

# TW-40

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**TWO-WAY RADIO INTERFACE**

## **INSTRUCTION MANUAL**



***Clear-Com***  
*Intercom Systems*

## BEFORE YOU BEGIN

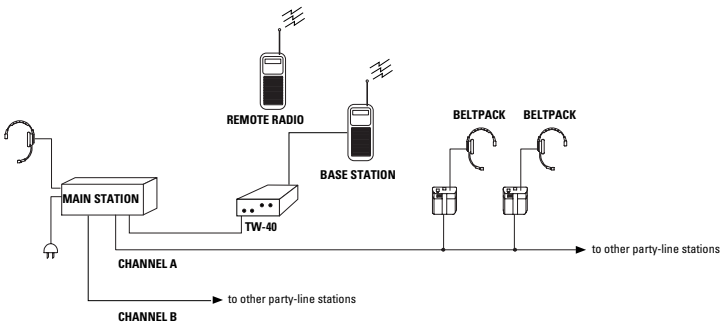
To get the most out of your Clear-Com equipment, read this manual carefully. It will answer many questions you might have about operating and servicing your equipment. You may also call Clear-Com's Customer Service department at (510) 527-6666 for answers to any questions that are not covered in this manual.

## FEATURES OF THE TW-40 SYSTEM

- Any walkie-talkie with an external microphone input and earphone output can be connected to the TW-40.
- Clear-Com or TW Channel A or B intercom line operation
- Powered from the intercom system.
- Base station radio keyed from intercom call signal.
- Visual transmitter keying indicator.
- Audio level indicator.
- Separate transmit and receive level control adjustment

## DESCRIPTION OF THE TW-40

The TW-40 Two-Way Radio Interface is a one-channel unit that is used to connect a two-way radio (commonly known as a walkie-talkie) to any channel in a party-line intercom system. When used with remote radios, the radio connected to the TW-40 acts as if it were the base station for a wireless remote system. The illustration below shows a typical intercom set-up.



## **CONNECTING THE TW-40 TO THE INTERCOM SYSTEM**

The TW-40 is connected to the intercom system by a 2 conductor, shielded cable plugged into its female XLR jack, labeled INTERCOM. The pin-out connectors on the XLR are configured as follows:

Pin 1 - Shield

Pin 2 - + 30 volts DC/TW Channel A

Pin 3 - Intercom audio/TW Channel B

This is the standard wiring for a Clear-Com intercom system. With a different setting of the internal switches, the TW-40 will also accommodate RTS® and compatible systems.

The TW-40 should be connected to the intercom station nearest to the person who will be operating the base-station radio. If the unit is being connected directly to the main intercom station, it should, if possible, be connected directly to a separate main station output.

**RF INTERFERENCE:** To avoid RFI interference, make sure the base-station radio and the TW-40 interface is well removed from the intercom station to which it is connected (2 to 5 feet). Make sure the cable connecting the TW-40 to the main station is kept separate from the other intercom cables.

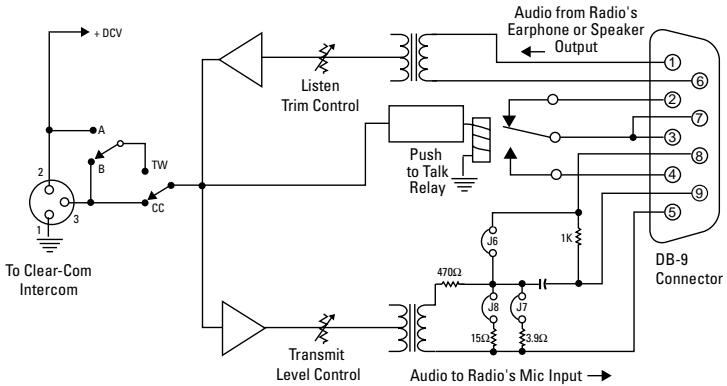
## **CONNECTING THE TW-40 TO THE BASE STATION RADIO**

In order to accommodate the widest variety of 2-way radios, the TW-40 is supplied with a 9-pin connector and wiring diagrams for many two-way radios. (See addendum sheet) This will allow you to make your own custom-made cable for your particular radio. This connector socket is labeled on the TW-40's back panel as TW0-WAY RADIO.

The combination of internal jumpers, connector wiring and front panel "Transmit" and "Receive" level controls assures correct level matching to virtually any radio. A relay provides the required

“Push-to-Talk” transmitter “keying” of the radio. This relay is activated when the “Call Signal” on the Clear-Com intercom channel is detected. The relay contacts, in conjunction with the custom-made cable, allow for correct transmitter keying to virtually any type of radio.

The illustration below is a simplified schematic of the TW-40, showing the DB-9 pin connections.



## BUILDING YOUR CUSTOM CABLE

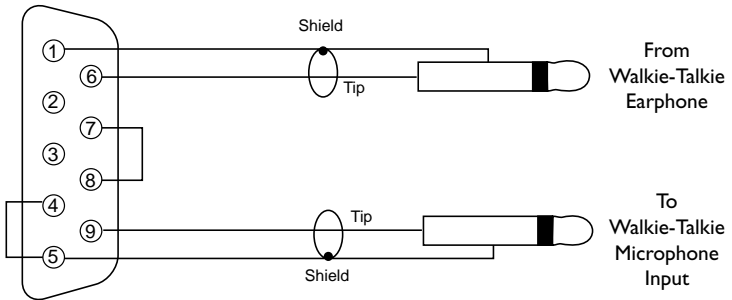
To connect the base-station radio to the TW-40, you must build your own custom connector cable. This involves several steps:

1. Obtain or make a cable using mini or micro plugs that fit your radio. Use single conductor shielded wire for each cable. Miniature type stereo cable is a good choice. Solder these cables to the DB9 connector as shown in example 1. This cable length should be kept under 5 feet. A good source of molded connectors for your radio would be an external microphone or earphone which can be purchased from your radio supplier. You will need to cut off the microphone or earphone as it will not be needed.

2. The next step will be to set the type and level of microphone. The TW-40 has three internal jumpers that can be set for specific types of microphones. The three illustrations that follow show how the TW-40 jumpers and male DB-9 on the channel cable are configured for most radios. The section that follows, "Setting the Jumpers on the Printed Circuit Board," gives instructions for setting the TW-40's internal jumpers.

3. The most difficult setting is getting your particular radio to key properly. Every radio has a different method of externally keying its transmitter. To determine how to set the jumpers and wire the connector, you need to know what type of external microphone is used in your radio, or you need to experiment. Below are three examples of how to key the transmitter. If you are unsure of which wiring to use, try all three one at a time. Pins 2, 3, 4 and 7 are the relay contacts in the TW-40. If your radio model is not listed in the addendum sheet and you have tried all three examples, and you still can't make the base station walkie-talkie work properly, call customer service and we will help you get the system working.

**Example 1: Relay shunting the microphone**



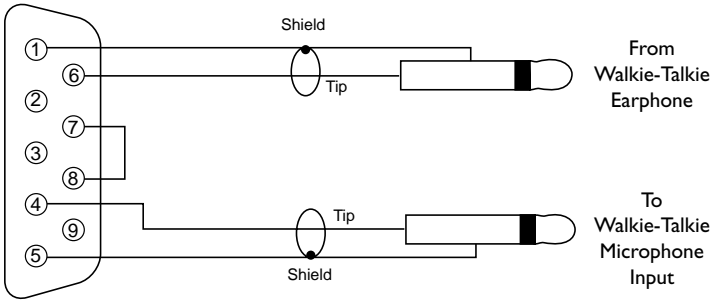
**JUMPER SETTINGS**

J6 Off

J7 Off

J8 On (Medium gain mic input)

### Example 2: Relay in series with the microphone



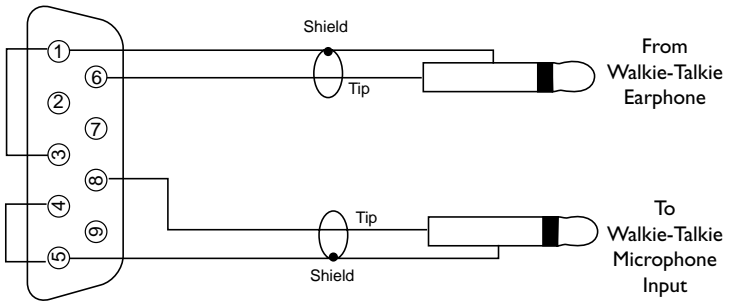
#### JUMPER SETTINGS

J6 On (DC path for mic)

J7 Off

J8 On (Medium gain mic input)

### Example 3: Relay across the sleeves of the microphone and earphone connectors



#### JUMPER SETTINGS

J6 On (DC path for mic)

J7 Off

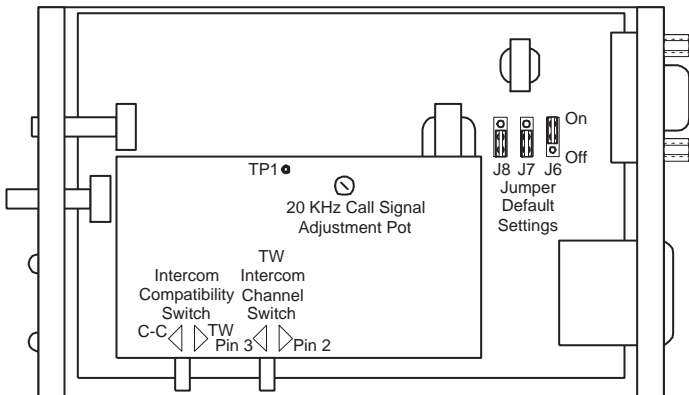
J8 On (Medium gain mic input)

## Option Settings

Internal switches select the intercom line interface of the TW-40. To access the switches, remove the four screws retaining the top cover and remove it. The switches are located on the underside of the upper PCB in the front right corner of the unit. The switch handles are easily accessible. Set the switches according to the diagram on this page. The settings are as follows:

- When the Intercom Compatibility Switch is set to Clear-Com (C-C), intercom audio is on pin 3 of the XLR connector. The DC level Call signal is sensed on this pin. In this position, the TW Intercom Channel Switch setting has no effect.
- When the Intercom Compatibility Switch is set to TW, the intercom audio XLR pin connection is determined by the TW Intercom Channel Switch. The Call signal is sensed as a 20 KHz signal on the selected intercom audio pin.
- When the TW Intercom Channel Switch is set to Pin 2, intercom audio is on pin 2 (channel A) of the XLR connector, and when the TW Intercom Channel Switch is set to Pin 3, intercom audio is on pin 3 (channel B) of the XLR connector.

The illustration below shows the location of the jumpers on the printed circuit board.



In this illustration, the jumper is set to ON when the top two connectors are joined (as in J6). The jumper is set to OFF when the bottom two connectors are joined (as in J7 and J8).

Output Level Jumpers. Set jumpers J7 or J8 to ON to lower the signal level to the walkie-talkie's microphone input. The jumpers change the levels, as follows:

Jumper J7 & J8 OFF:	+11 dBv to -20 dBv
Jumper J8 ON:	-26 dBv to -48 dBv
Jumper J7 & J8 ON:	-30 dBv to -57 dBv

In general, set jumper J8 to ON for most low-level mics (for example, electrets): set both jumpers J7 and J8 to ON to further reduce the input level of dynamic-type mics.

Transmit Key Jumper. For some walkie-talkies or two-way radios, a dedicated power path may be needed to activate their Transmit function. If so, set jumper J6 to ON.

The 20 KHz Call signal detector is calibrated at the factory and should not require further adjustment. If it becomes necessary to correct the frequency adjustment for any reason, this can be done by adjusting the internal pot. Refer to the diagram on the previous page for the location of the pot.

The adjustment is performed by measuring the frequency at TPI and adjusting the pot until the frequency is 20 KHz. If the adjustment must be performed without instruments, connect the TW-40 to a TW intercom and repeatedly assert a Call signal. Adjust the pot until the red Transmit On LED on the front panel accurately tracks the Call signal.

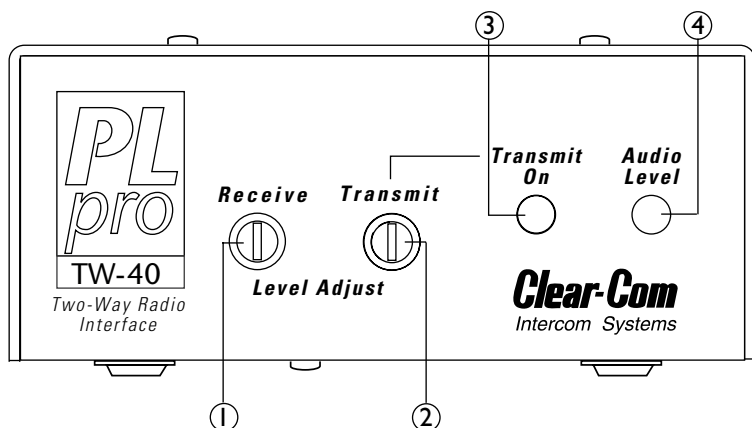
## CHECK OUT AND OPERATION OF THE TW-40 SYSTEM

After you have made the appropriate custom cable and connected the TW-40 to the wired main and wireless base stations, it is now time to check that everything is working properly.

1. Turn on the base station radio and the remote radio. Make sure you have fresh or fully charged batteries. With the external jacks on the base station removed, make sure the radios are communicating with each other.
2. Set the base station volume control to approximately half volume. Have one person listening on the intercom and have another person talking on the remote walkie-talkie. You should now be able to communicate from the remote station walkie-talkie through the base station into the intercom system. Observe the audio indicator level on the TW-40. While speaking on the remote walkie-talkie the LED should be flashing green with some occasional red. If this is not the case adjust the volume control on the base walkie-talkie to get the desired indication.
3. CHECKING OUT THE BASE STATION TRANSMITTER: From the main station or remote station, turn on the talk button for the channel that the TW-40 is connected to. Press and hold the Call button while speaking. Note the "Transmit On" LED on the TW-40 should illuminate and the transmit indicator on the base station radio (if any) should also illuminate. At this point you should be communicating from the intercom system to the remote station walkie-talkie. The transmit level control on the front panel of the TW-40 adjusts the volume to the remote station walkie-talkie. Adjust this level if necessary. Release the Call button.
4. Remember that communication to the remote walkie-talkie is "push-to-talk". You must release the Call button to receive communications from the remote walkie-talkies.

5. Certain Clear-Com stations can be set up so that the Call signalling can be activated automatically when the “Talk” button is pressed (Call-on-Talk). If this feature is available on your model of intercom station, set it, but make sure that the latching feature of the “Talk” button is disabled. (Latch disable)

## TW-40 FRONT PANEL ADJUSTMENT AND INDICATORS



① **RECEIVE LEVEL ADJUST.** Used to adjust the receive level of the base station two-way radio when there is no external volume control on the base station radio.

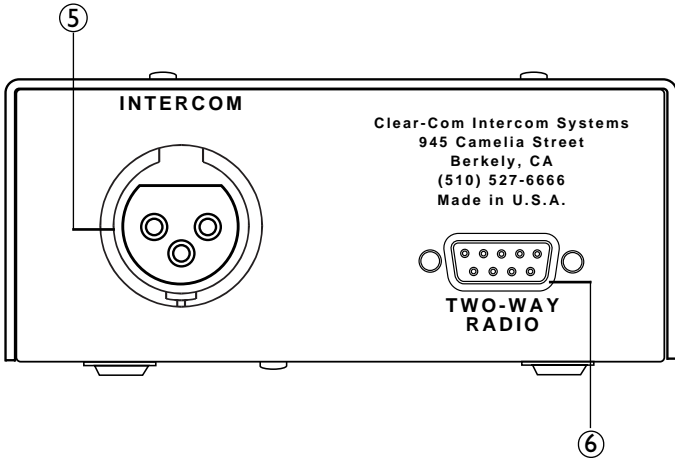
**CAUTION:** The receive level is set at the factory and should be adjusted only if the remote radio does not have its own volume adjustment. The default is 12 o'clock, (1/2 rotation).

② **TRANSMIT LEVEL ADJUST.** Use the TRANSMIT LEVEL ADJUST volume control to set the level of the intercom's audio as heard at the remote station walkie-talkie.

③ **TRANSMIT ON LED.** The LED illuminates when a call signal is being sent from the intercom system.

④ **AUDIO LEVEL LED.** This bi-color LED indicates audio levels in the intercom system. Use this indicator to adjust the volume control on the base station walkie-talkie to match the wired intercom levels. The LED turns red when the signal is too high. Note that proper intercom levels cause the LED to flash red about 10 percent of the time.

## REAR PANEL OF TW-40



⑤ **Intercom Line Connector.** Use the three-pin female XLR connector on the TW-40's back panel to connect the unit to the intercom channel. As with other Clear-Com remote stations, power is provided through the cable.

⑥ **Two-way Radio Connector.** Use the nine-pin DB-9F connector to connect the TW-40 to the base-station radio.

## TECHNICAL SPECIFICATIONS OF THE TW-40

### GENERAL:

Intercom System: Clear-Com Party-Line, RTS® Party-Line, or equivalent.

Power Requirements: 24 - 32 VDC

DC Current: 15-25 mA

Clear-Com Line Level: -15 dBv nominal.

Line Impedance: 15 k $\Omega$  bridging.

Transmit Output (to base station radio microphone jack):  
transformer isolated.

Microphone Type: Carbon, dynamic or electret

Level: -57 dBv to +11 dBv

Frequency Response: 100 - 10,000 Hz,  $\pm 3$  dB

Receive Input (from base station radio earphone jack):  
transformer isolated.

Impedance: 400 $\Omega$  balanced.

Level: - 8 dBv to +23 dBv

Frequency Response: 100 - 15,000 Hz,  $\pm 3$  dB

Connectors:

Intercom: XLR-3F

Two-way Radio: DB-9F

Dimensions: 1.8" H x 3.95" W x 6.4" D  
(46 mm x 100 mm x 163 mm)

Weight: 1 lb. 4 oz. (0.6 kg)

\*0 dBv is referenced to 0.775 volts RMS.

## CLEAR-COM LIMITED WARRANTY

This Clear-Com product is warranted to be free from defects in materials and workmanship for a period of two years from the date of sale.

The Clear-Com warranty does not cover any defect, malfunction or failure caused beyond the control of Clear-Com, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the manual, defective or improper associated equipment, attempts at modification and repair not authorized by Clear-Com, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

This warranty is the sole and exclusive express warranty given with respect to Clear-Com products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

Any and all implied warranties, including the implied warranty of merchantability are limited to the duration of this express limited warranty. Neither Clear-Com nor the dealer who sells Clear-Com products is liable for incidental or consequential damages of any kind.

For your own records fill in the information below.

Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_

Date Purchased \_\_\_\_\_

Purchased from (dealer) \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

## **FACTORY SERVICE**

All equipment returned for repair must be accompanied by documentation stating your return address, telephone number and date of purchase, along with a description of the problem.

**NOTE: Do not ship any equipment to Clear-Com without first calling and obtaining a Return Authorization Number.**

Send equipment to be repaired to:

Customer Service Department  
Clear-Com Intercom Systems  
945 Camelia Street  
Berkeley, CA 94710  
Telephone: (510) 527-6666  
Fax: (510) 527-6699

**Warranty Repairs** - If in warranty, no charge will be made for the repairs. Equipment being returned for warranty repair must be sent prepaid and will be returned prepaid.

**Non-Warranty Repair** - Equipment that is not under warranty must be sent prepaid to Clear-Com. If requested, an estimate of repair costs will be issued prior to service. Once your approval for repair, and repair of equipment is completed, the equipment will be shipped freight collect from the factory to the customer.



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