

Sigtronics Emergency Apparatus Intercom System (EAI)

INSTALLATION AND OPERATING INSTRUCTIONS Models EAI-S4, EAI-S6, EAI-D4, and EAI-D6



INTRODUCTION

ATTENTION INSTALLER: To assure a trouble free installation, please read these entire instructions through once before beginning.

The Sigtronics EAI system, when used with Sigtronics noise attenuating headsets provides the emergency apparatus crew with clear, hands free, voice actuated (VOX) intercom. The system also allows full radio monitoring at all headset positions as well as radio transmit capability from selected headsets via Push-To-Talk (PTT) switches.

Applications: The unit is designed for fire apparatus, rescue and ambulance vehicles, marine emergency equipment, airport ground vehicles, and mobile emergency command centers.

Voice Activated Intercom (VOX) feature allows "hands free" communication between headsets connected to the EAI unit. Start speaking and the intercom turns on instantly to relay your message clearly to the other headsets. Stop talking and it turns off to reduce background noise.

Up to Four Headset Positions can be connected to the EAI unit. More headset positions can be achieved by wiring additional jacks in parallel. Only one headset, however, can be plugged into paralleled jacks at one time. This paralleled jack scheme is most commonly used on pumper trucks at the pump panel. In this case, the driver plugs his headset into the engineer's jack while driving. He then unplugs and plugs into the pump panel when he arrives on scene.

Headphone Output: The EAI system is designed to easily drive six or more 300 to 1000 ohm headsets.



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Noise attenuating, full cushion headsets, such as the Sigtronics SE-2, or SE-40 are recommended for best results. The EAI system incorporates an automatic headphone limiting circuit to eliminate the possibility of painful spurious radio or noise spikes from getting to the headsets and into your ears.

Universal Radio Interface design to accommodate virtually any type of communication radio.

Mike Output: Designed to be fully compatible with virtually all mobile radios used on emergency vehicles. An adjustment for transmit microphone level is provided to perfectly match the EAI system to your particular radio. For applications where a very high transmit microphone level is required (some Midland and Wilson radios), an inexpensive plug in Mic Level Amplifier module is available.

Automatic Sidetone Generation allows everyone on the vehicle to hear both sides of the radio conversations.

Excellent RF Immunity guarantees clean, clear, radio communications.

Standardized for use with Sigtronics single plug headsets (ie. SE-2, SE-40, SE-41).

Model Differences: The EAI-S4 is used in applications requiring up to four persons at one time on intercom and using a single vehicle radio. The EAI-S6 is identical to the EAI-S4 but can intercom up to six people at one time. The EAI-D4 is used in applications requiring four intercom positions and the use of two separate radios. Similarly, the EAI-D6 is a six place intercom with two radio capability.

CONTROL FUNCTIONS

ON / OFF — Power Switch — In **“ON”** position; supplies power to all EAI circuits. In **“OFF”** position; disables all unit functions except radio receive.

VOL — Intercom Volume — Adjusts intercom volume level. Does not affect radio volume.

SQ — Intercom Squelch - Adjusts VOX operation of the intercom for variations in background noise levels.

RADIO 1 / RADIO 2 (TALK) — Transmit Select (EAI-D4 and D6 units only) — Used to select which radio to talk on -Radio 1 or Radio 2.

AUTO / BOTH (LISTEN) — Receive Select (EAI-D4 and D6 units only) — Used to select which radio is heard. In **“BOTH”** position, you hear both Radio 1 and the Radio 2. In **“AUTO”** position, only the radio selected by the **RADIO 1 / RADIO 2** switch is heard.

RADIO TRANSMIT MIC LEVEL — Sets the transmit mic audio level for the radio(s).

EAI INSTALLATION

Standard Equipment Included

Besides the Intercom unit and the Radio Adapter unit, each EAI system comes complete with the following:

	EAI-S4/D4	EAI-S6/D6
Intercom Drill Template	1	1
Intercom Panel (printed on both sides)	1	1
Intercom Control Knobs	2	2
Intercom Switch Nut	1	1
Intercom Panel Screws	2	2
Headset Jack Box	6	6
Headset Jack Box Cover		
with Pre-mounted Headset Jack	4	6
with Pre-mounted Headset Jack & Splash Cover	1	1
with Pre-mounted PTT Switch	1	1
PTT Switch with Hardware (loose, not in boxes)	2	2
Jack Box Cover Screws	12	16
Jack Box Mounting Screws	12	16
Wire Grommets	6	8
Jack Insulator Washer, Flat	5	7
Jack Insulator Washer, Shoulder	5	7
Radio Adapter Mounting Screws	4	4
Radio Adapter Mounting Nuts	4	4
Male Connector Housing	1	1
Male Crimp Pins	13	15
Female Connector Housing	1	1
Female Crimp Pins	13	15
4 ft. Headset Jack & PTT Switch Cable	1	1
4 ft. Radio 1/ Power Interface Cable	1	1
4 conductor hook-up wire	1 Roll	1 Roll
4 ft. Radio 2 Interface Cable	1*	1*
Radio Select Switch Cable	1*	1*
Radio Select Panel	1*	1*

* Supplied with Dual Radio EAI-D4 and EAI-D6 units only.

INSTALLATION OVERVIEW

Sigtronics has simplified the installation process, to assure perfect operation. Refer to the EAI Wiring Diagram (for EAI-S4 or EAI-S6 see Figure 4 on page 6 for EAI-D4 or EAI-D6 see Figure 5 on page 7). If you have any installation questions or problems that are not addressed in this manual, feel free to call our installation hot line number located on the last page of this manual.

Installation of the Sigtronics EAI System is a five step process:

- I. Mount the intercom unit. (Intercom Chassis Installation)
- II. Install the Radio Adapter unit. (Radio Adapter Chassis Installation)
- III. Install the headset jacks and PTT switches. (Headset Jack and PTT Switch Installation)
- IV. Wire the jacks and PTT switches. (Headset Jack and PTT Switch Wiring)
- V. Wire the radio(s). (**Radio Hook Up**)

I. INTERCOM CHASSIS INSTALLATION

Intercom Placement:

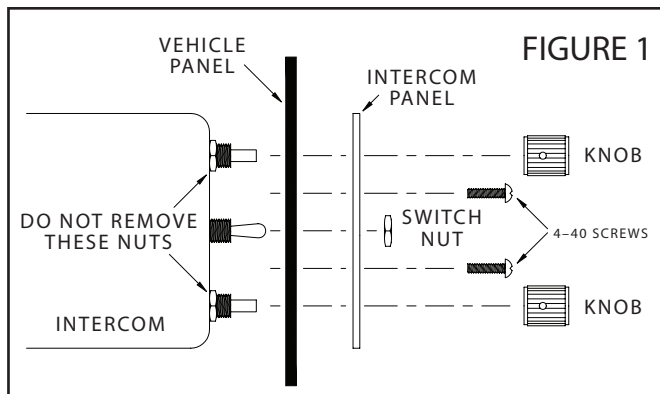
There are a few factors to consider when selecting a mounting location for the EAI Intercom chassis unit:

1. The unit should be placed in such a way that its controls can be easily seen and operated. Most commonly, this will be near the vehicle's communication radio controls.
2. The Intercom unit is primarily designed to be panel or dash mounted. Above and below dash mounting, however, can be accomplished by fabricating an inexpensive bracket.
3. The intercom unit has been designed to mount either horizontally or vertically. The printed panel is reversible for this purpose.
4. The location selected requires a minimum front panel area of 2 1/2" by 1 1/16".
5. The intercom unit normally mounts through the panel or dash. The maximum allowable panel thickness is 5/32 of an inch. If the panel is thicker than this, the volume and squelch knobs will not attach on the unit.
6. The depth required behind panel is 4 3/16", plus cable access. Verify that the rear of intercom unit and cable will not interfere with the normal operation of any vehicle controls or the operation of vehicle compartment doors.
7. The Radio Adapter part of the EAI system plugs into the intercom unit. Therefore, they are usually mounted near each other. If necessary, however, an extension between the two units can be fabricated. Connectors for this are included with the system.
8. For dual radio systems (EAI-D4 or EAI-D6), allow for an additional panel space of 1" x 1-1/2" near the Intercom unit for the radio selection switches.

Panel Preparation:

1. Once the location is selected, remove the protective paper from the back of the adhesive drill template. Then stick it down on the vehicle dash or panel in the selected area.
2. Center punch each hole at the cross lines. (The five holes are in straight line and equally spaced 0.4" apart).
3. Drill 1/8" pilot hole at all five places.
4. Enlarge ON / OFF switch hole to 1/4" and the volume and squelch control holes to 3/8" per template.

Mounting Intercom Unit: See Figure 1



1. Remove the nut from the Intercom unit ON / OFF switch.
2. Remove the two small black Phillips head screws (#4-40) located on either side of the ON / OFF switch.
3. Remove both knobs from the Volume and Squelch controls using a standard .050" Allen wrench. **CAUTION: DO NOT REMOVE** the nuts from the Volume and Squelch controls.
4. Insert the Intercom unit from the rear of panel. Arrows on the top and side of the intercom unit chassis indicate which way is up. One for horizontal mounting and the other for vertical.
5. Install the printed Intercom panel and lightly thread on the ON / OFF switch nut. The nuts on Volume and Squelch controls should fit inside the drilled 3/8" diameter holes.
6. Reinstall and tighten the two small black screws through the holes in intercom panel. Tighten ON / OFF switch nut.
7. Turn both Volume and Squelch controls fully clockwise. Reinstall the knobs on Volume and Squelch control shafts. Without moving the control shafts, align the white line on the knobs to the five o'clock position. Tighten with the Allen wrench.

II. RADIO ADAPTER CHASSIS INSTALLATION

Placement:

The Radio Adapter part of the EAI system is designed to be remote mounted (behind the dash) with four screws mounted through the grommets on the back of the chassis. Because the Adapter connects to the radio(s), select a mounting location near the emergency radio controls. Also, if space allows, mounting this Adapter within a few inches of the Intercom unit allows connectors P1 and J1 to be mated directly. An extension can be fabricated if necessary to connect the two together.

Make sure that the transmit mic level adjustment hole(s) on the side of the Radio Adapter chassis can be easily accessed for adjustment with the Adapter in place. As usual, with the Adapter in place, it or its cables should not interfere with the normal operation of the vehicle.

Mounting Radio Adapter Chassis:

1. Remove the four corner panel screws (the smaller ones) from the top of the Adapter unit. Remove the unit from the chassis.
2. Set the Adapter chassis in the intended mounting place. Using a small point pen or marker, mark the hole pattern through the four grommets located on the bottom of the Adapter chassis.
3. Drill four holes using a 5/32 inch drill (clearance for a 6-32 screw).
4. Secure the Adapter chassis to the vehicle using the four screws and locking nuts supplied. Be sure to install the screws with the screw heads inside the Adapter chassis. This should assure that these mounting screws will not touch the Adapter circuit board when in place. Do not tighten the nuts and screws so tight as to excessively crush the grommets.

5. Replace the Adapter circuit back into the chassis. Make sure that the transmit mic level adjustment(s) lines up with the hole(s) in the Adapter chassis. Be sure not to pinch any wires under the panel. Replace the 4 corner panel screws and tighten.
6. Plug the Intercom unit plug P1 into the mating connector J1 on the Radio Adapter unit.

If you are installing an EAI-D4 or EAI-D6 continue on with the following. Otherwise, for a EAI-S4 or EAI-S6 skip down to "Headset Jack and PTT Switch Installation" below.

Dual Radio Select Switch Cable Installation (EAI-D4 or EAI-D6):

The dual radio units have an additional switch cable that allows radio selection. The switches on this cable are designed to be panel or dash mounted. The other end of this four foot cable plugs into the Radio Adapter unit.

1. Select a location for the RADIO 1/ RADIO 2 select switches near the Intercom unit.
2. Use the printed RADIO 1/ RADIO 2 switch panel as a template to mark the two switch holes. Drill both holes using a standard 1/4" drill.
3. Remove the switch nuts and mount the switches from the back of the panel or dash with the key slots down. The smaller of the two switches is the AUTO / BOTH switch and it mounts on the right.
4. Install the printed switch panel, thread on the switch nuts and tighten.
5. Plug the switch cable plug P5 into the Radio Adapter J5 connector.
6. Secure the switch cable to the vehicle with suitable ties. Again, make sure that the cable does not interfere with anything on the vehicle.

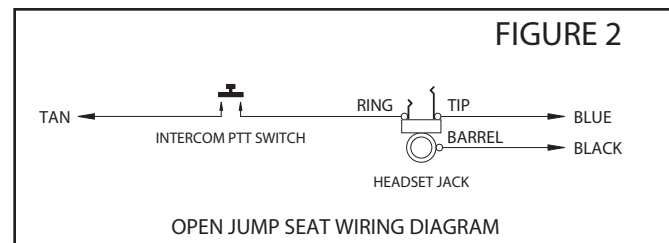
III. HEADSET JACK AND PTT SWITCH INSTALLATION

Headset Jack Placement:

It is assumed that it has already been determined which positions on the vehicle will have headsets. At this stage, it is helpful to have a headset handy to physically gauge the best place for the jack. There are several things to consider when selecting a place to mount the headset jacks:

1. In general, for headset positions inside the vehicle, the jacks should be placed towards the middle between the user's positions. They should also be placed up above and towards the back of the user's head. This will assure that the headset cord will not hang between the user and the vehicle door.
2. The headset jack should be out of the way so that the headset plug can't be hit during use or when entering or exiting the vehicle.
3. The jack position should also take into account how the headset cord will hang when the headset is in use. The cord should hang out of the way and should not interfere with vehicle controls.

4. Verify that the jack placement and headset cable do not interfere with the normal operation of vehicle doors or compartments.
5. In vehicles with intercom headset positions installed in open jump seat locations, the combination of wind, road, and engine noise, picked up by these jump seat headsets, can in some cases produce excessive background noise in the intercom system. Additionally, wide variations in engine noise (from idle to high RPM) can falsely trigger the intercom VOX (voice activated) feature. This is especially true for older vehicles with open jump seats located right next to the vehicle engine. There are two solutions for this situation. The first one is the recommended one:
 - a) Order an additional Push-To-Talk (PTT) switch (and mounting box if needed) for each open jump seat position. These switches can be conveniently mounted at each jump seat location and wired so that the jump seat headset microphone is disabled until the switch is pressed. See Figure 2 below. The firefighter then uses the PIT button to talk on the intercom instead of the VOX (voice activated) intercom feature. PTT buttons wired in this way only activate the intercom. They do not let the



jump seat locations talk on the vehicle radio(s).

- b) Order Sigtronics headsets (Models SE-2P, SE-40P, or SE-41P) with the intercom PTT switch already mounted on the ear cup for the open jump seat positions. The firefighter then uses the PIT button on his headset ear cup to talk on the intercom instead of the VOX feature. The advantage of this method is that it eliminates having to mount and wire in additional PIT buttons for the jump seats. Note, however, most departments prefer to have all the headsets on the vehicle(s) the same so that any headset can be used in any position. The headsets with intercom PTT switches on them cannot easily be used in a position that has radio transmit capability such as the driver or officer position.

Sigtronics provides two ways to mount the headset jacks for the EAI unit:

1. Mount the jacks in the supplied blue jack boxes.

Advantages:

 - a) Little or no "behind the panel" space required.
 - b) No vehicle panel thickness limitation.
 - c) Smaller holes are required to be drilled — a real advantage on vehicles with thick metal panels.
 - d) Complete electrical isolation of the jacks from the vehicles chassis, because the jack box is fabricated out of non-conductive high impact plastic.

2. Mount the jacks directly on the vehicle with a "through the panel" mounting scheme. Advantages:

- a) Smaller space requirement. (Only slightly larger than the jack itself).
- b) Only one hole to drill per jack (1/2 inch).
- c) Most of jack is behind panel and out of the way.

Sigtronics recommends that you use the jack box mounting method, but either approach can be used as well as a combination of both.

If required, additional headset jacks, PTT switches, mounting boxes, and hardware are available through your Sigtronics dealer.

Splash Cover:

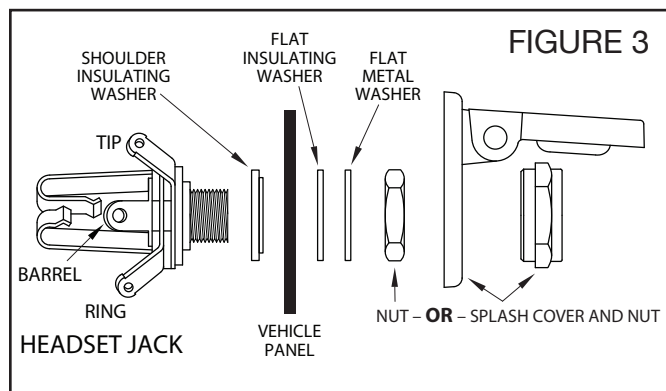
If a jack is to be mounted outside the vehicle (ie. on or near a fire engines pump panel), a splash cover should be used to keep excess moisture out of the jack when it is not in use. Every EAI system comes with one such splash cover already pre-mounted on a jack in a mounting box. On other positions, where the headset is always plugged in, a splash cover is not required.

Jack Box Mounting:

For most installations the wiring for the headset jack will come out the back of the jack box. Four holes are provided in the back of the box for mounting and headset jack wiring.

Place the jack box on the mounting surface and mark and drill the corresponding holes into the vehicle. Use a 1/8 inch drill for mounting holes, a 1/4 inch drill for the headset jack wiring. Mount the jack box to the vehicle with the provided #10 screws. The screws require a 5/16 inch hex driver.

Alternately, the headset jack wire can come out of the side of the jack box if desired. You will have to drill the hole where required. Use a 1/4 inch drill. Rubber wire grommets are provided for the wire going through the jack box hole.



Through the Panel Mounting:

For direct mounting of headset jacks on the vehicle panel you will need to remove the jack from the jack box cover with a 1/2 inch wrench. For normal jack mounting (no splash cover), the maximum panel thickness is 0.10 inches or a little less than 1/8 of an inch. If you need the splash cover (optional), the maximum panel thickness is 0.062 inches or 1/16 of an inch. NOTE: Longer headset jacks that can accommodate thicker panels are available from your Sigtronics dealer (order part

number 100418 - maximum panel thickness 0.155" with splash cover and 0.195" without).

Mounting on the panel requires that you insert the jack from the back of the panel. Test jack(s) for clearance and fit. Leave room behind - the jack expands when headset plug is inserted. Make sure the back of the jack does not interfere with any moving parts of the vehicle.

Drill a 1/2 inch hole in the panel. Install jack with mounting washers and nut as in Figure 3. Both jack insulating washers must be used. Jack has to be insulated from mounting spot to minimize electrical noise getting into intercom system. No need to tighten the jack now. You may have to remove the jack to connect the wires.

PTT Switch Installation:

In order for the officers to transmit on their selected radios, they will each need a Push-To-Talk (PU) switch.

The PTT switches should be placed within easy reach of the users. It is also helpful if they can be easily seen by the users. The maximum panel thickness that can accommodate the switches is 3/16 of an inch. The PTT switches are mounted through the panel from the front. They can also be mounted in a jack box.

In the selected spot, drill a 5/8 inch hole. Mount the switch into the hole but only loosely install the provided lock washer and nut from the back. The PTT switch will likely have to be removed to connect the wires later.

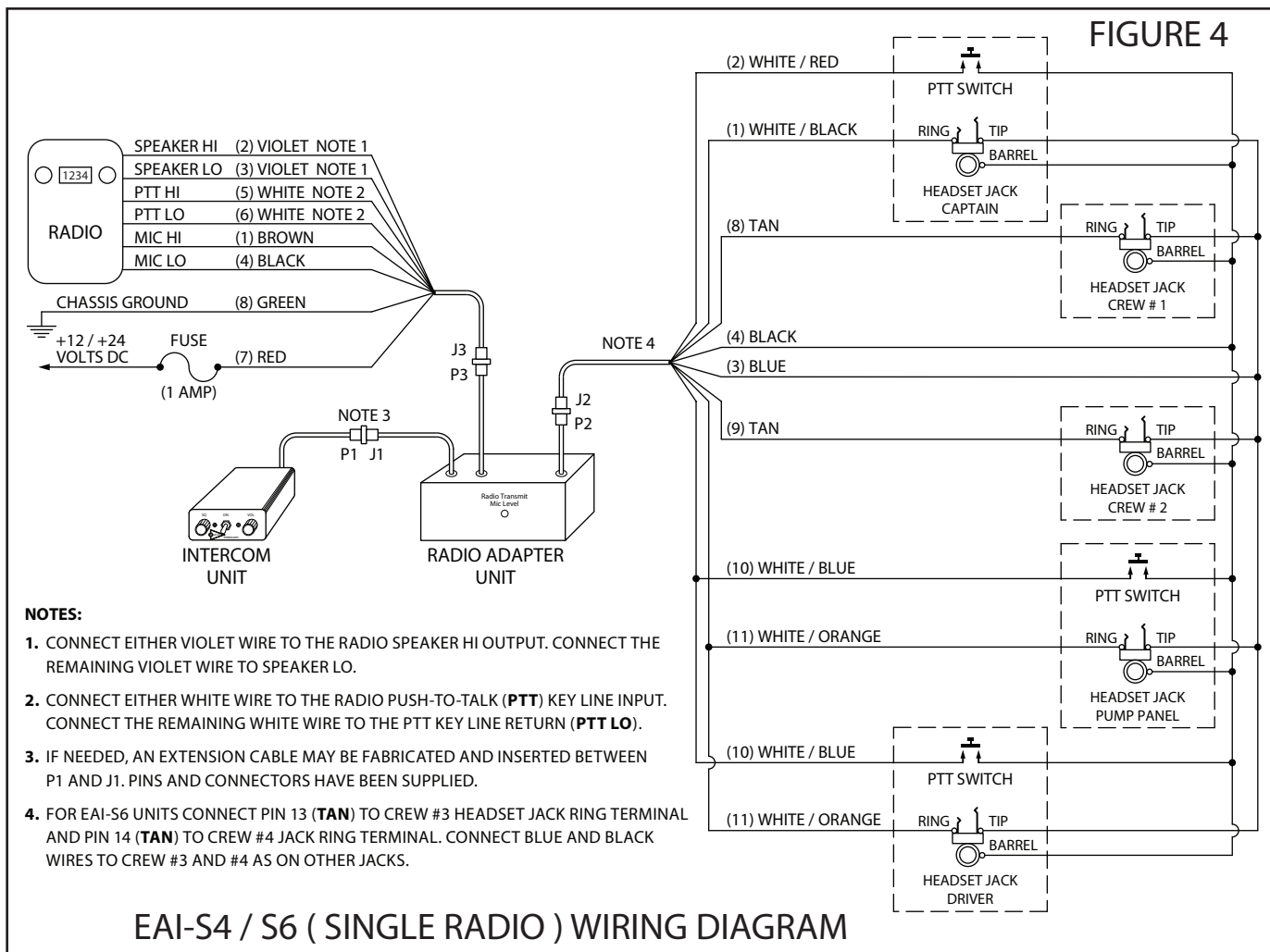
IV. HEADSET JACK AND PTT SWITCH WIRING

The wiring of the headset jacks and PTTs is straight forward. In general, the 4 ft.. Headset Jack and PTT Switch Cable gets wired to the four conductor Hook-up Wire (gray) and then the Hook-up wire connects to the jacks and the PTT switches. For the EAI-S4 and D4 models, this cable has a 12 pin connector with 8 wires. For the EAI-S6 and D6, there is a 15 pin connector and 10 wires. Before going on, plug in J2 of the cable into P2 on the Radio Adapter unit.

Flexible four conductor hook-up wire is provided with each system to connect each headset jack and PTT switch to the EAI unit's Headset Jack and PTT Switch Cable. Enough wire is provided for a typical vehicle installation. If required, additional hook-up wire can be purchased through your Sigtronics dealer.

Each headset jack requires three wires. Each PTT switch requires two. If an officer's PTT switch and headset jack are mounted near each other, only four wires are needed. Refer to the EAI Wiring Diagram (for EAI-S4 or EAI-S6 see Figure 4 on page 6 for EAI-D4 or EAI-D6 see Figure 5 on page 7) for the exact wiring information.

The connections between the Headset Jack and PTT Switch Cable and the hook-up wire should be soldered and insulated for reliability. Do not use crimp type splices. They can become intermittent over time. Use a good quality electrical tape, or better yet, use heat shrink tubing to cover the soldered connections. The connections to the headset jacks and PTT switches will also have to be soldered. See Figure 3 on page 5 for jack terminal identification.



We also **do not recommend** using screw type terminal strips for intercom connections. There have been several instances where terminal strips introduced high levels of electrical noise like alternator whine into the intercom system. It is acceptable however to tie the intercom red and green power wires to existing vehicle terminal strips.

The best place to run the wiring between the unit and the jack and PTT switches is out of sight. It should be run behind vehicle panels and/or up in the headliner. This will reduce the chance of personnel or equipment catching on or damaging the wiring. Wire routing should take into account normal vehicle operations. Wires should not interfere with any of the vehicle's controls, compartments, or doors. If the vehicle's cab tilts up for engine servicing, run wiring along the existing vehicle wiring bundle. Make sure that wiring does not interfere or restrict the tilting operation. Also, make sure that the tilting operation will not cut or sever the wiring.

Make sure that the wiring does not rest on sharp edges. Over time the vehicle's vibration may cause a sharp edge to cut into the wire. Use the provided wire grommets wherever the four conductor wire goes through the hole into a jack box. Use wire ties or tie wraps to secure and strain relieve the wire.

At this time do not put the covers on the jack boxes or tighten up the PTT switches. You will need to verify the correct operation of the system before you close everything up.

Power Connections:

The EAI unit will run on 11-34 VDC, so it automatically adjusts to 12 or 24 volt vehicles. **CAUTION:** This EAI unit is designed for **negative ground vehicles only**. It can be used on positive ground vehicles only if a Sigtronics Positive Ground Adapter is used. Contact your Sigtronics dealer on pricing and availability.

Make sure that the vehicle power is turned off before connecting the EAI power wire. The power for the EAI units comes in on the red and green wires on the Radio 1/ Power Interface Cable. It is an eight wire cable with a 9 pin connector. Plug the 9 pin connector J3 into the mating connector P3 on the Radio Adapter unit.

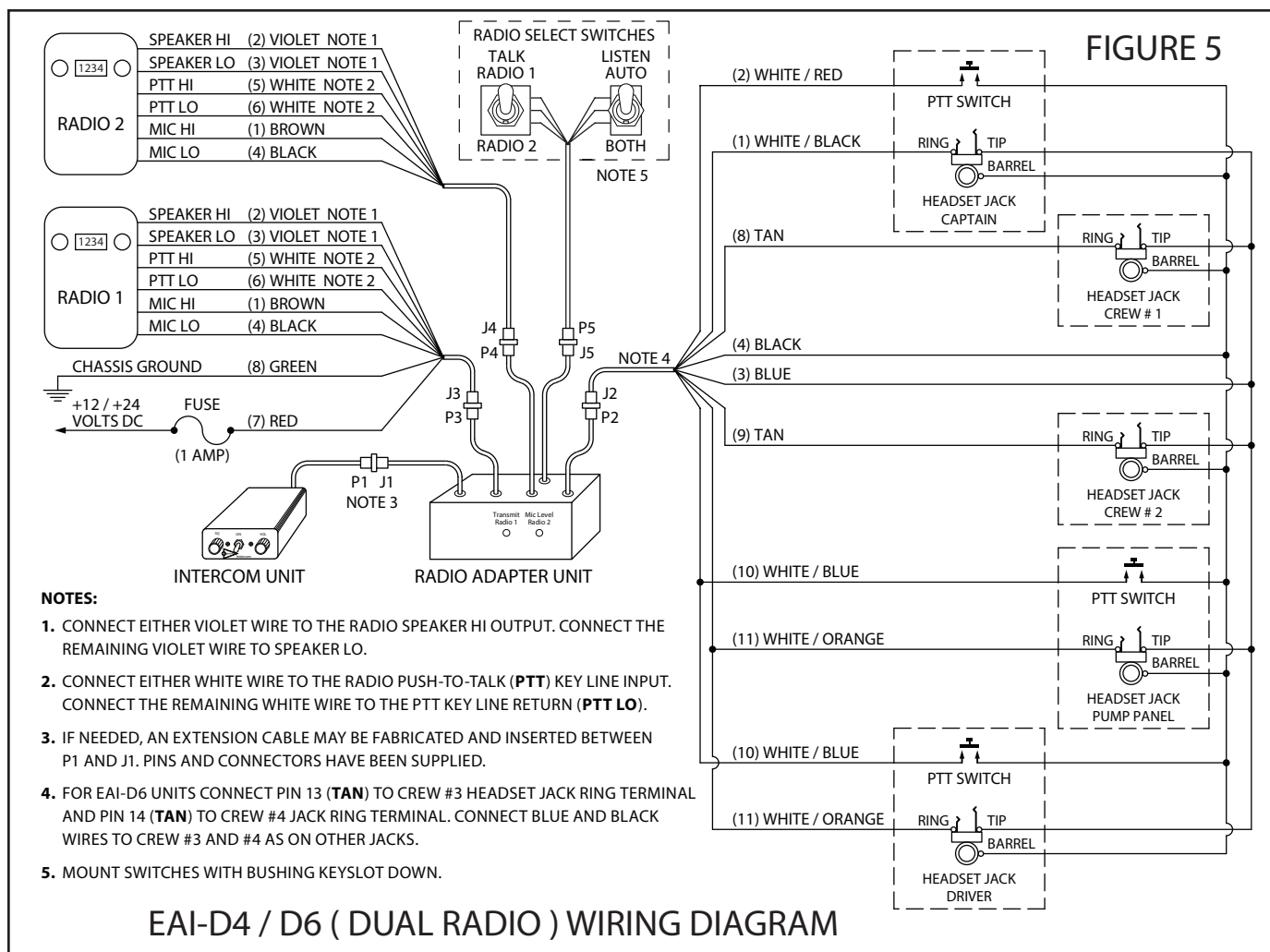
Connect the red wire to vehicle power. (Try not to use a power buss that also runs electrical motors such as fans or light bars with rotating lights.) Connect the green wire to the vehicle chassis ground.

INTERCOM WIRING CHECK OUT

System Setup:

Before you connect the vehicle's radios, check out the system operation. Do the following without the vehicle's engine running:

First plug all headsets into the respective headset jacks.



Put on one of the headsets and position the boom mic close to the mouth, as is the practice with hand-held microphones. Voice clarity is best when the mic is about 1/4 inch away and slightly off center from the lips. Turn the volume control on the headset, **all the way up** (clockwise).

On the EAI unit, set both the intercom volume (**VOL**) control and squelch (**SQ**) control to full clockwise position.

Now turn vehicle power on. Then turn the EAI power switch to **"ON"**. Verify that you can now hear yourself in your headset. Verify also that you can hear all the other headsets and that they can hear you. If everything is OK, skip to the "PTT Test" on page 8. Otherwise, if something is not working right, see the following troubleshooting guide to find and fix the problem before going on with the installation:

No Intercom In Any Of The Headsets:

1. Make sure the EAI power switch and **VOL**ume and **SQ**uelch controls are set as above.
2. Make sure the vehicle power is on.
3. Check in-line fuse in EAI Radio 1/ Power Interface Cable.
4. Check power connection - red wire.
5. Check ground connection - green wire.
6. Check for short or open on headphone wire (Blue wire on the Headset Jack and PTT Switch Cable). The problem could

be anywhere along the blue wire connection between the headset jacks and the EAI unit.

Intercom In Some Headsets But Not In Others:

1. Make sure that EAI switch and controls are set as above.
2. Make sure that neither of the PTT buttons are pressed.
3. Make sure that neither of the PTT wires (white / red or white / blue) are shorted to ground.
4. Check specific "bad" headset jack wiring for:
 - a) Microphone wire (jack ring terminal) open or shorted to ground.
 - b) Headphone wire (jack tip wire) open or shorted to ground.
 - c) Incorrect wiring - wires switched either at the jack or at the point where the hookup wire connects to the Headset Jack and PTT Switch Cable.

Loud Squelch In The Headsets All The Time:

1. First make sure all headset plugs are plugged in all the way and that no part of any headset jack is physically touching any metal.
2. Check headset jack wiring at all jacks. For example, incorrect wiring such as reversing the jack tip and ring wires will cause a squelch.

3. Check for open headset jack barrel connection (black wire). The open could be anywhere along the black wire connection between the jack and the EAI unit.
4. Check for a microphone line (white / black, white / orange, or tan wires) shorted to the headphone line (blue wire). The short could be at one of the headset jacks or in the wiring between the unit and a jack.

Note that for 2 and 3 above, it will only squeal if a headset is actually plugged into the specific jack that is wired incorrectly.

PTT Test:

If all above is good, make sure all headsets are plugged into their respective jacks. Put on the Engineer's (driver) headset and position the microphone as usual. Press the Engineer's PTT switch. While continuing to hold down the switch, talk into the mic and verify that you can still hear yourself. Also, while holding down the PTT switch, verify that **none** of the other head set microphones are active. Release the PTT switch.

Now put on the Captain's headset, position the microphone, and press the Captain's PTT switch. Verify that only Captain's head set microphone is active as his switch is held down.

If the system has a jack and PTT wired up at the vehicles pump panel, unplug the headset from the drivers position and plug it into the pump panels jack. Press and hold down the pump panel PTT switch. Verify that only the pump panel headset microphone is active.

If all works fine, skip down to "Electrical Noise Test" on this page. If anything does not work as above, you have one of three possible PTT switch wiring errors:

1. PTT line (white / red or white / blue wires) open or not connected between a PTT switch and the EAI unit.
2. Open or missing return line (black wire) to a PTT switch.
3. Reversed PTT lines. The Engineers PTT line connected to the Captain's PTT switch and visa versa.

Electrical Noise Test:

The last thing to do before the radios are hooked up to the unit is a simple noise test to verify system wiring as well as vehicle electrical system integrity.

1. Unplug all intercom headsets except for the drivers.
2. Make sure all the EAI panel controls and switches are set as in "System Setup" on page 6.
3. Start the vehicles engine and let it idle a bit. This is a stationary test - the vehicle should not be moving and should be in "PARK" or "NEUTRAL" with brakes set.
4. Close all vehicle windows and doors to eliminate as much background noise as possible.
5. Turn on as much vehicle electrical equipment as possible. This usually means all lights and strobes. Do not turn on sirens or horns.
6. Put on the driver's headset, position the mic, and make sure the headset volume control is set to maximum.
7. With the vehicle still in "PARK" or "NEUTRAL" and brakes set,

slowly increase the vehicle engine rpm from idle to about 1500 RPM and back again. While doing this, listen for any whine or hum in the headsets. Except for some possible engine background noise being picked up from the headset microphone you should not hear any "Electrical" whine or hum in the headset.

8. Shut off the vehicle engine as well as the lights, strobes, etc. If, while the engine was running, there was no electrical noise, skip down to "Radio Hook Up" on page 9. If you did hear electrical noise, use the following to track down the problem:

Turn the vehicle power off and disconnect the EAI ground connection (green wire) from ground. Turn on the vehicle power (engine off), put on the driver's headset and see if the intercom part of the EAI unit is working.

If You Can Hear Yourself In The Headset:

1. Then the EAI intercom return wire (black) is incorrectly grounded to the vehicle chassis. Look for:
 - a) A headset jack barrel touching the vehicle chassis. Most common when a headset jack is mounted directly into the vehicle's panel without using the supplied insulating washers or incorrectly installing the washers.
 - b) The black wire pinched or cut and shorting to the vehicle chassis. This can be anywhere along the intercom wiring as the black wire goes to all head set jacks and PTT switches.
2. Once the problem has been found and fixed, again make sure that the intercom now does not work with the green wire disconnected. You could have the black wire grounded in more than one spot.
3. The next step is to reconnect the green wire and do the electrical noise test again to assure that you have fixed all possible noise problems.

If You Cannot Hear Yourself In The Headset:

The intercom wiring is correct, but excessive electrical noise from the vehicle's power system is affecting the EAI unit operation. This noise is getting into the unit on the EAI power wires (red and green). There are basically two types of power line electrical noise sources:

1. Noise generated directly by the vehicle's electrical/charging system - most commonly known as alternator whine. This is only present when the vehicle's engine is running and recognized by the fact that the pitch or frequency of the whine changes directly with the change in engine rpm. (Higher frequency at higher engine rpm's and lower frequency at lower rpm's.)

The preferred way to solve this type of problem is to have the vehicle's electrical / charging system serviced. The most common cause of this type of noise is bad diodes in the vehicle's alternator. Other possible causes are: bad vehicle voltage regulator; bad alternator or battery cable connections; missing or bad engine or alternator grounding straps.

If servicing the vehicle's charging system is impractical, installing a good alternator whine power line filter

between the vehicle power and the EAI red wire will usually accomplish the same thing. Do not use the type of filter that installs on or near the alternator. **NOTE:** This solution should not be considered a permanent fix. Vehicle charging system problems of this type will eventually cause other equipment failure as well as shorten the life of the vehicle's batteries.

2. The other type of noise is that generated by equipment that uses the vehicle's power. This type of noise is usually constant and does not vary with engine rpm. It does, however, go away completely if the offending equipment is shut off or disconnected. Electrical motors in fans or light bars with rotating lights are two common examples.

Several things can be done to rectify this type of electrical noise:

- a) Find a better (less noisy) vehicle power source for the EAI unit. Move the EAI red wire to another power buss. Try not to use a power buss that also runs electrical motors such as fans or light bars with rotating lights.
- b) Move the EAI ground connection (green wire) to another ground point on the vehicle.
- c) Install an electrical noise filter on the power line going to the equipment causing the noise. Contact the company that makes the offending equipment for a recommendation on the type of filter to use.

If something does not work as described, go back over the wiring and correct **before** going on. If all is well, you can tighten all headset jacks and secure all jack box covers with the supplied hardware. Also, tighten and secure all PTT switches. On the EAI unit, turn down the intercom **VOLUME** control to approximately 1/3 position.

V. RADIO HOOK UP

The connection of the EAI unit to the vehicle's radio(s) should be done by someone familiar with the radio(s) such as your radio installer. Refer to the EAI Wiring Diagram -Figure 4 on page 6 for EAI-S4 or EAI-S6 units or for EAI-D4 or EAI-D6 see Figure 5 on page 7. Only the radio functions are shown for the radio end of the EAI Radio Interface Cable. Because the connector(s) used by radio manufacturers varies widely, you will have to consult the radio manual or manufacturer for the connector(s) and pin assignments used. Sigtronics has extensive radio interface experience and can assist with any question you might have concerning this or any other aspect of the EAI system. See our installation hot line number located on the last page of this manual.

Using the radio manuals and the EAI Wiring Diagram, identify the correct signal wires or connector pins to attach the respective EAI wires. For most radios, these connections are at the back of the radio or radio control head. For some radios, the only place to connect the MIC HI and LO and PTT HI and LO wires is to the hand-held microphone connector.* It is best to wire in such a way that the radio hand microphone can still be used as normal. Make sure that you do not physically tie the EAI MIC LO and SPEAKER LO wires to the same pin on the radio, even if they are tied together inside the radio. As in the headset wiring, the connections between the EAI and

radios should be soldered and insulated for reliability. Do not use crimp type splices.

Use a good quality electrical tape or heat shrink tubing to cover the soldered connections.

* For the more popular radios of this type Sigtronics manufactures plug in "Y" adapters to make these connections easy. Contact your Sigtronics dealer for pricing and availability.

For dual radio units (EAI-D4 or EAI-D6), hook up Radio 1 first and test before moving on to Radio 2.

Connect the six wires from the Radio 1 / Power Interface Cable to the appropriate connections on the vehicle's radio. Once that is done you will need to adjust the Radio 1 Transmit Mic Level.

Radio transmit mic level adjustment for the radio (or both radios for EAI-D4 and EAI-D6) is provided through a hole (or holes) on the side of the Radio Adapter unit. The adjustment(s) sets the microphone audio level going to the radio(s) during transmit. The radio transmit mic level adjustment(s) will need to be initially set to your particular radio(s). The level(s) once set, should never need adjustment again unless the type of radio(s) used are changed. The following simple procedures take you through the adjustment of the mic level(s).

Radio Transmit Mic Level Adjustment can be made with a small, flat blade screwdriver. Clockwise rotation increases the output level to the radio. Counter-clockwise rotation decreases it. The basic adjustment concept is simple. You will be setting the level and clarity of outgoing radio transmissions through the EAI unit headsets, to match or exceed that of transmissions using the radio's standard hand microphone. To do this, you will need to transmit and receive on the vehicle's radio to a remote station. Arrange to have someone nearby with a radio compatible to the radio you are using with the EAI. Then

1. Set the EAI **ON / OFF** switch to the "**ON**" position. Plug a headset into the Captain's jack. Make sure that the volume control on the headset is turned up to full. It is not necessary to connect the other headsets (or Radio 2 on EAI-D4 or EAI-D6 units) for this adjustment. On dual radio units (EAI-D4 or EAI-D6), set **RADIO 1 / RADIO 2** switch to "**RADIO 1**" and the **AUTO / BOTH** switch to "**AUTO**".
2. Set the headset aside for a moment. With the radio's hand mic, transmit as normal, to the remote station. Transmit long enough so that the receiving station can get "calibrated" to your transmission (voice) level.
3. Put on the Captain's headset and position the headset microphone as normal. Verify radio reception. If OK, use Captain's PTT to transmit to your receiving party. If receiving station reports weak transmission, use the screwdriver to turn the RADIO TRANSMIT MIC LEVEL clockwise a small amount. If they report garbled, broken, or noisy transmissions, turn the RADIO TRANSMIT MIC LEVEL counter-clockwise a small amount. Repeat as necessary until the receiving party reports that transmissions through the EAI sound as good or better than when using the radio hand microphone. That's all there is to it!

Once the mic level is set also check radio operation with the

vehicles engine running. If radio reception and transmission through the EAI unit is fine, for EAI-S4 or EAI-S6 units this completes the installation. Skip down to the "System Operation" section on page 11. If everything is OK for EAI-D4 or EAI-D6 units skip down to the "Radio 2 Hook Up" section on page 11. If something does not work correctly, check the following trouble shooting guide:

RADIO TROUBLESHOOTING GUIDE

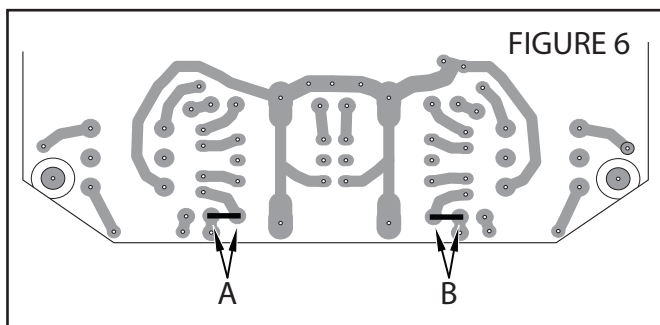
NOTE: For dual radio units (EAI-D4 or EAI-D6) it is far easier to troubleshoot with only one radio connected to the Sigtronics at a time.

First determine if the trouble occurs with the vehicle engine running.

Vehicle Engine Off:

1. Can't hear radio in headset:

- Turn up radio volume at the radio as normal. Make sure however, you are not picking up the radio through the headset mics by briefly turning down (counter-clockwise) the intercom **VOL**ume control all the way.
- Check violet wire (SPEAKER HI and LO) connections from the EAI to the radio.
- For EAI-D4 or EAI-D6 units, make sure that **RADIO 1 / RADIO 2** switch is set to the radio you want to hear.
- Some radios do not have sufficient speaker audio to be heard on a standard EAI system. For such radios a minor modification can be done to the Radio Adapter unit to increase the level (by approximately 300%). Refer to Figure 6 below. Using small piece of hook up wire and a soldering iron, jumper across the pads as indicated on the solder side of the Radio Adapter unit circuit board. For EAI-S4 or EAI-S6 units jumper across the "A" pads. To increase the audio for RADIO 1 of a EAI-D4 or EAI-D6 unit, also jumper across the "A" pads. To increase the audio of RADIO 2 on a EAI-D4 or EAI-D6, jumper across the "B" pads.



2. Can't talk to dispatch (transmit) on radio through the headset:

- Check the connections between EAI Radio Adapter unit and the radio. Both white wires (PTT HI and LO) and the Brown and Black wires (MIC HI and LO).
- Check the Radio Transmit Mic Level adjustment.
- If the EAI is connected to a Midland radio a Sigtronics Mic Level Amplifier might be required to boost the transmit level. Contact your Sigtronics dealer for details.

- For EAI-D4 or EAI-D6 units, make sure the RADIO 1 / RADIO 2 switch is set to the radio you want to transmit on.

Vehicle Engine On:

1. Electrical noise (alternator whine) in headsets when receiving on radio, or

Dispatch reports that they hear electrical noise (alternator whine) when transmitting from vehicle through the headsets.

First make sure that the problem is only related to the radio hook up. Make sure that you did the "Electrical Noise Test" for the intercom (without the radios connected) on page 8 and fixed any problems there before you go further. If OK then:

Check all six radio interface wires between the EAI unit and the radio - MIC HI, MIC LO, PTT HI, PTT LO, SPEAKER HI, and LO. Make sure that you have the correct pin numbers for the radio you are hooking to. Make sure that MIC LO and SPEAKER LO are not physically tied to the same pin on the radio; even if they are tied together inside the radio.

If the wiring is OK, then noise is coming from radio.

Possible bad radio wiring, (Check radio power and ground-connections for loose or corroded connections) or

Excessive noise is generated directly by the vehicle's electrical / charging system – most commonly known as alternator whine. This is only present when the vehicle's engine is running and recognized by the fact that the pitch or frequency of the whine changes directly with the change in engine rpm.

The preferred way to solve this type of problem is to have the vehicle's electrical / charging system serviced. The most common cause of this type of noise is bad diodes in the vehicles alternator. Other possible causes are: bad vehicle voltage regulator; bad alternator or battery cable connections; missing or bad engine or alternator grounding straps.

If servicing the vehicle's charging system is impractical, installing a good alternator whine power line filter in-line with the radio power wire(s) will usually accomplish the same thing. All radio power wires will have to be filtered. Some radios have more than one wire that hooks to vehicle power. Contact the radio manufacturer for a recommendation on the best filter for the particular radio. **NOTE:** This solution should not be considered a permanent fix. Vehicle charging system problems of this type will eventually cause other equipment failure as well as shorten the life of the vehicle's batteries.

2. Dispatch says too much background noise or unclear or weak transmissions.

- Check to see if a radio hand mic on the vehicle is also active or 'live' when transmitting through the EAI unit. Check this while not wearing a headset and by talking directly into the radio hand mic and pressing either EAI PTT switches. Do not press the PTT button on the hand mic itself. If dispatch can hear you loud and clear, then

the background noise pick up is coming from this active hand mic. If you have this type of hand mic then it is best to contact the radio manufacturer for instructions on a possible microphone modification to fix the problem. Some radio manufacturers can supply a compatible microphone that does not have this problem.

- b) Adjust the EAI Radio Transmit Mic Level Adjustment. If the mic level is set too low, you will get reports of weak transmissions. If the mic level is too high, you will get reports of noisy or garbled transmissions. See "Radio Transmit Mic Level Adjustment" on page 9.

Radio 2 Hook Up:

Plug in J4 of the Radio 2 Interface Cable into P4 of the Radio Adapter unit. (This cable has a six pin connector.) Using the radio manual and Figure 5 on page 7, connect the six wires to the appropriate connections on the vehicle's radio. Once that is done you will need to adjust the Radio 2 Transmit Mic Level.

The **Radio 2 Transmit Mic Level Adjustment** is the right one of the two located on the Radio Adapter unit. The adjustment procedure is very similar to that of the Radio 1 Transmit Mic Level adjustment. Arrange to have someone nearby with a radio compatible with your Radio 2. Then, proceed as follows:

1. Set the EAI **ON / OFF** switch to the "**ON**" position. Again, Plug in a headset into Captain's jack. Make sure that the volume control on the headset is turned up to full. (Radio 1 and the other headsets are not needed for this adjustment.) Set the **RADIO 1/ RADIO 2** switch to "**RADIO 2**" and the **AUTO / BOTH** switch to "**AUTO**".
2. Set the headset aside for a moment. With the radio's hand mic, transmit as normal, to the remote station. Transmit long enough so that the receiving station can get "calibrated" to your transmission (voice) level.
3. Put on the Captain's headset and position the headset microphone as normal. Verify Radio 2 reception. If OK, use Captain's PTT to transmit to your receiving party. If receiving station reports weak transmission, use the screwdriver to turn the **RADIO 2 TRANSMIT MIC LEVEL** clockwise a small amount. If they report garbled, broken, or noisy transmissions, turn the **RADIO 2 TRANSMIT MIC LEVEL** counterclockwise a small amount. Repeat as necessary until the receiving party reports that transmissions through the EAI sound as good or better than when using the radio hand microphone.

If Radio 2 does not operate as it should, use the "Radio Trouble shooting Guide" on page 10 to find and fix the problem. This completes the EAI installation.

SYSTEM OPERATION

The following describes how to use the EAI System as well as adjust the EAI controls. It also explains exactly how the EAI unit operates. This will allow you to easily set all unit functions to your specific needs. If you are not familiar with the EAI operation, perform the next few steps while the vehicle is not in motion.

HEADSETS

Put on the headset(s) and position the boom mike close to the mouth, as is the practice with a hand-held mike. For best voice clarity, the headset microphone must be positioned to one side of the mouth and **1/4 inch from the lips**. Turn the volume control on the headset ear cup to maximum. Turn down for individual hearing needs if necessary only after intercom and radio volumes have been set correctly. (see below)

Intercom operation and adjustment can be performed by the following procedure:

1. Set the **ON / OFF** switch to the "**ON**" position.
2. Turn the intercom **S**quelch control to the maximum clockwise position. For best system performance set the intercom **VOL**ume control as low as possible. On most systems this will be approximately between 1/4 to 1/3 open. **Note:** the intercom volume control only adjusts the volume of conversation between the headsets inside the vehicle. **It does not** affect the level at which you hear the dispatch radio. (see Radio Volume below) You should now hear yourself and others on the intercom.
3. To adjust the Intercom **S**quelch for voice activated operation (VOX), it is helpful to have some background noise (truck engine or ...). Turn intercom **S**quelch control all the way counter-clockwise. Now, without speaking, rotate the **S**quelch control clockwise until you hear the background noise in your headset. Next, rotate it counterclockwise in **small** amounts until the background noise disappears. Finally, make **small** adjustments until your voice triggers the unit at comfortable speaking levels. This procedure is necessary because the squelch is a "Fast-on, Slow-off" system.

When you speak, your voice will be heard in the headsets but the sound will cut off about a second after you stop speaking. Minor readjustment of the Squelch may be necessary if the background noise level changes significantly (engine idling to cruise power with siren on).

RADIO OPERATION

With the EAI System, your radio(s) are heard through the headsets as well. Adjust the volume level of the dispatch radio(s) in the headsets with the volume control on the radio as normal. Note that the radio volume does not effect the intercom volume and visa versa.

Transmitting (talking to dispatch) from the selected headset positions is possible on a one-at-a-time basis. For a typical EAI installation the Captain or Engineer positions can transmit at any time simply by pressing their PTT switch. The Crew positions cannot transmit on the radios. When one position transmits, several things take place automatically:

- All headset microphones, except for the transmitting position, are muted.
- The selected radio is put into transmit mode.
- The headset microphone audio (your voice) is sent to the selected radio.

- Sidetone is generated and sent to your headphones.*
- * Sidetone is a portion of the transmitted voice signal sent back into your headset so that you can hear what you are saying while transmitting. The intercom **VOLUME** control adjusts the volume level of the sidetone that you hear in your headset. The other headsets will also hear the transmission sidetone. Of course, when the PTT switch is released, (stop transmitting) all functions return to normal, instantly and automatically.

For Dual Radio Units - EAI-D4 and EAI-D6:

The operation of the dual radio EAI units are identical to that of the single radio units except for the addition of radio selection:

Radio Selection of both Radio 1 and Radio 2 radios are provided by two switches.

1. **RADIO 1/ RADIO 2 (TALK)** determines the radio you wish to transmit on.
2. **AUTO / BOTH (LISTEN)** selects which radio(s) you receive or hear in your headset.
 - a) **"AUTO"** position allows you to hear the radio that the **RADIO 1 / RADIO 2** switch is set to.
 - b) **"BOTH"** position permits you to hear both the radios at the same time.

EAI Specifications

Input Voltage:11 - 34 VDC

Nominal Current: 0.06 Amps

Maximum Current: 0.10 Amps

Intercom Unit Size: 2.5 x 1.06 x 4.2 inches

Radio Adapter Unit Size: .. 4 x 2.9 x 2 inches

Weight:12 oz. (not including cables and hardware)

TWO YEAR WARRANTY

Every Sigtronics product has been carefully inspected before shipment. We guarantee to correct any defect caused by faulty material or workmanship free of charge to the user who originally purchased the product for a period of two years from the original purchase date. Our obligation assumed under this guarantee is limited to the replacing of any part or parts which prove to our satisfaction, upon examination to have been defective, and which have not been misused or carelessly handled. The complete unit must be returned to our factory, transportation charges prepaid. We reserve the right to decline responsibility where repairs or replacements have been made or attempted by others. No other guarantee, written or verbal, on our products is authorized by us.

Repairs required due to abuse, misuse, damage or normal service beyond the warranty period will be subject to normal service charges.

To expedite factory service work, contact Sigtronics Service Department and explain the problem. All correspondence relative to service work should include model and serial number. Frequently problems can be resolved by phone. The Sigtronics number is located below.

Sigtronics Installation Hot Line Number:

1-800-367-0977 ext. 8

M-F 8:00 am to 4:30 pm Pacific Time

www.sigtronics.com

