

Price \$4.00



***Model SS2000SM Series***

***ELECTRONIC SIREN/LIGHT CONTROL SYSTEM  
WITH  
SignalMaster™ DIRECTIONAL LIGHT  
(with Slide Switch Control Head)***



**HARDWARE INSTALLATION AND MAINTENANCE INSTRUCTIONS**

## LIMITED WARRANTY

*The Signal Division, Federal Signal Corporation (Federal), warrants each new product to be free from defects in material and workmanship, under normal use and service, for a period of two years on parts replacement and one year on labor from the date of delivery to the first user-purchaser.*

*During this warranty period, the obligation of Federal is limited to repairing or replacing, as Federal may elect, any part or parts of such product which after examination by Federal discloses to be defective in material and / or workmanship.*

*Federal will provide warranty for any unit which is delivered, transported prepaid, to the Federal factory or designated authorized warranty service center for examination and such examination reveals a defect in material and / or workmanship.*

*This warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product, or labor charges for removal and re-installation of the product. Lamps, flash tubes, or batteries are not covered under warranty.*

*This warranty does not extend to any unit which has been subjected to abuse, misuse, improper installation or which has been inadequately maintained, nor to units which have problems relating to service or modification at any facility other than the Federal factory or authorized warranty service centers.*

**THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL FEDERAL BE LIABLE FOR ANY LOSS OF PROFITS OR ANY INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF ANY SUCH DEFECT IN MATERIAL OR WORKMANSHIP.**

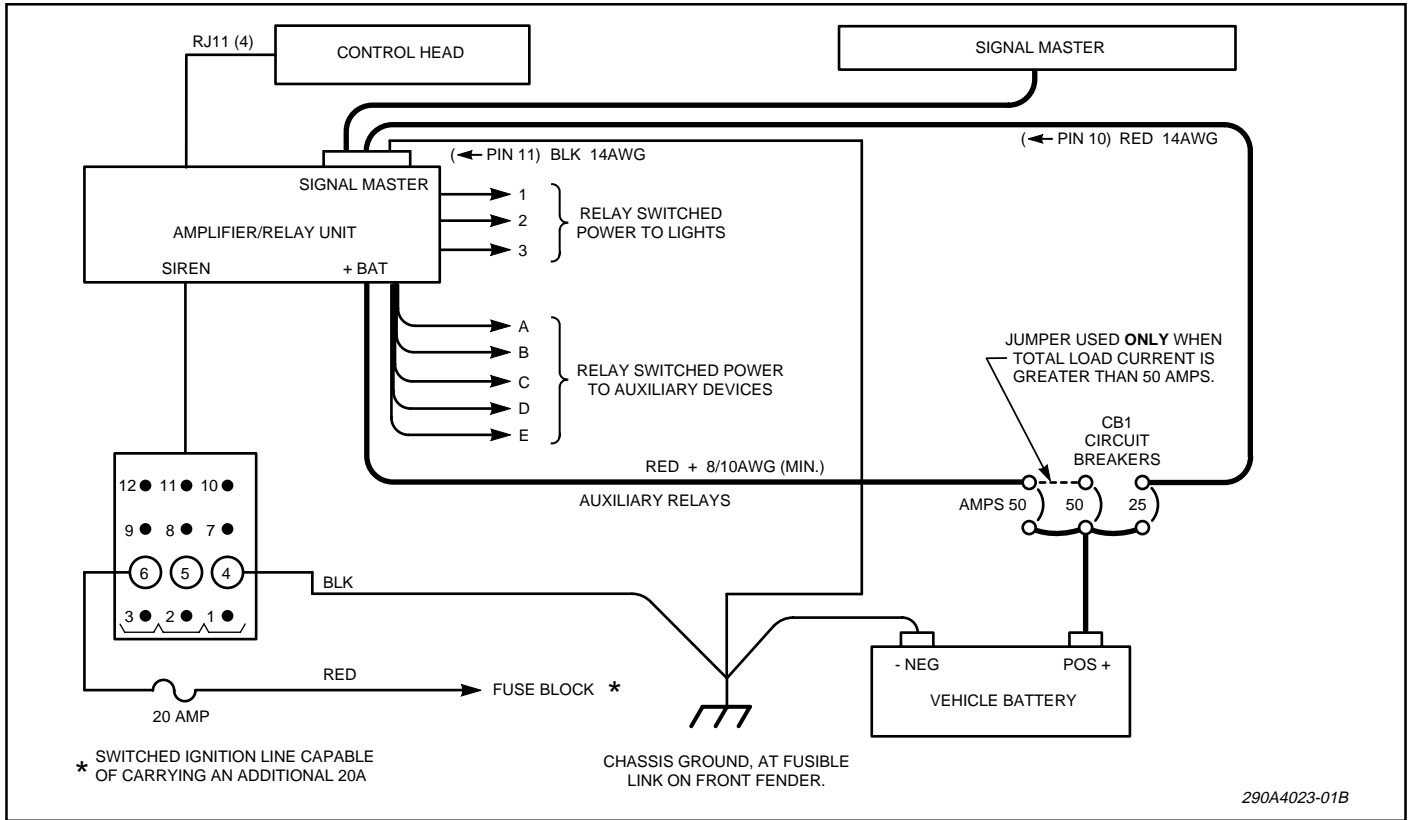


**FEDERAL SIGNAL CORPORATION**  
Emergency Products

# IMPORTANT WIRING INFORMATION

## ⚠ WARNING

The Federal SmartSiren® is an advanced microprocessor based siren system. Unlike conventional siren systems, malfunctions and/or improper operation **WILL** result if proper installation procedures are not followed. Refer to the accompanying diagram and pay special attention to the "CHECK LIST" at the bottom of this page. To complete the electrical installation, refer to paragraph 3-6.



### CHECK LIST

1. Is the red wire from the twelve pin connector (Pin 6) connected to a point on the fuse block that is powered in run and start positions? Use an in-line 20A fuse.  YES

2. Is the black wire from the twelve pin connector (Pin 4) connected to the fusible link at the front fender between the negative (-) battery terminal and chassis ground? This is the ONLY chassis ground allowed for this wire.  YES

#### AUXILIARY RELAY/SIREN POWER:

3. Is an 8/10 AWG wire connected to the load side of the 50/100-ampere circuit breakers? Route it through the hole labeled +BAT on the amplifier/relay unit and attach it to LUG 1 on the circuit board. Use a 10 AWG wire with the 50-ampere circuit breaker. Use an 8 AWG wire with the 100-ampere circuit breaker.  YES

#### SIGNALMASTER POWER:

4. Is the red 14 ga. wire (pin 10 of eleven-position connector) connected to the load side of the 25-ampere circuit breaker?  YES

# SECTION I

## GENERAL DESCRIPTION



Figure 1-1.

The Federal Model SS2000SM (figure 1-1) is a full-featured, programmable electronic siren and light control system. State-of-the-art microprocessor technology is utilized to produce a system with a small, compact Control Head, and an Amplifier/SignalMaster™ Control/Relay Unit which may be remotely mounted. Programming of the various features is done from the keys on the Control Head, without disassembly or removing the unit from its mounting location. When properly programmed, the Model SS2000SM provides a highly versatile electronic siren and light system.

The SS2000SM produces wail, yelp, priority, and hi-lo siren tones, as well as an air horn sound. A horn ring transfer feature allowing horn ring control of siren tones (Tap II) is also provided. Public address (PA), with and without common microphone operation, and radio rebroadcast are available. Eight relay outputs are available for control of light bars, other auxiliary lights, and accessories. In addition, a full feature SignalMaster controller is integrated into the system.

Provision is made to allow installation of a user-supplied switch, such as a foot switch, to activate lights and siren in the pursuit mode.

This system provides the automatic, simultaneous light and siren activation required by some laws. Momentary, push-on/push-off, or timed relay operation can be selected. A security shotgun timer is also provided to minimize the possibility of unauthorized shotgun release. The SS2000SM's technology allows variation of these features during programming. The Control Head can be customized with an assortment of replaceable function labels (supplied) to identify the switches.

The SS2000SM may be installed in the trunk, under the seat, or under the dash of any vehicle with a 12 volt, NEGATIVE ground electrical system. The siren circuits are protected from failure modes by an in-line fuse that is replaceable without tools. Relay outputs are protected by individual fuses. Connection between the Control Head and the SS2000SM is via a telephone-type, four-conductor cable with standard modular phone connectors at both ends for simple installation.

The SS2000SM can drive one or two 11-ohm impedance high power (100 Watt) or low power (58 Watt) speakers. When two speakers are used they must always be connected in parallel and in phase.

The SS2000SM controls the SignalMaster with the top row of switches and/or the slide switch on the remote control head. Directional and warning signals can be generated on the SignalMaster as well as fast and low power versions of these signals. Control of a six lamp SignalMaster is also available.

Other advanced features of the SS2000SM include:

- High degree of reliability and compact size through the use of CMOS microprocessor and other integrated circuits.
- Simplified installation and service through use of plug-in cables and printed circuit boards.
- Relay outputs are individually fused with standard automotive type fuses.
- A one-inch thin remotely mounted control head operates all lighting and siren functions.
- The siren tones comply with SAE J1849 JUL89 for the following model: SS2000SM.

# SECTION II SPECIFICATIONS

## A. GENERAL.

Input Voltage .....	11VDC to 15VDC.
Polarity .....	Negative ground only.
Operating Temperature Range .....	-30°C to +65°C.
Standby Current .....	Less than .5 ampere

### Dimensions:

#### Amplifier/SignalMaster Control/Relay Unit

Height .....	3-1/8"
Width .....	6-3/8" (16.2cm)
Length .....	6-1/4" (15.9cm)
Net Weight .....	3-3/4 lbs. (1.704kg).

#### Control Head

Height .....	3-1/8" (5.87cm).
Width .....	1.25" (3.18cm).
Length .....	6-3/4" (17.15cm).
Net Weight .....	9-5/8 oz. (0.273kg).

Shipping Weight .....	6.8 lbs. (3.09kg).
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## B. SIREN SPECIFICATIONS.

Operating Current .....	9 amperes (nominal).
(no lamps on)	(13.6V battery, 11 ohm load @ high power)
Frequency Range .....	725 to 1600Hz.
Nominal Cycle Rate .....	Wail - 12 cycles/min. Yelp - 180 cycles/min. Hi-Lo- 60 cycles/min.
Nominal Voltage Output .....	64V peak to peak (siren tones).
Audio Response .....	300Hz to 3,000Hz ± 3db.
Audio Power .....	45 watts in PA Mode (typical with 1.4V peak to peak input).
Harmonic Distortion .....	Less than 10% from 5 to 45 watts.
Input Impedance (PA) .....	4000 ohms (nominal).

## C. SIGNALMASTER SPECIFICATIONS.

Fuse .....	25 amperes (Halogen and LED) 7.5 amperes (CudaTriOptic™ , 6 and 8 module)
Output Drive	
Capability (Total) .....	8,27 watt lamps
Normal Flash Rate	
Directional .....	35 patterns/min.
Warn .....	60 patterns/min.
Fast Flash Rate	
Directional .....	60 patterns/min.
Warn .....	95 patterns/min.

# SECTION III INSTALLATION

## SAFETY MESSAGE TO INSTALLERS OF ELECTRONIC SIRENS

### WARNING

**The lives of people depend on your proper installation and servicing of Federal products. It is important to read and follow all instructions shipped with the products. In addition, listed below are some other important safety instructions and precautions you should follow:**

#### *Before Installation*

##### *Qualifications*

- To properly install an electronic siren, you must have a good understanding of automotive electrical procedures and systems, along with proficiency in the installation and service of safety warning equipment. Always refer to the vehicle's service manuals when performing equipment installations on a vehicle.

##### *Sound Hazards*

- Your hearing and the hearing of others, in or close to your emergency vehicle, could be damaged by loud sounds. This can occur from short exposures to very loud sounds, or from longer exposures to moderately loud sounds. For hearing conservation guidance, refer to federal, state, or local recommendations. OSHA Standard 1910.95 offers guidance on "Permissible Noise Exposure."
- All effective sirens and horns produce loud sounds (120 dB) that may cause permanent hearing loss. Always minimize your exposure to siren sound and wear hearing protection. Do not sound the siren indoors or in enclosed areas where you and others will be exposed to the sound.
- Federal Signal siren amplifiers and speakers are designed to work together as a system. Combining a siren and speaker from different manufacturers may reduce the warning effectiveness of the siren system and may damage the components. You should verify or test your combination to make sure the system works together properly and meets federal, state and local standards or guidelines.

#### *During Installation*

- DO NOT get metal shavings inside the product. Metal shavings in the product can cause the system to fail. If drilling must be done near the unit, place an ESD approved cover over the unit to prevent metal shavings from entering the unit. Inspect the unit after mounting to be sure there are no shavings present in or near the unit.
- DO NOT connect this system to the vehicle battery until ALL other electrical connections are made, mounting of all components is complete, and you have verified that no shorts exist. If wiring is shorted to vehicle frame, high current conductors can cause hazardous sparks resulting in electrical fires or flying molten metal.
- Be sure the siren amplifier and speaker(s) in your installation have compatible wattage ratings.
- In order for the electronic siren to function properly, the ground connection must be made to the NEGATIVE battery terminal.

- Sound output will be severely reduced if any objects are in front of the speaker. If maximum sound output is required for your application, you should ensure that the front of the speaker is clear of any obstructions.
- Install the speaker(s) as far forward on the vehicle as possible, in a location which provides maximum signaling effectiveness and minimizes the sound reaching the vehicle's occupants. Refer to the National Institute of Justice guide 500-00 for further information.
- Mounting the speakers behind the grille will reduce the sound output and warning effectiveness of the siren system. Before mounting speakers behind the grille, make sure the vehicle operators are trained and understand that this type of installation is less effective for warning others.
- Sound propagation and warning effectiveness will be severely reduced if the speaker is not facing forward. Carefully follow the installation instructions and always install the speaker with the projector facing forward.
- DO NOT install the speaker(s) or route the speaker wires where they may interfere with the operation of air bag sensors.
- Installation of two speakers requires wiring speakers in phase.
- Never attempt to install aftermarket equipment, which connects to the vehicle wiring, without reviewing a vehicle wiring diagram - available from the vehicle manufacturer. Insure that your installation will not affect vehicle operation and safety functions or circuits. Always check vehicle for proper operation after installation.
- DO NOT install equipment or route wiring or cord in the deployment path of an air bag.
- Locate the control head so the vehicle, controls, and microphone can be operated safely.
- When drilling into a vehicle structure, be sure that both sides of the surface are clear of anything that could be damaged.

#### *After Installation*

- After installation, test the siren system and light system to ensure that it is operating properly.
- Test all vehicle functions, including horn operation, vehicle safety functions and vehicle light systems, to ensure proper operation. Ensure that installation has not affected vehicle operation or changed any vehicle safety function or circuit.
- After testing is complete, provide a copy of these instructions to the instructional staff and all operating personnel.
- File these instructions in a safe place and refer to them when maintaining and/or reinstalling the product.

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

**⚠ WARNING**

When installing equipment inside air bag equipped vehicles, the installer **MUST** ensure that the equipment is installed **ONLY** in areas recommended by the vehicle manufacturer.

Failure to observe this warning will reduce the effectiveness of the air bag, damage the air bag, or potentially damage or dislodge the equipment, causing serious injury or death to you or others.

**CAUTION**

The SS2000SM Amplifier Unit housing is **NOT** waterproof. It must be mounted in a location which is sheltered from falling rain, snow, standing water, etc. Also, it must be installed in an adequately ventilated area. Never install near heater ducts.

Do not mount the SS2000SM Amplifier Unit under the vehicle's hood.

**3-1. UNPACKING.**

After unpacking the Model SS2000SM, examine it for damage that may have occurred in transit. If the equipment has been damaged, file a claim immediately with the carrier stating the extent of damage. Carefully check all envelopes, shipping labels and tags before removing or destroying them.

**3-2. AMPLIFIER/SIGNALMASTER CONTROL/RELAY UNIT MOUNTING LOCATION SELECTION.**

When selecting a mounting location for the SS2000SM Amplifier/SignalMaster Control/Relay Unit (hereinafter called: Amplifier Unit) and the control head, it is necessary to keep in mind any limitations due to cable length. Before performing any installation, see figure 3-1 (block wiring diagram); plan all wiring and cable routing.

Some possible Amplifier Unit mounting locations are: under the dash, under the front seat, or in the trunk (under the rear deck, near the rear seat speakers, if vehicle is so equipped).

Using the supplied mounting bracket will allow the Amplifier Unit to be easily removed for wiring and servicing, should it be needed.

**3-3. SIGNALMASTER LIGHT ASSEMBLY.**

Install the light assembly as described in the instructions packed with the Federal Signal SignalMaster™ Light Assembly. Route the cable near the eventual location of the Amplifier Unit.

**3-4. AMPLIFIER UNIT MOUNTING BRACKET.**

To install the Amplifier Unit using the mounting bracket, proceed as follows:

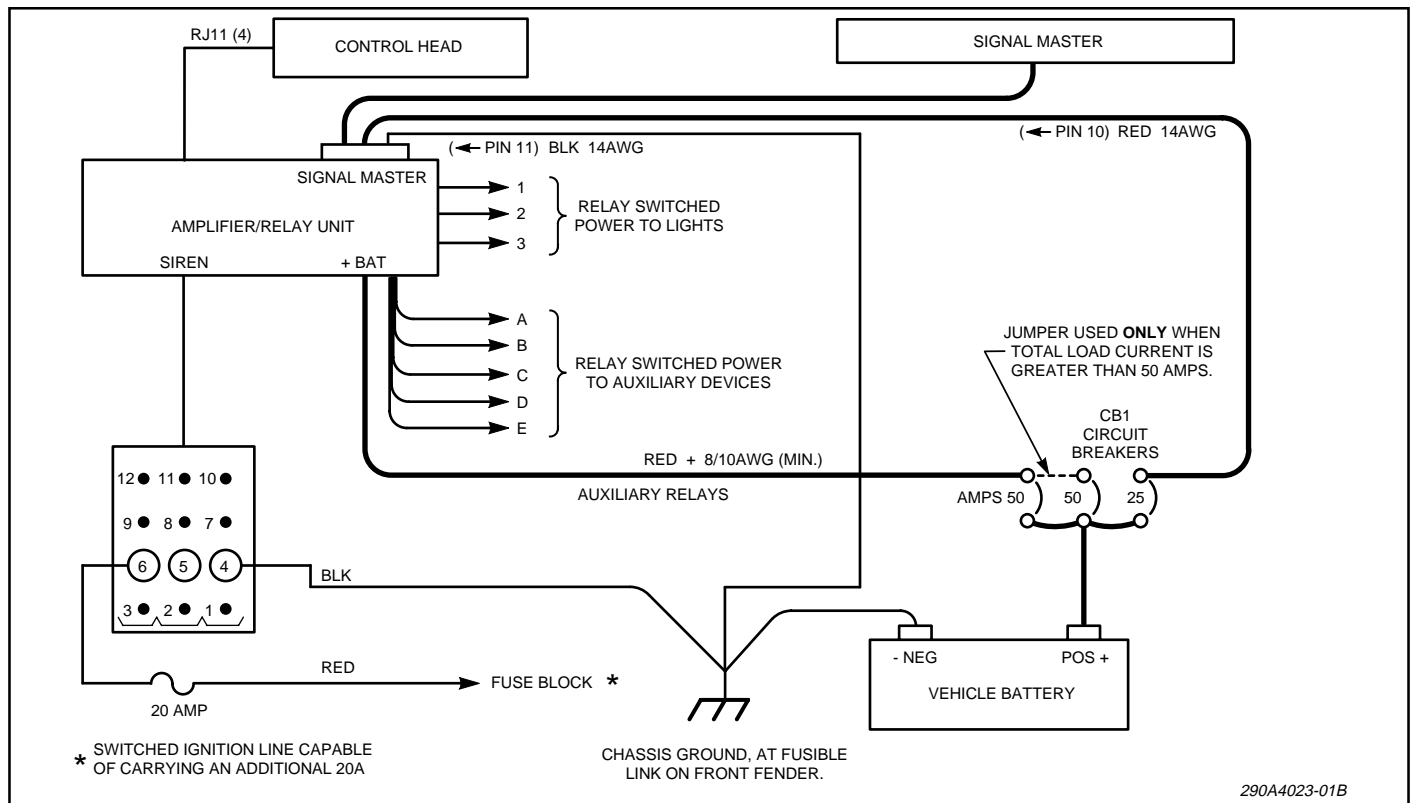


Figure 3-1. Block Wiring Diagram.

A. Use the mounting bracket as a template and scribe two drill positioning marks at the selected mounting location.

**CAUTION**

Before drilling holes in ANY part of a vehicle, be sure that both sides of the mounting surface are clear of parts that could be damaged; such as brake lines, fuel lines, electrical wiring or other vital parts.

**NOTE**

If desired, the #14 thread-forming screws may be used in place of the 1/4-20 x 3/4 hex head screws.

B. Drill two mounting holes at the position marks.

C. Secure the mounting bracket to the mounting surface with (2 each) 1/4-20 x 3/4 hex head screws, 1/4 split lockwashers and 1/4-20 hex nuts as shown in figure 3-2.

**3-5. CONTROL HEAD INSTALLATION.**

Several control head mounting methods are available. The mounting method used will depend on available room, and user preference.

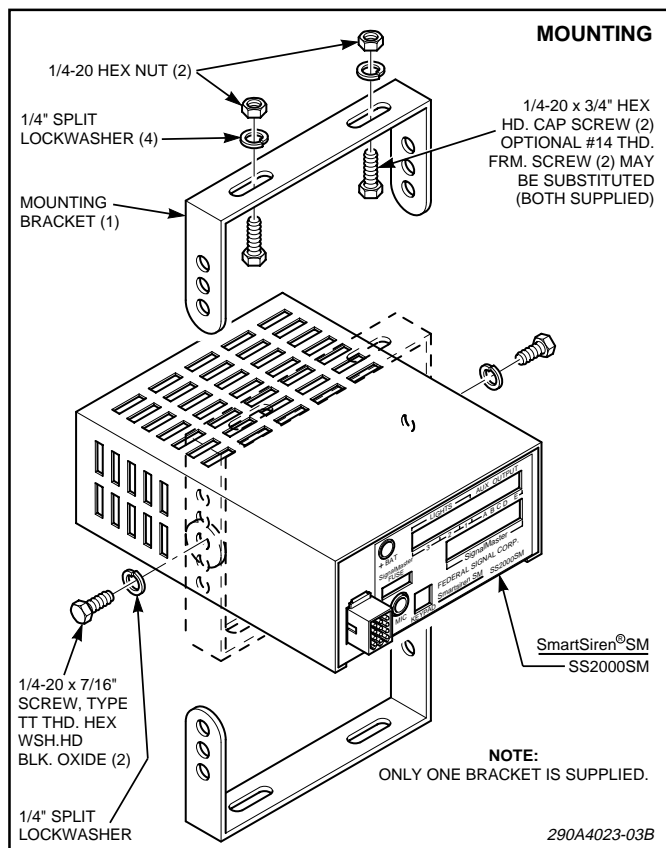


Figure 3-2. Mounting Bracket Installation.

**CAUTION**

Unreliable switch activation and loss of “tactile feedback” will result if the control head mounting method allows movement. DO NOT mount the control head on padded surfaces.

**WARNING**

**When installing equipment inside air bag equipped vehicles, the installer MUST ensure that the equipment is installed ONLY in areas recommended by the vehicle manufacturer.**

**Failure to observe this warning will reduce the effectiveness of the air bag, damage the air bag, or potentially damage or dislodge the equipment, causing serious injury or death to you or others.**

Choose a location for the control head that allows the vehicle, controls, and microphone to be operated safely at all times.

See figure 3-3. The supplied hinged mounting bracket enables the control head to be mounted in a variety of positions. Positioning the bracket above the unit allows mounting the control head on the underside of the dash. Positioning the bracket below the unit will permit mounting on any horizontal surface. To mount the control head using the bracket, proceed as follows:

A. Assemble a bracket to the control head using the 6-32 x 1/4 screws and #6 lockwashers. Assemble the other bracket to the control head/bracket assembly using the 1/4-20 x 3/4 hex head screws and 1/4" lockwashers as shown in figure 3-4.

**NOTE**

The brackets are not symmetrical. After assembling the brackets to the control head, ensure that the assembly can be properly positioned at the intended mounting location. If proper positioning cannot be achieved, reverse the bracket.

B. Use the mounting bracket as a template and scribe two drill positioning marks at the selected mounting location.

**CAUTION**

Before drilling holes in ANY part of a vehicle, be sure that both sides of the mounting surface are clear of parts that could be damaged; such as brake lines, fuel lines, electrical wiring or other vital parts.



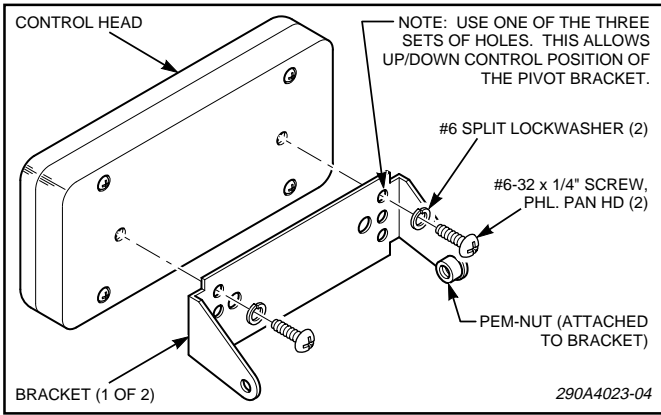


Figure 3-3. Control Head Bracket Assembly.

C. Drill two mounting holes at the position marks.

D. Secure the mounting bracket to the mounting surface with the #10 thread-forming screws as shown in figure 3-4.

### 3-6. ELECTRICAL INSTALLATION.

#### A. Power Cable Connections.

The power cable included in the carton is equipped with a twelve-pin plug that mates with the connector on the rear of the Amplifier Unit (see figure 3-5). The cable is supplied with a 20-ampere in-line fuse. Additional wire (the same gauge or heavier) may be spliced to the leads as required. The various wires on the connector must be connected as follows:

#### 1. Speaker.

The unit is designed to operate with one 11-ohm impedance speaker or two 11-ohm impedance, low power (58W) or high power (100W), speakers connected in parallel and in phase. On Federal speakers, this can be accomplished by connecting the two speaker leads marked "1" to the SPEAKER COMMON power cable lead and the two

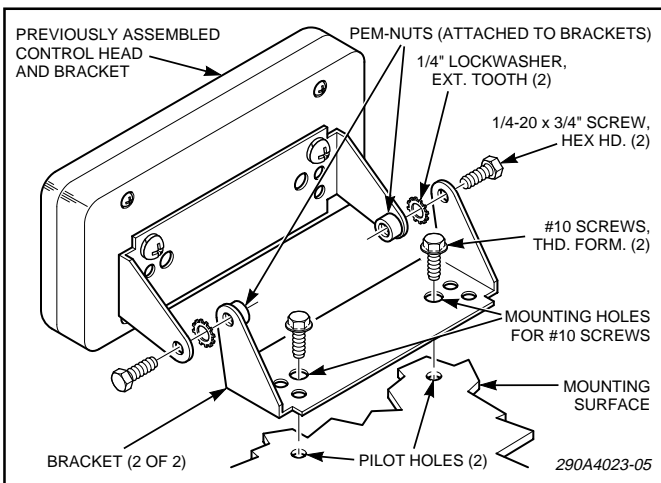


Figure 3-4. Control Head and Bracket Installation.

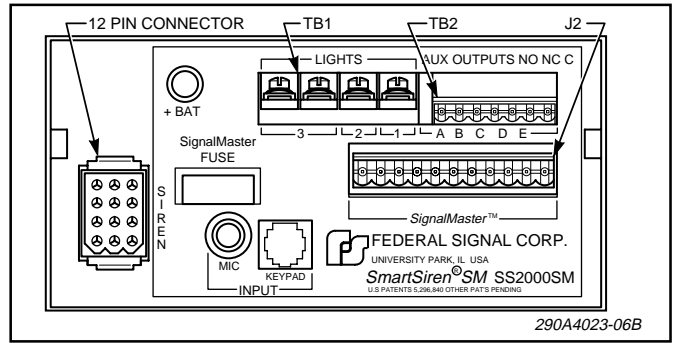


Figure 3-5. Rear View of SS2000SM.

speaker leads marked "2" to the SPEAKER HI POWER or SPEAKER LO POWER power cable leads. See figure 3-6.

Using 18 gauge wire, connect the speaker leads (58W speakers to SPEAKER LO POWER or 100W speakers to SPEAKER HI POWER) as shown in Power Cable Wiring Diagram, figure 3-6.

#### 2. Radio.

To allow incoming radio messages to be rebroadcast over the outside speakers, connect the two brown zip cord leads (pins 9 and 12 of the power cable) across the two-way radio's speaker.

#### 3. Horn Ring.

In order to utilize the horn ring control of siren tones (Tap II) and other features of the siren, the following procedure must be performed.

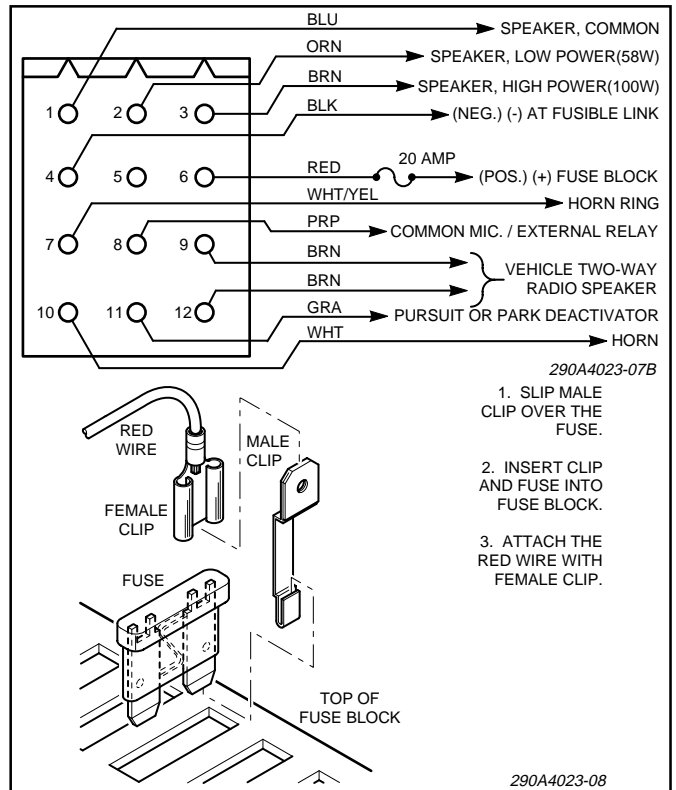


Figure 3-6. Amplifier Unit Power Cable and Fuse Clip Adapter Installation.

a. Locate the wire that connects the vehicle horn ring switch to the horn or horn relay. Cut this wire.

b. See figure 3-7. Splice the white/yellow power cable wire to the horn ring side of the wire that was cut in step a. Insulate the splice with the wire nuts (supplied).

### CAUTION

The horn ring transfer circuit of the siren is capable of switching a maximum of 2-amperes. Some vehicles do not have a horn relay and, consequently, will draw more than 2-amperes when the vehicle horn is activated. Consult your vehicle service manual or a qualified mechanic to determine the current required to activate the horn. If it is *less* than 2-amperes, perform the procedure in step c. If it is *greater* than 2-amperes, perform steps d through j.

c. Splice the white power cable wire to the horn side of the cut wire. Insulate the splice with a wire nut.

d. Obtain a SPST relay of sufficient contact current capacity to activate the vehicle horn. Refer to figure 3-7 while performing the following steps.

e. Mount the relay in a suitable location.

f. Connect the horn side of the wire cut in step a to the relay contact terminal.

g. Determine the “sense” of the vehicle’s horn ring activation circuit, i.e., does the horn circuit require a switched positive voltage or switched ground for activation.

h. Connect the switched relay contact terminal to the positive or negative potential determined in step g.

i. Connect the white power cable wire to one end of the relay coil.

j. Connect the other end of the relay coil to the opposite potential of that connected to the switched relay contact terminal in step h.

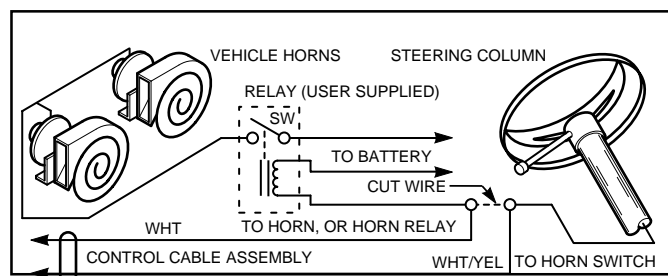


Figure 3-7. Horn Ring Connections. 290A4023-09

4. Park-Siren Deactivator.

### IMPORTANT

It is the installer’s responsibility to determine an appropriate location in the vehicle circuitry to connect the pursuit wire.

This feature uses the pursuit wire to automatically deactivate siren tones when the vehicle is shifted into PARK.

See figure 3-6. To use this feature, connect the power cable’s gray wire to a vehicle circuit that is grounded when the vehicle is shifted into PARK.

5. Pursuit Switch.

### NOTE

When the Model SS2000SM is shipped from the factory, the pursuit function is NOT ACTIVATED. The Operation and Configuration Instructions (Part No. 255283) describes the procedure for activating the pursuit function.

Either *the pursuit function* **or** *the park-siren deactivator function* must be selected. Both functions are not available at the same time.

The SS2000SM Pursuit function is activated by momentarily grounding the Pursuit switch input using a user-supplied momentary switch (Federal Part Numbers 122A108 and 164B101) or other equivalent momentary contact SPST switch.

a. Install the pursuit switch in a location which allows the vehicle, controls, and microphone to be operated safely at all times. In addition, the pursuit switch should be installed in a location which allows minimum reaction time in an emergency situation.

b. Connect one side of the switch to a RELIABLE chassis ground using #18AWG or larger wire.

c. See figure 3-6. Connect the other side of the switch to the power cable’s gray wire using #18AWG or larger wire.

6. Common Microphone.

a. If the PA and RADIO transmitter are to share a common microphone, the audio switching must be performed by a user-supplied switching device. The violet wire provides +12VDC when the SS2000SM is operating in the PA mode.

Refer to the instructions provided with the switching device. Connect the +12VDC ACTIVATED (1-ampere or less) switching device to the violet wire.

b. If the PA and RADIO transmitter are to have separate microphones, fold back and insulate the violet wire.

#### 7. External Auxiliary Relay.

When switch 11 of the control head is not used for the common microphone function, it can be used to activate an external relay. In addition to the SmartSiren's eight relay-controlled outputs, this external relay can be used to activate another auxiliary device. Switch 11 can function only in a push-on/push-off mode.

When switch 11 is activated, +12VDC is supplied on the power cable's violet wire. This +12VDC is capable of supplying 1-amp., which should be adequate for most automotive relays.

A 40-amp. relay (Federal Signal Part No. 131A175) is recommended. Figure 3-8 shows the wiring for any single pole relay. The pin numbers shown are for the recommended Federal Signal relay.

#### 8. Connection to Power Source (see figure 3-6).

The SS2000SM must operate from a 12 volt NEGATIVE ground vehicle electrical system. Therefore, before making any electrical connections, verify the polarity of the vehicle electrical system ground.

#### NOTE

Transient noise pulses caused by the automotive power system or surge currents due to switching inductive or incandescent lamp loads may cause malfunctions in the SS2000SM if proper wire routing is not followed.

The Amplifier Unit red (positive) power cable lead should be as short and direct to the fuse block or user-supplied switch (current capacity of at least 20 amps) as possible. DO NOT splice to accessory power leads.

The Amplifier Unit black (negative) power cable lead should be as short and direct to the fusible link on the front fender as possible. DO NOT splice to accessory negative (black) leads.

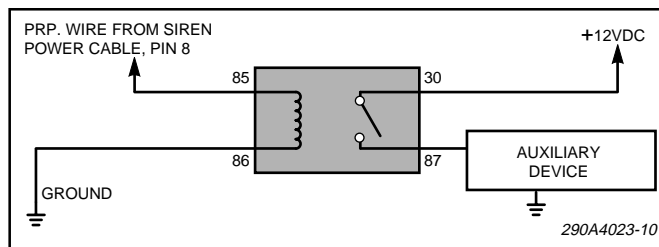


Figure 3-8. External Auxiliary Relay.

#### IMPORTANT

The SS2000SM does not have an on-off switch. If power is obtained directly from the vehicle battery, the system will continuously draw approximately 0.5A and will eventually discharge the vehicle's battery. It is RECOMMENDED that Amplifier Unit power be obtained from a vehicle circuit that is powered in the RUN, and START positions. Power can also be obtained from a user-supplied switch (current capacity of at least 20 amps).

#### CAUTION

Before drilling holes in ANY part of a vehicle, ensure that both sides of the surface are clear of parts that could be damaged; such as brake lines, fuel lines, electrical wiring or other vital parts.

a. Power for the Amplifier Unit can be obtained from the vehicle's fuse block; or a 20-ampere fused, switched circuit. When obtaining power from the vehicle's fuse block, refer to the vehicle's wiring manual to ensure the unit will be powered in the RUN and START positions.

Route the red (+) power cable lead to the fuse block or user-supplied switch. When the red (+) power cable lead is routed to the fuse block, install the supplied fuse clip adapter as follows (see figure 3-6):

- (1). Slip the fuse clip adapter over the fuse.
- (2). Insert the adapter clip/fuse into the applicable fuse block location (refer to the vehicle's wiring manual) with the adapter clip end toward the top of the fuse block. Make sure that the selected fuse block location is capable of supplying an additional 20-amperes.
- (3). Attach the power cable's red wire on the fuse clip.

b. To protect the wires, use the in-line fuseholder and 20-ampere fuse. The fuseholder and fuse should be installed in the red (+) lead as close as practical to the power source.

c. Route the black (-) power cable lead through the previously drilled hole into the engine compartment, and through existing clamps and holders toward the fusible link on the front fender. DO NOT make any connections to the battery until all other wiring is complete.

**B. Light Bar and Auxiliary Light Connections.**

The SS2000SM is programmed at the factory to satisfy most installation requirements. Before proceeding with installation, refer to the supplied Operation and Configuration Instructions for a description of the “standard” program, and instructions on how to change the programming.

The SS2000SM provides two terminal strips (TB1 & TB2) for control of light bars, auxiliary lights and accessories. A total of eight fused relay-controlled outputs are available.

Each output switches a nominal +12-volts to the controlled device. Do NOT use the black wire in the power cable for grounding the switched device(s). Ground the switched devices separately.

Refer to the installation instructions provided with the light bar or auxiliary light for additional precautions and details.

**IMPORTANT**

Since the terminals labeled LIGHTS 1, 2, and 3 can be reprogrammed to activate in any of the three modes, select the terminals used for the various loads in accordance with the current ratings of the terminals.

Primary rotating lights normally require more current than flashing or secondary warning lights. If, for example, primary rotating lights are to be activated in Modes 2 and 3, connect the rotators to LIGHTS 3 (rated at 40-amperes). Then, reprogram the unit to activate the LIGHTS 3 terminal in Modes 2 and 3.

Fuse current ratings and suggested uses for each output are shown in table 3-1.

Complete the wiring to the light bar or accessories as follows:

Output Terminal	Fuse / Rating	Relay	Suggested Application
LIGHTS 1	F1 / 20-amps	K1	Rear Flashing
LIGHTS 2	F2 / 20-amps	K2	Front Flashing or Secondary Warning Lights
LIGHTS 3	F3A & F3B / two 20-amps= 40-amps total	K3	Rotating or Primary Warning Lights
A - E	FA, FB, FC, FD, FE / 10-Amps. ea.	KA, KB, KC, KD, KE	Auxiliary Lights (Takedown, Alley, etc.)
<b>Note:</b> Output E provides both normally open/normally closed (NO/NC) and common contacts. By removing the fuse labeled FE, it can be isolated from the +12-volt battery supply for switching other POSITIVE voltages.			

Table 3-1. Output Ratings.

**CAUTION**

The relay board WILL be damaged if correct polarity is not observed.

1. Remove the chassis cover by loosening the 2 screws on the bottom of the unit. Slide the cover to expose the relay board and terminal strips.

2. Route a #10AWG (minimum) red wire through the hole labeled +BAT and attach it to the large lug-type terminal (LUG1) on the relay board. The lug is accessible through the top of the unit via the hole labeled +BAT. Use a flathead screwdriver to loosen and tighten this lug. Use a #8 AWG red wire if the total light bar and auxiliary load currents exceed 50-amperes. Since this wire provides the power source for all switched lighting functions, a good mechanical and electrical connection here is important.

3. Route this wire through the previously drilled hole into the engine compartment and through existing clamps and holders toward the battery. Do NOT make any connections to the battery until all wiring is complete.

4. See figure 3-9. To protect the wire, 2 circuit breakers (CB1) rated at 50-amperes (Federal Part No. 8474A176 or equivalent) should be connected as close as practical to the positive (+) battery terminal. When the total load current is greater than 50-amperes, use a 100-ampere circuit breaker. When the total load current is less than 50-amperes, use a 50-ampere circuit breaker.

To use the Federal 50-ampere circuit breakers (Part No. 8474A176) as a 100-ampere

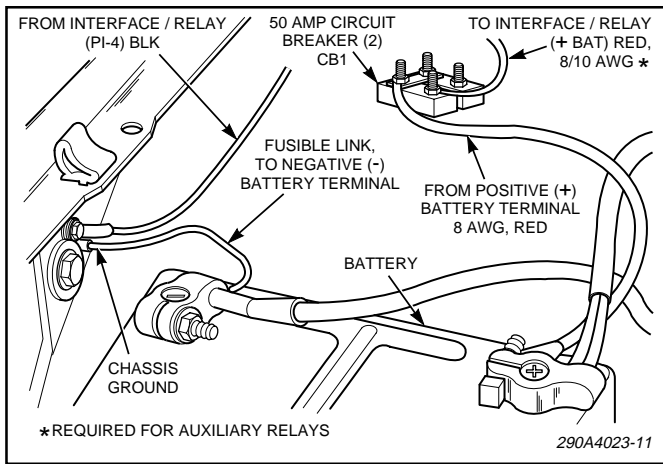


Figure 3-9. Battery Connections.

circuit breaker, add the supplied jumper between the two circuit breakers on the load side. **DO NOT** remove the jumper on the battery side of the circuit breakers.

**⚠ WARNING**

**When making the following connections, never exceed the current rating of the circuit breakers (CB1) near the battery (see figure 3-9). Failure to do this will result in a shutdown of the vehicle warning system.**

5. See figures 3-5 and 3-10. Connect wires from the light bar or accessories to TB1-1 through TB1-3 or TB2-A through TB2-E as applicable. All wire connections for TB2 will be made with the right angle plug. (See face plate for relay designators.) Refer to the instructions packed with the light bar or accessory for proper wire gauge, current requirements, and any additional instructions. **DO NOT** exceed fuse ratings shown in table 3-1.

**CAUTION**

**NEVER** exceed fuse current ratings. Installation of higher current fuses **WILL** damage the unit and void the warranty.

**NOTE**

Although output #3 is rated at 40-amperes, the circuit is protected by two 20-ampere fuses which are connected in parallel. TB1-3 (output #3) has two terminals in parallel to obtain that rating.

6. When the current requirement for LIGHTS 3 exceeds 30-amperes, split the load between the two terminals of TB1-3 or connect the two terminals together with the supplied jumper (Federal Part No. 233A198 or equivalent).

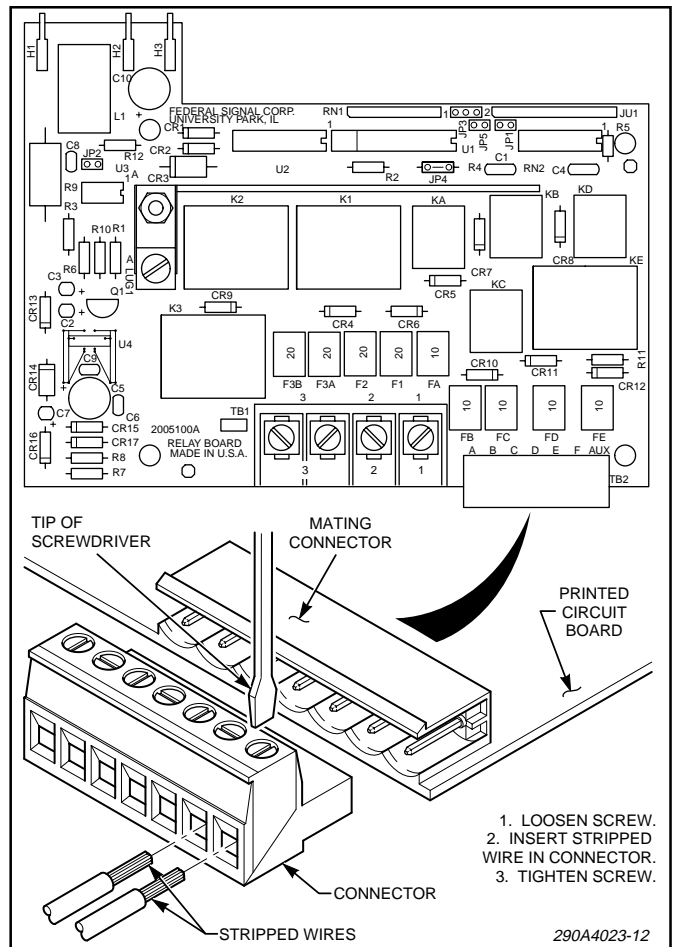


Figure 3-10. Relay Board.

**CAUTION**

Personal injury, vehicle component damage, and/or damage to the Amplifier Unit will occur if the LIGHTS 3 terminal (TB1-3) is shorted to the chassis. Before replacing the chassis cover, ensure that the jumper (if installed) between the two terminals of TB1-3 will not short to the chassis.

7. Replace the chassis cover. Slide it forward and secure with the two screws.

**C. SignalMaster Connections.**

**⚠ WARNING**

**Do not connect more than one, 6 or 8 head, halogen SignalMaster assembly to a SignalMaster controller or the SignalMaster outputs of a SmartSiren. Electrical fire or damage to the controller or siren will result.**

The Amplifier unit is not supplied with a fuse installed for the SignalMaster. The kit contains a 25-ampere and a 7.5-ampere fuse. Follow the appropriate installation instructions depending on the type of SignalMaster, halogen or LED.

1. Halogen.

a. Unless previously routed, route the SignalMaster cable toward the Amplifier Unit. Use caution to avoid scraping the wires on any sharp edges.

b. Cut the cable to the appropriate length as required.

c. Route user-supplied red and black 14-gauge wires through the firewall and toward the battery. Connect the red wire to one end of the supplied 25-ampere circuit breaker (Part No. 152118-25). Do not connect the other end of the circuit breaker to the (+) positive terminal until ALL wiring is complete.

d. Strip 1/4" of insulation off each wire at the eleven-position connector end. Insert the eight 22-gauge wires, the 16-gauge red wire, and the 14-gauge red and black wires into the connector as shown in figures 3-11 and 3-12. Tighten the screw at each connector position to secure the wires in the connector.

e. As supplied in the kit, insert a 25-ampere fuse in the fuse holder in the back of the Amplifier unit.

2. LED.

a. Unless previously routed, route the SignalMaster cable toward the Amplifier Unit. Use caution to avoid scraping the wires on any sharp edges.

b. Cut the cable to the appropriate length as required.

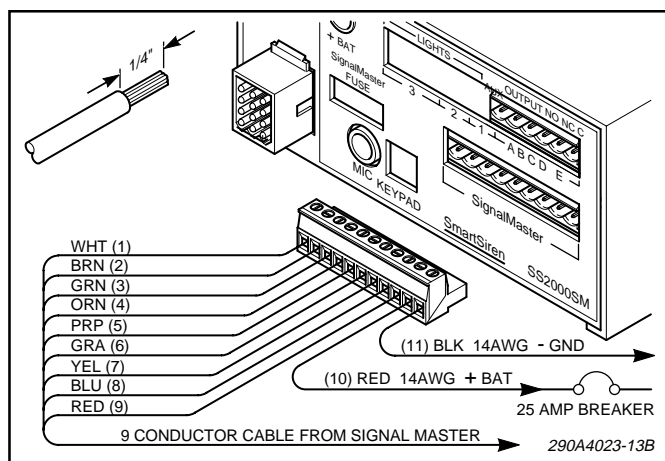


Figure 3-11. SignalMaster Connections.

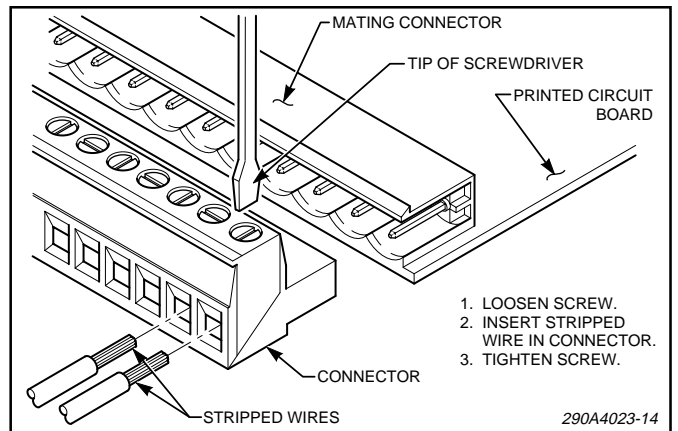


Figure 3-12. SignalMaster Eleven-position Connector.

c. Route user-supplied black 14-gauge wire through the firewall and toward the battery. Route the user-supplied red 14-gauge wire toward the ignition terminal. Connect the red wire to one end of the supplied 25-ampere circuit breaker (Part No. 152118-25). Do not connect the other end of the circuit breaker to the ignition terminal until ALL wiring is complete.

d. Strip 1/4" of insulation off each wire at the eleven-position connector end. Insert the eight 22-gauge wires, the 16-gauge red wire, and the 14-gauge red and black wires into the connector as shown in figure 3-12. Tighten the screw at each connector position to secure the wires in the connector.

e. As supplied in the kit, insert the appropriate fuse (25-ampere for LED SignalMasters or 7.5-ampere for Cuda TriOptic™, 6 or 8 module) in the fuse holder in the back of the Amplifier unit.

D. Control Head Connections.

All connections between the SS2000SM control head and Amplifier Unit are accomplished by a single 20-foot telephone-type cable (provided). It is terminated with modular-type connectors on each end.

**CAUTION**

The unit will not operate if the telephone-type cable is improperly wired. If it is necessary to shorten the 4 conductor telephone-type cable, ensure that the connections made to the modular connector are exactly the same as the original cable connections.

To complete this portion of the installation, proceed as follows:

1. Route the 20-foot cable between the SS2000SM control head and the Amplifier Unit. Secure the cable with user-supplied clamps and hold downs as required.

2. Insert the modular connector in the receptacle on the back of the SS2000SM Amplifier Unit. Secure with user-supplied clamps and/or wire ties to provide strain relief.

3. Insert the other modular connector in the receptacle on the control head. Secure with user-supplied clamps and/or wire ties to provide strain relief.

E. *Microphone Connections.*

The SS2000SM is not supplied with a microphone. A Federal Model MNCT-SB microphone may be plugged into the microphone jack on the rear of the Amplifier Unit.

If the Amplifier Unit is remotely mounted, Model RMK (microphone extension kit) is available from Federal. It includes a 20-foot extension cable with phone plug, jack, and dashboard mounting bracket.

Carefully route the extension cable through the vehicle along with the telephone-type cable, and secure with user-supplied clamps and ties as required.

### 3-7. INSPECTION AND FINAL INSTALLATION.

A. See figure 3-2. Secure the SS2000SM Amplifier Unit to the mounting bracket with the BLACK 1/4-20 x 1/2 hex head screws and 1/4 split lockwashers. Ensure all fasteners are properly tightened.

B. Before connection to the power source, perform a visual check of all connections and wiring.

C. Ensure that there are no loose wire strands or other bare wire which may cause a short circuit. Also, all wires must be protected from any sharp

edges which could eventually cut through the insulation.

D. Use an ohmmeter to verify that a short circuit does NOT exist between the positive (+) and negative (-) power cable leads. Also, there must be NO short circuits between the positive (+) wires and the vehicle chassis.

E. After performing steps 1 through 4, connect all black (-) wires to the fusible link on the front fender. Secure mechanical and electrical connections are required.

### WARNING

**If wires are shorted to the vehicle frame or each other, high current conductors can cause hazardous sparks resulting in electrical fires and molten metal.**

**Verify that no short circuits exist before connecting to the Positive (+) battery terminal.**

**DO NOT connect this system to the vehicle battery until ALL other electrical connections are made and mounting of all components is complete.**

**Failure to observe this WARNING will result in fire, burns and blindness.**

F. Connect all #8 or #10AWG (minimum) red (+) wires to the positive (+) terminal of the power source. Also, connect a 14-gauge red wire from the unused end of the 25-ampere circuit breaker (from the SignalMaster connector) to the positive (+) terminal of the power source. Again, secure mechanical and electrical connections are required.

### 3-8. REPLACEABLE FUNCTION LABELS.

See figure 3-13. Replaceable function labels identify the switches on the control head. A sheet of applicable function legends is supplied.

To install the function legends, proceed as follows:

Select the appropriate labels from the supplied sheet of function legends. Peel the labels from the sheet and apply to the key pad in the area provided as shown in figure 3-13. Verify that the label is properly tucked under the retaining ridge on the pushbutton.

### 3-9. TESTING AFTER INSTALLATION.

#### **⚠ WARNING**

**All effective sirens and horns produce loud sounds (120 dB) that may cause permanent hearing loss. Always minimize your exposure to siren sound and wear hearing protection. Do not sound the siren indoors or in enclosed areas where you and others will be exposed to the sound.**

Before testing, read and understand the supplied Operation and Configuration Instructions. After installation is complete, test all siren and light functions to ensure that all functions and controlled devices operate as intended. Test all vehicle func-

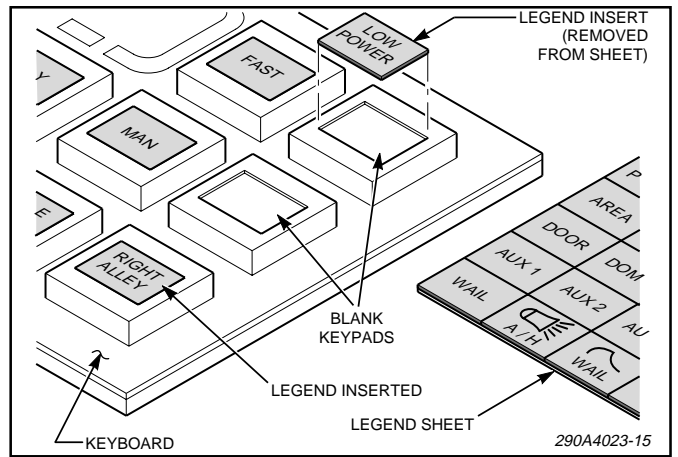


Figure 3-13. Function Label Installation.

tions, including horn operation and vehicle light systems, to ensure proper operation.

Programming is described in the supplied Operation and Configuration Instructions.

After testing is complete, provide a copy of this manual to all operating personnel.



# SECTION IV OPERATION

## SAFETY MESSAGE TO OPERATORS OF FEDERAL SIGNAL ELECTRONIC SIRENS AND LIGHT/SOUND SYSTEMS

### WARNING

**The lives of people depend on your safe operation of Federal products. It is important to read and follow all instructions shipped with the products. In addition, listed below are some other important safety instructions and precautions you should follow:**

#### *Qualifications*

- To properly use an electronic siren and speaker(s): you must have a good understanding of general vehicle operation, a high proficiency in the use of safety warning equipment, and thorough knowledge of state and federal UNIFORM TRAFFIC CODES.

#### *Sound Hazards*

- Your hearing and the hearing of others, in or close to your emergency vehicle, could be damaged by loud sounds. This can occur from short exposures to very loud sounds, or from longer exposures to moderately loud sounds. For hearing conservation guidance, refer to federal, state, or local recommendations. OSHA Standard 1910.95 offers guidance on “Permissible Noise Exposure.”
- All effective sirens and horns produce loud sounds (120 dB) that may cause permanent hearing loss. Always minimize your exposure to siren sound, roll up your windows and wear hearing protection. Do not sound the siren indoors or in enclosed areas where you and others will be exposed to the sound. Only use the siren for emergency response situations.

#### *Sound Limitations*

- Before using the vehicle, check to see if the siren speakers are concealed from view. If the siren speaker is not in clear view on the front of the vehicle, use extra caution when operating the vehicle. A concealed siren speaker installation is less effective at warning others.
- Maximum sound output will be severely reduced if any objects are in front of the speaker. If your installation has obstructions in front of the speaker, drive even more cautiously.
- Frequently inspect the speaker to ensure that it is clear of any obstruction, such as mud or snow, which will reduce maximum sound output.

#### *Signaling Limitations*

- Be aware that the use of your visual and audible signaling devices does not give you the right to force your way through traffic. Your emergency lights, siren, and actions are REQUESTING the right-of-way.
- Although your warning system is operating properly, it may not alert everyone. People may not hear, see, or heed your warning signal. You must recognize this fact and continue driving cautiously.
- Situations may occur which obstruct your warning signal when natural or man-made objects are between your vehicle and others. This can also occur when you raise your hood or trunk lid. If these situations occur, be especially careful.

#### *Driving Limitations*

- At the start of your shift, you should ensure that the light/sound system is securely attached to the vehicle and operating properly.
- If the unique combination of emergency vehicle equipment installed in your vehicle has resulted in the siren controls being installed in a position that does not allow you to operate them by touch only, OPERATE CONTROLS ONLY WHILE YOUR VEHICLE IS STOPPED.
- If driving conditions require your full attention, you should avoid operating the siren controls while the vehicle is in motion.

#### *Continuing Education*

- File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees.

**Failure to follow these safety precautions may result in property damage, serious injury, or death to you, to passengers, or to others.**

### IMPORTANT

Since many SS2000SM features are programmable, operation is described for the “standard” program. Refer to the supplied Operation and Configuration Instructions for additional discussion of the “standard” program. It is the operator’s responsibility to understand how his particular unit is configured (programmed) to operate.

## OPERATING INSTRUCTIONS

The SS2000SM control head is designed to assist the operator's selection of functions. Each control head switch is recessed and aids guiding the operator's finger to the switch's center for activation. When a switch is pressed, "tactile feedback" provides

function selection indication as follows: a click is felt, a beep is heard, and the selected function's key illuminates brightly.

Specific operating instructions are provided in the supplied Operation and Configuration Instructions.

# SECTION V CONFIGURATION

## WARNING

**Property damage, serious injury, or death to you or others may result if the SmartSiren is improperly programmed. Programming, if required, is to be performed at the time of installation. It is NOT intended for operators to "customize" the unit's operation for their individual preferences. It is the USER's responsibility to determine compatibility, suitability, and ensure proper programming of the SmartSiren.**

**The person responsible for programming MUST be familiar with local codes and procedures for safe emergency vehicle siren and light operation.**

## CONFIGURATION INSTRUCTIONS

The SmartSirenSM is an extremely versatile and configurable electronic siren and light control system. Available siren tones are: wail, yelp, priority, hi-lo, and an air horn sound. Horn ring control of siren tones is provided. Public address and radio rebroadcast are available. Eight relay outputs are available for controlling light bars, other auxiliary lights, and accessories. An integrated SignalMaster controller is available for controlling directional lights.

For configuration instructions, refer to the supplied Operation and Configuration Instructions.

# SECTION VI

## SERVICE AND MAINTENANCE

### SAFETY MESSAGE TO PERSONNEL SERVICING FEDERAL SIGNAL ELECTRONIC SIRENS

#### WARNING

**The lives of people depend on your proper servicing of Federal products. It is important to read and follow all instructions shipped with the products. In addition, listed below are some other safety instructions and precautions you should follow:**

- Read and understand all instructions in this manual before servicing the electronic siren or speaker.
- To properly service an electronic siren or speaker: you must have a good understanding of automotive electrical procedures and systems, along with proficiency in the installation and service of safety warning equipment. Always refer to the vehicle's service manuals when performing service on a vehicle.
- Electronic circuit and speaker repairs must be performed by a qualified and competent electronic technician.
- Your hearing and the hearing of others, in or close to your emergency vehicle, could be damaged by loud sounds. This can occur from short exposures to very loud sounds, or from longer exposures to moderately loud sounds. For hearing conservation guidance, refer to federal, state, or local recommendations. OSHA Standard 1910.95 offers guidance on "Permissible Noise Exposure."
- All effective sirens and horns produce loud sounds (120 dB) that may cause permanent hearing loss. Always minimize your exposure to siren sound and wear hearing protection. Do not sound the siren indoors or in enclosed areas where you and others will be exposed to the sound.
- DO NOT connect this system to the positive terminal of the battery until servicing is complete, and you have verified that there are no short circuits to ground.
- In order for the electronic siren to function properly, the ground connection must be made to the NEGATIVE battery terminal.
- After repair, test the electronic siren and speaker system to ensure that it is operating properly.

- Federal Signal siren amplifiers and speakers are designed to work together as a system. Combining a siren and speaker from different manufacturers may reduce the warning effectiveness of the siren system and may damage the components. You should verify or test your combination to make sure the system works together properly and meets both federal, state and local standards or guidelines.

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

#### 6-1. GENERAL.

For warranty service, contact your local Distributor.

The factory can and will service your equipment or assist you with technical problems that cannot be handled satisfactorily and promptly locally.

Communications and shipments should be addressed to:

Service Department  
Federal Signal Corporation  
2645 Federal Signal Drive  
University Park, IL 60466

1-800-433-9132

#### 6-2. CONTROL HEAD.

The SS2000SM control head consists of two circuit boards stacked on top of each other. See figure 6-1. To disassemble the control head, proceed as follows:

- A. Disconnect the control head cable at the control head. Remove the control head from its bracket (if used).
- B. Remove and retain the four screws from the rear of the control head. Separate the control head rear housing (base) from the bezel. Lift the keyboard assembly out through the bezel.
- C. Separate the two circuit boards by gently pulling them apart.
- D. Disconnect the green wire at the stud on the keypad circuit board.

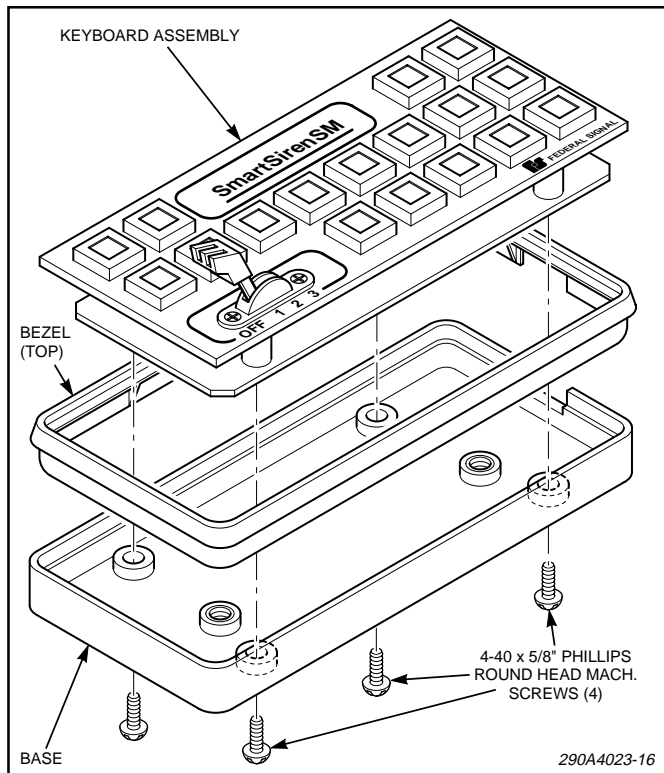


Figure 6-1. Control Head Disassembly.

E. Observe the slide switch connector's orientation and then disconnect the slide switch connector.

F. After repair or replacement, reconnect the green wire and slide switch connector. Ensure the slide switch connector is reconnected in the proper orientation—white wire toward the edge of the circuit board and the connector's wires away from the component side of the lower circuit board. Reassemble the control head using the previously removed screws. Reassemble the control head in its bracket (if used), and insert the modular connector in the receptacle. slide switch connector is reconnected in the proper orientation—white wire toward the edge of the circuit board and the connector's wires away from the component side of the lower circuit board. Reassemble the control head using the previously removed screws. Reassemble the control head in its bracket (if used), and insert the modular connector in the receptacle.

### 6-3. SLIDE SWITCH REPLACEMENT.

1. Disassemble the control head as described in paragraph 6-2.
2. Observe the orientation of the slide switch. Remove and retain the knob, the two torx head screws and the switch bezel.
3. Place the new switch in position with the same orientation as the old switch.
4. Secure the switch in position using the previously removed switch bezel and phillips head screws. Install the switch knob.

5. Reassemble the control head as described in paragraph 6-2.

### 6-4. AMPLIFIER/SIGNALMASTER/RELAY UNIT.

#### A. General.

Any competent TV repairman or electronic technician should have little difficulty in tracing a malfunction, should any occur. For emergency replacement of any of the small components, care must be used when soldering. Heat easily damages transistors, capacitors and circuit boards. It is therefore advisable to use longnose pliers or a similar heat sink on the lead being soldered.

#### CAUTION

To avoid damage to the unit, disconnect both red wires to the SS2000SM at the battery before proceeding.

#### B. Removal for Servicing.

When removing the chassis for servicing, loosen the two hexagon head screws on the underside of the unit. Slide the entire chassis out of the case.

#### CAUTION

Excess heat can damage the unit. When reassembling, ensure that the cover's vent slots are positioned over the transformer.

#### C. Printed Circuit Board Removal.

The SS2000SM consists of three circuit boards stacked on top of each other. The top board is the relay board, the center board is the SignalMaster Controller board, and the bottom board is the amplifier board.

1. To remove the relay board, proceed as follows:
  - a. Disconnect the wires from the terminal strip TB1.
  - b. Disconnect the large red wire at LUG1.
  - c. Disconnect the red, black, and red wires at positions H1, H2, and H3.
  - d. Unplug the ribbon cable (JU1) from the relay board.
  - e. The relay board is secured to the amplifier board by four stand-offs. Remove and retain the two relay board screws at the rear of the siren. Depress the locking tab on the two stand-offs and gently lift the relay board off the stand-offs.

2. To remove the SMC (SignalMaster Controller) board, proceed as follows:
  - a. Remove the relay board as described above.
  - b. Unplug all connectors and plug-in type terminals from the printed circuit board.
  - c. Remove the four stand-offs which secure the SMC board to the amplifier stand-offs.
3. To remove the amplifier board, proceed as follows:
  - a. Remove the SMC board as described above.
  - b. Unplug all connectors and plug-in type terminals from the printed circuit board.
  - c. Remove the screws that secure the output transistors.
  - d. Remove the four stand-offs which hold the amplifier board to the chassis.

#### D. Control Head Fuse.

A solder-in sub-miniature fuse (F1 on the amplifier board) provides short-circuit protection for the control head and cable. F1 is located next to J3 (the phono jack) on the amplifier board. Failure of this fuse, although unlikely, will cause the SS2000SM to be completely inoperative. If failure of F1 is suspected, proceed as follows:

1. Remove the amplifier board as described in 6-3.C.2. above.
2. Check the fuse for continuity with an ohmmeter.
3. If fuse failure has occurred, replace with an EXACT replacement (refer to paragraph 6-5.).

#### NOTE

Failure of the control head fuse is usually the result of a shorted control head cable, or the control head cable was damaged during installation. Ensure that the cause of F1's failure is located and repaired before reapplying power to the unit.

#### E. Replacement of Output Transistors.

Failure of one or both of the output transistors (Q3, Q4) is usually the result of a defective speaker (short circuited voice coil). Rebroadcast of unquelled radio or music for long periods will also have a detrimental effect on the output transistors, and is therefore not recommended.

Federal recommends that both output transistors be replaced should only one device prove to be defective. This practice will ensure long periods of service between failures.

When installing new output transistors, ensure that the Sil-Pad insulators are installed between the heat-sink and transistors.

#### F. Testing.

#### CAUTION

Make certain that the speaker is not defective prior to installing the repaired SS2000SM.

#### WARNING

**All effective sirens and horns produce loud sounds (120 dB) that may cause permanent hearing loss. Always minimize your exposure to siren sound and wear hearing protection. Do not sound the siren indoors or in enclosed areas where you and others will be exposed to the sound.**

After servicing is complete, perform a test of all functions to ensure the siren is operating properly.

## 6-5. REPLACEMENT PARTS LIST.

<i>Reference Designation</i>	<i>Description</i>	<i>Part Number</i>	<i>Reference Designation</i>	<i>Description</i>	<i>Part Number</i>
<b>SS2000SM Components</b>			<b>Fuses</b>		
T2	Transformer, Output	120C165-03		Fuse, 2 Amp., Pico Fuse	148151-08
Q3, Q4	Transistor, Output	125467	FA, FB,	Fuse, 10 Amp., Automotive Blade	148A142-05
	Legend Sticker Card	8572294	FC, FD,		
	RJ-11 Data Cable	146863	FE		
	Power Harness (11 Conductor)	175684-06	F1, F2,	Fuse, 20 Amp., Automotive Blade	148A142
CB1	Circuit Breaker (2-50 ampere)	8474176	F3A, F3B		
	Circuit Breaker, 25 Amp.	152118-25		Fuse, 25 Amp., Automotive Blade	148A142-07
	Mounting Bracket, Amplifier	85361059		Fuse, 20 Amp., In-line	148A127
	Mounting Bracket, Control Head	85361065		Fuse, 7.5 Amp., Automotive Blade	148A142-04
	Installation Accessory Kit	85361099			
	Microphone	MNCT-SB	<b>Assemblies</b>		
	Remote Microphone Cable	RMK		Control Head Assy.	8572311
	Remote Microphone Cable with volume	RMK-V		Amplifier Assy.	85361174
	Plug, SignalMaster	140338-11		SignalMaster PCB Assy.	2001181
	Slide Switch Assembly	122290		Amplifier PCB Assy.	2005092-12
	Slide Switch Knob	8536C1041		Relay PCB Assy.	2005100
	Slide Switch Bezel	8573060			
	Two Position Jumper	233A198			
	Right Angle Plug, Relay	140338-07			



