

# FC, FCH, and FCU Models

## One-Way Siren Controller



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## *Description, Installation, Operation, and Service Manual*

## Limited Warranty

This product is subject to and covered by a limited warranty, a copy of which can be found at [www.fedsig.com/SSG-Warranty](http://www.fedsig.com/SSG-Warranty). A copy of this limited warranty can also be obtained by written request to Federal Signal Corporation, 2645 Federal Signal Drive, University Park, IL 60484, email to [info@fedsig.com](mailto:info@fedsig.com) or call +1 708-534-3400.

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## **Safety Messages**

**⚠ WARNING**

***It is important to follow all instructions shipped with this product. This device is to be installed by trained personnel who are thoroughly familiar with the country electric codes and will follow these guidelines as well as local codes.***

Listed below are important safety instructions and precautions you should follow:

### **Important Notice**

Federal Signal reserves the right to make changes to devices and specifications detailed in the manual at any time in order to improve reliability, function or design. The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for any inaccuracies.

### **Publications**

Federal Signal recommends the following publications from the Federal Emergency Management Agency for assistance with planning an outdoor warning system:

- The “Outdoor Warning Guide” (CPG 1-17)
- “Civil Preparedness, Principles of Warning” (CPG 1-14)
- FEMA-REP-1, Appendix 3 (Nuclear Plant Guideline)
- FEMA-REP-10 (Nuclear Plant Guideline).

### **Planning**

- If suitable warning equipment is not selected, the installation site for the siren is not selected properly or the siren is not installed properly, it may not produce the intended optimum audible warning. Follow Federal Emergency Management Agency (FEMA) recommendations.
- If sirens are not activated in a timely manner when an emergency condition exists, they cannot provide the intended audible warning. It is imperative that knowledgeable people, who are provided with the necessary information, are available at all times to authorize the activation of the sirens.
- When sirens are used out of doors, people indoors may not be able to hear the warning signals. Separate warning devices or procedures may be needed to effectively warn people indoors.
- The sound output of sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren placement, post warnings, and restrict access to areas near sirens.
- Activating the sirens may not result in people taking the desired actions if those to be warned are not properly trained about the meaning of siren sounds. Siren users should follow FEMA recommendations and instruct those to be warned of correct actions to be taken.
- After installation, service, or maintenance, test the siren system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.

- If future service and operating personnel do not have these instructions to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also give a copy to anyone who is going to service or repair the siren.

### **Installation and Service**

- Electrocutation or severe personal injury can occur when performing various installation and service functions such as making electrical connections, drilling holes, or lifting equipment. Therefore only experienced electricians should install this product in accordance with national, state and any other electrical codes having jurisdiction. Perform all work under the direction of the installation or service crew safety foreman.
- The sound output of sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren placement, post warnings and restrict access to areas near the sirens. Sirens may be operated from remote control points. Whenever possible, disconnect all siren power including batteries before working near the siren.
- After installation or service, test the siren system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.
- If future service personnel do not have these warnings and all other instructions shipped with the equipment to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also, give a copy to anyone who is going to service or repair the sirens.

### **Operation**

Failure to understand the capabilities and limitations of your siren system could result in permanent hearing loss, other serious injuries or death to persons too close to the sirens when you activate them or to those you need to warn. Carefully read and thoroughly understand all safety notices in this manual and all operations-related-items in all instruction manuals shipped with equipment. Thoroughly discuss all contingency plans with those responsible for warning people in your community, company, or jurisdiction.

***Read and understand the information contained in this manual before attempting to install or service the siren.***

Pay careful attention to notices located on the equipment.

## **General Description**

### **Overview**

The FC, FCH, and FCU are controllers that allow remote control of sirens, doors, gates, or lights. The FC Controller can be equipped with a one-way High Band or UHF radio receiver. The FC Controller can decode a variety of signals and then activate one to four relays for control of external devices. The versatility of the FC Controller makes it an ideal choice for siren control applications or any other process that can be controlled through relay contacts.

The FC Controller consists of a NEMA 4 enclosure for indoor or outdoor use. The cabinet houses an aluminum backplane on which the FC Controller Board is mounted.

If using the one-way radio receiver model, the appropriate directional or omni-directional antenna system (antenna, cabling, and lightning protection) must be ordered separately. For special orders contact Federal Signal. See Getting Service for contact information. The following lists the standard FC models.

**Table 1 FC Models**

| <b>FC Model</b> | <b>Description</b>   |
|-----------------|--|
| FC              | Controller with FC Control Board                               |
| FCH             | Controller with one-way High-band (150-172 MHz) radio receiver |
| FCU             | Controller with one-way UHF band (450-470 MHz) radio receiver  |

### **Features**

The FC Controller has the following features.

- Optional one-way radio receiver (VHF or UHF)
- Two-tone sequential, DTMF, EAS, POCSAG, and digital AFSK decoding for security (requires radio receiver)
- Four individually programmable output relays
- Local activation via on-board pushbutton or externally wired (not supplied) pushbuttons
- Audio output to drive external speaker and six built-in siren tone signals for standard alerting
- Four contact closure inputs for remote land line activation
- Four individually programmable output relays with selectable N.O. or N.C. contacts LED level meter to aid in setting receive level.
- Two RS232 Serial/Programming Ports
- 8 remote sensor inputs and a built-in monitor for AC voltage
- Local display of function counters and incoming decoded signals
- Single PCB reliability



- Powered via 120/240 Vac, 12 Vdc or 48 Vdc
- Six user programmable functions in addition to the five preset functions: ARM, DISARM, REPORT, GROWL TEST, and MASTER RESET.
- Supports standard EAS codes and wildcards
- Supports Binary frequency shift keying 512 Baud numeric messages.

## **RF Receiver**

The Receiver Module (RF) is a fully shielded receiver that plugs into the FC controller. It is available in High (FCH) and UHF (FCU) bands.

The FC control board provides power and adjustments for the RX frequency of the receiver. The radio receiver provides over the air transmission signals to the FC Controller for decoding. The FC Controller can decode two-tone sequential, DTMF, EAS, POCSAG, and digital AFSK.

## **RF Receiver Features**

The RF Receiver has the following features.

- Small size
- Rugged construction using surface mount components
- Shielded receiver assembly to prevent interference
- Available in VHF and UHF bands
- Low current draw, excellent for battery powered operation
- Synthesized frequency selection
- Wide temperature operating range
- Excellent selectivity, able to receive its signal while rejecting others
- Clean, low distortion recovered audio.
- Noise based squelch circuit, doesn't open receiver in high radio noise environments that is, near computers etc.

## **POCSAG Decode**

The FC Controller can decode POCSAG messages when equipped with a radio receiver. All POCSAG messages contain a Receiver Identity Code (RIC) or CAP code. This indicates which unit or group of units a message is intended for. The unit must have its RIC configured before it responds to a message.

The Standard Format for Federal Signal POSAG codes consists of a 5 character numeric message preceded by an open bracket “[” and followed by a closed bracket “]” for a total of 7 characters. The first 3 numbers are the unit number. Any unit number less than 300 activates only that unit number. A unit number of 300 activates all units. Unit number of 301 to 316 activates all units in zones 1 to zone 16 respectively. The unit must be configured for the zone in which it is to function.

## Specifications

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The last two numbers in the message are the function number (01 through 06), which activates functions 1 through 6. Function numbers 96, 97, 98 and 99 activate Poll All, Reset, Quiet Test, or Cancel respectively.

## Specifications

### Control Board Specifications

**Table 2 Electrical Requirements**

|                               |  |
|-------------------------------|--|
| AC Input Voltage (switchable) | 120 or 240 Vac +/- 10%, 50-60 Hz                     |
| AC Current Draw               | < 100 mA   |
| DC Input Voltage              | 15-75 Vdc (JP5 9/10)<br>11-15 Vdc (JP5 11/12)        |
| Current draw                  | 200 mA maximum at 48 Vdc<br>400 mA maximum at 12 Vdc |

**Table 3 Two-Tone Sequential**

|                 |  |
|-----------------|--|
| Frequency range | 282-3000 Hz  |
| Tone timing     | First Tone – 0.5 second (minimum)<br>Second Tone – 0.25 second (minimum)<br>8 seconds maximum for both tones |
| Intertone Gap   | 400 ms (maximum)   |
| Tone Accuracy   | +/- 1.5%   |
| Tone Spacing    | 5.0% preferred, 3% (minimum)   |

**Table 4 Single Tone**

|                 |                                  |
|-----------------|----------------------------------|
| Frequency range | 282-3000 Hz                      |
| Tone timing     | 0.5 second - 8 seconds (maximum) |
| Tone Accuracy   | +/- 1.5%                         |
| Tone Spacing    | 5.0% preferred, 3% (minimum)     |

### Inputs and Outputs

**Table 5 Relay Outputs**

|                    |                                     |
|--------------------|-------------------------------------|
| Four relay outputs | Normally Open or Normally Closed    |
| Contact Rating     | 5 A at 120/240 Vac<br>8 A at 24 Vdc |

**Table 6 Audio Output (Optional)**

|                           |                          |
|---------------------------|--------------------------|
| Output Voltage            | > 2 V <sub>r-p</sub>     |
| Maximum Load              | 8 ohms                   |
| Total Harmonic Distortion | < 10% at 1 kHz sine wave |

**Table 7 Remote Activation Inputs**

|            |  |
|------------|--|
| Quantity   | 4  |
| Input Type | Dry contact closure <1 k ohm<br>(Requires >1 second closure) |

**Table 8 Serial Communications**

|                              |                       |
|------------------------------|-----------------------|
| <b>Serial Communications</b> |                       |
| Serial Port Configuration    | RS232C 1200,N,8,1,DCE |

**Table 9 Environmental**

|                       |                                 |
|-----------------------|---------------------------------|
| <b>Environmental</b>  |                                 |
| Operating Temperature | -30°C to +65°C / -22°F to 149°F |
| Humidity              | 0-98% non-condensing            |

**Table 10 Dimensions**

|                           |   |
|---------------------------|---|
| Dimensions<br>(H x W x D) | 13.5 inches x 10 inches x 6 inches<br>34.3 cm x 25.4 cm x 15.3 cm |
| Net Weight                | 12 lb/5.4 kg  |
| Shipping Weight           | 13 lb/5.9 kg  |

**For the FCH and FCU Models**

**Table 11 RF Receiver Specifications**

|  |   |
|--|---|
| Antenna Impedance                                      | 50 ohms, +/- 10 ohms  |
| Frequency range  | 150-172 MHz, 450-470 MHz  |
| Frequency stability over temperature range             | =/< 2.5ppm from -30°C to +60°C  |
| Spurious Response and Image Rejection                  | HB => -70 dBm<br>UHF => -70 dBm<br>(Measured per EIA-603, part 4.1.9)   |
| Intermodulation Distortion Rejection                   | HB => -70 dBm<br>UHF => -70 dBm<br>(Measured per EIA-603, part 4.1.9)   |
| Adjacent Channel Selectivity                           | HB => -70 dBm<br>UHF => -70 dBm<br>(Measured per EIA-603, part 4.1.6)   |
| Sensitivity – 12 dB SINAD                              | =/< 0.35 μV for 12 dB SINAD per EIA-603, Part 4.1.4   |
| Sensitivity – 20 dB Quieting                           | =/< 0.5 μV, 20 dB quieting  |
| Squelch Sensitivity with 1 kHz tone at 3 kHz deviation | Minimum squelch setting = Open Squelch<br>Maximum squelch setting = < 29 dB SINAD<br><br>Shall be set at the reference decode sensitivity (20 dB SINAD) Shall open and close in less than 250 ms per EIA-603, Part 4.1.13.2.4 |
| Audio Output with 1 kHz tone at 3 kHz deviation        | 0.8 V <sub>p-p</sub> +/- 0.20 V <sub>p-p</sub>  |
| Audio frequency response                               | 300-3000 Hz, +/- 1 dB, with 6 dB per octave de-emphasis   |
| Hum and Noise  | -35 dB relative to full quieting signal with 1 kHz tone at 3 kHz deviation  |
| Audio distortion with 1 Kc tone at 3 Kc deviation      | < 10%   |

## Signaling Format Specifications

Table 12 DTMF

| All timing in milliseconds  |   |
|---|---|
| String length   | 3-12 standard DTMF characters   |
| Mark/Space timing:<br>Decoder Minimum<br>Decoder Maximum<br>Encoder | 50 ms/50 ms (below 50/50 consult factory)<br>800 ms total mark/space timing per function<br>50 ms/50 ms mark/space timing |
| Space between Stacked codes, minimum                                | 1.25 seconds  |

**NOTE:** Wildcard options for each of the DTMF strings via programming software.  
Optional fast DTMF 40 ms/20 ms via solder joint.

Table 13 FSK

|                 |                         |
|-----------------|-------------------------|
| Baud rate       | 1200 bps                |
| Modem type      | MSK (minimal shift key) |
| Mark frequency  | 1200 Hz                 |
| Space frequency | 1800 Hz                 |
| Error checking  | 16 bit CRC              |

## Installation

**⚠ DANGER**

***Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, experienced electricians in accordance with national and local electrical codes, acting under the direction of the installation crew safety foreman, should perform installation.***

## Siren Controller Installation

The information in this section provides guidelines to aid you when using the FC Controller to activate a mechanical siren.

**⚠ WARNING**

***The output sound level of a siren is capable of causing severe hearing discomfort or permanent hearing damage. Therefore, always wear adequate hearing protection and minimize exposure time when performing any testing or maintenance on the siren.***

**NOTICE**

***Federal Signal recommends that all control devices be padlocked to discourage tampering and vandalism.***

***When servicing the board, avoid Electrostatic discharge by properly grounding yourself and the board.***

---

## Electrical Code Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

**⚠ CAUTION**

***Changes or modifications not expressly approved by Federal Signal could void the user's authority to operate the equipment.***

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio technician for help.

## Preliminary

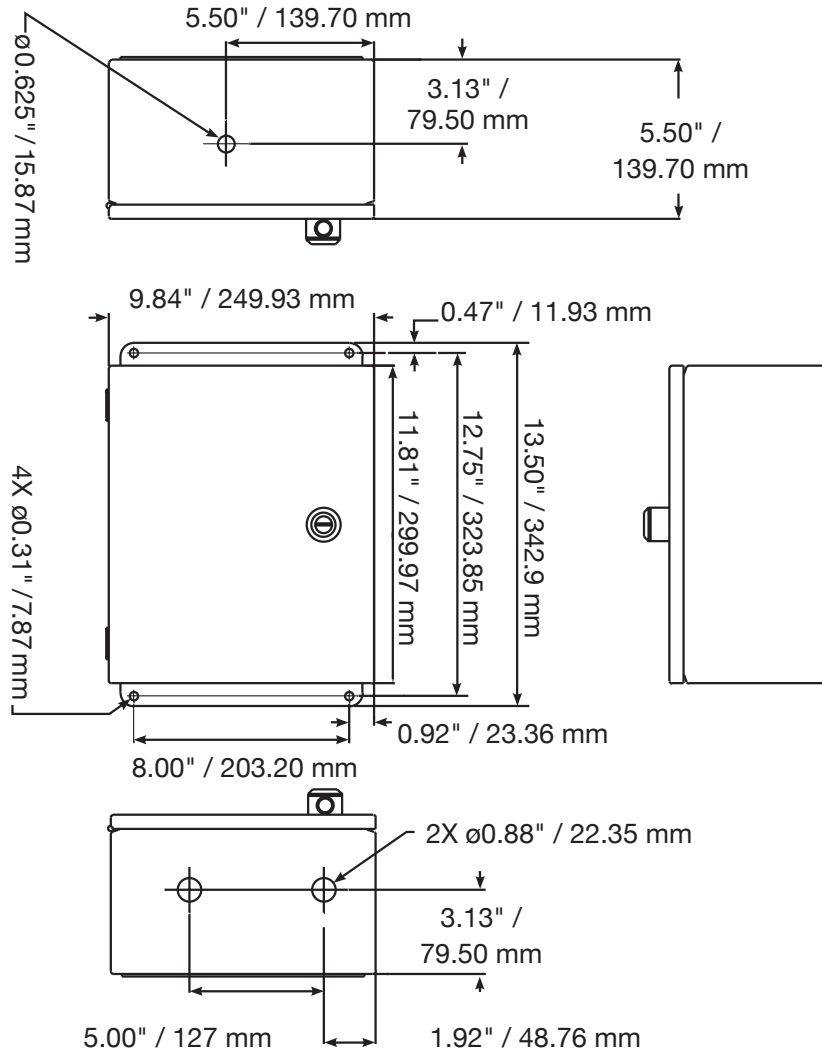
Carefully inspect the unit for signs of damage that may have occurred in transit. Should there be any evidence of physical damage to the unit or components, notify the carrier immediately stating the extent of damage.

A typical installation showing the relative location of the controller is illustrated in Figure 3. There are numerous methods to use to mount the controller. In all cases, the installation must be rigid, secure, and free from physical shock or vibration.

If the controller is to be used in extremely hot climates, locate out of the direct path of the sun. If the antenna is to be mounted directly to the controller cabinet, make sure the cabinet is mounted on the side of the pole facing the base station antenna.

The FC cabinet has four 5/16-inch mounting holes located on both the top and bottom mounting flanges that can be used to mount to a wall or other horizontal structure. In the bottom of the FC cabinet, two 1/2-inch conduit fitting knockouts are provided for AC power and siren control conduit connections. A ground stud is provided inside the FC cabinet at the bottom, which must be connected to earth ground.

Figure 1 FC Cabinet Dimensions



## General Mounting Guidelines

**⚠ CAUTION**

**Use good installation methods and follow local ordinances for mounting cabinet.**

These general installation instructions are pertinent to all installations. Specific mounting methods and required installation materials are described in the next section.

1. The FC cabinet has four 5/16-inch mounting holes located on both the top and bottom mounting flanges that can be used to mount to a wall or other horizontal structure.
2. The total weight of the FC Controller Cabinet with batteries is listed in the Specifications section. It is important that the mounting surface and mounting method selected can safely sustain the weight of the assembly.

3. Prepare the mounting surface for hanging the cabinet by predetermining the location of the mounting holes. Attach the cabinet to a wall or other substantial vertical surface.  
  
If the mounting surface is not flat, the cabinet may require shimming to keep the cabinet square.
4. Guidelines for various attachment methods to accommodate different wall types are described in the following section. Make provisions for spacing behind the cabinet when mounting to an exterior wall that is susceptible to condensation or other surface moisture.
5. Lift the cabinet to the desired mounting height and lag to the wall using the prepared holes and anchors.

### **Installation Material List and Installation Guidelines**

The following material lists and guidelines describe basic installation details required to install the cabinet. This list varies depending on mounting methods, other options, local and national electrical codes, etc. Use list as a reference guideline only.

#### **Concrete or Filled Cement Block Wall Mounting Guidelines**

**Table 14 Concrete or Filled Cement Block Wall Mounting Materials**

| <b>Material Description</b>                                | <b>Purpose</b> | <b>Qty</b> |
|--|----------------|------------|
| 1/4 in x 2 in Pin/Sleeve/<br>Lock Washer/Nut Style Anchors | Anchor Bolts   | 4          |

1. Mark the mounting hole locations on the wall for the cabinet.
2. Install the anchor bolts for the four cabinet corners according to the manufacturer’s instructions.
3. Mount the cabinet to the wall.
4. Proceed to following section.

**NOTE:** If wall is not straight, use shims to insure enclosure maintains square and structural integrity.

#### **Hollow Block Wall Mounting Guidelines**

**Table 15 Hollow Block Wall Mounting Materials**

| <b>Material Description</b>           | <b>Purpose</b> | <b>Qty</b> |
|---------------------------------------|----------------|------------|
| 1/4 in x 2 in Heavy Duty Toggle Bolts | Anchor Bolts   | 4          |

1. Mark the mounting hole locations on the wall for the cabinet.
2. Install the anchor bolts for the four cabinet corners according to the manufacturer’s instructions.
3. Mount the cabinet to the wall.
4. Proceed to following section

**Wood Stud Wall Mounting Guidelines**

**Table 16 Wood Stud Wall Mounting Materials**

| <b>Material Description</b>                | <b>Purpose</b>                       | <b>Qty</b> |
|--|--------------------------------------|------------|
| 1/4 in x 1 in Lag bolts                    | Backboard and cabinet mounting bolts | 8          |
| 2 ft x 2 ft x 3/4 in B/C or better plywood | Mounting backboard                   | 1          |
| Construction adhesive                      | Mounting backboard attachment        | 1          |

1. Locate the wall studs for attaching the mounting backboard to the wall. Attach the backboard to at least two studs.
2. Mark the wall stud location on the mounting backboard and drill four pilot holes for the lag bolts.
3. Apply construction adhesive to the back of the mounting backboard.
4. Attach the mounting backboard to the wall with four lag bolts.
5. Locate the mounting position of the cabinet on the mounting backboard.
6. Drill pilot holes for the lag bolts.
7. Mount the cabinet to the mounting backboard.
8. Proceed to the following section.

**Metal Stud Wall Mounting Guidelines**

**Table 17 Metal Stud Wall Mounting Materials**

| <b>Material Description</b>       | <b>Purpose</b>         | <b>Qty</b> |
|-----------------------------------|------------------------|------------|
| 1/4 in x 2 in lag bolts           | Cabinet mounting bolts | 4          |
| 2 ft x 2 ft B/C or better plywood | Mounting backboard     | 1          |
| #14 x 2 in metal stud screws      | Backboard mounting     | 12         |
| Construction adhesive             | Backboard mounting     | 1          |

1. Locate the wall studs for attaching the Mounting Backboard to the wall.
2. Mark the wall stud location on the mounting backboard and drill pilot holes for the #14 metal stud screws. Place three screws in each stud evenly spaced apart.
3. Apply construction adhesive to the back of the mounting backboard.
4. Attach the mounting backboard to the wall with #14 metal stud screws.
5. Locate the mounting position of the cabinet on the mounting backboard.
6. Drill pilot holes for the 1/4 lag bolts.
7. Mount the cabinet to the mounting backboard.
8. Proceed to the following section.



**Table 18 Suggested Installer Supplied FC Electrical Installation Material List**

| <b>Material Description</b>   | <b>Purpose</b>   | <b>Qty</b> |
|---|--|------------|
| NEMA 3R minimum if used outdoors.   |  | 1          |
| 30 A/250 V/ 2 Pole Solid Neutral/ Fused Disconnect with Ground Kit/ NEMA 1 Rating/ Lockable Cover Tang/ Lockable Operator | Optional Electrical Disconnect   | 1          |
| 1 A FRNR Fuse   | Fuses for 120 V Service  | 1          |
| 0.5 A FRNR Fuse   | Fuses for 240 V Service  | 2          |
| 12-14 AWG White Wire  | AC Neutral from disconnect   | 8 ft       |
| 12-14 AWG Black Wire  | AC Load from disconnect  | 8 ft       |
| 12-14 AWG Green Wire  | Equipment ground from disconnect   | 8 ft       |
| 1/2 inch Seal Tight Conduit and Fittings  | Electrical conduit from AC disconnect and separate conduit to interface with other equipment | Varies     |
| Metal Ground Bushings   | Equipment ground connections   | 2          |
| Screws, appropriate to mounting surface   | Disconnect mounting  | 4          |
| 15 A Breaker  | Service panel breaker serving unit   | 1          |
| White Wire appropriately sized  | AC neutral from breaker panel to disconnect  | Varies     |
| Black Wire appropriately sized  | AC load from breaker panel to disconnect   | Varies     |
| Green Wire appropriately sized  | Equipment ground from breaker panel to disconnect  | Varies     |
| Conduit and fittings, appropriately type and size for particular installation requirements                                | Electrical conduit from breaker panel to disconnect  | Varies     |
| 6 AWG Stranded  | Cabinet ground to earth ground for external antenna applications                             | Varies     |
| 18-26 AWG stranded wire pairs   | Audio, Relay Output, and Remote System Operation Sense                                       | Varies     |

Figure 2 FC Assembly Drawing

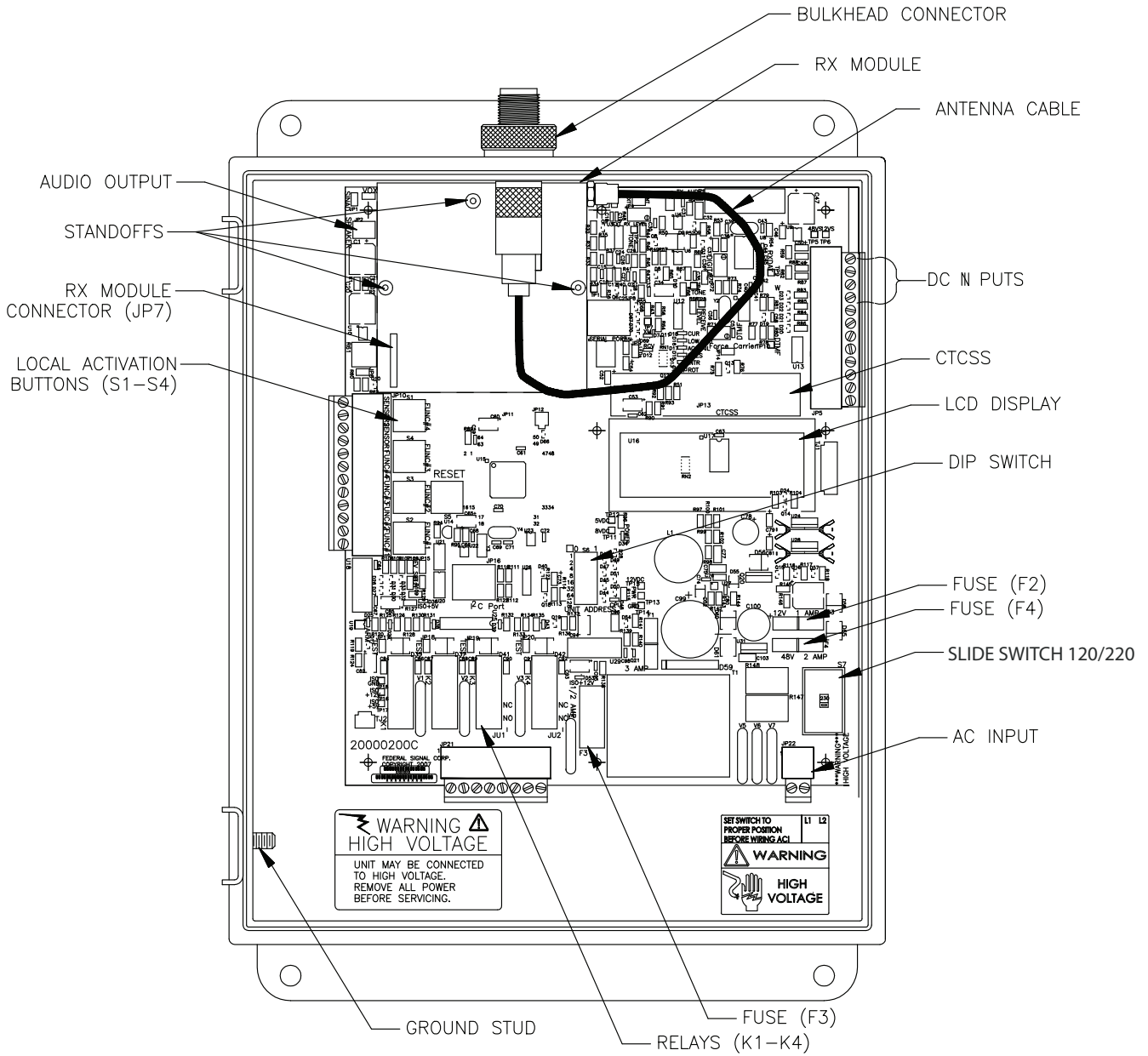
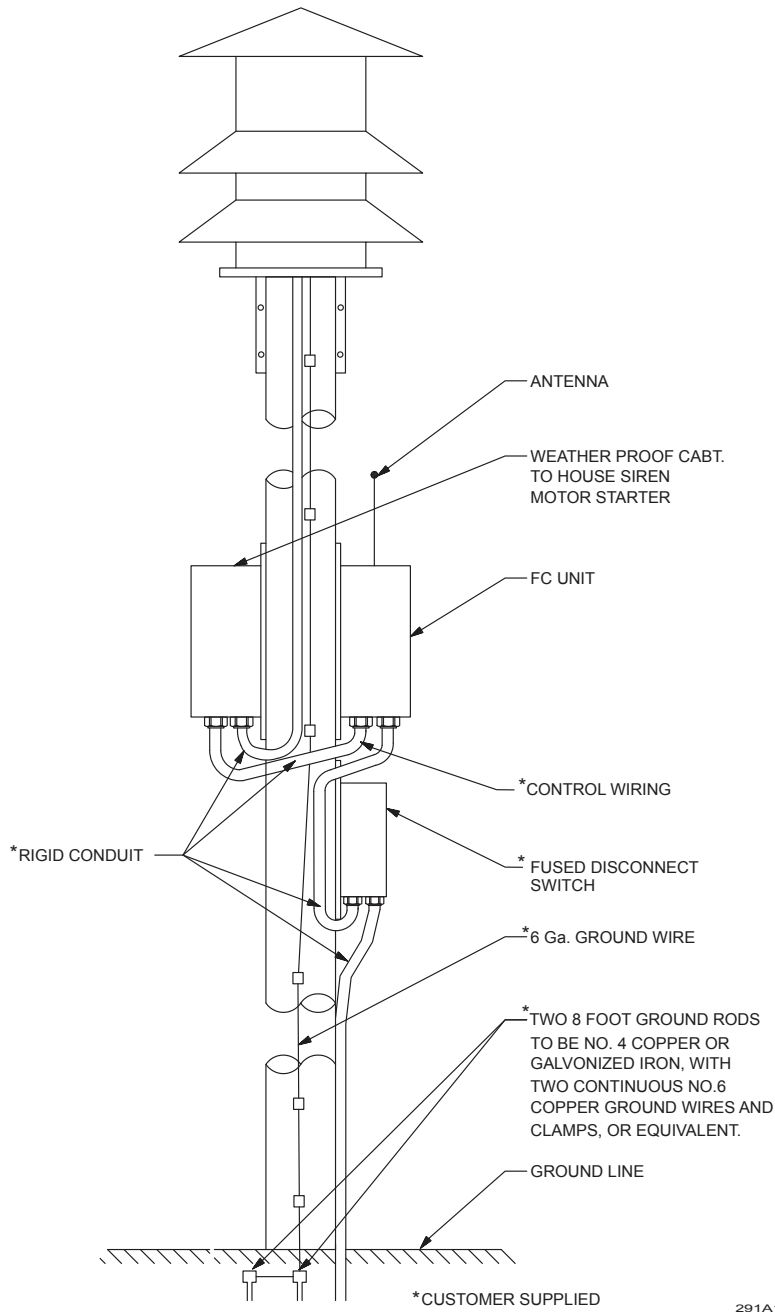


Figure 3 Typical FC Installation Example



291A124A1

## Installing the Antenna

**⚠ WARNING**

***To prevent electrocution or severe personal injury, install antenna away from power lines and install with proper grounding. Refer to section 810 of the National Electrical Code, ANSI/NAPA No. 70.***

A factory installed, internally wired, antenna bulkhead adaptor is provided on the top side of the controller cabinet for ease of antenna cable interface. The bulkhead adaptor requires the installation of a male PL259 connector on the antenna cable for correct interface. It is essential that the installer follow all tuning (if applicable), installation and safety instructions provided by the antenna manufacturer.

For installation instructions on the Yagi and Omni Antennas, go to the Federal Signal's website.

## Electrical Connections

**⚠ WARNING**

***Install the siren electrical system in compliance with local electrical codes and NEC recommendations. Federal Signal also recommends that all user-installed conduit connections enter from the bottom of the cabinet. Disconnect all power and read all warnings at the beginning of this manual and before making connections.***

**⚠ CAUTION**

***The siren and control system must be solidly connected to an earth ground. If the siren is installed in a building, ground the system to a metallic object known to be grounded.***

***For pole mount installation, drive two ground rods separated by at least eight feet and into the ground by at least eight feet. Use a separate, continuous 6 AWG or larger wire from the siren frame to ground and from the cabinet of each siren control system to ground.***

## Connecting FC

To connect the FC:

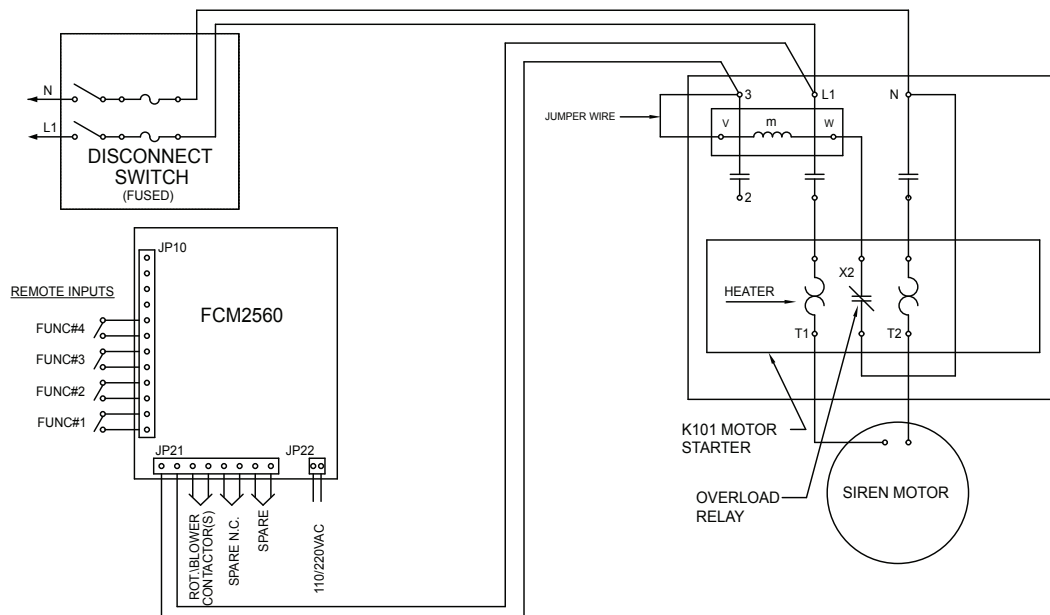
1. Install two ½-inch user supplied conduit fittings at the bottom of the FC cabinet.
2. Route ½-inch conduit (steel preferred) between a user supplied fused disconnect switch, and the conduit fittings in the bottom of the FC cabinet. Fuse the disconnect switch with a 1 ampere fast acting fuse.
3. Follow the instructions included with the lightning protector (supplied with controller) and install in the AC service disconnect.

4. Set the AC input voltage selector switch located near the bottom right of the controller for either 120 or 240 Vac input voltage. Push the switch up for 120 Vac or down for 240 Vac. Route two 12 AWG wires between the fused disconnect and the AC input at JP22. (See Figure 4 and 5.)
5. Route a 6 AWG ground wire from the earth grounding rod to the FC Controller cabinet ground stud.
6. Route ½-inch conduit between the conduit fittings on the bottom of the FC Controller cabinet and the siren motor starter cabinet, or alternatively to other equipment.

**NOTE:** The following wiring is for the RC2W motor starter. For the 2001-AC wiring, see the 2001-AC manual.

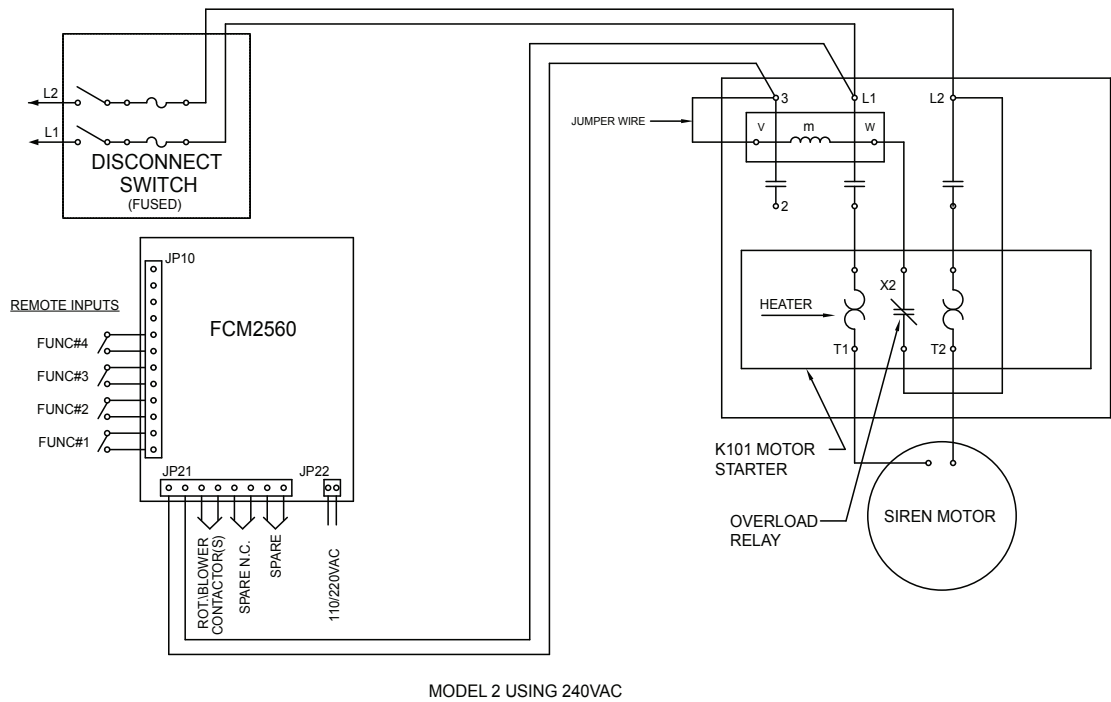
7. Route two 12 AWG wires between JP21 on the FC circuit board and the siren motor contactor as follows (See Figures 4 and 5.):
  - Connect one wire between JP21-1 of the FC control and 3 RC2W motor starter.
  - Connect one wire between JP21-2 and L1 of the RC2W motor starter.
8. If the siren is to be controlled remotely through a momentary contact closure, apply the contact closure to the appropriate input on JP10. The wire run from the contact to JP10 must not exceed 50 feet. If longer wire runs are required, you can purchase a model TRC1020 for each function. The inputs on JP10 require 1-second contact closures.

**Figure 4 Contactor Wiring for Model 2 using 120 Vac**



MODEL 2 USING 120VAC

Figure 5 Contactor Wiring for Model 2 using 240 Vac



## Factors Affecting Radio Reception and Antenna Connection

### ⚠ WARNING

*If the Radio system is not installed and calibrated properly, the controller may not receive the activation signals. This may cause the siren to fail and not operate in an emergency resulting in extensive property damage or death.*

### ⚠ CAUTION

*Other local siren sites may have the same activation code. Take appropriate precautionary measures.*

### NOTICE

*All antenna connections must be properly sealed.*

The radio network (transmitter, receiver and decoder) is the vital link to proper controller operation. Consider the following during installation.

1. Individually evaluate all controller installations. Contact Federal Signal to discuss a suitable controller site location, the proper type and location of antenna and transmission line, and to answer any questions regarding the installation.
2. Distance from the transmitter is not necessarily the only factor which determines signal quality. The effects of terrain and structures can result in weak or variable reception at a given siren site.

It is desirable to evaluate each proposed site under various weather conditions by means of a portable receiver. Distance of a few hundred feet can often make a significant difference in signal strength.

3. Connect the antenna or antenna cable to the SO-239 connector.
4. Mount the antenna on the side of the pole facing the base station location. Mount as high as possible. The tip of the antenna should, when possible, be no closer than three feet from any metal siren mounting brackets.

**NOTE:** For installation instructions on the Yagi and Omni Antennas, go to the Federal Signal's website.

5. In general, use a gain antenna if a site must be located in a known weak signal area.
6. The following paragraphs pertain to the operation of the transmitter, tone-generating equipment, and other equipment used at the base station.
  - Tone generating equipment used in a siren system requires frequency stability within  $\pm 1\%$  and a total distortion of less than 5%. Tone duration must be compatible with the siren tone-timing scheme selected by the user.
  - It is important to arrange the base station keying circuitry so that the microphone is disconnected when the tones are transmitted to prevent microphone noise from distorting the signal.
  - To ensure good frequency response, the output of the tone encoder must be properly matched to the transmitter. Adjust the transmitter according to the manufacturer's instructions to provide the proper level of deviation. Typical deviation level for narrowband is 1.5 kHz and if using PL/DPL add 375 Hz. If using for wideband, such as EAS (NOAA), the modulating deviation is 3 kHz.

## Aligning the Receiver

To align the receiver:

1. In the RF receiver insert jumper JP1 for narrowband receive.
2. Inject a 100  $\mu\text{V}$  signal into the receiver and modulate the signal with a 1 kHz tone at 1.5 kHz deviation.
3. Monitor the receive audio at JP7 pin 7 on the FCM+ board. With an oscilloscope, carefully adjust coil L1 for the most level.
4. Set jumper JP1 on one pin for wide band receive.
5. Set the modulating deviation to 3 kHz.
6. The level at JP7 pin 7 should be 800 mVp-p  $\pm$  200 mV.
7. Connect a SINAD meter to TP4 on the FCM board and reduce the level of the RF signal from the service monitor until the SINAD meter reads 12 dB.
8. Slowly adjust variable cap C46 (rev D or earlier), C39 (rev F) or C53 (rev G or later) for best SINAD. This is less than 0.35  $\mu\text{V}$  for all bands.

## Operations

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9. With the RF level at 12 dB SINAD, monitor Carrier Detect LED on the FCM board and adjust the squelch pot until the LED just comes on.
10. Configure the RF receiver for narrowband or wideband. For narrowband, JP1 should be present (typical). If being used for wideband, such as EAS (NOAA), remove jumper JP1, which makes the RF receiver wideband.

### TCS/DCS Programming

Typically, the optional TCS/DCS decoder FS-PL1 comes preprogrammed from the factory. If field reprogramming is desired, see the Tone and Digital Coded Squelch Module FS-PL1 manual.

## Operations

### FC Controller Board Indicators

The following table provides a description of LED indicators on the FC Controller Board.

**NOTE:** The default FC does not come with sensors. The following sensor LEDs are ignored: pressure, intrusion, current, rotation, low battery, AC power fail.

**Table 19 FC Controller Board Indicators**

| Component Number | Label       | Description       | Indication  |
|------------------|-------------|-------------------|---|
| D48              | CPU         | CPU LED           | Microprocessor Heartbeat                                  |
| D12              | RCV         | RECEIVE LED       | RF Carrier Indicator on with carrier                      |
| D7               | XMIT        | TRANSMIT LED      | Transmit  |
| D25              | ARM         | RELAYS ARMED      | Power to relays on  |
| D29              | D29         | RELAY #1 LED      | Relay #1 closed   |
| D38              | D38         | RELAY #2 LED      | Relay #2 closed   |
| D39              | D39         | RELAY #3 LED      | Relay #3 closed   |
| D43              | D43         | RELAY #4 LED      | Relay #4 closed, or PA mode                               |
| D15              | PRES        | PRESSURE LED      | Pressure Sensor input                                     |
| D13              | INTR        | INTRUSION LED     | Intrusion Sensor input                                    |
| D18              | CUR         | CURRENT LED       | Current Sensor input                                      |
| D14              | ROT         | ROTATION LED      | Rotation Sensor input                                     |
| D16              | LOWBAT      | LOW BATTERY LED   | Low Battery Sensor (internal)                             |
| D17              | AC FAIL     | AC POWER FAIL LED | AC Power Fail Sensor (internal)                           |
| D34              | POWER       | POWER LED         | 12 V Operating Power                                      |
| D53              | ISO+12V     | ISO 12V           | Isolated 12 V power                                       |
| D36              | ISO+5V      | ISO 5V            | Isolated 5 V power  |
| U16              | LCD Display | LCD Display       | Displays Function Counters, Decodes and Software Revision |



## Connectors, Selections, and Switches for the FC Controller Board

The following tables provide descriptions of the FC Controller Board connectors, selections, and switches.

| JP1 | SINAD (optional)   |
|-----|--|
| 1   | Receiver module carrier detect, short to pin 2 when using SINAD board along with both sides of JP4 |
| 2   | External transceiver carrier detect  |

### Speaker Output

Passes radio audio or generates warning sounds, which are routed to the speaker output JP2.

| JP2 | Test Speaker/Audio Out (See R61 for output level adjustment)  |
|-----|---|
| 1   | 0 to 2 V <sub>p-p</sub> , Audio Source: Receiver Audio during P.A. functions<br>Siren Audio during Electronic Siren functions |
| 2   | Ground  |

### VOX

JP3 which can be jumpered to provide VOX carrier detect for radios that do not provide carrier detect.

| JP3 | Short For VOX Carrier Detect          |
|-----|---------------------------------------|
| 1   | Short together for VOX carrier detect |
| 2   | (Not used for one-way systems.)       |

### Receiver Priority (For use with two-way systems.)

Jumper JP4 sets the priority if an external transceiver and an on-board receiver are both used. The receiver with priority can interrupt the other receiver and its audio passes through to the rest of the circuits in the controller. The receiver with priority cannot be interrupted. If neither receiver is given priority then whichever receiver asserts carrier detect first will pass through and the other receiver will not be able to interrupt it.

If the “EXT” side is jumpered then the external transceiver has priority.

If the “INT” side is jumpered then the on-board receiver has priority.

If both sides of JP4 are jumpered then the two receive audio signals are mixed together. This is done if the SINAD option is used as it allows receive audio from the external transceiver jack to pass through to the on-board receiver connector to feed the SINAD option board. JP1 must also be jumpered when the SINAD option is installed.

| JP4  | Test Speaker  |
|--|---|
| 1 <input type="checkbox"/><br>3 <input type="checkbox"/> | Short pins 1 and 3 to give priority to the external transceiver   |
| 2 <input type="checkbox"/><br>4 <input type="checkbox"/> | Short pins 2 and 4 to give priority to the internal receiver.<br>With no shorting jumper, first carrier detect has priority.<br>Short both sides when using SINAD board along with JP1. |

## Operations



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### Sensor Inputs and DC Inputs

| <b>JP5</b> | <b>Sensor Inputs (#1 at left edge)</b>  |
|------------|---|
| 1          | Pressure sensor input, dry Contact closure < 1 K (Not used in a one-way system.)  |
| 2          | ISO Ground  |
| 3          | Intrusion sensor input, dry Contact closure < 1 K (Not used in a one-way system.)   |
| 4          | ISO Ground  |
| 5          | Current sensor input, dry Contact closure < 1 K (Not used in a one-way system.)   |
| 6          | ISO Ground  |
| 7          | Rotation sensor input, dry Contact closure < 1 K (Not used in a one-way system.)<br>For legacy hall effect sensor in the 2001SRN. |
| 8          | ISO Ground  |
| 9          | 48 Volt input, 15-75 Vdc  |
| 10         | Ground  |
| 11         | 12 Volt input, 11-15 Vdc  |
| 12         | Ground  |

### Speaker Mute gate bypass

The receiver audio coming out of JP2 is normally kept turned off until an activation signal has been received. Jumpering JP6 turns the receiver audio on all of the time. Jumper if you want to listen to the receive channel all the time.

| <b>JP6</b>   | <b>Speaker Mute gate bypass</b>  |
|--|--|
| 1 <br>2  | Short pins 1 and 2 to bypass speaker mute gate, allow monitoring of radio channel with local speaker |

### Receiver Module

The receiver module (JP7) is for receiving high-band VHF or low-band UHF signals to activate the FC controller when a two-way system is not required.

| <b>JP7</b> | <b>Receiver Module for one-way receiver</b> |
|------------|---|
|------------|---|

### Serial and FLASH programming Port

The RS232 serial port is used to transfer new code into the FC controller and configure the FC controller's activation codes and functions.

| <b>JP8</b> | <b>Serial and FLASH programming Port</b> |
|------------|--|
|------------|--|

LEDs on with Intrusion

When JP9 is shorted, the LED lights on the board turn off when the door is closed to reduce current draw.

Uses less power for Solar powered systems.

Intrusion switch is only present on two-way systems.

| JP9 | LEDs on with Intrusion  |
|-----|---|
| 1/2 | Short pins 1 and 2, to disable LEDs when Intrusion switch is closed |

Sensor Input and Landline/Local Pushbutton Activation

You can activate the first four pre-programmed functions locally through the pushbuttons, on the FC Controller Board, or remotely by grounding one of the landline activation inputs at JP10 for at least one second. The remote inputs are protected by limiting diodes and cannot exceed 5.1 Volt.

JP10 is four contact closure activation inputs with two spare sensor inputs.

The remote inputs on JP10 are identified as follows.

| JP10 | Remote Activation and Sensor Inputs (#1 at left edge of connector)  |
|------|---|
| 1    | Spare Sensor Input #2, dry Contact closure < 1 K<br><b>NOTE:</b> Typically used for transformer rectifier or AC sensor. |
| 2    | ISO Ground  |
| 3    | Spare Sensor Input #1, dry Contact closure < 1 K<br><b>NOTE:</b> Typically used for rotation sensor.                    |
| 4    | ISO Ground  |
| 5    | Remote Activation Input #4, Activates Functions under code 4, dry Contact closure < 1 K                                 |
| 6    | ISO Ground  |
| 7    | Remote Activation Input #3, Activates Functions under code 3, dry Contact closure < 1 K                                 |
| 8    | ISO Ground  |
| 9    | Remote Activation Input #2, Activates Functions under code 2, dry Contact closure < 1 K                                 |
| 10   | ISO Ground  |
| 11   | Remote Activation Input #1, Activates Functions under code 1, dry Contact closure < 1 K                                 |
| 12   | ISO Ground  |

| JP11     | Used for special software applications |
|----------|--|
| 1 and 2  | Normally Jumpered                      |
| 3-8      | Not used                               |
| 9 and 10 | Normally Jumpered                      |

## Operations

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### SINAD Connector

JP12 is used in special applications only.

|             |   |
|-------------|---|
| <b>JP12</b> | <b>SINAD Connector</b> for engineering use only |
|-------------|---|

### CTCSS Encoder/Decoder (FS-PL1)

The Tone Coded Squelch/Digital Coded Squelch board is a small plug-in board to add to existing products and provides decoding of Tone Coded Squelch (CTCSS) and Digital Coded Squelch (DPL) Signals. See the Tone and Digital Coded Squelch Module (FS-PL1) for more information.

|             |                                       |
|-------------|---------------------------------------|
| <b>JP13</b> | <b>CTCSS Encoder/Decoder (FS-PL1)</b> |
|-------------|---------------------------------------|

### Force Carrier Detect

Some radios do not provide a carrier detect signal to inform the FC controller that a receive signal is coming through. Jumpering JP14 forces the carrier detect to be active all of the time, which allows the FC controller to monitor the receive audio.

|             |   |
|-------------|---|
| <b>JP14</b> | <b>Force Carrier Detect (Not used with one-way)</b> |
| 1/2         | Short to force carrier detect on                    |

### Set Deviation









Shorting JP15 causes the FC controller to transmit a tone for setting deviation of the transmitter attached.

|             |   |
|-------------|---|
| <b>JP15</b> | <b>Short To Set Deviation (Not used with one-way)</b> |
| 1/2         | Short causes unit to transmit for setting deviation   |

|             |                                       |
|-------------|---------------------------------------|
| <b>JP16</b> | <b>I<sup>2</sup>C Port (Not used)</b> |
|-------------|---------------------------------------|

### Relay Outputs

There are four relay outputs on the FC Controller Board, which are controlled by the microprocessor. The relays provide isolation and are spike protected to prevent voltage spikes from affecting the unit. As the relay coil is energized, the outputs close and the associated LED lights. The FC Controller Board comes standard with four DPST relays.

| <b>JP21</b>   | <b>Relay Outputs (#1 at left edge of connector)</b>                           |
|---|---|
| 1  | Relay 1, Common   |
| 2  | Relay 1, Normally Open Contact  |
| 3  | Relay 2, Common   |
| 4  | Relay 2, Normally Open Contact  |
| 5  | Relay 3, Common   |
| 6  | Relay 3, Normally Open Contact (Normally Closed when JU1 is shorted, default) |
| 7  | Relay 4, Common   |
| 8  | Relay 4, Normally Open Contact (Normally Closed when JU2 is shorted)          |

### AC Power Input

JP22 is the AC Power Input. Switches are described in table.

|             |                                |
|-------------|--------------------------------|
| <b>JP22</b> | <b>AC Power Input (Set S7)</b> |
| 1/2         | 120 or 240 Vac                 |

### Switches

Switches provide: local activation via on-board pushbutton, master reset, site address, and AC voltage selection.

|           |   |
|-----------|---|
| <b>S1</b> | <b>Local Activation #4</b>                                    |
|           | Press and hold for ½ second, Activates Functions under code 4 |
| <b>S2</b> | <b>Local Activation #1</b>                                    |
|           | Press and hold for ½ second, Activates Functions under code 1 |
| <b>S3</b> | <b>Local Activation #2</b>                                    |
|           | Press and hold for ½ second, Activates Functions under code 2 |
| <b>S4</b> | <b>Local Activation #3</b>                                    |
|           | Press and hold for ½ second, Activates Functions under code 3 |
| <b>S5</b> | <b>Processor Reset</b>  |
| <b>S6</b> | <b>Site Address Switch</b>                                    |
|           | Sets units site number  |
| <b>S7</b> | <b>120/240 Vac Selector switch</b>                            |

### Speaker Output

You can use the speaker output at JP2 to monitor received audio, route remote P.A. or provide signal out when the tone generator option is used. You can adjust speaker output up to 2.0 V<sub>p-p</sub> into an 8-ohm load using R61.

|            |                                      |
|------------|--------------------------------------|
| <b>R61</b> | <b>Test Speaker output level set</b> |
|------------|--------------------------------------|

### Radio Adjustment (Not used with one-way)

If a two-way radio is connected to the Transceiver Interface Connector P1, radio deviation level adjustments need to be completed using the potentiometers listed below. For radio deviation level adjustment procedure refer to the DCFCTB manual.

|            |   |
|------------|---|
| <b>R48</b> | <b>External transceiver receive audio set to 1 V<sub>p-p</sub> at TP8</b> |
| <b>R70</b> | <b>MSK modem transmit deviation level set</b>                             |
| <b>R71</b> | <b>DTMF transmit deviation level set</b>                                  |

### Assigning Site Address (S1)

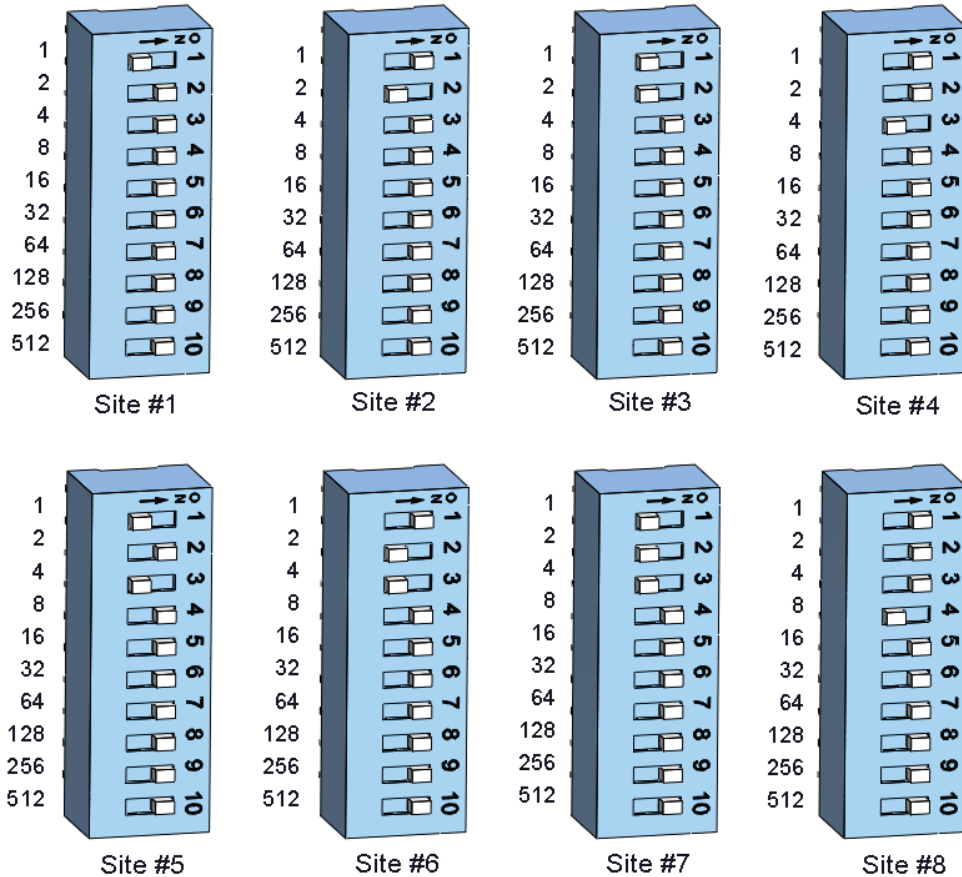
The site address switch gives each FC controller in a two-way system its unique unit number.

For use with Commander: In order for the siren to report back with its identity, define the site address by setting dip switches located on the board. The dip switches have values of 1, 2, 4, 8, 16, 32, 64, 128 256, 512. Add appropriate dip switch values to define the site number address.

Example

To define the board for Site #1 toggle first dip switch to the left. All other dip switches are to the right. For Site #2 toggle the second dip switch to the left. For Site #3 toggle the first and second dip switch to the left. For Site #4 toggle the third dip switch to the left. For Site #5 toggle the first and third dip switch to the left. Continue this method to define other site number addresses.

Figure 6 Setting the Switch Number Example



|               |   |   |   |   |    |    |    |     |     |     |
|---------------|---|---|---|---|----|----|----|-----|-----|-----|
| Switch number | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8   | 9   | 10  |
| Binary number | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 |

Example: Switch numbers 1, 2, and 3 are binary numbers 1, 2, and 4.

Add  $1 + 2 + 4 = 7$ ; 7 is the unit address

**NOTE:**

- Set site address to one to program controller card with firmware (HEX code).
- To program a non-digital unit using FSPWARE Software, set site address to one. When programming is completed, change the dip switch setting to the actual site address.
- The site address is stored at power up of the controller. If the site address is changed,

cycle all power to the card (battery and AC).

- For DTMF, 2 Tone Sequential Systems and MOSCAD only: The unit address is defined in the programming; therefore, all dip switches shall be positioned all to the right.

## Terminal Strips, Jacks, and Controls

### Connectors and Jacks for optional RF Receiver

For the FCH and FCU units.

|           |                  |
|-----------|------------------|
| <b>J1</b> |                  |
| Shield    | Ground           |
| Center    | Antenna RF Input |

|           |   |
|-----------|---|
| <b>J2</b> | <b>Radio to FC Controller Connector</b> |
|-----------|---|

### Squelch Controls

The squelch control adjusts the squelch threshold level.

|           |                        |
|-----------|------------------------|
| <b>R1</b> | <b>Squelch control</b> |
|-----------|------------------------|

## Programming

All functions of the FC Controller are programmable from a computer with an RS232 port using Federal Signal's FSPWARE programming software. The software allows configuration, uploading, and downloading of control programs.

Programming options include:

- Radio Receiver Frequency
- Single and Two-Tone Sequential Decode Tones and Tone Lengths
- DTMF Decode Digits
- EAS Events and Locations
- POGSAG messages
- Output Relay Timing Patterns

Up to six (6) control timing sequences may be programmed into the controller. Standard siren control timings can be chosen or custom relay output timings can be designed. The control functions can be activated from any combination of six (6) Single Tone, Two Tone Sequential and/or DTMF tones. Timing sequences can also be initiated using the local push buttons and contact closure inputs.

Configuration programs are stored in nonvolatile memory to ensure retention even during a complete power failure.

The Function Counter values, last decoded signal and current software revision are scrolled across the built-in LCD display.

## Maintenance

### Testing

Federal Signal recommends periodic testing of these systems to ensure operation is performing as expected. Users should define the appropriate schedule for testing. FEMA can be used to identify good practice for periodic testing requirements.

### Inspection

To inspect the controller:

1. Check the integrity of the installation. Make sure mounting; conduit, antenna, and connections are secure and sealed.
2. Check enclosure for signs of water entry or corrosion. Seal any leaks, and repaint any flaws in the painted finish.
3. Check contacts of the control relay(s). Replace relay(s) if contacts are excessively worn.
4. Confirm the CPU is flashing. (D48) If the LED is not flashing, the control board may be defective, or missing power.
5. Test the controller for proper operation. Test all functions of the controller locally and via radio when applicable.
6. If the controller is not operating properly, check the power supply.
7. Check power supply and AC for proper voltage.

## Options

**Table 20 Optional Accessories**

| Accessories        | Description  |
|--------------------|--|
| FSPWARE            | Federal programming software (Non-digital applications)  |
| FS-PL1             | Tone Coded and Digital Coded Squelch Decode  |
| PBS-4              | Pushbutton Panel   |
| 2001-AC            | 208-240 Vac Transformer Rectifier provides 48 Vdc to a NEMA4 enclosure with contactors for the Eclipse8 or 2001-130 siren head |
| RC2W-120 (Model 2) | Motor starter/cabinet NEMA 3R 120 Vac  |
| RC2W-240 (Model 2) | Motor starter/cabinet NEMA 3R 240 Vac  |
| 2-120              | Model 2, 120 VAC/DC Omni-directional Siren   |
| 2-240              | Model 2, 240 VAC/DC Omni-directional Siren   |
| PMS                | Model 2 Pole Mount   |

**Table 21 Antenna**

| Model     | Description                              |
|-----------|--|
| RP164     | Antenna Grounding Plane 132-928 MHz      |
| AMB-RP164 | Bracket, Antenna Mounting                |
| 10A3      | Cable, ANT, 25 feet,VCR (used for RP164) |



| Model | Description   |
|-------|---|
| 10A5  | Cable, ANT, 35 feet,VCR (used for RP164)                  |
| 10A6  | ANT ARC 136-512 MHZ 24 inches (mounted direct on cabinet) |

**NOTE:** Standard antenna connections are PL259 connector.

## Replacement Parts

To order replacement parts, call Customer Care. See Getting Service.

**Table 22 Replacement Parts**

| Description              | Part Number  |
|--------------------------|--|
| Antenna Cable            | Q175902A-07  |
| Bulkhead                 | Q124A056A  |
| Control Board            | Q2005263B (for systems before January 2019)<br>Q20000200C (for systems shipped after January 2019) |
| Radio Receiver High Band | Q2005240G-02   |
| Radio Receiver UHF Band  | Q2005240G-03   |

## Getting Service

If you are experiencing any difficulties, contact Federal Signal Customer Care at: 800-548-7229 or 708-534-3400 extension 5822 or Technical Support at: 800-524-3021 or 708-534-3400 extension 7329 or through e-mail at: [techsupport@fedsig.com](mailto:techsupport@fedsig.com). For instruction manuals and information on related products, visit: <http://www.fedsig.com/>



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Safety and Security Systems

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