

# Sigtronics S-A-F-E Communicator

## Dual Radio Select Panel with VOX Intercom Installation and Operating Instructions



### INTRODUCTION

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

The Sigtronics SAFE unit, when used with Sigtronics noise attenuating headsets, provides personnel with the ability to transmit and receive on two radios at the same time; talk to each other via a voice activated (VOX) intercom, and monitor a third radio.

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

**Dual Radio Capability** allows the two command headset positions (officers) to select which radios to transmit and receive on independent of the other headsets. Each headset position has dual volume controls, one for radio reception, and one for intercom volume level. The third and fourth headset positions (crew) are slaved to the right side of the unit and hear whatever radio(s) that side has selected.

**Auxiliary Input** lets you monitor a third radio.  
**Voice Activated Intercom (VOX)** feature allows "hands free"

communication between headsets connected to the SAFE 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 SAFE 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 engineers jack while driving. He then unplugs and plugs into the pump panel when he arrives on scene.

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

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

Excellent RF Immunity guarantees clean, clear, radio communications.

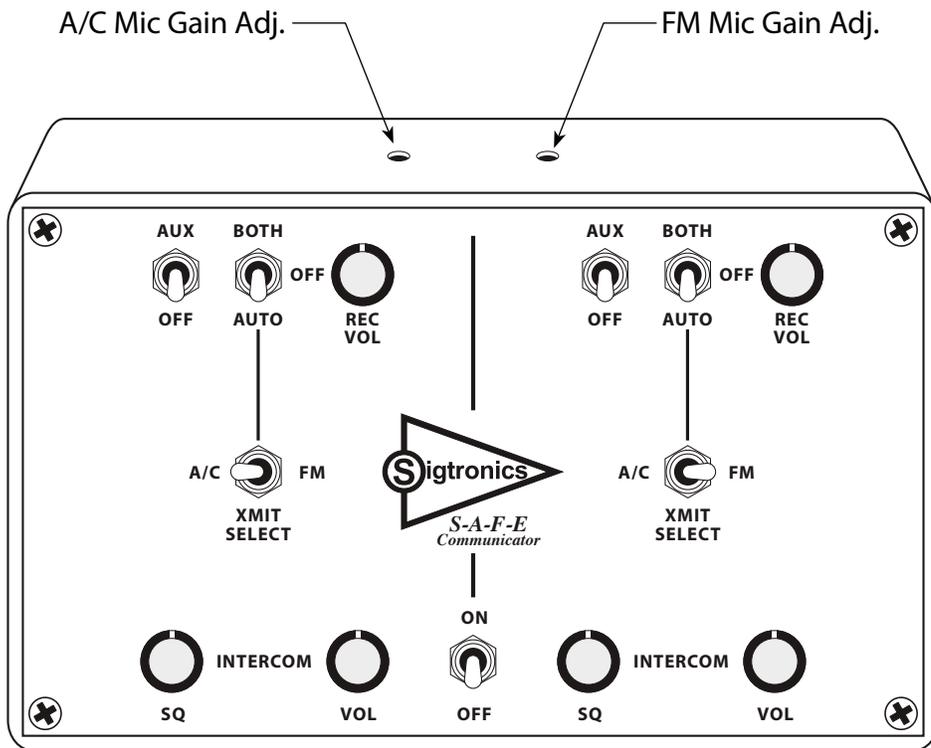
Standardized for use with Sigtronics single plug headsets (ie. SE-8, SE-48, SE-18).



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Figure 1



## CONTROL FUNCTIONS

**ON/OFF** - Power Switch - In "ON" position; supplies power to all SAFE circuits. In "OFF" position; disables all unit functions.

**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.

**XMIT SELECT** - Transmit Select - Used to select which radio to talk on - A/C (Radio 1) or FM (Radio 2).

**BOTH/OFF/AUTO** - Receive Select - Used to select which radio is heard. In "BOTH" position, you hear both the A/C radio and the FM radio. In "OFF" position you will not hear either radio. In "AUTO" position, only the radio selected by the XMIT SELECT switch is heard.

**AUX/OFF** - Auxiliary Select - Turns the auxiliary (third radio) on or off.

**REC VOL** - Receive Volume - A general control used to set the volume level of all three radios.

**A/C MIC GAIN ADJ** - A/C Radio Microphone Gain Adjustment - Sets the transmit mic audio level for the A/C radio.

**FM MIC GAIN ADJ** - FM Radio Microphone Gain Adjustment - Sets the transmit mic audio level for the FM radio.

## Standard Equipment Included

Description	Qty.
S.A.F.E. Intercom Unit	1
Intercom Mounting Bracket	1
Intercom Mounting Thumb Screws	4
Headset Jack Box and Cover with Pre-mounted Headset Jack	4
PTT Switch Box and Cover with Pre-mounted PTT Switch	2
Headset Hooks	4
Jack Box and Switch Box Cover Screws	12
Jack Box, Switch Box, Headset Hook, and Bracket Mounting Screws	24
Wire Grommets	6
Jack Insulator Washer, Flat	4
Jack Insulator Washer, Shoulder	4
4 ft. Interface Cable with Fuse	1
4 conductor hook-up wire (Roll)	1

## Installation Overview

Installation of the Sigtronics SAFE unit is a four step process:

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

Do not fear, Sigtronics has simplified the installation process, to assure perfect operation. Refer to the SAFE Unit Wiring Diagram (Figure 4). 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.

## I. INTERCOM CHASSIS INSTALLATION

### Intercom Placement:

There are a few factors to consider when selecting a spot for the SAFE 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 SAFE unit is designed to be dash mounted (above or below) or mounted from the vehicle's ceiling.
3. The location selected requires a minimum area of 4.25 by 7.25 inches.
4. The unit mounting bracket has three sets of mounting holes, allowing three different mounting angles. This provides for different dash slopes as well as different viewing angles.
5. 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.

### Intercom Mounting:

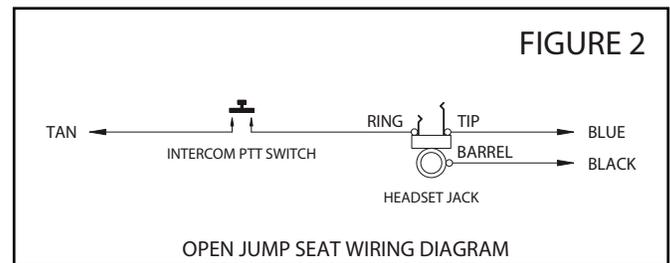
1. Once the intercom position is selected, remove the mounting bracket from the intercom unit. This is done by removing the thumb screws on both sides of the unit. Two on each side.
2. Position the mounting bracket on the selected area in the vehicle. Mark at least two holes for mounting. Drill the holes using 1/8 inch drill. **CAUTION:** Make sure that neither the drill nor the screws will puncture any vehicle cabling or components.
3. Attach the bracket to the vehicle using the hex head screws and a 5/16 inch driver.
4. Plug the SAFE unit interface cable into the back of the unit and tighten the two connector retaining screws finger tight.
5. Mount the unit on the bracket at the selected angle and secure the 4 thumb screws.

## II. 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 a particular 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 head-sets, 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 next to the vehicle engine. There are **two solutions** for this situation. **Solution (a)** 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. The user then presses his PTT button to talk on the intercom. 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-8P, SE-48P, or SE-18P) with the intercom PTT switch already mounted on the ear cup for the open jump seat positions. The user

then presses the PTT button on his headset ear cup to talk on the intercom. The advantage of this method is that it eliminates having to mount and wire in additional PTT 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 SAFE 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) No large 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 (optional):

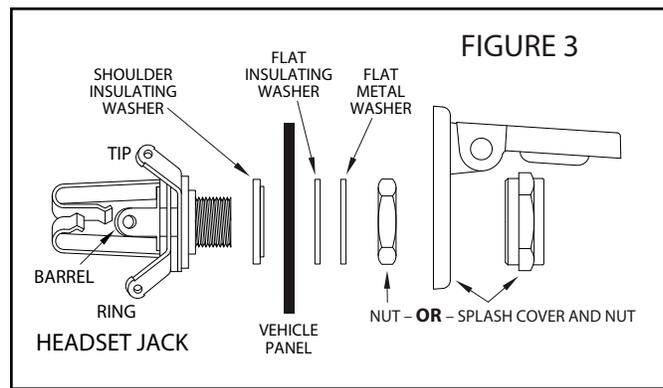
If a jack is to be mounted outside the vehicle (ie. on or near a fire engines pump panel), a splash cover (*purchased separately*) should be used to keep excess moisture out of the jack when it is not in use. On other positions, where the headset is always plugged in, a splash cover is not required.

### Jack Box Mounting:

Set the jack box on the mounting surface in the selected area and mount with two of the hex head self drilling screws. For most applications\* these screws can be installed with no pre drilling. Just power in the screws with a standard electric driver with a 5/16" hex bit.

*\* No pre drilling required for aluminum and steel. 1/8" inch pilot hole will still be required with some stainless steels.*

For most installations the wiring for the headset jack will come out the back of the jack box. A hole is already provided in the



jack box for this purpose. Of course, you will also have to drill a similar hole into the vehicle. Use a 5/16 inch drill for this.

Alternately, the wire can come out of the side of the jack box if desired. You will have to drill the hole where required. Use a 5/16 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).

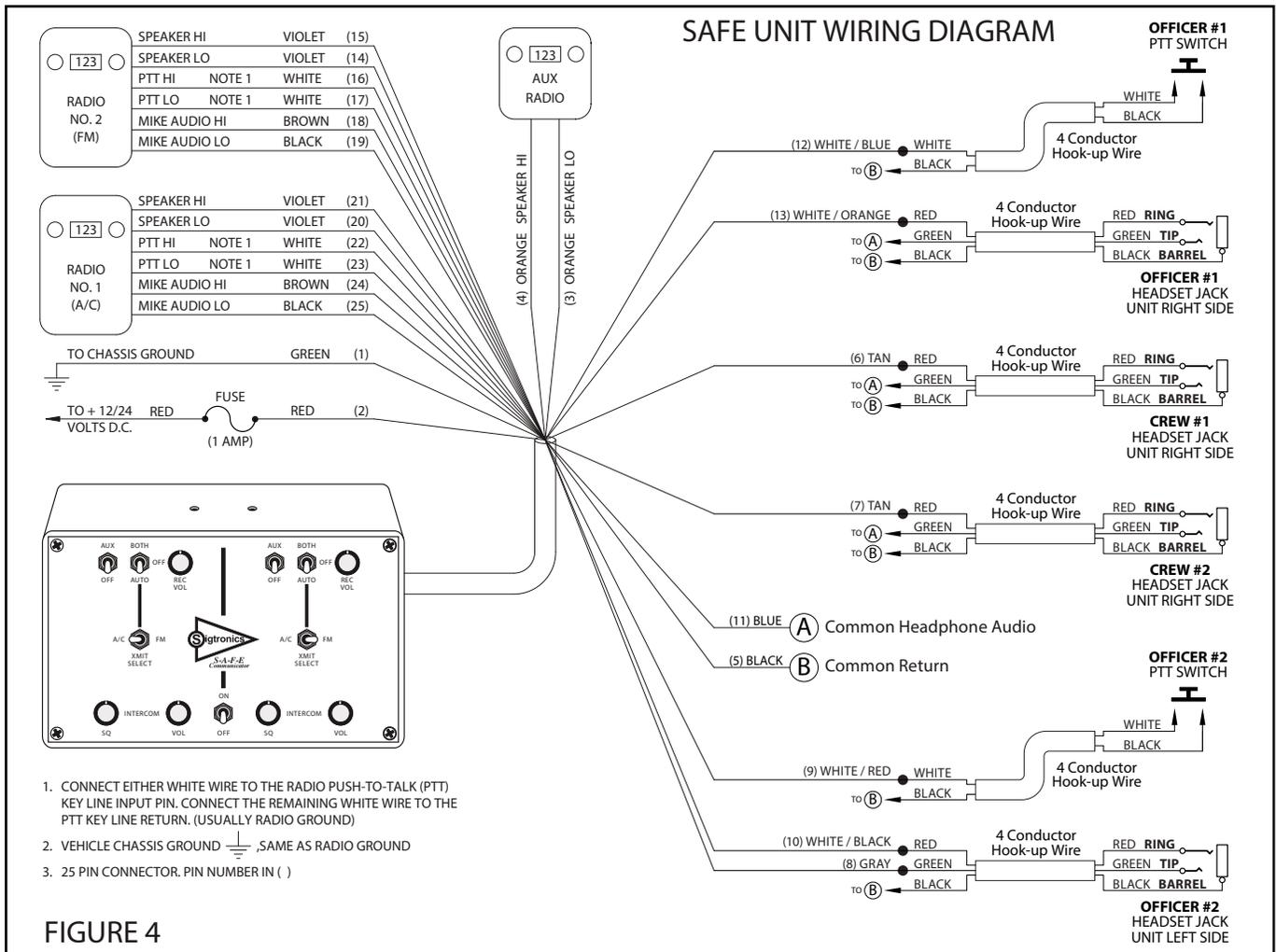
Mounting on the panel requires that you insert the jack from the back of the panel. Test jack(s) for clearance and fit. Leave room behind - the jack expands when headset plug is inserted. Make sure the back of the jack does not interfere with any moving parts of the vehicle.

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. The Jacks have 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 Driver or Officer positions to transmit on the radio, they will each need a Push-To-Talk (PTT) 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 PTT switches can be mounted in the blue ptt mounting boxes or directly into a panel. If using the ptt boxes, set the box on the mounting surface in the selected area and mount with two of the hex head self drilling screws. For most applications\* these screws can be installed with no pre drilling. Just power in the screws with a standard electric driver with a 5/16" hex bit. *\* No pre drilling required for aluminum and steel. 1/8" inch pilot hole will still be required with some stainless steels.*



If mounting the PTT switches directly into a panel the switch is mounted from the front and the panel can have a maximum thickness of 3/16 of an inch.

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. The nut requires a 7/8" wrench

### III. HEADSET JACK AND PTT SWITCH WIRING

The wiring of the headset jacks and PTTs is straight forward. In general, the 4 foot 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.

Flexible four conductor hook-up wire is provided with each system to connect each headset jack and PTT switch to the SAFE 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 SAFE Unit Wiring Diagram (see Figure 4) 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 for jack terminal identification.

We also **do not recommend** using screw type terminal strips for Headset Jack and PTT connections. There have been several instances where terminal strips introduced high levels of electrical noise like alternator whine into the system. It is acceptable however to tie the SAFE unit's 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 SAFE unit will run on 11-34 VDC. **CAUTION:** SAFE units are designed for **negative ground** vehicles **only**. They 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 SAFE power wire. The power for the SAFE unit comes in on the red and green wires on the Headset Jack and PTT Switch Cable.

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 SAFE unit, set both intercom volume controls (**VOL**) and receive volume (**REC VOL**) controls to full clockwise position. Set both intercom squelch (**SQ**) controls to full clockwise position. Set both **BOTH/OFF/AUTO** switches to **"AUTO"**. Set the left transmit select (**XMIT SELECT**) switch to **"A/C"**. Set the right transmit select switch to **"FM"**.

Now turn vehicle power on. Then turn the SAFE 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". Otherwise, if something is not working right see the following troubleshooting guide to find and fix the problem:

### No Intercom In Any Of The Headsets:

1. Make sure all SAFE switch and controls are set as above.
2. Make sure vehicle power on.
3. Check in-line fuse in SAFE interface cable.
4. Check power connection - red wire.
5. Check ground connection - green wire.

### Intercom In Some Headsets But Not In Others:

1. Make sure SAFE 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.

### Loud Squeal 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 for correct headset jack wiring at all jacks. For example, reversing the jack tip and ring wires will cause a squeal.
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 SAFE unit.
4. Check for a microphone line (white/black, white/orange, or tan wires) shorted to one of the headphone lines (blue or gray 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 Officer 2's headset and position the microphone as usual. Press Officer 2'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 headsets microphones are active. Release the PTT switch.

Now put on Officer 1's headset and press Officer 1's PTT. Verify that only Officer 1's headset microphone is active as his switch is held down.

If all works fine, skip down to "Electrical Noise Test" on this. 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 SAFE unit.
2. Open or missing return line (black wire) to a PTT switch.
3. Reversed PTT lines. Officer 1's PTT line connected to Officer 2'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 SAFE 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 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". If you did hear electrical noise, use the following to track down the problem:

### Finding The Source of Electrical Noise

Turn the vehicle power off and disconnect the SAFE 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 SAFE unit is working.

### If You Can Hear Yourself In The Headset:

1. Then the SAFE 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 headset 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 SAFE unit operation. This noise is getting into the unit on the SAFE 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 SAFE 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 SAFE unit. Move the SAFE 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 SAFE 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 SAFE unit, turn down both intercom VOLUME controls to approximately the 10 o'clock position.

#### IV. RADIO HOOK UP

The connection of the SAFE unit to the A/C, FM, and AUX radios should be done by someone familiar with the radios such as your radio installer. Referring to Figure 4, only the radio functions are shown for the radio end of the SAFE 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) used and pin assignments. Sigtronics has extensive radio interface experience and can assist with any question you might have concerning this or any other aspect of the SAFE. See our installation hot line number located on the last page of this manual.

Using the radio manuals and Figure 4, identify the correct signal wires or connector pins to attach the respective SAFE 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 SAFE 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 SAFE 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.

#### A/C (Radio 1) Hook Up

To keep the installation simple, hook up one radio and test before moving on to the next. Starting with the A/C radio, connect the six wires bundled with the "A/C (Radio 1)" label.

Once that is done you will need to adjust A/C radio transmit microphone gain.

Radio microphone gain adjustments for both the A/C radio and the FM radio are provided through two small holes on the top of the SAFE unit. These adjustments set the microphone audio level going to the radios during transmit. The radio transmit mic gain adjustments will need to be initially set to your particular radios. Adjustment should be made only if the outgoing radio transmissions are reported as weak, garbled, or noisy. The levels 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 these mic gain levels.

A/C Radio Mic Gain Adjustment can be made through the left hole with a small, flat blade screwdriver. The basic adjustment concept is simple. You will be setting the level and clarity of outgoing radio transmissions through the SAFE 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 A/C radio to a remote station. Arrange to have someone nearby with a radio compatible to the radio you are using with the SAFE. Then...

1. Set the SAFE ON/OFF switch to the "ON" position. Plug a headset into Officer 2's jack. Make sure that the volume control on the headset is turned up to full. (It is not necessary to connect the FM Radio or the other headsets for this adjustment.) Set Officer 2's (left side) XMIT SELECT switch to "A/C", the BOTH/OFF/AUTO switch to "AUTO", and the AUX switch to "OFF". Set the RECeive VOLUME control to the 12 o'clock position.
2. Set the headset aside for a moment. With the A/C 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 Officer 2's headset and position the headset microphone as normal. Verify A/C radio reception. If OK, use Officer 2's PTT to transmit to your receiving party. If receiving station reports weak transmission, use the screwdriver to turn the A/C MIC GAIN ADJ clockwise a small amount. If they report garbled, broken, or noisy transmissions, turn the A/C MIC GAIN ADJ counterclockwise a small amount. Repeat as necessary until the receiving party reports that transmissions through the SAFE sound as good or better than when using the A/C radio hand mic. That's all there is to it!

If A/C radio reception and transmission through the SAFE unit is fine, skip down to the "FM (Radio 2) Hook Up" section. If something does not work correctly, check the following troubleshooting guide.

#### Radio Troubleshooting Guide:

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

## Vehicle Engine Off:

1. Can't hear selected radio in headset:
  - a) Make sure the BOTH/OFF/AUTO switch is set to "AUTO" position and that the XMIT SELECT switch is set to the radio you want to hear. Turn up the REceive VOLume control to 12 o'clock position.
  - b) Turn up radio volume at the radio as normal. Make sure however, you are not hearing the radio through intercom mics by turning down (counter-clockwise) both SAFE intercom VOLume controls all the way.
  - c) Check violet wire (SPEAKER HI and LO) connections from the SAFE to the radio
2. Can't transmit to dispatch on radio through the headset.
  - a) Make sure that the XMIT SELECT switch is set to the radio you want to transmit on.
  - b) Check the connections between SAFE unit and the radio. Both white wires (PTT HI and LO) and the Brown and Black wires (MIC HI and LO).
  - c) Check the specific Radio Mic Gain Adjustment on the SAFE unit.

## 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) and fixed any problems there before you go further. If OK then:

Check all six radio interface wires between the SAFE 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.
  - a) Check to see if a radio hand mic on the vehicle is also active or "live" when transmitting through the SAFE unit. Check this while not wearing a headset and by talking directly into the radio hand mic and pressing either SAFE intercom radio 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) Readjust the SAFE Radio Mic Gain Adjustment. If the mic gain is set too low, you will get reports of weak transmissions. If the mic gain is too high, you will get reports of noisy or garbled transmissions. See "A/C Radio Mic Gain Adjustment" or FM Radio Mic Gain Adjustment.

## FM (Radio 2) Radio Hook Up

Connect the FM radio to the six SAFE wires bundled by the FM (Radio 2) label. Adjust mic gain as follows:

The FM Radio Mic Gain Adjustment is the right one of the two located on the top of the SAFE unit. The adjustment procedure is very similar to that of the A/C (Radio 1) radio mic gain adjustment. Arrange to have someone nearby with a radio compatible with the FM radio that is connected to the SAFE unit. Then, proceed as follows:

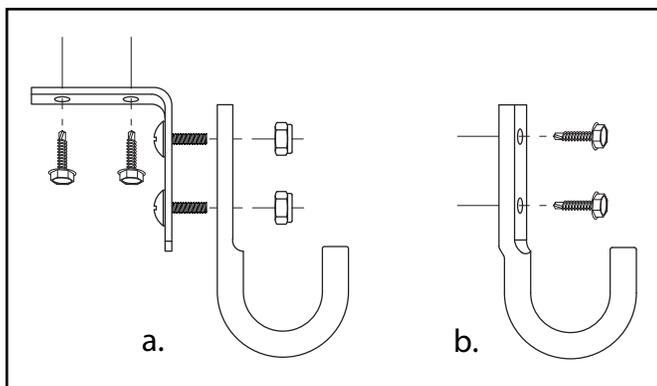
1. Set the SAFE ON/OFF switch to the "ON" position. Again, Plug in a headset into Officer 2's jack. Make sure that the volume control on the headset is turned up to full. (A/C radio and the other headsets are not needed for this adjustment.) On Officer 2's side of the SAFE, set the XMIT SELECT switch to the "FM" position, the BOTH/OFF/AUTO switch to "AUTO", and the AUX/OFF switch to "OFF". Set the REceive VOLume control to the 12 o'clock position.

2. Set the headset aside for a moment. With the FM 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 Officer 2's headset and verify FM radio reception. If OK, use Officer 2's PTT to transmit to your receiving party. If the receiving station reports weak transmissions, use the screwdriver to turn the FM MIC GAIN ADJ clockwise a small amount. If they report garbled, broken or noisy transmissions, turn the FM MIC GAIN ADJ counterclockwise a small amount. Repeat as necessary until the receiving party reports that transmissions through the SAFE unit sound as good or better than when using the FM radio's hand mic.

If the FM radio does not operate as it should, use the "Radio Troubleshooting Guide" to find and fix the problem.

### Auxiliary Radio

If you are using an auxiliary radio, only two connections (orange wires) are required to hook it to the SAFE unit. See Figure 4. No adjustments are required for the auxiliary radio. Turn the AUX switch to "ON" to hear the auxiliary radio in the headsets.



### HEADSET HOOK INSTRUCTIONS

The enclosed headset hooks are provided at no additional charge to allow for a convenient way to store the headset. These strong and durable hooks may be mounted in any location. Two mounting methods seem to be preferred:

1. Top Mounting ( Figure 7-a ). The hooks may be mounted from the existing headliner screws and hardware, or you may use the enclosed attaching screws. When used with an electric driver these screws are self drilling. For most metals such as aluminum or common steel, they will not require a pilot hole. For some stainless steels however, 1/8" pilot holes will need to be drilled. Attach the right angle mounting bracket to the hooks with the machine screws and lock nuts.
2. Side Mounting ( Figure 7-b ). The hooks may be mounted on the side of the cab with the enclosed attaching screws.

**Note:** The right angle mounting bracket may be shortened (one hole removed) by cutting with any standard hack saw.

### SYSTEM OPERATION

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

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

1. Set the ON/OFF switch to the "ON" position and turn both RECeive VOLume controls all the way down (counterclockwise).
2. Turn both intercom VOLume controls to the 10 o'clock position and both SQuelch controls all the way up (clockwise). Notice the intercom is now continually activated and you should be able to talk between headsets.
3. To adjust the intercom SQuelch controls for voice activated operation (VOX), it is helpful to have some background noise present. It may also be necessary to turn up the intercom VOLume controls. Turn both intercom SQuelch controls all the way counterclockwise. Now, without speaking, rotate one of the SQuelch controls clockwise until you hear the background noise in your headset. Next, using that same SQuelch control, rotate counterclockwise small, incremental amounts until the background noise disappears. (This procedure is necessary because the squelch is a "fast on, slow off" system). That SQuelch control is now set.
4. Adjust the other intercom SQuelch control similarly by turning it clockwise until you hear background noise. Rotate counterclockwise incremental amounts until the background noise disappears.

Small adjustments may be necessary if background noise changes significantly - such as from idle to full power.

Radio Selection of both the A/C (Radio 1) and FM (Radio 2) radios are provided by two switches.

1. XMIT SELECT determines the radio you wish to transmit on.
2. BOTH/OFF/AUTO selects which radio(s) you receive or hear in your headset.
  - a) "BOTH" position permits you to hear both the radios at the same time.
  - b) "OFF" position disables the hearing of either radio.
  - c) "AUTO" position allows you to hear the radio that the XMIT SELECT switch is set to.

The AUXiliary audio source is selected by the AUX/OFF switch. In the "AUX" position, you can hear it, and in the "OFF" position you cannot.

Receive Volume Controls (REC VOL) are general volume

controls, meant to provide overall listening level for all three radios simultaneously - A/C radio, FM radio, and AUXiliary radio. Finite volume adjustments of any individual radio should be done by altering the radio volume control at the radio itself.

Once the radios are selected, Officer 1 or 2 can transmit at any time simply by pressing their PTT switch. The two Crew positions cannot transmit on the radios. When one position transmits, several things take place automatically to the transmitting side of the SAFE unit:

- The intercom between the two sides of the SAFE unit is turned off.
- The Auxiliary audio, if selected, is muted.
- The receive audio of the radio not selected by the XMIT SELECT switch is muted, regardless of the position of the BOTH/OFF/AUTO switch.
- If Officer 1 is transmitting, both Crew headset microphones 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 RECeive VOLume control adjusts the volume level of the sidetone that you hear in your headset.

The non-transmitting side of the SAFE is not affected (except for intercom) when the other side transmits. The non-transmitting side can monitor the transmissions of the other side by simply selecting the same radio on his side of the SAFE. Of course, when the PTT switch is released, (stop transmitting) all functions return to normal, instantly and automatically.

Simultaneous Transmit is the most attractive and powerful feature of the SAFE. Both Officers 1 and 2 can transmit at the same time - either on separate radios or on the same radio transmitter! When on different radios, neither Officer position will interfere with the other's communications. For example, if using the SAFE on an airport crash vehicle, Officer 2 can talk to air traffic control while Officer 1 talks on the emergency dispatch radio, or visa versa. On the other hand, they can also transmit on the same radio transmitter. If, for example, Officer 1 is talking on one of the radios, Officer 2 can jump right in and add to the conversation simply by pressing his PTT switch. Both voices will be heard by the receiving station.

**NOTE:** Only the A/C radio and the FM radio can be transmitted on. The AUXiliary input is for listening only. It can be used for listening to a scanner, monitoring the audio portion of a video camera, listening to background music, and many other possibilities.

## SAFE SPECIFICATIONS

Input Voltage: .....	11-34 VDC
Nominal Current: .....	0.08 Amps
Maximum Current: .....	0.18 Amps
Weight: .....	24 oz.
Unit Size (w/o bracket): .....	3.75 x 6.25 x 2.5 inches
Overall Size (w/ bracket): .....	4.25 x 7.25 x 2.5 inches plus cable access

## ONE 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 one year 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**

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

**Web Site:** [www.sigtronics.com](http://www.sigtronics.com)