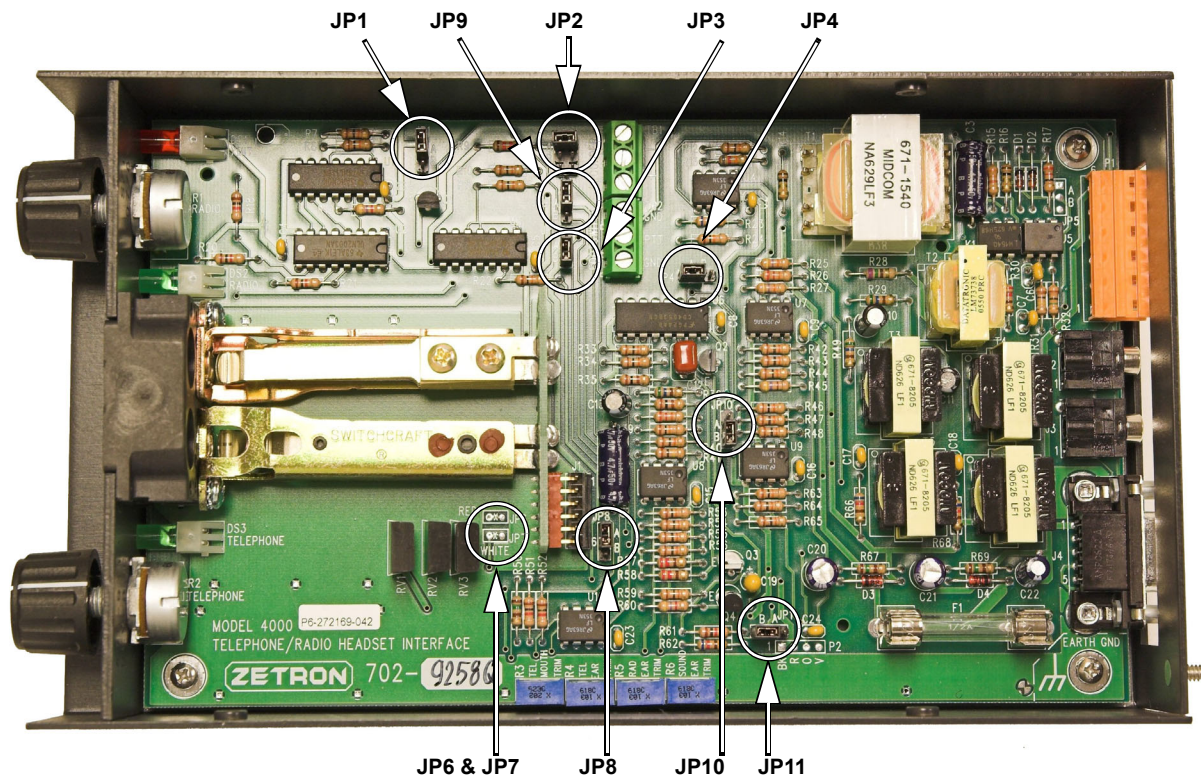
Note   The default jumper position for all jumpers is A.

Note   JP9, JP10, and JP11 exist only on 702-9257M and later revision boards.

Table 1: Jumper Table - TRHI

Jumper	Name	Description
JP1	EAR	Affects behavior of the headset speaker (EAR) when transmitting (PTT). A= With PTT active, dispatcher hears incoming audio from phone. B= With PTT active, dispatcher does not hear incoming audio from phone. See *Audio Behavior Matrix* on page 11 for additional information about how JP1 affects operation.
JP2	OFF HOOK FROM	Determines how to sense that the phone is off hook. A= Telephone Contact. Use this for a Zetron phone or a NENA-compliant phone. B= Telephone Mic Current. Use this for a 1A2 phone or "plain old telephone". C= Console. Use this to have the console control off hook status. Note: a console key must be programmed to activate spare output #1.
JP3	HEADSET	Identifies the type of headset, 4-wire (voice only) or 6-wire (voice + PTT). A= 4-Wire. Headset does not have PTT switch and connector has 4 contacts. B= 6-Wire. Headset has a PTT switch and connector has 6 contacts.
JP4	MOUTH	Affects behavior of the headset mic (MOUTH) when transmitting (PTT). A= With PTT active, dispatcher voice is sent over the radio only. B= With PTT active, dispatcher voice is sent over the radio and to the telephone. See *Audio Behavior Matrix* on page 11 for additional information about how JP4 affects operation.
JP6 & JP7	CRADLE MUTE	These are contacts used for installing TRHI PTT Handset and Cradle Option (P/N 950-0360). With this option, the handset cradle switch toggles E&M between the handset's mic/spkr and the console's mic/spkr.
JP8	SENSE	Determines how to detect whether or not a headset is present. A= Mic Current (for using a quick-disconnect in the headset cable) B= Jack Presence (for using dual-prong to disconnect the headset) See further notes about JP8 following this table.*
JP9	PTT-IN	Adjusts PTT signalling to be compatible with Model 4010, Series 4000, or Acom. A= Radio Console (J4) PTT IN and PTT OUT are separate signals. Use for Model 4010 or Series 4000. B= Radio Console PTT OUT is tied to PTT IN. Use for ACOM.
JP10	TEL-IN	An option that allows ringing tones to be sent to the headset regardless of hookswitch position and PPT-IN status. A= Headset earpiece telephone audio when telephone is off-hook and PTT-IN is inactive. This is the normal setting. B= Headset earpiece telephone audio is ALWAYS present and radio console audio is added whenever the telephone is on hook. This is the optional setting. Also, the Series 3200 must be set to send ring tones to EAR. See *Audio Behavior Matrix* on page 11 for additional information about how JP10 affects operation.
JP11	MIC HKSW	This signal lets the console know if a headset is present. A= Mic hook switch normal mode. Use for Model 4010 and Series 4000. B= Mic hook switch inverted. Use for ACOM.

⚠️ **Caution!**　Do not mix older and newer revisions of TRHIs on the same cabling. Older boards are 702-9257 rev A through L. Newer boards are rev M or later.

⚠️ **Caution!**　Do not install a four-wire plug into a TRHI configured for six-wire operation; the console may unexpectedly transmit on the selected channel.

📝 **Note**　* If you use MIC current to determine off-hook (JP2-B) or the presence of a headset (JP8-A), the microphone must draw 5mA or greater. An impedance of 2KΩ or less in the microphone circuitry will accomplish this.

With wireless headsets, MIC current is always supplied by the headset's base station even if a quick-disconnect is used.

The following table shows how audio behavior is affected by jumper settings, handset removal, on/off hook status, and PTT status.

Table 2: Audio Behavior Matrix

Headset/ Handset	Phone	Radio	Headset/Handset Ear	Headset/Handset Mouth	Console Select Speaker
Inserted	On hook	Idle	Radio (and phone if JP10 - B)	N/A	
Inserted	On hook	Transmit	Radio (and phone if JP10 - B)	Radio transmit	
Inserted	Off hook	Idle	Phone receive	Phone transmit	Radio receive
Inserted	Off hook	Transmit	JP1 - A: Phone receive JP1 - B: Radio receive	JP4 - A: Radio transmit JP4 - B: Radio & phone transmit	Radio receive
Removed	Any	Any	N/A	N/A	Radio receive

Connector Signaling

The TRHI's rear panel contains most of the connection points for interfacing the unit to other equipment (Table 3). There are also recorder and footswitch connections on the inside of the TRHI and a headset jack on the front.

Figure 3: TRHI Rear Panel Connectors
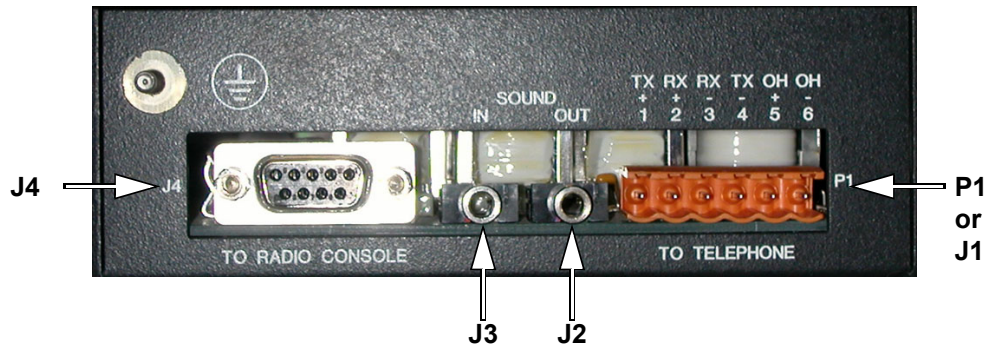
Telephone Connector (P1)

Connector P1 is used for signaling to a telephone instrument. It is a 6-conductor removable screw-terminal plug. The 4-conductor modular cable (supplied) may be used to connect the TRHI to a modular telephone handset. If the telephone instrument does not use a modular handset connector, other installer-supplied cables may be used. In either case, you must supply appropriate wiring for the telephone instrument hookswitch signals. The signals on P1 are shown in Figure 4 and Table 3.

Figure 4: P1 Connector

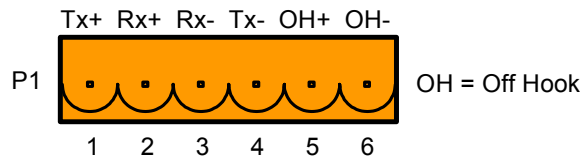*Table 3: P1 Connector Description*

Pin	Cable	Signal Name
1	Yellow	Telephone Mouthpiece (transmitter) +
2	Green	Telephone Earpiece (receiver) +
3	Red	Telephone Earpiece (receiver) -
4	Black	Telephone Mouthpiece (transmitter) -
5	---	Off Hook +
6	---	Off Hook - (ground)

Sound In/Out (J3 and J2)

The Sound In (J3) and Sound Out (J2) connectors are 1/8 inch stereo jacks suitable for direct connection to a computer sound card using a cable with 1/8 inch stereo jacks at both ends. With appropriate software, these outputs can be used to monitor and/or record telephone and/or radio audio. The inputs can be used to send audio, usually prerecorded

announcements, from the computer to the telephone caller. If the operator holds PTT for the duration of the message, prerecorded audio can also be sent to the radio.

Table 4: Sound Card Connections

Connector	Signal

J2 Output to Sound Card
    Line In
    1/8 inch stereo jack
	Tip = Telephone Audio = Left Channel
	Ring = Radio Audio = Right Channel
	Sleeve = Audio Common

J3 Input from Sound Card
    Line Out
    1/8 inch stereo jack
	Tip = Telephone Audio = Left Channel
	Ring = Radio Audio = Right Channel
	Sleeve = Audio Common

Radio Console Connector (J4)

The radio console connector is a DB-9 connector. It is labeled J4 on the rear panel (Figure 3). The pinouts and signaling for this connector are shown in Table 5.

5 4 3 2 1

9 8 7 6
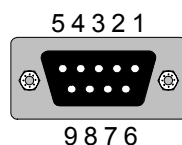
The female DB-9 connector, looking at the back of the TRHI. This is identical to the headset connection on the 4010, 4018, 4118, 4217, and 4219 consoles and audio panels.

Note Connections are explained in conjunction with their use for the Zetron Telephone Radio Headset Interface (TRHI) only.

Table 5: Pinouts for J4 Connector (female DB9)

Pin	Direction	Signal	Description
Pin 1	GND Reference*	Ground	Ground.
Pin 2	Input to TRHI	PTT In	When the console is transmitting, it uses this line to cause the XMIT LED on the front of the TRHI to illuminate.
Pin 3	Input to TRHI	Tel Connection	With JP6 in the "C" position, this line manually forces the TRHI to switch between phone and radio. The console must be programmed with Spare output #1 to toggle this line.
Pin 4	Output from TRHI	PTT Out	This line is used to indicate PTT, causing the console to transmit on the Select channel(s). Requires a 6-wire headset with a transmit/PTT switch, or an external PTT switch such as a footswitch.
Pin 5	Output from TRHI	Mouth	This line provides TX audio from the headset to the console.
Pin 6	Input to TRHI	+12 volt	The console uses this line to supply voltage to the THRI for Mic bias, ICs, and LEDs.

Pin	Direction	Signal	Description
Pin 7	Input to TRHI	Ear	This line provides RX audio from the console to the headset.
Pin 8	Output from TRHI	Ear Hook SW	If the Speaker/Headset key is programmed on the console, this line toggles between sending the RX audio to the speaker and the headset.
Pin 9	Output from TRHI	Mic Hook SW	This line indicates to the console when a headset is plugged in to the TRHI. The headset mic goes active and the goose mic is disabled. The console must be programmed with "Spare Input 9" audio steering.
* The connector body is chassis ground.			

Recorder Connection (TB1)

To enable headset audio recording, remove the TRHI cover and connect the recorder to screw terminal TB1 as shown in Figure 5. TB1 is adjacent to jumper JP2 (see Figure 2 on page 9).

*Figure 5: TRHI Recorder Connections*

TB1

–
–
+
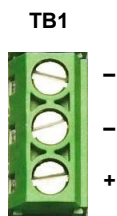
Footswitch Connection (TB2)

A footswitch may be used with the TRHI to transmit headset mouthpiece audio. The 3-conductor screw terminal TB2 provides a connection for the footswitch. Figure 6 shows the screw terminal and signaling.

To access the terminal screws, remove the top cover and connect the footswitch cable to TB2. TB2 is adjacent to jumper JP3 (see Figure 2 on page 9).

Figure 6: TRHI Footswitch Connection



TB2

1 GND

2 PTT (xmit)

3 GND
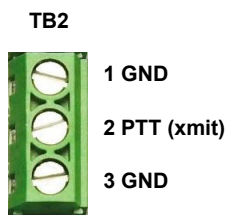
Connecting the TRHI to Model 4010 and Series 4000 Consoles

The J4 connector on the TRHI is used to connect to the Model 4018 and Model 4118 consoles, or the Model 4217B and Model 4219 audio panels. Use the supplied 9-pin cable (P/N 709-7167) to connect the TRHI's **Radio Console** port J4 to the **Headset Jackbox** port on the Series 4000 console or audio panel.

See *Radio Console Connector (J4)* on page 13 for signaling information from the TRHI. See Figure 7 and Table 6 for signaling information from the DB-9 headset connection on the Series 4000 consoles and audio panels.

Figure 7: Series 4000 Generic DB-9 Headset Connection

5 4 3 2 1

9 8 7 6
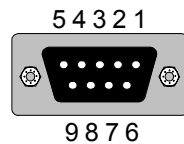
The female DB-9 connector, looking at the back of the 4010, 4018, 4118, 4217, and 4219 consoles and audio panels. This is identical to the radio console connector J4

Table 6: Series 4000 Generic Female DB-9 Headset Connection

Pin	Name	Description
1	Ground	Common ground.
2	Busy	When the console is transmitting, it uses this line to cause the XMIT LED on the front of the TRHI to illuminate.
3	Switch	With JP6 in the "C" position, this line manually forces the TRHI to switch between phone and radio. The console must be programmed with Spare output #1 to toggle this line.
4	PTT	This line is used to indicate PTT, causing the console to transmit on the Select channel(s). Requires a 6-wire headset with a transmit/PTT switch, or an external PTT switch such as a footswitch.
5	Mic	This line provides TX audio from the headset to the console.
6	+12v	Voltage to the THRI for Mic bias, ICs, and LEDs.
7	Ear	This line provides RX audio from the console to the headset.
8	Ear/sw	If the Speaker/Headset key is programmed on the console, this line toggles between sending the RX audio to the speaker and the headset.
9	Mic/sw	Line goes low when headset is plugged in to indicate to the console that the headset mic is active. Also disables goose mic when console is programmed with "Spare Input 9" audio steering.

Note Connections are explained in conjunction with their use for the Zetron Telephone Radio Headset Interface (TRHI) only.

Connecting the TRHI to Series 3200 Phones

Two cables are provided for connecting the TRHI to Series 3200 phones:

- Cable 709-7641 terminates with a 6-pin RJ plug
- Cable 709-7140 terminates with a 4-pin RJ plug

Model 3240 and 3299 Phones

Cable 709-7641 is suitable for connecting directly to the Model 3240 and Model 3299 phones. Make this simple connection as shown in Figure 8.
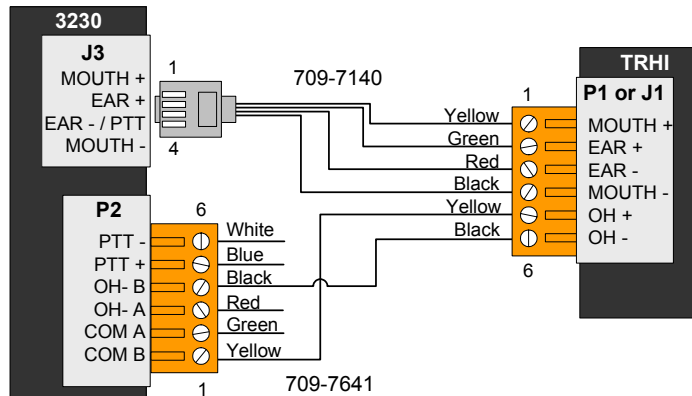
Figure 8: TRHI Connected to Model 3240 or Model 3299 Desktop Phone
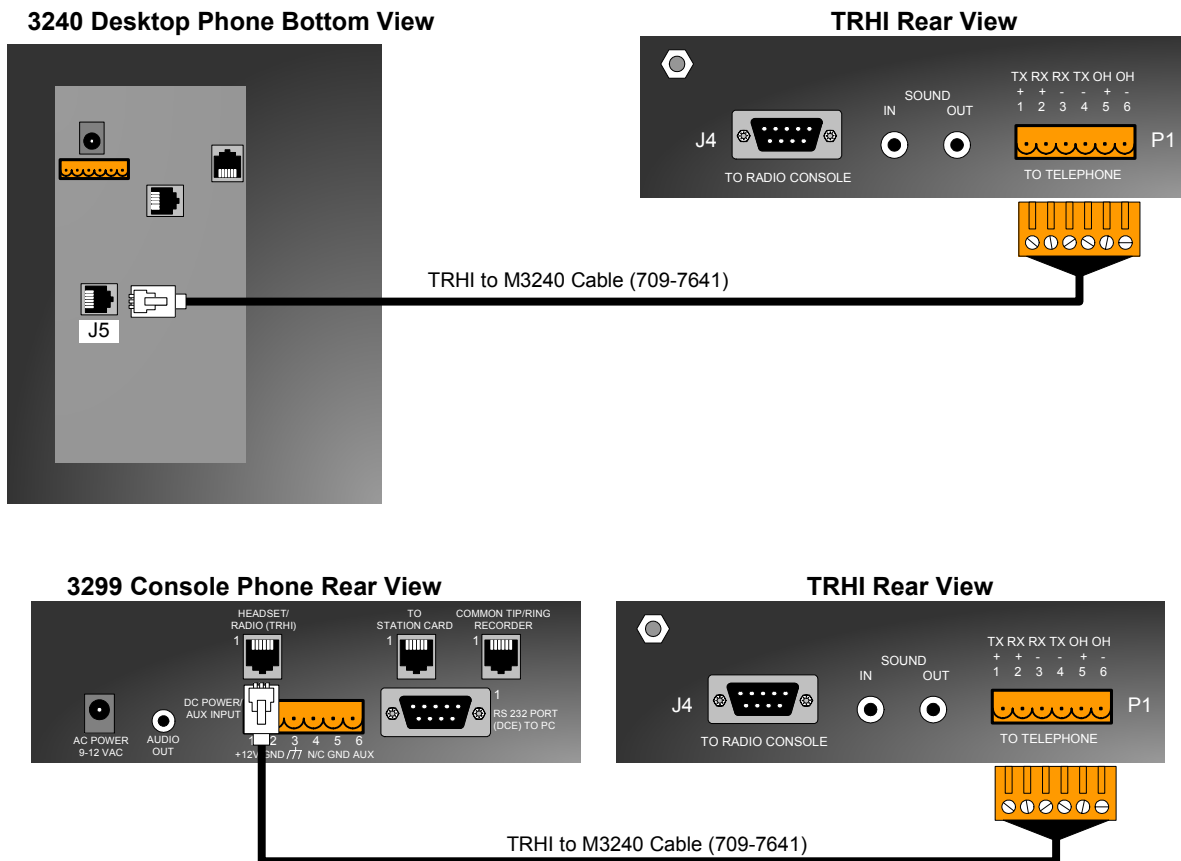
Model 3230 Phones

Cable 709-7641 must be modified and used in conjunction with cable 709-7140 to connect the TRHI with the Model 3230 phone. The modification is shown in Figure 9 and Figure 10, and also described in the following procedure.

Figure 9: Cable Modification for Model 3230

◆ **To create the modified cable for the Model 3230 phone**

1. Cut off and remove the 6-pin RJ-type connector from cable 709-7641.

2. There are four wires left unused at the end of this procedure. If you would like to cover the bare wires with heat shrink tubing, place the tubing over the cable now.

3. As shown in Figure 9, connect the yellow wire to pin 5 and the black wire to pin 6 of the screw terminal on cable 709-7140.

4. Shrink the heat shrink tubing or cover the remaining four wires with electrical tape.

5. Connect the TRHI to the Model 3230 as shown in Figure 10.

Figure 10: TRHI Connected to Model 3230 Rack Phone
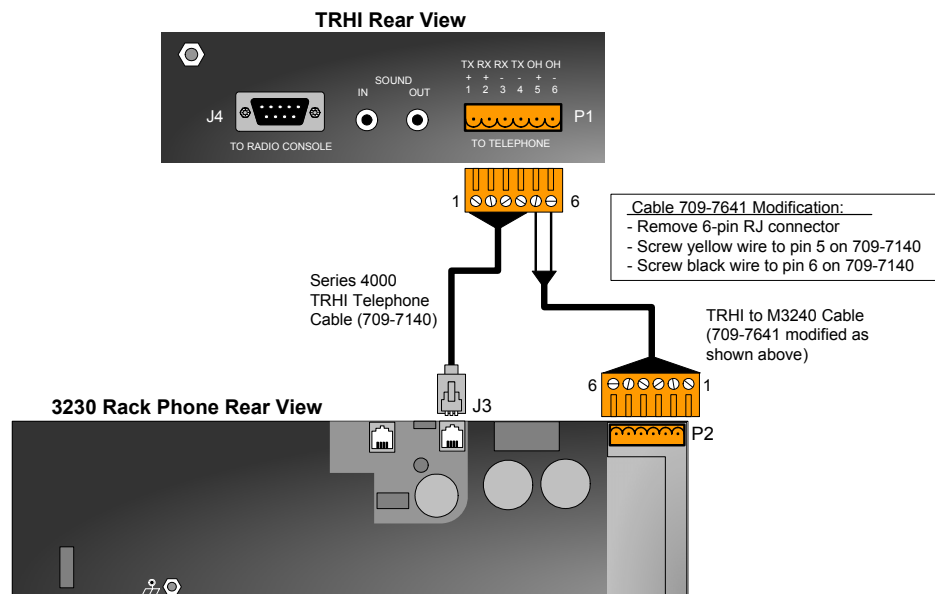
> **Tip**   The 6-pin screw terminals are identical but not interchangeable, so ensure that the correct connectors are joined with the correct equipment.

Connecting the TRHI to Third Party Equipment

This section describes the interface requirements for attaching the TRHI to telephone instruments made by other manufacturers.

Interface Requirements

To interface the TRHI to a telephone instrument, the telephone must already have an operational headset port or jack. The telephone instrument must provide an "Off-Hook" signal to the TRHI to indicate that the telephone is connected to a line. Absence of this signal greatly reduces the usefulness of the TRHI and may cause undesirable audio levels at the headset earpiece. In any case, a source of "Off-Hook" signal must be provided in order to switch the headset earpiece between the telephone and the radio.

If the signal is not available on the telephone, it can sometimes be generated by an accessory headset jack adapter (available from the headset supplier). It can also be generated by pressing a key that has been programmed on the console to manually switch the TRHI audio between the telephone and radio console.

The preferred method of operation is pressing a telephone line-connect button to generate the "Off-Hook" signal. This provides a single action for answering the line and for switching the headset. Activating the "OFF-HOOK" signal by other means usually requires a step to switch to the headset and another step to answer the line.

Generally, it is easier to interface to standard 1A2 key telephones than to electronic telephones, especially Automatic Call Distributors (ACDs). Zetron can supply headsets that are compatible with the TRHI.

> **Note**   Zetron, Inc. does not support the use of amplified headsets with a Series 4000 console equipment.

Off-hook Contact Closure

One of the key requirements for interfacing Zetron products to a telephone instrument is that the telephone have an "off-hook" contact closure. This serves various functions for various Zetron products.

For Radio Consoles (such as Series 4000 and Model 4010), this causes the Telephone Radio Headset Interface (TRHI) to switch the common headset between telephone and radio. Recent revisions of the TRHI permit one alternative to a contact closure. If contact closure is not available, then the handset microphone current must flow when "off-hook" and must stop flowing when "on-hook."

The "off-hook" contact closure from the telephone should be "dry" (no voltage supplied by the telephone). It should have at least 60 volts of isolation between telephone circuitry and the contact pair. The contact pair should work reliably with as little as 1 milliampere and as much as 50 milliamperes when switching a 5 to 18 volt resistive load. The contact pair must close when the phone is involved in a conversation (off-hook) and must be open when the phone is not in conversation (on-hook).

Telephone Audio

The other key requirement for interfacing Zetron products to a telephone set is audio. Here is a summary of the audio requirements for different Zetron products:

For Radio Consoles (such as Series 4000 and Model 4010), the TRHI must be plugged into the telephone set's handset or headset port. The telephone set should have a "standard" handset pinout (pins 1 & 4 are transmitter; pins 2 & 3 are receiver). Certain models of the AT&T Merlin and certain models of Siemens phones do not have standard handset pinout. The telephone set should accept a "carbon" compatible handset or headset. If the telephone set only accepts dynamic or electret handsets, then it may be feasible to reduce the TRHI phone transmit output to be compatible.

The handset receive audio output from the telephone set should have a source impedance no higher than 600 ohms. The receiver signal voltage output should be no less than 12 dB below phone line signal voltage level. To be "carbon" compatible, the transmit audio input to the telephone set should carry a maximum of 60 mA of DC current and have a minimum impedance of 50 ohms. The transmitter signal voltage should be within +/- 4 dB of the phone line signal voltage level produced by the transmitter.

Interfacing Tips

If the telephone does not have a contact closure, but does have an analog common tip/ring signal (such as with a 1A2 telephone set), then a current sensing relay may be placed in series with the common tip/ring to generate a contact closure. Such as relay is available from TelTone (1-800-426-3926) under part number "M949-01."

If the telephone is a Northern Telecom (NorTel) Meridian 1, SL-1, SL-100, or Norstar, then a special recorder interface (D-to-A converter) available from two sources may be used to generate a contact closure and a recorder audio output. One source is Digital Techniques, Inc. (www.dtech.com) (262-860-0199). The other source is DEES Communications (www.dees.com) (1-800-663-5601).

If you plan to use the handset of the telephone (rather than a headset), then a contact closure can be generated based on handset position. DynaMetrics (www.dynametrics.com)

(1-800-525-6925) manufactures accessories for various models of telephones that will produce both a recorder output and a contact closure. When the handset is up, the contact is closed. When it is down, the contact is opened. Since this works only with handsets this will not work with the TRHI.

If the telephone is a Plant Equipment set, then an optional circuit may be added to the phone to provide contact closure. Contact PlantCML (www.peinc.com) (909-719-2100) to obtain the proper option for the telephone.

If the telephone set is only equipped with one handset port, and you need to connect to the handset receive signal with the handset plugged in, then use a modular handset adapter (part #3684C) from Hello Direct (1-800-444-3556) (www.hellodirect.com).

If multiple contact closures are required due to having multiple devices attached (for example, Instant Recall Recorder and TRHI), then the single contact closure from the telephone set may be used to control an external, multi-pole relay. Alternatively, most Zetron products can be wired in parallel across one contact closure as long as signal polarity is maintained.

Connection

Assuming your phone meets the recommendations above and the TRHI is revision C or later, use cable 709-7140 to connect directly to the phone's handset jack (if so equipped) as shown in Figure 11. As described in prior sections, you may also need to add a relay to generate contact closure.

> **Note**   The handset jack refers to the smaller modular plug used to connect a handset to the phone, not the larger modular plug used to connect the phone to a line.

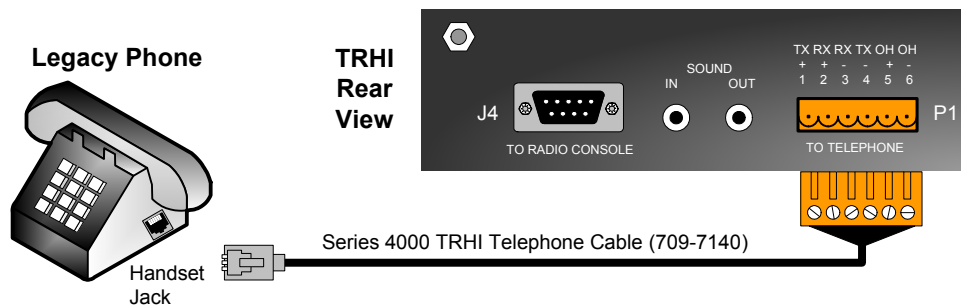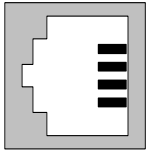*Figure 11: Connecting a Legacy Phone to the TRHI*

Table 7: Handset Jack Wiring

Telephone Handset Jack	Tel-Network	TRHI P1 Connector (J1 on older revs)	709-7140 Wire Color	Signal
	"B" (black)	4	Black	TX -
	"R" (white)	3	Red	RX -
	"GN" (white)	2	Green	RX +
	"E2" (red)	1	Yellow	TX +

When using the TRHI with a generic telephone instrument, the transmitter and receiver audio may be available on an internal network or on the 4-pin modular handset jack as shown in Figure 11. Follow the handset wires to their termination at the network, as the network designations are often different than described here.

Many telephone instruments do not provide an off-hook contact. This is especially true of systems controlled by an ACD or systems that use newer electronic telephones. In this case, check with the telephone or headset manufacturer to see if a modification can be made to provide an off-hook signal. See *Interfacing Tips* on page 19.

If no off-hook signal is available from the telephone instrument, the TRHI can be configured to detect off-hook from one of the following two sources:

Microphone Current

Most headsets are of the electric type, which means that bias current is required to operate. Most telephone devices supply this current when a telephone line is selected. The TRHI can be configured to detect this current and generate the off-hook signal.

To use this method, set jumper JP2 (on the TRHI) to position B.

Console Off-Hook Control

The console can be programmed to generate an off-hook when a key is pressed. The disadvantage of this method is that it requires the operator to press a key in addition to taking the telephone off hook.

♦ **To implement this method**

1. On the console, select the key to be defined as "OFF HOOK."
2. On the TRHI, set jumper JP2 to position C.
3. Using CPS or CPSW, define the console key to be "Spare Output #1."
4. On the Model 4010 or 4018, verify that the "switch" jumper JP8 is installed.
5. On the Model 4116B, 4118, or 4217B, verify that the "switch" jumper JP5 is installed.

Audio Level Adjustments

There are separate volume adjustments for telephone and console ear audio. Trim adjustments are available for setting the telephone mouth, telephone ear, radio ear, and PC sound ear levels (PC sound ear is used to adjust the audio gain of the SOUND IN jack at the rear of the TRHI). The location for these adjustments is shown in Figure 12.
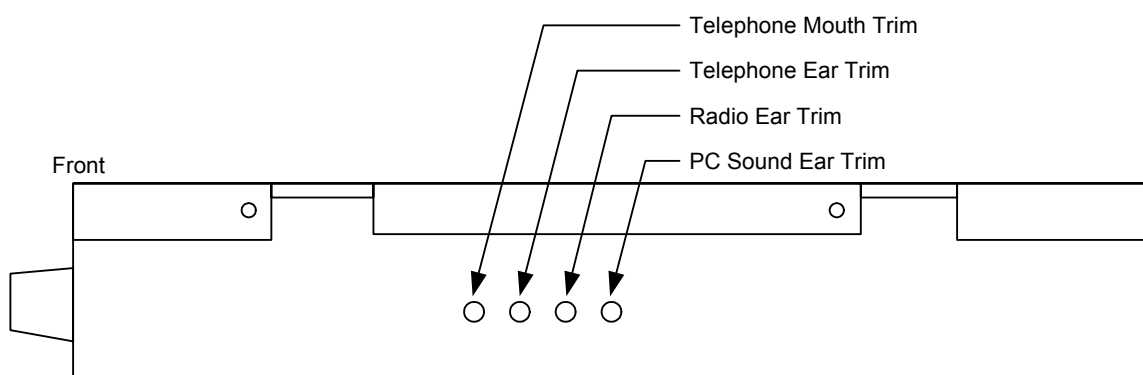
💡 **Tip**   Use a non-conductive flat screwdriver to make these adjustments.

Figure 12: TRHI Audio Level Adjustments

If the audio heard from the radio or telephone is not loud enough, the **Radio Ear Trim** and/or **Telephone Ear Trim** pots can be turned clockwise to provide up to 20dB of additional gain. The factory default is no added gain (fully counterclockwise).

The **Telephone Mouth Trim** pot can be used to adjust the audio level sent to the telephone by about ±10dB from the factory default setting (mid-range).

Mounting

The TRHI can be conveniently mounted most anywhere near the operator, but frequently it's installed under the writing surface of the dispatch furniture. Place it where it will avoid damage from any chairs or possible spills, but convenient to the operator.

♦ **To mount the TRHI**

1. Remove the top cover and secure it to the bottom of the writing surface using the supplied screws.

2. Attach the body of the interface to the top cover.

3. Connect the case ground, located on the rear panel (Figure 3), to the central earth ground.

4. Isolate the earth ground wire from any signal lines.

Secondary Headset Jackbox

The Series 4000 Secondary Headset Jackbox (SHJB) (P/N 950-9208) allows multiple headsets to be connected to a console. The SHJB is low profile and, like the TRHI, it is meant to be mounted under the writing surface of a dispatch station. The SHJB is equipped with a dual-prong jack (accepting either 4-wire or 6-wire plugs) and a volume control to adjust the earpiece volume.

Installation

Installation includes mounting the SHJB, configuring interface operation, setting mouthpiece muting, wiring the SHJB to a console, wiring the jackbox to parallel jackboxes, and wiring the jackbox to a footswitch (optional).

Mounting

The SHJB can be mounted anywhere, but is usually installed under the writing surface of a dispatch station. Place it where it will avoid damage from chairs and spills, but convenient to the operator.

◆ **To mount the SHJB**

1. Remove the top cover and secure it to the bottom of the writing surface using the supplied screws.
2. Attach the body of the interface to the top cover.
3. Connect case to the central earth ground.
4. Isolate the earth ground wire from signal lines.

Configuration

The SHJB circuit board is equipped with two jumpers, which allows the operation of the jackbox to be tailored to the installation (Table 8). Normally, if a headset is plugged into any of the headset jackboxes, transmissions from the console use the mouthpiece audio from ALL of the attached headsets. The person(s) wearing a headset may not know that a transmission is taking place.

If each SHJB can be provided with its own transmit switch (such as a foot-switch or 6-wire PTT headset), the jackboxes may be reconfigured to mute the mouthpieces of all headsets not being used. Set JP6 in the "A" position to enable muting.

PTT Override

If each SHJB has its own transmit switch (such as a foot-switch or 6-wire PTT headset), PTT override operation may be used. When PTT override is enabled (set JP1, JP3, and JP6 to position B), pressing PTT on the primary jackbox mutes the secondary jackbox transmit audio and routes the primary jackbox audio to the transmitter, allowing the primary jackbox user to preempt (override) the secondary jackbox user. If PTT override operation is desired, only two jackboxes can be used on each console position, one primary and one secondary.

Table 8: Secondary Headset Jackbox Jumper Settings

Jumper	Operation
*JP1-A	Normal.
JP1-B	PTT Override (Must set JP3=B and JP6=B).
*JP3-A	Normal.
JP3-B	PTT Override (Must set JP1=B and JP6=B).
*JP5-A	For six-wire (w/ PTT) operation).
JP5-B	For four-wire (w/o PTT operation).
*JP6-A	Enables mouthpiece muting via local PTT.
JP6-B	Disables mouthpiece muting (mouthpiece always live). This position should be set when used with a phone card.

* = Factory jumper settings.

📝 **Note**   DO NOT install a four-wire plug into an SHJB configured for six-wire operation. Doing so may cause the console to unexpectedly transmit on the selected channel.

Wiring to Console

The SHJB plugs easily into any of the consoles. The 9-pin, D-type connector, J2 (console) at the rear of the jackbox provides the signals to the console. Use the supplied 9-pin cable to connect the jackbox to the console at the console's headset connector.

Wiring to Additional Jackboxes

If you are installing more than one jackbox to a single console, only one SHJB connects to the console. Additional jackboxes must be connected in a daisy-chain fashion to the initial jackbox at connector J1 (expansion) at the rear of the box.

If the standard headset jackbox (P/N 950-9327) is used, then the SHJB must be the last jackbox in the daisy chain. If the TRHI is used, then the TRHI must be the last jackbox in the daisy chain. When multiple Secondary Headset Jackboxes are used, connect J2 of one box to J1 of the preceding box.

Wiring to Footswitch

Connector TB2 (footswitch) is used to wire a footswitch to the headset jackbox. Wire the switch across the terminals labeled "GND" and "PTT."

Console and Phone Programming

In order to assure proper routing of the headset mouthpiece audio when using the "soft" console transmit buttons, specific procedures must be following according to the equipment and customer requirements. Each are described in the following:

Programming IntegratorRD Consoles

Selecting the Default Audio Source

This selection defines which microphone and speaker are active according to the console configuration. The dialog box for these parameters is shown in Figure 13. To access this dialog box, start Integrator RDPS, click on **Misc Params**, then **Miscellaneous Parameters**.

Figure 13: Integrator RDPS Configuration Miscellaneous Parameters

In all but unusual situations, the selection "Spare input #9 Steered" should be chosen. This selection allows for console configurations with different combinations of gooseneck microphone, desk microphone, headset, and TRHI connections. The other selections, "Dynamic MIC" and "Electret MIC" are not applicable to the IntegratorRD workstation.

"Spare input #9 Steered," detects the state of a headset jack and phone hook switch to direct microphone audio, depending on the PTT selection. If the system does not have a headset or TRHI, the default states for these switches provide for normal operation of a standard gooseneck or desk microphone. These abbreviations are used in the following look-up tables.

Table 9: Abbreviations Used on Lookup Tables

Transmit buttons:	D.PTT = Gooseneck/desk Mic PTT
	E.PTT = Footswitch or Headset PTT
	X.PTT = Screen or Keyboard XMIT
Microphones:	D.MIC = Goose/desk Mic
	E.MIC = Handset or Headset Mic
Audio Output:	SPKR = Console panel Speaker
	HDST = Headset speaker

Table 10 and Table 11 identify the different modes.

Table 10: Microphone Source Look-up Table

PTT Switch	Headset Jack	Phone (TRHI)	MIC Source
D.PTT	(don't care)	(don't care)	D.MIC
E.PTT	Plugged in	(don't care)	E.MIC
	Removed	(don't care)	D.MIC
X.PTT	Plugged in	(don't care)	E.MIC
	Removed	(don't care)	D.MIC

Table 11: Receive Audio Output Look-up Table

Headset Jack	Phone (TRHI)	RX Audio	Phone Audio
Plugged in	On-hook	HDST	(N/A)
Plugged in	Off-hook	SPKR	HDST*
Removed	(N/A)	SPKR	(N/A)
* When a headset is plugged into the TRHI with the phone off-hook, and no PTT is pressed, the headset mic will be open to the phone and phone audio will be heard through the headset.			

Tip For systems that may include only a handset microphone, you may select "Hookswitch steering." See Table 12 and Table 13.

Table 12: Microphone Source Look-up Table (Hookswitch Controlled)

PTT Switch	Headset Jack	Handset	MIC Source
D.PTT	(don't care)	(don't care)	D.MIC
E.PTT	Plugged in	On-hook	D.MIC
	Removed	Off-hook	E.MIC
X.PTT	Plugged in	On-hook	D.MIC
	Removed	Off-hook	E.MIC

Table 13: Receive Audio Output Look-up Table (Hookswitch Controlled)

Headset	RX Audio
On-hook	SPKR
Off-hook	HDST

Programming Series 4000 Consoles

Series 4000 consoles must be programmed through CPS (DOS) or CPSW (Windows) so that the "soft" console transmit buttons, (for example, INSTANT XMIT and SITE ICOM), will work properly. The following menu items must be selected and set:

- Edit, Position #, Miscellaneous, Audio Source for "soft" xmit keys
- Edit, Position #, Miscellaneous, Spare Input #9 steered

For Series 4000 CPSW programming instructions, click help in the CPSW application or refer to the CPSW chapter in *Series 4000 Installation and Configuration* (P/N 025-9533).

For Model 4010 CPSW programming instructions, click help in the CPSW application or refer to the CPSW chapter in *Model 4010 Installation and Configuration* (P/N 025-9227 rev Q or later).

Programming Phones with PPS

Series 3200 and Series 3300 phones are programmed using Zetron's Phone Programming System (PPS). For the most part, follow the programming instructions for PPS as provided by the E9-1-1 Telephone System Installation (P/N 025-9419 rev K or later) or by accessing the online help directly in PPS by pressing F1.

There is one specific TRHI-related setting in PPS. Navigate to this setting in PPS by clicking **Edit, Misc Phone Parameters, Page 1, B Relay Mode (TRHI)**.

Choose one of the following settings for the **B Relay Mode (TRHI)**:

Line Controlled	The state of the B relay is controlled by the individual line programming when the phone is off-hook. This type of operation is rare and should only be configured if you know your line programming controls off-hook.
TRHI	The B relay will close whenever the phone is off-hook and whenever the internal instant recall recorder is accessed for message playback. This allows you to use both the handset and the headset at the same time, but you must physically prevent audio feedback by keeping the devices away from each other and from sound-reflecting surfaces.
TRHI + Handset Bypass	The B relay will operate the same as if set to TRHI while there is no handset plugged into the phone's front jack. As long as a handset is plugged into the front jack, the relay will remain open. The TRHI + Handset Bypass mode permits split telephone/radio operation when the phone is interfaced to non-Motorola headset interfaces. **This is the default mode to use when interfacing to a Zetron radio console.**

Operation

Headset Operation

With the proper signals available from the telephone instrument, the TRHI will operate according to the following headset conditions:

Table 14: Headset Combinations

Headset Condition	TRHI Operation
Headset out of jack	Console Select audio heard on console speaker.
Headset in jack, Telephone On-Hook (no line connected)	Console Select audio heard on headset earpiece. May also be heard on console speaker if desired. Unselect audio may also be heard on headset if desired.
Headset in jack, Telephone Off-Hook (line connected)	Console audio heard on console speakers. Telephone receiver audio heard on headset earpiece. Headset mouthpiece audio transmitted over telephone.
Headset in jack, Radio Console Foot-switch depressed	Headset mouthpiece audio transmitted over radio console, but not over telephone. May also be transmitted to telephone if desired.

Audio Routing

The TRHI itself performs the following audio routing:

- The sound in jack J3 audio is ALWAYS summed with the audio to the console mouth and telephone mouth inputs (J3 tip to the telephone, J3 ring to the console).
- The sound out jack J4 audio is ALWAYS the same as the audio being sent to and received from the telephone and console. J4 tip is the sum of the telephone Tx and Rx channels, and J4 ring is the sum of the console Tx and Rx channels.

- The headset microphone audio is ALWAYS summed with the audio to the console.

- The headset microphone audio is ALWAYS summed with the audio to the telephone if JP4 is set to B = "LIVE."

- The headset microphone audio is summed with the audio to the telephone if PTT-IN is idle and the telephone is detected as "off-hook" and the headset is detected as "present."

- The audio output to the headset earpiece ALWAYS includes the sum of both channels from the sound in jack J3.

- The audio output to the headset earpiece ALWAYS receives audio from the telephone ear input if JP10 is set to B = "ALWAYS."

- The audio output to the headset earpiece will also receive switched audio from either the console or the telephone (normally from the console but switched to the telephone if the telephone is detected as "off-hook" and the headset is detected as "present").

LED Indicators

The TRHI has three LED indicators. From left to right, they are XMIT, RADIO, and TELEPHONE.
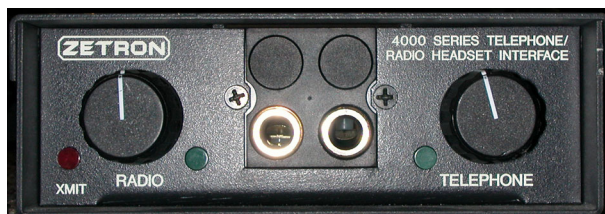
XMIT

The **XMIT** LED is ON whenever the radio is transmitting (PTT active). PTT usually mutes audio to the telephone, but JP4 may be set to allow audio to the telephone even during PTT.

RADIO

The **RADIO** LED is ON whenever the telephone is on-hook and PPT is not active. The Radio LED is the default LED and is ON whenever neither of the other LEDs is ON.
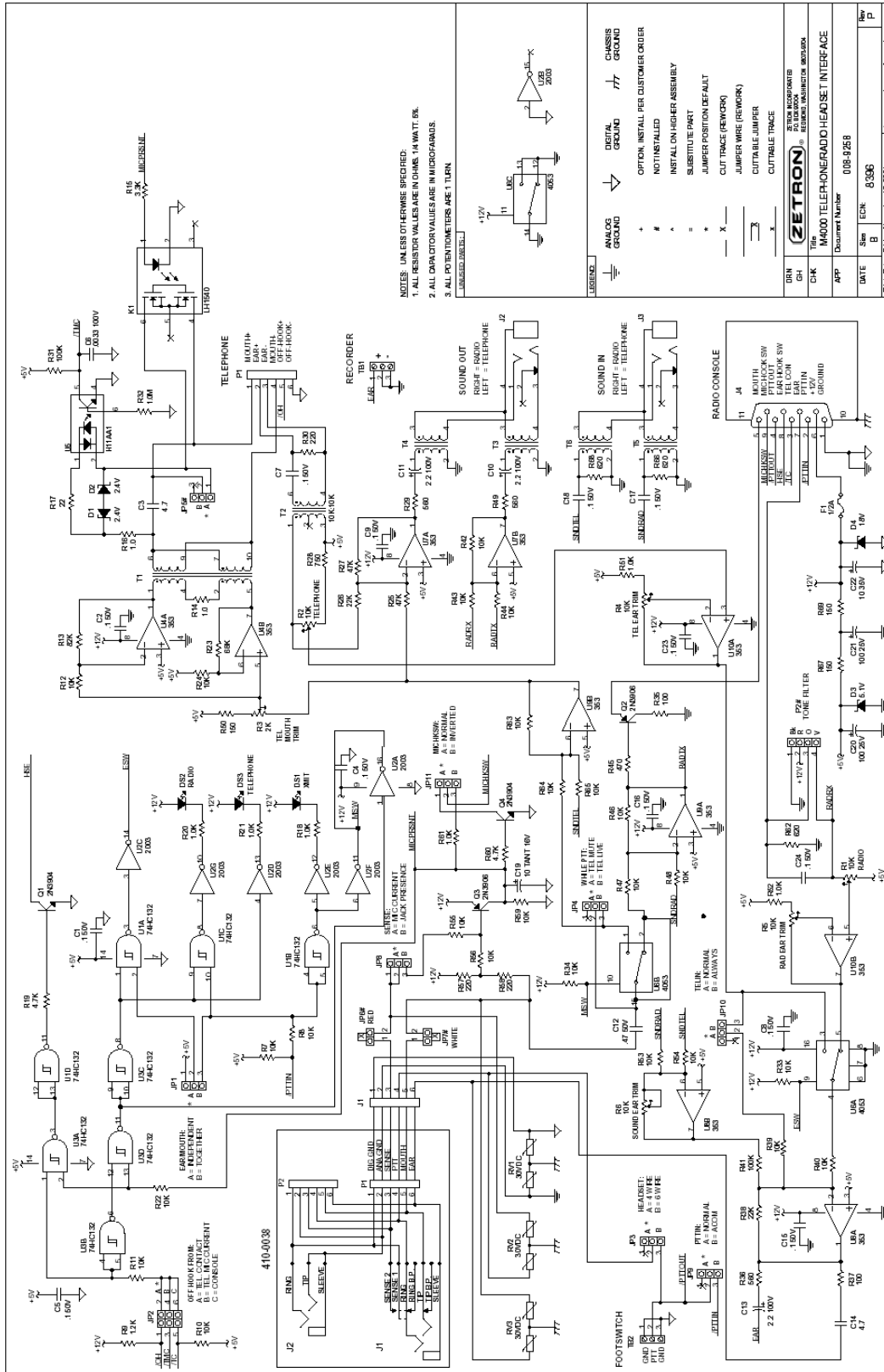
TELEPHONE

The **TELEPHONE** LED is ON whenever the telephone is off-hook and a headset is plugged in. While this indicator is ON, telephone audio is heard in the headset and radio audio is sent to the console speaker.

Appendix A - Dual TRHI Connector Cable

NOTES:

1. CUT CABLE INTO TWO 17" PIECES. STRIP OUTER JACKET .75" ON ALL ENDS.
2. J1 HAS TWO WIRES ON EACH PIN.
3. ADD RESISTOR TO DB9-F (401-0155) CONNECTOR. SHORTEN LEADS. COVER RESISTOR WITH 1/8" SHRINK TUBING.
4. DISCARD STRAIN RELIEF GROMMETS.
5. MARK PART NUMBER AND REVISION ON CABLE PER MANUFACTURING PROCEDURE 019-0001.

WIRE TABLE

COLOR	2 CONNECTOR J1	CONNECTOR J2	CONNECTOR J3
BARE	1	1	1
BRN	2	2	2
BLUE	3	3	3
ORG	4	4	4
WHT	5	RESISTOR	RESISTOR
RED	6	6	6
GRN	7	7	7
YLW	8	8	8
BLK	9	9	9

CONNECTOR J1 — WIRE ENTRY VIEW

CONNECTORS J2, J3 — WIRE ENTRY VIEW

Parts List

ITEM	QTY.	PART NUMBER	DESCRIPTION
7	1"	525-1498	SHRINK TUBING, 1/8" BLACK
6	34"	408-0016	8 COND SHIELDED WIRE
5	1	401-0373	SHELL, LARGE 9 PIN, PLASTIC
4	2	401-0155	CONN, DB9, FEMALE
3	2	401-0039	9 PIN HOOD, GREY PLASTIC
2	1	401-0038	CONN, DB9, MALE
1	2	101-0066	510 OHM 1/4W 5% CARBON FILM

ZETRON INCORPORATED
PO BOX 97004
REDMOND, WASHINGTON 98073-9704

TITLE: MODEL 4000
DUAL T.R.H.I. CONNECTOR

DRN	VP	4-25-95	SIZE C	DRAWING NUMBER 709-7350	REV B
CHK			SCALE:	DO NOT SCALE DRAWING	SHEET 1 OF 1
APV					

TOLERANCES ± .125 UNLESS OTHERWISE NOTED

REVISION		DESCRIPTION	DRAWN	CHECKED	APPROVED	DATE
A		RELEASE	VP		BVO	4-30-95
B		ECN 4158	BW			4-25-97

(HOOD 401-0373 NOT SHOWN)

Appendix B - TRHI Block Diagram/ Schematic

TELEPHONE RADIO HEADSET INTERFACE
BLOCK DIAGRAM

Index