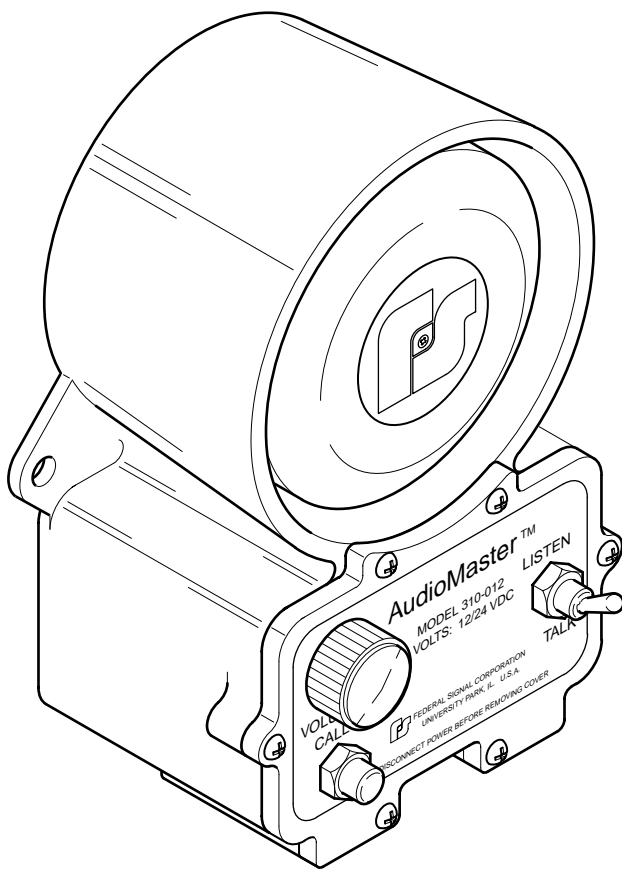




**FEDERAL SIGNAL CORPORATION**  
Emergency Products

# **MODEL 310-012, MODEL 310SAO, AND MODEL 310-ALT**



**INSTALLATION AND SERVICE INSTRUCTIONS**

# **INSTALLATION AND SERVICE INSTRUCTIONS FOR MODELS 310-012, 310SAO, AND 310-ALT**

## **SAFETY MESSAGE TO INSTALLERS, USERS AND MAINTENANCE PERSONNEL**

People's lives depend on your safe installation or our products. It is important to read, understand and follow all instructions shipped with the products. In addition, listed below are some other important safety instructions and precautions you should follow:

- This is not a Listed safety device and is not intended to be used as such.
- To properly install this intercom, you must have a good understanding of automotive electrical procedures and systems.
- Disconnect power before connecting or doing any maintenance on this intercom.
- All effective warning speakers produce loud sounds which may cause in certain situations, permanent hearing loss. You should take appropriate precautions such as wearing hearing protection.
- After testing is complete, provide a copy of this instruction sheet to all operating personnel. File these instructions in a safe place and refer to them when maintaining and/or reinstalling the product.
- Establish a procedure to routinely check the intercom installation for integrity and proper operation. You should frequently inspect the intercom to ensure that it is operating properly and that it is securely attached to the vehicle.

Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death to you or others.

### **A. GENERAL FEATURES.**

The 310-012 intercom is a heavy duty, 2-way, communications device designed for vehicular applications. Nominal operating voltage is 12 VDC. The positive (+) power line is fused with a 2 amp 250 volt type GMC fuse. The unit also offers internally selectable balanced or unbalanced line operation, transformer isolated audio inputs and internally selectable Master or Slave mode configurations. A call button with remote call dry contacts is also factory supplied in the unit.

The Model 310SAO is a 310-012 with a factory installed cable. Per customer specifications, it is factory preset as a master or slave with balanced or unbalanced line operation.

## MASTER MODE:

Each intercom can be configured as a Master unit (Push-to-Talk) or a Slave unit (Push-to-Listen) by changing the MAS/SLA jumper (J2) on the printed circuit board (see figure 1). The intercom comes from the factory set in the Master (MAS) mode.

In the Master mode the intercom acts as an amplifier, constantly broadcasting over its speaker any signal that it receives on the signal lines. Holding down the Listen/Talk switch changes the unit from a speaker to a microphone (see figure 2). The intercom will now transmit over the signal lines to additional intercom(s) also set in the master mode. When the switch is released it will default back to the Listen or Speaker mode, allowing the user to receive any messages transmitted back to it.

## SLAVE MODE:

Some applications may require that the intercom constantly transmit (i.e. act as a microphone) as opposed to constantly receive (i.e. act as a speaker). To accomplish this the intercom must be switched into the Slave mode (Push-to-Listen) mode.

To switch an intercom into the Slave mode there are three steps to follow.

## WARNING

Disconnect power to the intercom before any installation, maintenance, or configuration changes are performed.

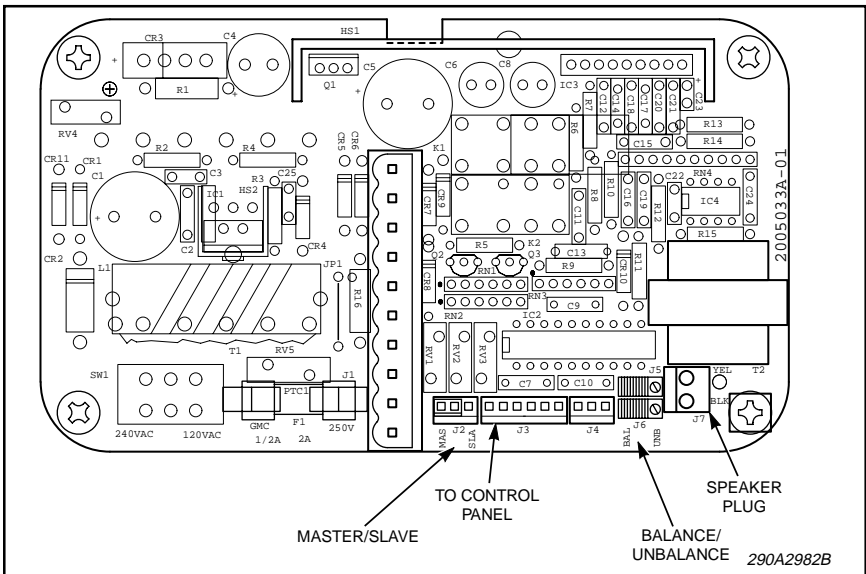


Figure 1.

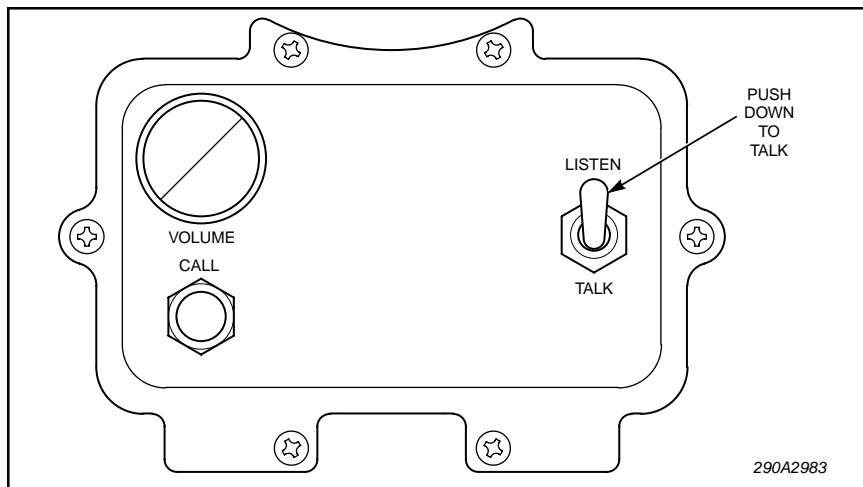


Figure 2.

Move the J2 jumper on the P.C. board from the MAS to SLA position (see figure 1). This can be done using long nose pliers, pulling the block off the “MAS” and center position and placing it on the “SLA” and center position.

An intercom configured in the Slave mode needs to have the Listen/Talk switch default to the talk position on the cover plate (see figure 3).

The second change required is to rotate the position of the Talk/Listen switch. This can be accomplished by loosening the rubber boot covering the toggle switch enough to allow the toggle switch to turn 180 degrees. The dimple on the locking ring must seat itself in the locating hole (see figure 4). The rubber boot is then tightened up against the cover plate with the toggle switch leaning to the talk position, as shown in figure 3.

The third change involves the interconnect wiring. When a unit is placed in the Slave mode it defaults to the Talk or transmit position. When hooked to a Master unit it is necessary to override the Slave unit in order for the Master unit to be able to transmit. The #6 pin (remote) on both terminal blocks (see figure 5) must be connected between the Master and the Slave unit. Wiring diagrams of typical intercom configurations are shown in Paragraph G.

#### REMOTE CONTROL:

Remote control is used to change the operation mode of a remote intercom from listen to talk or from talk to listen upon activation of a local intercom. The wiring diagram section illustrates Master/Slave Installation and Using Foot Switches Diagrams. (See figures 8 and 9.)

Normally open foot switches can also be connected to the Remote Control line in order to allow “hands free” operation of the listen/talk functions.

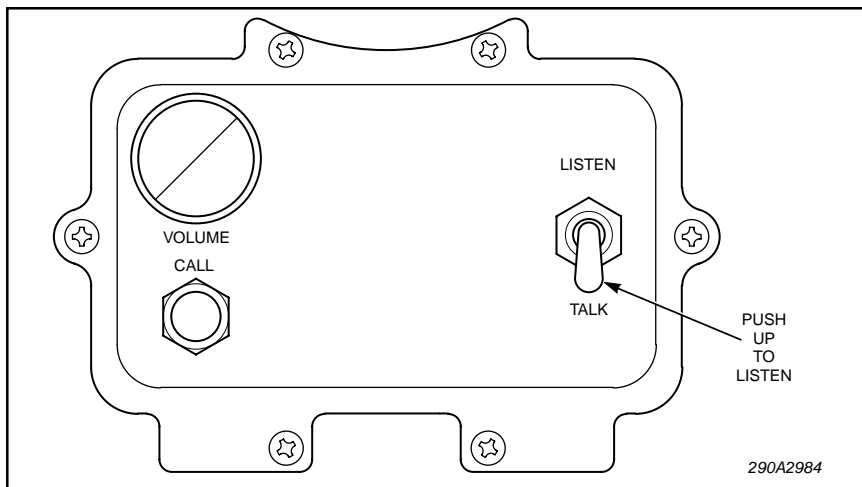


Figure 3.

#### CALL BUTTON:

Depressing the call button sends a 1 khz tone onto the signal lines. All units listening to the line will then broadcast this signal as a call.

#### CAUTION

The call signal is substantially louder than normal voice messages being carried on the line. Do not depress the call switch while carrying on a conversation with someone on the system. This will subject the listener to very loud sound levels.

The volume of the call signal is affected by the volume control on the receiving unit, so if the volume is turned all the way down at a receiving station, the call signal will not be heard. To avoid this problem, the call dry contacts can be utilized to drive an external signalling device.

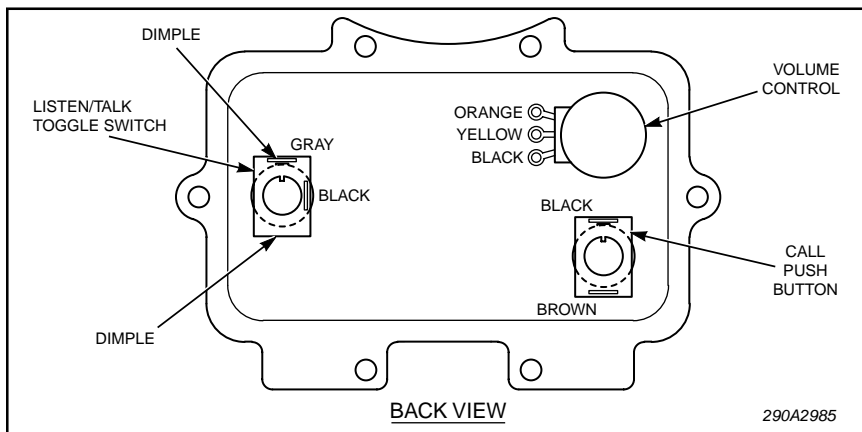


Figure 4.

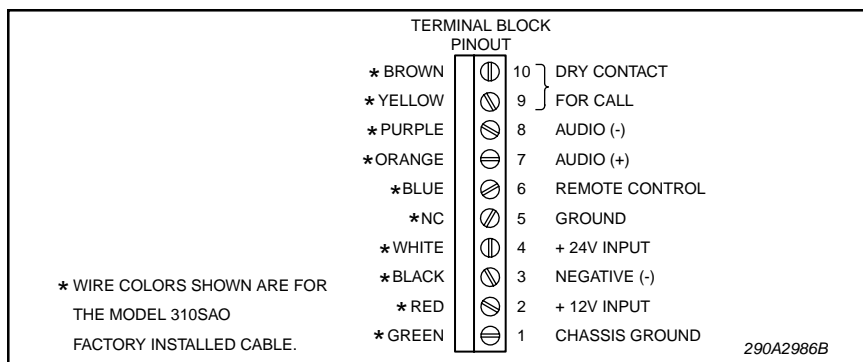


Figure 5.

## CALL DRY CONTACTS TO EXTERNAL DEVICE:

Depressing the call button also closes a normally open dry contact at pins 9 and 10 on the terminal block. The contact is rated at 1.25 amps @ 24 VDC or 2.0 amps @ 12 VDC. This contact can be used to trigger a higher rated relay, a remote sounder, or a light in order to accent the call feature. The wiring diagram illustrates how an external light or horn can be wired in to augment the call tone. (See figure 10.)

## ISOLATED BALANCED/UNBALANCED LINES:

The audio signals for the 310-012 are transmitted over a wire pair using balanced line technology. This means each wire carries a signal that is opposite in polarity of the other. At the input of the intercom is an isolated balanced line transformer. This transformer subtracts the two signals from each other providing an output free of noise generated onto the wires by some other noise source such as a motor or light fixture near the wires.

The isolation provided by the transformer means that the grounds of the units are not connected by the audio lines. Therefore, ground loops and other problems caused by non-isolated systems are avoided. The polarity of the audio lines between the + and - signal terminals need not be maintained.

A shielded cable can be used in installations where extreme problems from interference are suspected. The shield should always be connected to the ground of only one of the intercoms. Connecting the shield to ground at both ends will cause ground currents to travel through the shield which could cause hum in the system.

There are several diagrams in the back of the manual to aid in wiring intercoms together. The wiring diagram section illustrates balanced and unbalanced line interconnection along with how a shielded audio cable can be used. (See figures 11 through 13.) It also illustrates multiple intercom interconnections.

## SURGE PROTECTION:

Metal Oxide Varistor (MOV) devices are used to protect the audio lines and the remote control line. The intercom must have Earth Ground terminated to it to ensure surge protection.

The output amplifier of the 310-012 offers full short-circuit protection and overheat protection.

**MODEL 310-012**  
**SPECIFICATIONS**

Operating Voltage Range ..... 10VDC to 18VDC on the 12V input  
20VDC to 30VDC on the 24V input

Nominal Voltage ..... 12VDC/24VDC

Current Draw	Voltage	Operating	Standby
	12VDC	0.9A	0.3A
	24VDC	260MA	62MA

**Amplifier Specifications**

Frequency Response (-6dB) ..... 150Hz to 12 KHz

Input Impedance ..... 3400 Ohms

Max. Output Voltage

Sine Wave:

Balanced Output ..... 15VRMS

Unbalanced Output ... 7.5VRMS

Square Wave:

Balanced Output ..... 19VRMS

Unbalanced Output ... 9.5VRMS

Speaker Rating ..... 30 Watts

Speaker Impedance ..... 16 Ohms

Temperature Range ..... -31° to +150° F  
(-35° to +66° C)

Fuse,Type GMC-2 ..... 2 AMP, 250 VOLT

Call Switch Contact Rating ..... 1.25A @ 24VDC  
2.0A @ 12VDC

**Weight**

Shipping ..... 10 Lbs., 5 oz.

Net ..... 8 Lbs.,14 oz.

Housing Dimensions ..... 6-7/8" W x 10-3/8" H x 4-3/4" D

Conduit Entrances ..... Dual 1/2"-14 IPS

Housing Material ..... Aluminum

Color ..... Grey



## **B. UNPACKING.**

After unpacking the unit, examine it for damage that may have occurred in transit. If the equipment has been damaged, do not attempt to install or operate it, file a claim immediately with the carrier stating the extent of the damage. Carefully check all envelopes, shipping labels and tags before removing or destroying them.

Model 310SAO is factory preset for master/slave and balanced/unbalanced line operation. The label on the carton indicates the factory settings.

Before attempting to install the intercom, be sure that all parts listed in the KIT CONTENTS LIST have been supplied.

## **C. KIT CONTENTS LIST.**

<i>Qty.</i>	<i>Description</i>	<i>Part Number</i>
1	Wiring Block	140A326
1	Instruction Sheet	2561146
1	Resistor, 1K, 1W	101216 (Not included with Model 310-ALT)

### **NOTE**

The resistor and the wiring block are not included with the Model 310SAO.

## **D. MOUNTING.**

### **CAUTION**

The selection of the mounting location for the device, its controls and the routing of the wiring is to be accomplished under the direction of the facilities and the safety engineer.

The intercom is intended to be mounted on any relatively flat and rigid surface by the two mounting ears on the exterior of the housing. Figure 6 is a dimensional outline drawing showing the proper mounting configuration. The two mounting ears are 13/32" diameter holes spaced 6-5/8" apart. Hardware for mounting the intercom to the surface is left up to the installer.

### **WARNING**

This unit is heavy and should be mounted on a rigid surface capable of supporting the weight of the intercom.

The intercom housing has two 1/2"-14 IPS openings in the bottom. When installing the conduit to these openings seal the threads with pipe compound or other sealing material.

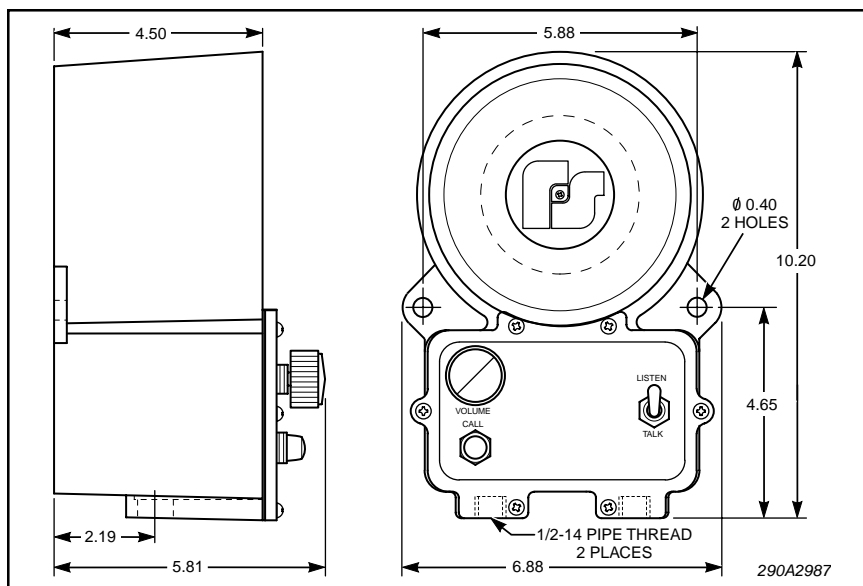


Figure 6.

## E. ELECTRICAL CONNECTIONS.

### WARNING

Do not connect wires when power is applied.

### NOTE

The Model 310SAO is supplied with a color-coded cable. Wiring is terminated to the color-coded wires (see figure 5). Also, the unit is preset (master/slave and balanced/unbalanced) at the factory. The factory settings are indicated on the carton label.

All wiring to the intercom is terminated to the terminal block provided. The terminal block plugs into a header on the PC board and is configured such that it can only plug in one way. Figure 7 shows the orientation of the wiring block and describes the function of each position.

### NOTE

Pins 3 and 5 are connected together on the circuit board for a common ground.

There are three jumpers shown on the PC board in Figure 7 which may need to be moved depending on the desired operation of the intercom. J5 and J6 are for operating the intercom in either a balanced signal line or unbalanced signal line configuration. These must be moved together as a pair. They are factory set in the balanced line position. J2 is for configuring the intercom as either a master or slave device. The intercom is factory set in the master position.

See figures 8 through 13 for typical intercom configurations.

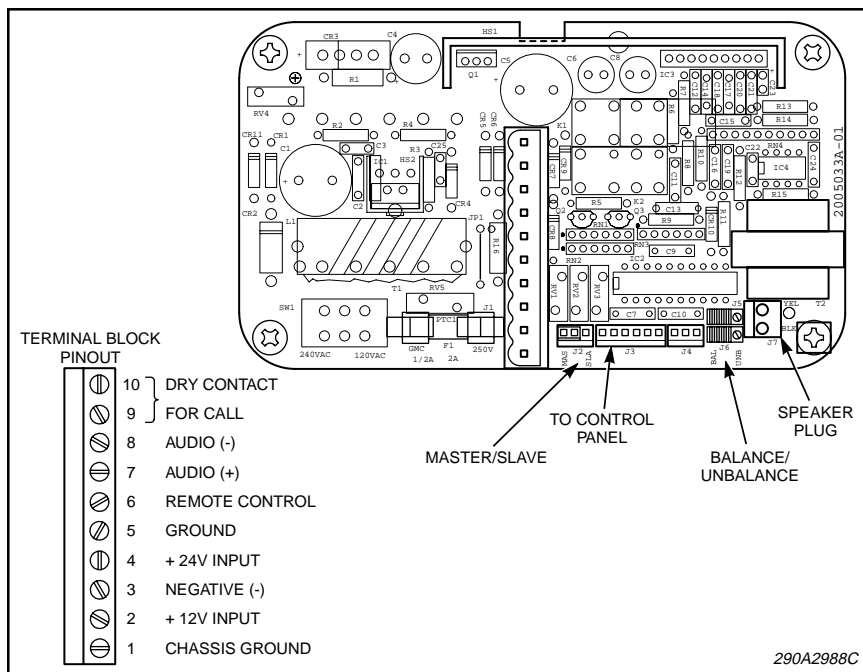


Figure 7.

## F. SERVICE.

### CAUTION

Any maintenance must be performed by a trained electrician.

#### 1. General.

### CAUTION

The call signal is substantially louder than normal voice messages being carried on the line. Do not depress the call switch while carrying on a conversation with someone on the system. This will subject the listener to very loud sound levels.

Federal Signal will service your equipment or provide technical assistance with any problems that cannot be handled locally.

Units may be returned to Federal Signal for service or repair. A brief explanation of the service requested or the nature of the malfunction, should be given.

Address all communications and shipments to:  
 Service Department  
 Signal Division  
 Federal Signal Corp.  
 2645 Federal Signal Dr.  
 University Park, IL 60466-3195  
 1-800-433-9132

## 2. *Replacement Parts.*

### **WARNING**

Replace fuse with GMC-2 only. DO NOT substitute.

Description	Part Number
PC Board Assy., 310-012	2005033
PC Board Assy., 310-ALT	2005033-01
Potentiometer	106A123
Toggle Switch	122A298
Push Button Switch	122A299
Knob, Pot	141A129
Rubber Boot, Tgl, Open	288A577
Rubber Boot, Button	288A541
Rubber Boot, Pot	288A542
Terminal Block	140A326
Speaker/Housing Assembly	8502022
Cover Gasket	8502A005
Resistor, 1K, 1W	101216 (Not included with Model 310-ALT)
Fuse, GMC-2	148A155-02

## **G. WIRING DIAGRAMS.**

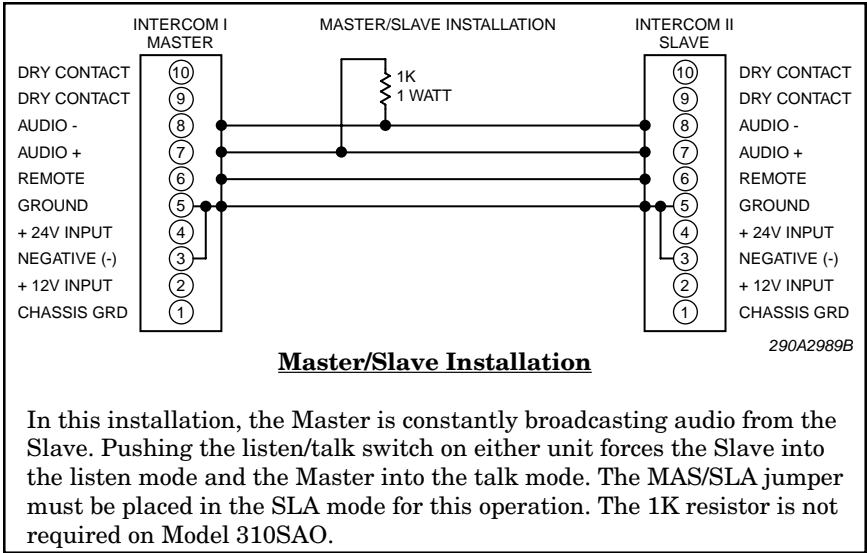


Figure 8.

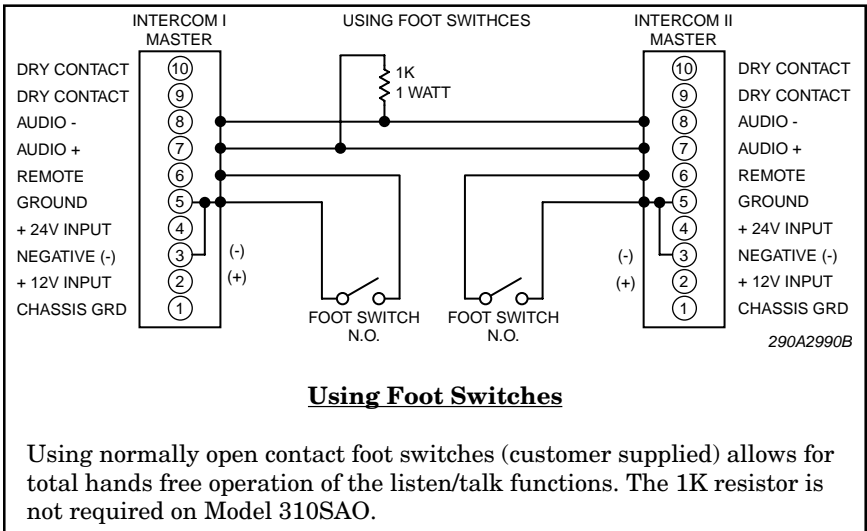
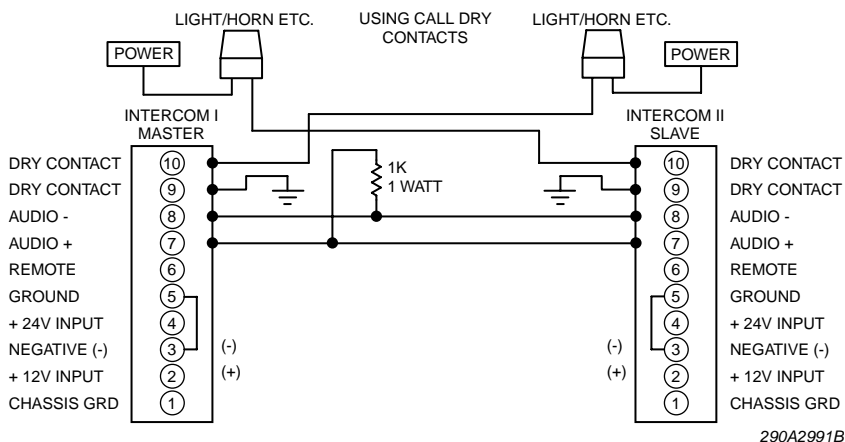


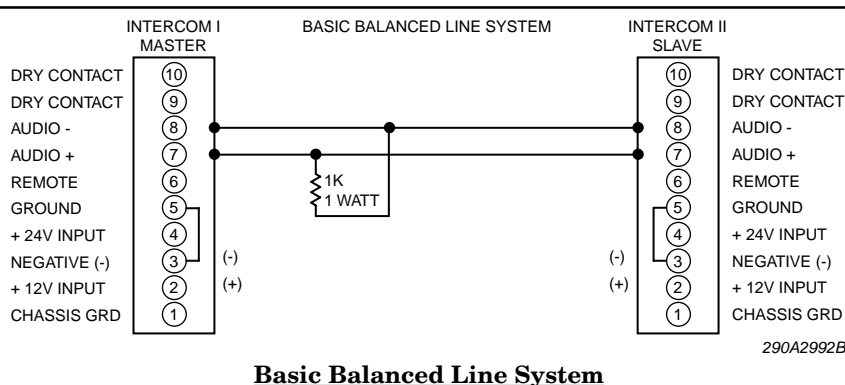
Figure 9.



## Using Call Dry Contacts

The dry contacts can be used to switch devices such as an auxiliary sound or light when call is depressed. The maximum ratings for the dry contacts are 2 amps @ 12VDC and 1.25 amps @ 24VDC. An additional relay is required if the load exceeds these ratings. This method assures a call is received even when the volume on one of the intercoms is turned all the way down. The 1K resistor is not required on Model 310SAO.

Figure 10.



## Basic Balanced Line System

This is a simple system with only two conductors connected between the units. DC power is utilized at both sites. The Unit is configured for balanced line operation. (NOTE: both jumpers in BAL position.) The 1K resistor is not required on Model 310SAO.

Figure 11.

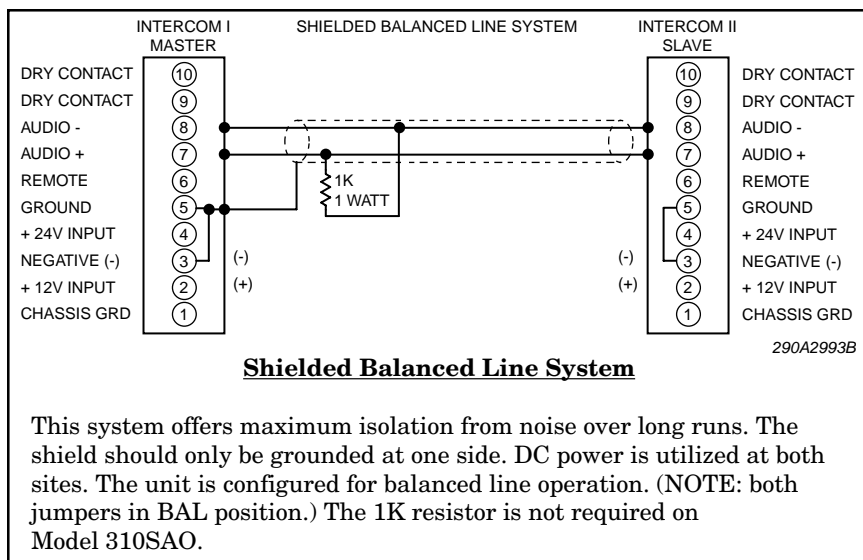


Figure 12.

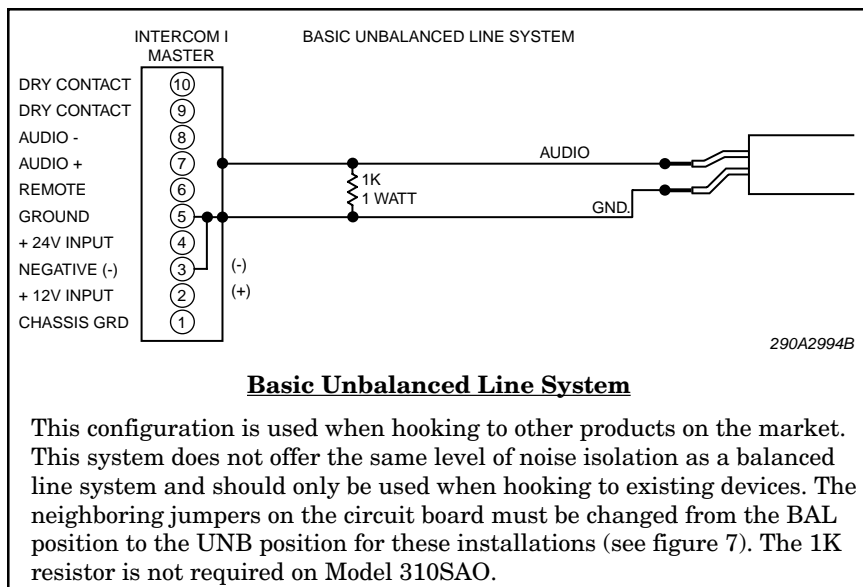


Figure 13.

