FEDERAL SIGNAL
Safety and Security Systems

UltraVoice® Compact Siren/Speaker

Models: RF100UX and RF100HX
For use in hazardous locations

Description, Specifications, Configuration, and Installation Manual

25500705
Rev. A1 0423
Printed in U.S.A.

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. 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 or call +1 708-534-3400.

This limited warranty is in lieu of all other warranties, express or implied, contractual or statutory, including, but not limited to the warranty of merchantability, warranty of fitness for a particular purpose and any warranty against failure of its essential purpose.

FEDERAL SIGNAL
Safety and Security Systems

2645 Federal Signal Drive
University Park, Illinois 60484

www.fedsig.com

Customer Support	800-548-7229 • +1 708 534-3400
Technical Support	800-524-3021 • +1 708 534-3400

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⚠ 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's electric codes and will follow these guidelines as well as local codes and ordinances, including any state or local noise-control ordinances.

Planning

- If suitable warning equipment is not selected, the installation site for the RF100X is not selected properly, or the RF100X is not installed properly, it may not produce the intended optimum audible warning. Follow Federal Emergency Management Agency (FEMA) recommendations.
- If RF100X 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, be available at all times to authorize activation.
- When RF100Xs 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 warn people indoors effectively.
- 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. Review and comply with any local or state noise control ordinances as well as OSHA noise exposure regulations and guidelines.
- Activating the RF100X may not result in people taking the desired actions if those to be warned are not properly trained about the meaning of warning sounds. Users should follow FEMA recommendations and instruct those to be warned of corrective actions to be taken.

After installation, service, or maintenance, test the system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.

Safety Messages to Installers

People's lives depend on your safe installation of our products. It is important to follow all instructions shipped with this product. This device is to be installed by a trained electrician who is thoroughly familiar with the National Electrical Code and/or Canadian Electrical Code and will follow the NEC and/or CEC Guidelines as well as all local codes. NFPA70, Chapter 5, "Special Occupancies," must be followed. This RF100X should be considered a part of the warning system and not the entire warning system.

The selection of the mounting location for this RF100X, its controls, and the routing of the wiring is to be accomplished under the Facilities Engineer and the Safety Engineer's direction. Listed below are some other important safety instructions and precautions you should follow:

- Electrocution 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 compliance with national, state, and any other applicable codes, ordinances, and

regulations. Perform all work under the direction of the installation or service crew safety foreman.

- Read and understand all instructions before installing, operating, or servicing this equipment.
- This product shall be mounted at a minimum hearing distance of ten feet per FEMA guidelines limiting sound level exposure to 123 dBc maximum sound level.
- All effective warning sounds may, in certain circumstances, cause permanent hearing loss. Take appropriate precautions, including wearing adequate hearing protection. Do NOT exceed the maximum sound level exposure limits specified in OSHA 29 CFR 1910.
- I-IP100 series, DSA1, and DS100 devices are intended for permanent installation and operation per Title 46, Code of Federal Regulations, Parts 110–113, or Title 33, Code of Federal Regulations, Part 183, Subpart I, Section 183.410, and the applicable requirements of the American Boat and Yacht Council, Inc., and/or ANSI/NFPA 302, “Fire Protection Standard for Pleasure and Commercial Motor Craft.”
- For optimum sound distribution, do not install this speaker where objects would block any portion of the front of the RF100X.
- Do not paint the RF100X. No finish or coating is required. Paint may obstruct the sound output, reducing the effectiveness of the horn.
- Establish a procedure to check the signal system for proper activation and operation routinely.
- Any maintenance to the unit MUST be performed by a trained electrician per NEC Guidelines and local codes or a Federal Signal certified Service Provider.
- Never modify or alter the unit in any manner.
- The nameplate should NOT be obscured, as it contains cautionary and/or other information of importance to maintenance personnel.
- After installation and completion of the initial system test, provide a copy of these instructions to all personnel responsible for the operation, periodic testing, and maintenance of the equipment.
- File these instructions in a safe place and refer to them when maintaining, servicing, and/or reinstalling the device.
- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F and G; Class III or nonhazardous locations only.
- Substitution of any components may impair suitability for Division 2.

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

⚠ WARNING

EXPLOSION HAZARD: Do not disconnect the equipment unless power has been switched off or unless the area is known to be non-hazardous.

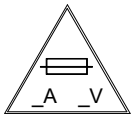
⚠ WARNING

EXPLOSION HAZARD: Do not remove or replace fuse when energized.

Installation and Service

- After installation or service, test the 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 and are not properly trained, the system may not provide the intended audible warning, and service personnel may be exposed hazards that could result in death, permanent hearing loss, or other bodily injuries. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to recruits and trainees. Also give a copy to anyone who is going to service or repair the RF100X.
- To reduce the risk of electric shock, do not perform any servicing other than what is contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel. Always test the RF100X before using it after repairs have been made. Comply with all applicable OSHA standards regarding Lock Out/Tag Out.

Symbol Definition



Indicates to reduce the risk of fire, replace the fuse as marked.

Pay careful attention to the notice located on the equipment.

Hazard Classification

Federal Signal uses signal words to identify the following:

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

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

General Description

Introduction

The UltraVoice® Compact Siren/Speaker (RF100X) is an outdoor or indoor RF-enabled high-powered speaker with an integral controller and radio that can be used in hazardous (classified) locations. The RF100X is part of Federal Signal's UltraVoice series of products. Use the RF100X as a warning and alerting device with both audible and visual indicators. The audible capabilities include locally stored, high-quality, high-powered tones, pre-recorded voice messages, and live PA. The visual indicators include the use of strobes and lights. Equip the RF100X with up to four local initiation devices (switches) to activate the unit locally.

The RF100X is equipped with either a VHF or UHF two-way radio. The two-way radio allows for configuring the controller, activating the speaker, or polling for supervision. The radio and controller can accept single-tone, two-tone, DTMF, EAS, and Federal Signal MSK digital for speaker communications. Using Federal Signal MSK digital provides a secure communications channel.

The RF100X has an internal 100-watt amplifier/driver to deliver tone warnings and intelligible voice messages from RF100X stored memory. The RF100X has remote volume control for optimizing sound levels across your alerting area. The remote volume control also includes an ambient noise monitoring capability to automatically adjust the volume depending on external noise levels.

The RF100X is powered from either 120/240 Vac or 24 Vdc. When the RF100X is powered from AC, there are four solid-state relay outputs to activate AC-powered visual alert devices. When the RF100X is powered from DC, there is a DC solid-state relay output. The RF100X has a 1/2-inch NPT opening on the top of the speaker for simple installation of pipe mount devices such as strobes. The bottom of the speaker has three 3/4-inch NPT openings to allow access to power, relay outputs, and activation inputs. The rear cover also includes an N-type connection for the external RF antenna. Use the Commander® software system to configure the speaker for specific alerts and the outputs for strobe or visual devices.

The RF100X comes with an adjustable stainless steel wall mount bracket that allows the angle of the speaker to be adjusted. Optional pole mount brackets are available for small and large diameter poles.

Features

The RF100X has the following features; some features require the use of the Commander® software system:

- Compact, self-contained siren/speaker
- High-powered outdoor or indoor RF-enabled speaker for audible and visual alerts
- Equipped with integrated UHF or VHF two-way radio with an external antenna connection
- Small size with rugged NEMA4X construction
- Speaker rated at 120 dBa for tones and 114.5 dBa for voice at 10 feet

- Seven standard built-in warning signals: Wail, Steady, Alternate Wail, Alternate Steady, Pulsed Wail, Pulsed Steady, Auxiliary Chime
- Broadcasts live voice and prerecorded voice or tone files
- Deliver intelligible voice messages from locally stored prerecorded files or from over-the-air P.A.
- Includes a removable microSD card for custom message generation. Store over 4000 voice or tone messages that total up to 17 hours of recording time.
- Ambient noise level monitoring with automatic volume control
- Each device can be individually configured for volume and noise-level adjustments
- Remote volume control for optimizing sound levels
- Activation via single-tone, two-tone, DTMF, EAS, and MSK using Commander® secure communications
- Wall, pole, or omni-directional mount options
- Combine with DS100 for a multi-direction system
- Four local initiation inputs to activate unit locally
- Outputs to control strobes or other devices
- Powered from either 120/240 Vac or 24 Vdc
- Wide outdoor temperature operating range
- Commander® software provides full two-way control and status monitoring
- Secure communications using Commander® 128/256-bit encryption
- Listed to UL 464A and complies with FCC Title 47, Part 15
- The RF100X models are designed specifically for use in Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F and G; and Class III locations as defined in the National Electrical Code (NEC) ANSI/NFPA 70.

Commander Software System (SFCDWARE)

Commander® is software used to control, monitor, and configure the siren controller. Configuration of the speaker is done either at the factory or using Commander® software. When configuring with Commander® software, use with a serial connection for local configuration. The speaker can be programmed or reconfigured over the RF channel.

See the UltraVoice Compact Siren/Speaker Setup, Program, and User manual (part number 25500714) for more information.

Digital Voice Wizard

Loading voice or tone files onto the microSD card requires a PC and proper file naming. Use the Digital Voice Wizard to load and name files onto a microSD card correctly.

Ordering Information

Table 1 Ordering Information

Part Numbers	Description
RF100U	Radio Controlled Siren/Speaker with UHF radio
RF100H	Radio Controlled Siren/Speaker with VHF radio
RF100UX	Radio Controlled Siren/Speaker with UHF radio for Hazardous Location
RF100HX	Radio Controlled Siren/Speaker with VHF radio for Hazardous Location
Q19902536A	Radio Programming Software with USB Interface Cable Kit
Q19902535A	RF100 and RF100X Lightning Surge Suppressor
AMB-P	Large pole side mount (6-inch diameter or larger), all antennas
AMB-W	Antenna bracket for offset wall mounting
AMB-LP-U	UHF antenna bracket for large pole top mount (6-inch diameter or larger), includes bracket and bolts. Bands not included.
AMB-LP-H	VHF antenna brackets for large pole top mount (6-inch diameter or larger), includes two brackets and bolts. Bands not included.
AMB-LP-Y	Yagi antenna bracket for large pole mount (6-inch diameter or larger), includes bracket and bolts. Bands not included.
AMB-SP-U	UHF antenna bracket for small pole, includes bracket and bolts
AMB-SP-H	VHF antenna brackets for small pole, includes two brackets and bolts
AMB-SP-Y	Yagi antenna bracket for small pole, includes bracket and bolts
I-IP100-PM	Small pole mount (2-3/8 to 4-1/2 inch diameter) for RF100 and RF100X Speakers
I-IP100-PMW	Large pole mount (6-inch diameter or larger) for RF100 and RF100X Speakers
I-IP100-OMNI	Omni directional option for speaker with hardware

Table 2 Omni Antenna Kits

Part Number (with 35 ft cable)	Part Number (with 10 ft cable)	Frequency
OMNI-0	OMNI-0-10	138-140 MHz
OMNI-1	OMNI-1-10	140-144 MHz
OMNI-2	OMNI-2-10	144-148 MHz
OMNI-3	OMNI-3-10	148-152 MHz
OMNI-4	OMNI-4-10	152-156 MHz
OMNI-5	OMNI-5-10	156-162 MHz
OMNI-6	OMNI-6-10	162-168 MHz
OMNI-7	OMNI-7-10	168-174 MHz
OMNI-15	OMNI-15-10	450-460 MHz
OMNI-16	OMNI-16-10	460-470 MHz

Table 3 YAGI Antenna Kits

Part Number (with 35 ft cable)	Part Number (with 10 ft cable)	Frequency
YAGI1	YAGI1-10	136-150 MHz
YAGI2	YAGI2-10	150-174 MHz
YAGI10	YAGI10-10	450-470 MHz

Configuring the RF100X requires Federal Signal Commander® application software (sold separately).

The RF100X can be field configured or factory preconfigured to customer requirements. Contact your local representative for a quotation.

Antenna and brackets are sold separately.

Specifications

Table 4 Specifications

Electrical	
AC Operating Voltage	Switch-selectable 120/240 Vac
AC Input Current	55 mA in standby 2.3 A at full power (no external relay loads) 5.5 A at full power (with fully loaded relays)
DC Operating Voltage	24 Vdc
DC Input Current	75 mA in standby 6.2 A at full power (no external relay loads) 9.9 A at full power (with fully loaded relays)
Maximum Sound Pressure Level	120 dB (± 2 dB) at 10 feet 130 dB (± 2 dB) at 1 m at 100 W

Table 5 Hazardous Location Ratings

T-CODE AT 40°C	
CLASS I, DIV 2, GRPS A,B,C,D	T3B
CLASS II, DIV 2, GRPS F,G	T5
CLASS III	T5

Table 6 Environmental and Physical

Operating temp range	-40˚F to 104˚F (-40˚C to +40˚C)
Humidity range	0-95%, non-condensing
Size (Width x Length x Depth)	9.4 x 8 x 12.6 inches (23.9 x 20.3 x 32.0 cm)
Weight	21 lb (9.5 kg)

Table 7 Radio Communication

Number of functions Commands allowed stacked under each function	Up to 50 user-defined functions Up to 20

Two Tone Sequential Frequency range Tone timing Inter-tone Gap Tone Accuracy Tone Spacing	(Not a secure communications method) 282-2600 Hz First Tone: 0.5 second minimum Second Tone: 0.25 second minimum 8 seconds maximum for both tones 400 ms (maximum) +/- 1.5% 5.0% preferred, 3% minimum
Single Tone Frequency range Tone timing Tone Accuracy Tone Spacing	(Not a secure communications method) 282-2600 Hz 0.5-8 seconds maximum +/- 1.5% 5.0% preferred, 3% minimum
DTMF String length Mark/Space timing: Decoder Minimum Decoder Maximum Encoder Space between Stacked codes	(Not a secure communication method) 3-12 standard DTMF characters 50 ms/50 ms (See JP4 for fast DTMF) 800 ms total mark/space timing per character 100 ms/100 ms mark/space timing 1.25 seconds, minimum
AFSK Baud rate Modem type Mark frequency Space frequency Error checking	Federal Signal recommends the use of encryption for secure activations. 1200 bps MSK (minimal shift key) 1200 Hz 1800 Hz 16-bit CRC
EAS	Supports standard EAS codes and wildcards.
Decode Sensitivity	18 dB SINAD for Tone at 3 kHz deviation (except with CTCSS tones >200 Hz and decode tones < 400 Hz) and 21 dB SINAD for MSK, EAS, and DTMF with 50 ms/50ms or greater timing
Two Way Formats	Federal Signal uses MSK for communications. Use of encryption is recommended.

Table 8 Input and Outputs

AC Solid-State Relay Outputs Quantity Contact Rating	 4 1 A, 96-264 Vac (supplied from AC power input) Optically isolated, zero crossing fused at 2 A
DC Solid-State Relay Output Quantity Contact Rating	 1 5 A, 28 Vdc max with external DC power, 250 mA when powered from AC supply. Optically isolated, inrush current limited
Local Activation Inputs Quantity Input Type	 4 Optically Isolated activated by Dry Contact closure < 1 kΩ

Audible Indications Warning Siren Audio Pre-recorded files	 Seven user-configurable tones Over 4000 voice or tone messages that total up to 17 hours of recording time
Audio Outputs Balanced 24 kΩ 10 V_{RMS} Output	 0.2-10.0 V_{RMS}

Configuration

Connectors

The following table provides a description of the RF100X Controller Board connections.

Table 9 Connectors

JP1	AC Solid-State Relay Outputs 1 – Solid-State Relay #1 Hot 2 – Solid-State Relay #1 Neutral 3 – Solid-State Relay #2 Hot 4 – Solid-State Relay #2 Neutral 5 – Solid-State Relay #3 Hot 6 – Solid-State Relay #3 Neutral 7 – Solid-State Relay #4 Hot 8 – Solid-State Relay #4 Neutral
JP2	Balanced 10 V_{RMS} Audio output
JP6	AC Input – distributed to amplifier and AC outputs 1 – L1 / Hot 2 – L2 / Neutral 3 – Earth Ground
JP7	AC Power Output to Amplifier – 1.50 Amps AC maximum, prewired from the factory. 1 – L1 / Hot 2 – L2 / Neutral 3 – Earth Ground
JP8	Transceiver Port
JP9	Controller / Amplifier Interface
JP10	microSD FLASH card holder
JP12	Activation Inputs **NOTE**: Each input is activated by shorting the two pins associated with the input.
JP13	Serial Port
JP14	DC Power Input 1 – (+) Nominal 24 Vdc 2 – (-) GND
JP15	DC Solid-State Relay Outputs 1 – Solid-State Relay #1 (+) 24 V 2 – Solid-State Relay #1 (-) GND
JP16	DC Power Output to Amplifier 1 – (+) Nominal 24 Vdc 2 – (-) GND
J1	Factory use only.

Jumpers and Switches

The following table provides a description of the RF100X Controller Board jumpers and switches.

Table 10 Configuration Jumpers (Located on the control board.)

JP3	Disable Digital Receive. Short to disable. Disabling will disable all digital radio communication.
JP4	Fast DTMF Decode. Short for fast timing. The standard is not shorted.
JP5	Options Jumper 1: 1 – Microcontroller Input 2 – Ground
JP11	Options Jumper 2: 1 – Microcontroller Input 2 – Ground
JP17	Short to put unit in Test mode.
JP18	+/- Shorted center to plus is active high, which is the default. Shorted center to minus is active low.

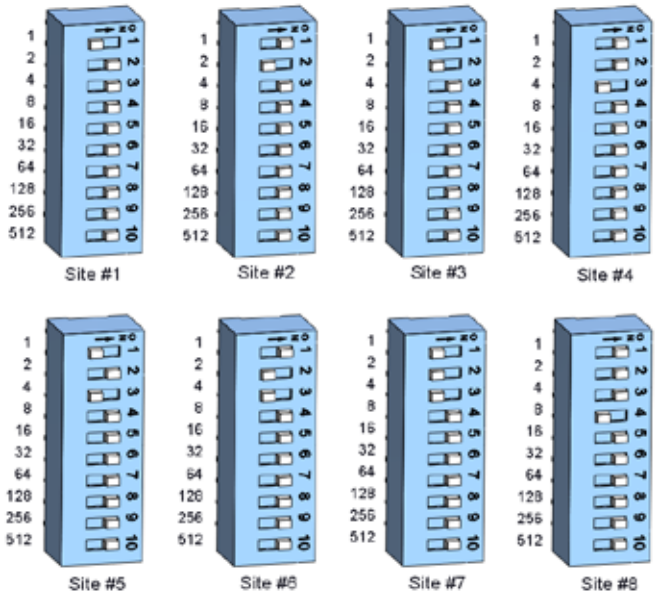
Site Address Switch–Located on the control board (S1)

For digital systems only: 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 the 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 1 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: Programming details are in the software manual. The site address is stored at power up of the controller. If the site address is changed, the power (battery and AC) must be turned off and then on.

Visual Indicators

The following table provides a description of the RF100X Controller Board visual indicators.

Table 11 Visual Indicators (Located on internal control board.)

D1	CPU
D4	Relay output #1
D2	Relay output #2
D5	Relay output #3
D3	Relay output #4
D31	Relay output #5
D7	TX PTT
D10	Digital input #1
D12	Digital input #2
D19	Digital input #3
D21	Digital input #4
D11	Isolated Power Supply
D15	CARRIER - RF Carrier Indicator on with carrier present.
D23	Amplifier Output Voltage
D28	Amplifier Output Current
D29	DC Power
D35 and D37	Receive Level indicator, Off when the receive level is too low. D37 (Green) on when the receive level is correct. D35 (Yellow) on when the receive level is too high

Radio Interface

The RF100X has a built-in radio that is programmed at the factory. If changes are required, contact Federal Signal or a local radio shop.

Programming Functions

The RF100X can store up to fifty unique functions. Each function contains up to twenty stacked commands. Assigning more than one command (for example, relay on, digital message 1, 2, and 3, relay off) to each activation code or function allows you to run a sequence of commands without sending additional activations. A complete list of activation functions is found in the Commander® Software Reference Manual.

Installation

⚠ WARNING

Read and adhere to all safety warnings in this manual before installing the RF100X.

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F and G; Class III or nonhazardous locations only.

⚠ WARNING

SOUND HAZARD: The sound output of speakers is capable of causing permanent hearing damage. Ensure people are not exposed to sounds exceeding 120 dB– post warnings where applicable.

⚠ DANGER

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

Before installing, commissioning, or performing maintenance for the RF100, visit www.fedsig.com/warning-mass-notifications-systems-tech-support to download the ICM checklist for the RF100.

Determine a Suitable Location

The RF100X can be mounted on any relatively flat surface with the supplied mounting brackets. The mounting surface must be capable of supporting the weight of the speaker.

As a general rule, the warning signal SPL should be at least 10 dB above the ambient sound level to ensure it will be heard. Speaker fidelity and placement will also affect voice intelligibility. Review and comply with any local or state noise control ordinances as well as OSHA noise exposure regulations and guidelines.

Many factors affect the propagation of sound through barriers, over various types of materials, terrain, and changing weather conditions. Consult FEMA CPG1-17, CPG1-14, and your local Federal Signal representative for assistance to place your warning equipment properly.

Selectively turn on RF100X units and test for proper sound coverage.

Determine the Mounting Method

The following speaker and antenna mounting options are available for the RF100X.

Table 12 Speaker and Antenna Mounting Options

Mounting Options	Description
Flat Wall Mount	• A wall-mount bracket is included with the speaker. • The model AMB-W antenna wall mount bracket is available to provide a pipe mount off the surface of the wall.
Larger Pole Mount (6-inch or larger diameter poles)	• Use a model I-IP100-PMW to attach the speaker to the pole. The bracket can be secured with lag bolts or stainless steel banding. • AMB-LP-Y bracket is for YAGI antenna mounting. • AMB-LP-H brackets are for VHF top of pole antenna mounting. Two brackets are included in the kit. • AMB-LP-U bracket is for UHF top of pole antenna mounting. • AMB-P bracket is for side pole mounting any Federal Signal antenna.
Small Pole Mounting (2-3/8 inch to 4-1/2 inch diameter poles)	• Use a model I-IP100-PM to attach the speaker to the pole. U-bolts are provided for pipe mounting. • AMB-SP-Y bracket is for YAGI antenna mounting. U-bolts are provided for pipe mounting. • AMB-SP-H brackets are for VHF top of pole antenna mounting. U-bolts are provided for pipe mounting. Two brackets are included in the kit. • AMB-SP-U bracket is for UHF top of pole antenna mounting. U-bolts are provided for pipe mounting. **NOTE**: Federal Signal does not recommend side pole antenna mounting for omni-directional antennas.

Wall Mounting

The RF100X comes standard with a bracket for vertical wall or pole mount with optional pole accessories. The standard mount can be flipped to allow ceiling mount.

To wall mount the RF100X:

1. Find a suitable location to mount the speaker. Use industry or company preferred practices when mounting hardware to structures.
2. Verify the mounting is adequate to hold the weight of the speaker, cables, and visual devices if equipped.
3. Refer to Figure 2 or use the U-shaped wall bracket as a template to scribe the mounting hole locations.
4. Mount the RF100X to the mounting surface with user-supplied hardware. Federal Signal recommends 3/8-inch fasteners.
5. Loosen the pivot bolts to provide the direction of the speaker.

Attaching the Mounting Brackets to the Speaker Housing

The RF100X comes standard with a bracket attached for vertical wall or pole mount with optional pole accessories.

To attach the bracket to the speaker:

1. The mounting brackets are attached to the speaker, as shown below, using the six supplied 1/4-20 by 5/8-inch screws.

   Note the orientation of the curved slots on the L-shaped brackets; this orientation is important for the speaker to pivot downward.

2. Tighten the 1/4-20 by 5/8-inch screws to approximately 80 in-lb.

3. Attach the U-shaped wall bracket with four supplied sets of 3/8-16 by 1-inch bolts, flat washers, lock washers, and nuts.

Figure 2 Bracket attached to speaker

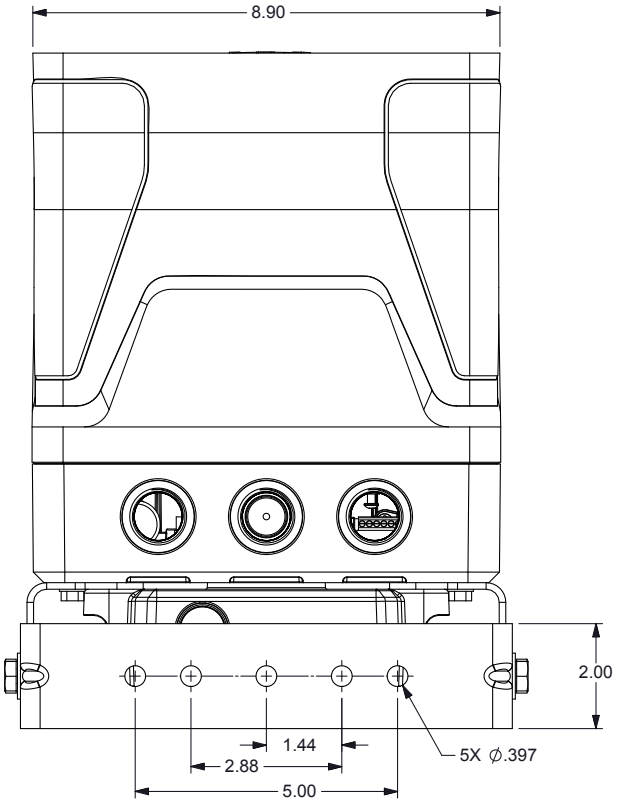


Figure 3 Depth and height with bracket

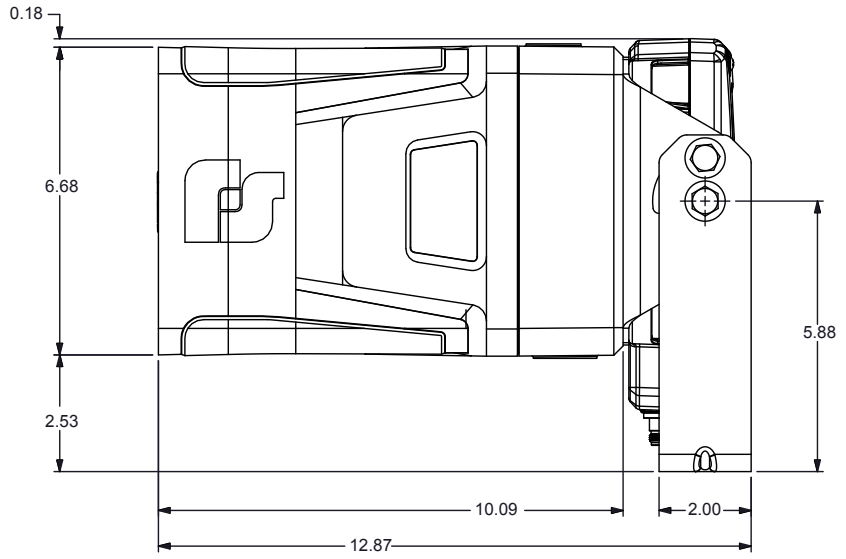
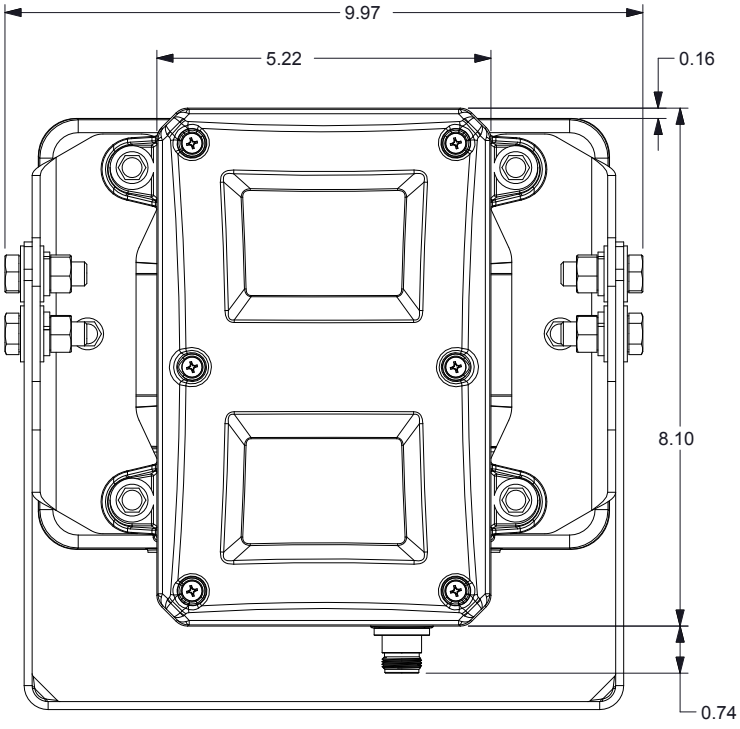


Figure 4 Back view of speaker



Pole Mounting

The RF100X comes standard with a bracket for vertical wall or pole mount with optional pole accessories.

Large Pole Mounting (6-inch diameter or larger)

Use the I-IP100-PMW bracket kit for poles that have a diameter of 6 inches or larger. The following figures illustrate typical examples of a pole installation with a bracket and antenna. The Yagi and Omni Antennas Installation manual is available for download at the Federal Signal website (part number 25500445).

IMPORTANT: Ensure that the antenna base is mounted more than 36 inches from the top of the RF100X.

Use the following procedure to mount the speaker with the optional I-IP100-PMW bracket:

1. Find a suitable location to mount the speaker. Use industry or company preferred practices when attaching hardware to poles or other structures.
2. Attach the I-IP100-PMW bracket to the pole using banding or use the pre-drilled holes to bolt the bracket to the pole or structure.
3. Using the supplied flat washers, lock washers, and 3/8-inch nuts, mount the speaker to the I-IP100-PMW bracket.
4. Use the side-pivot bolts to allow adjustment of the speaker up and down to optimize speaker effectiveness.

Figure 5 Bracket Kit I-IP100-PMW

Figure 6 Large Pole Mount with Yagi Antenna

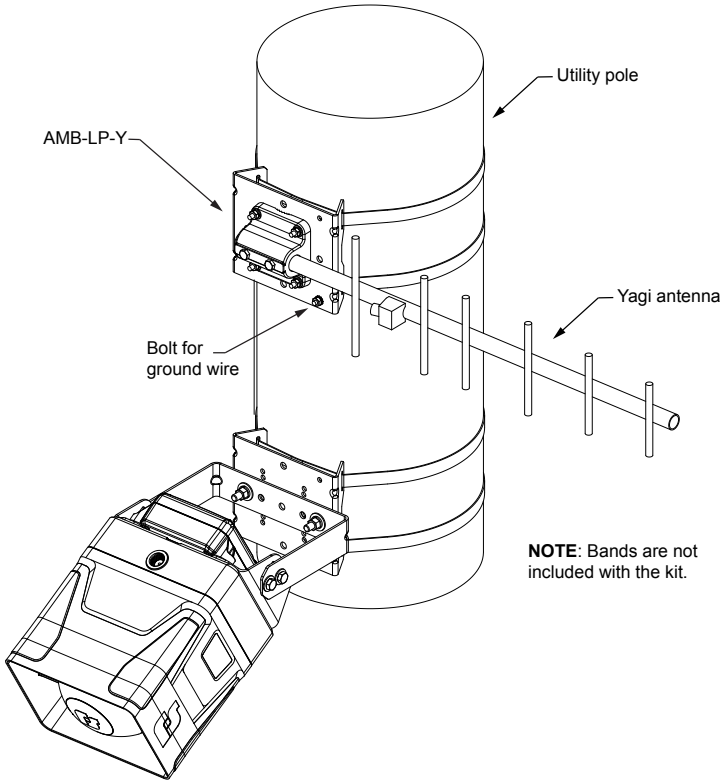


Figure 7 Large Pole Mount with UHF Antenna

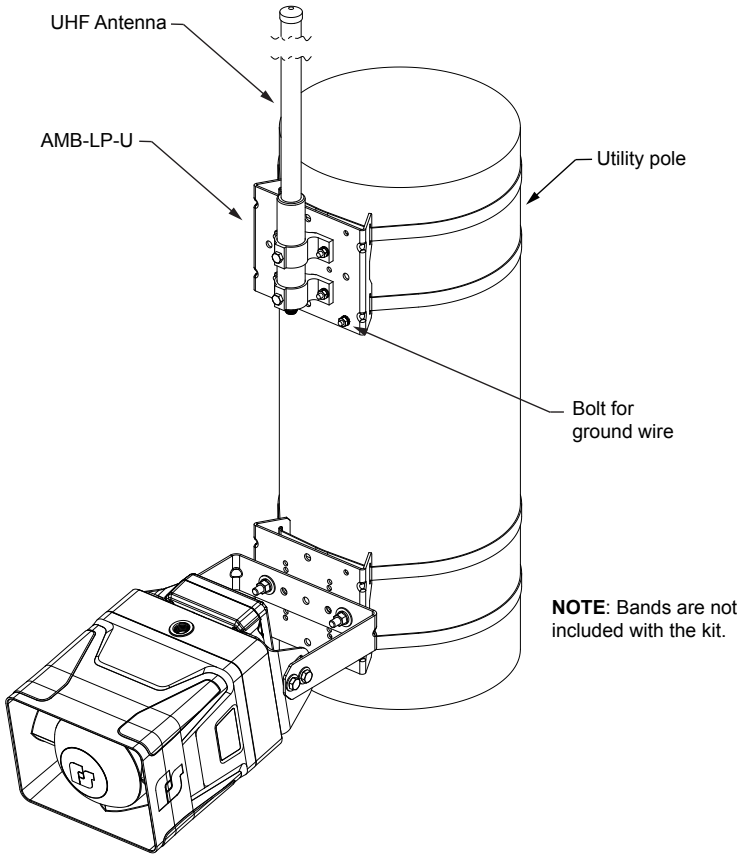
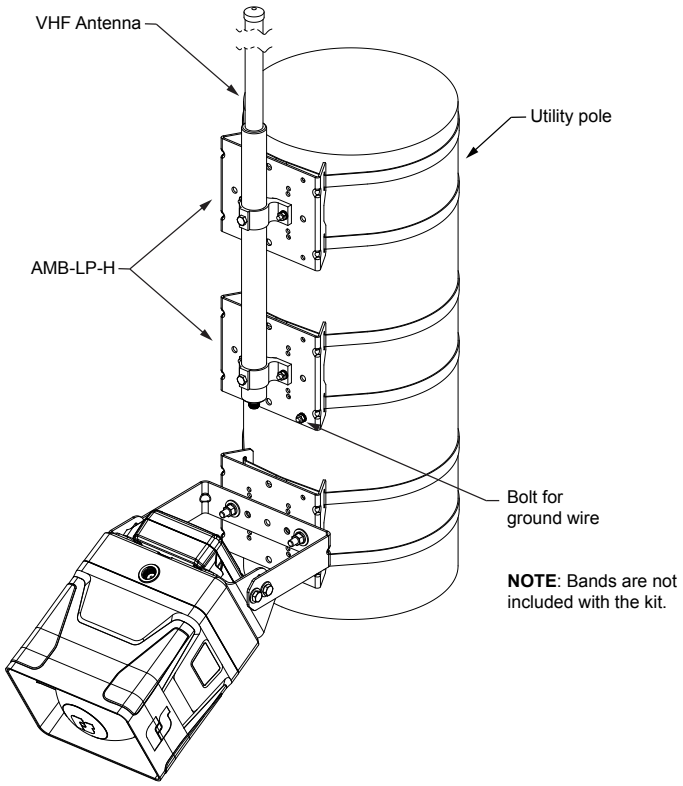


Figure 8 Large Pole Mount with VHF Antenna



Small Pole Mounting (2-3/8 inch to 4-1/2 inch diameter poles)

Use the I-IP100-PM bracket kit for poles that have a diameter between 2-3/8 and 4-1/2 inches. The following figures illustrate typical examples of a pole installation with a bracket and antenna. The Yagi and Omni Antennas Installation manual is available for download at the Federal Signal website (part number 25500445).

IMPORTANT: Ensure that the antenna base is mounted more than 36 inches from the top of the RF100X.

Use the following procedure to mount the speaker with the optional I-IP100-PM bracket:

1. Find a suitable location to mount the speaker. Use industry or company preferred practices when attaching hardware to poles or other structures.
2. Remove the speaker U-shaped bracket; store the pivot/lock bolts.
3. Select the proper I-IP100-PM U-bolt for the pole.
4. Attach the U-shaped bracket from the speaker to the pole using the I-IP100-PM U-bolt, bracket, nuts, and washers.
5. Attach the speaker and set direction using the pivot and lock bolts.

Figure 9 Bracket Kit I-IP100-PM

Figure 10 Small Pole Mount with Yagi Antenna

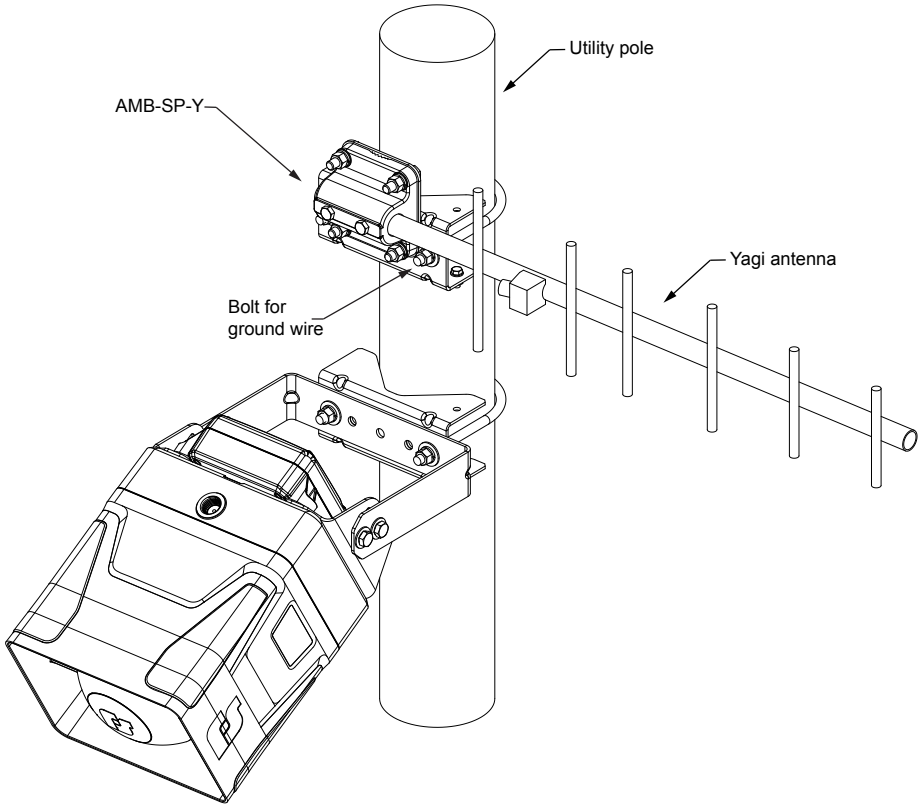


Figure 11 Small Pole Mount with UHF Antenna

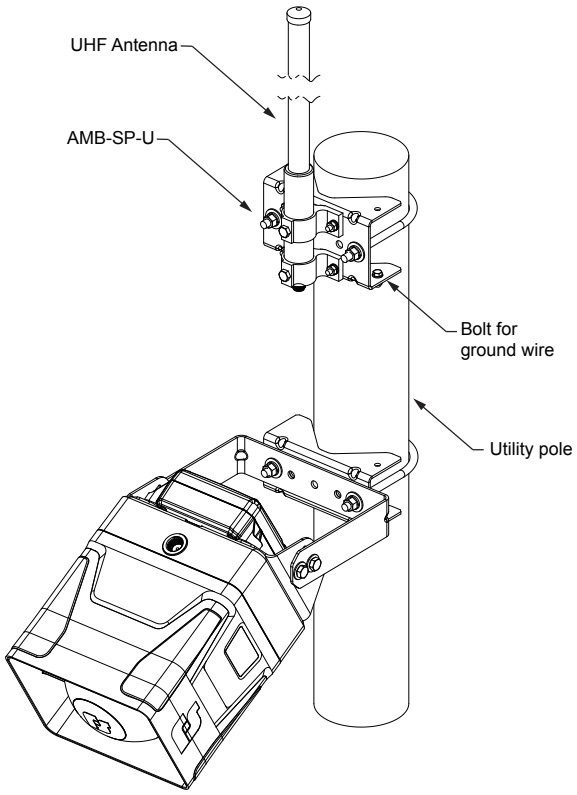
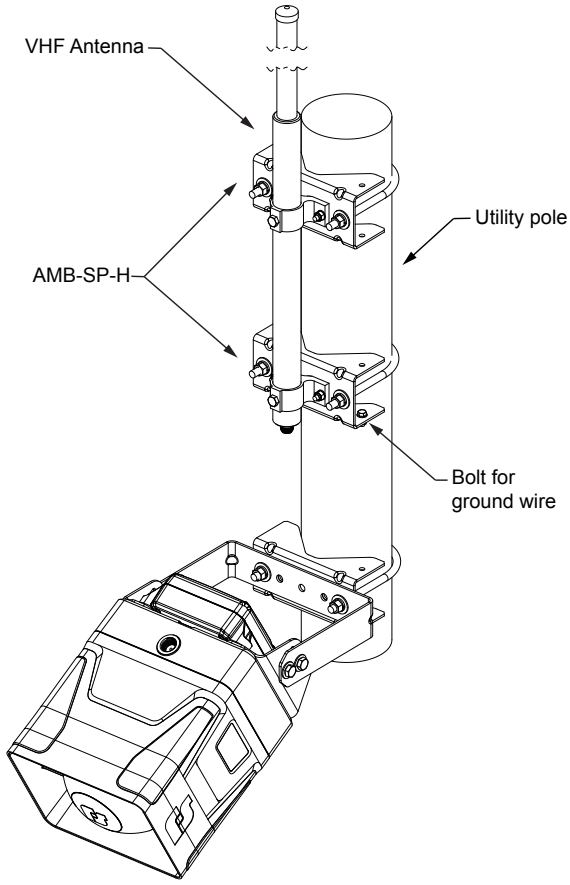


Figure 12 Small Pole Mount with VHF Antenna



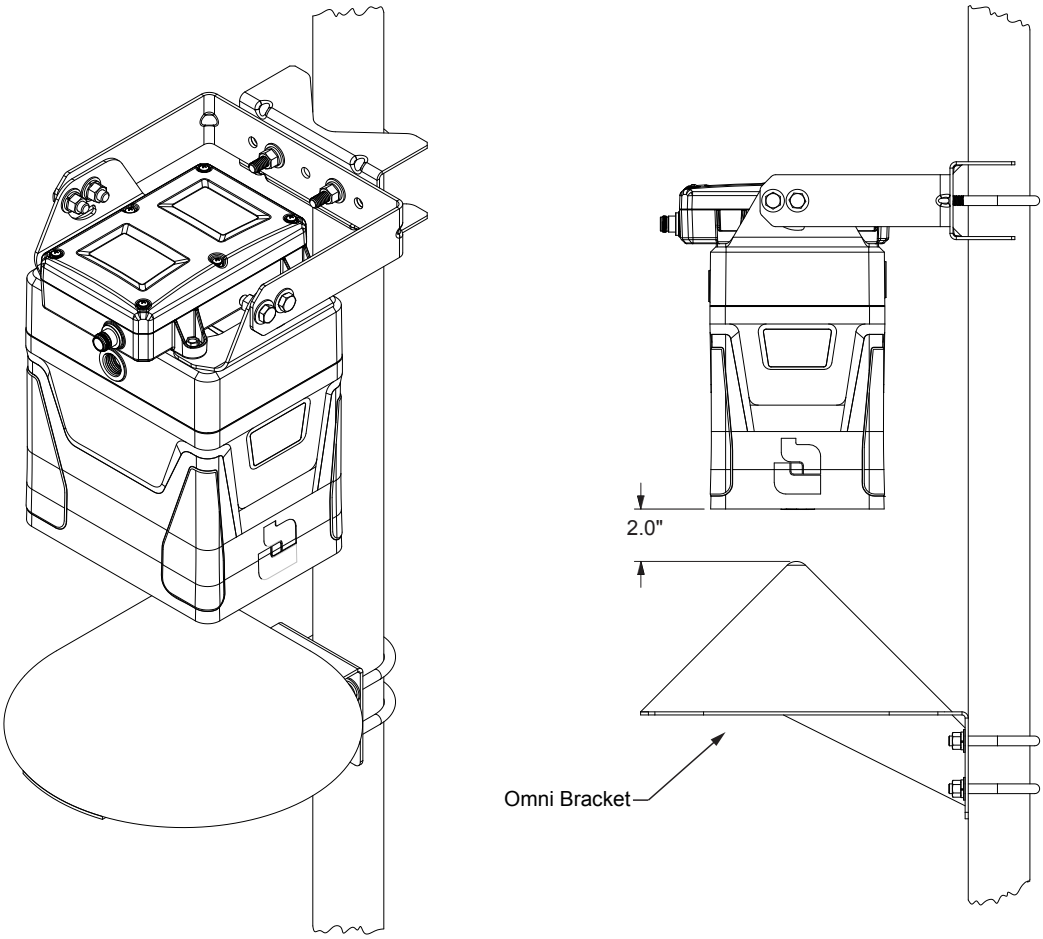
Mounting with Omni Direction Bracket (2-3/8 inch diameter pole)

Use the I-IP100-OMNI bracket kit to create an omni-directional speaker. The speaker is mounted as described in the Small Pole Mounting section, with the omni bracket mounted at a distance of 2.0 inches from the speaker.

To mount the speaker with the optional I-IP100-OMNI bracket

1. Identify the desired location for the bracket.
2. Consult Technical Support on the procedure to remove the radio and turn in the opposite direction.
3. Attach the bracket using the supplied U-bolts and hardware.

Figure 13 Bracket Kit I-IP100-OMNI



Using Optional Warning Lights

Warning lights, such as strobes, often have a high inrush current that may damage mechanical relays. A solid-state relay is used to minimize potentially high inrush current devices. Use the AC solid-state relay outputs for control of the AC-powered visual indicators or other devices.

See the following list of Federal Signal AC powered warning lights that may be controlled by the RF100X:

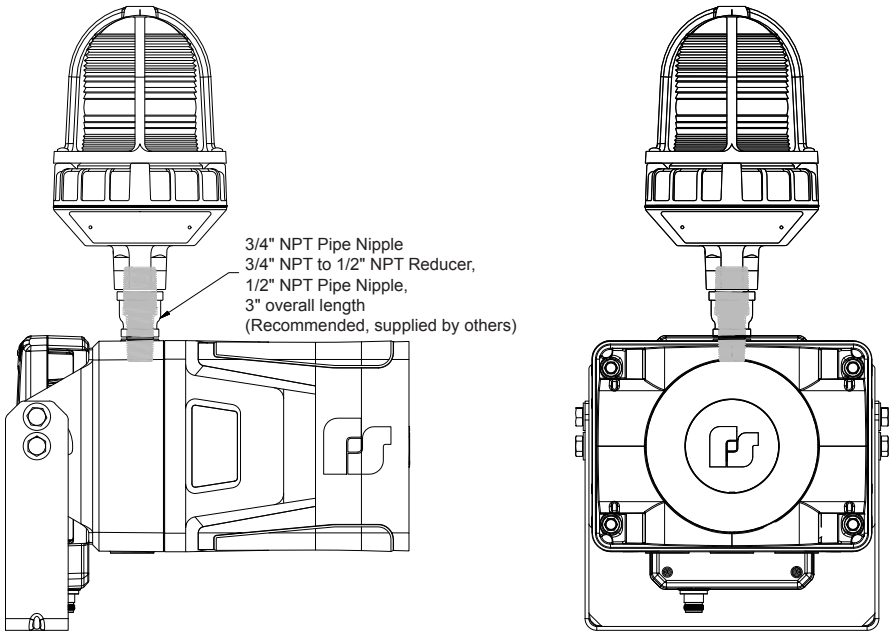
- 225X Electraray® Hazardous Location Rotating Warning Light
- 371LEDX Hazardous Location Commander® LED
- FB2LEDX Fireball Hazardous Location LED Warning Light
- 191XL Hazardous Location Division Listed LED Warning Light
- 225XL Electraray® Hazardous Location LED Flashing Warning Light
- 225XST and 225XST-I Electraray® Hazardous Location Strobe Warning Light
- 151XST Hazardous Location Warning Light

NOTE: When the RF100X is powered from AC, the DC current is limited. See Specifications. Do not exceed the rated power when using AC.

Use the DC solid-state relay for 24 Vdc warning lights or devices. When the RF100X is powered from 24 Vdc, the solid-state relay output can provide power to the following visual indicators:

- 191XL Hazardous Location Division Listed LED Warning Light
- FB2LEDX Fireball Hazardous Location LED Warning Light
- 225XL Electraray® Hazardous Location LED Flashing Warning Light
- 225XST and 225XST-I Electraray Hazardous Location Strobe Warning Light
- 151XST Hazardous Location Warning Light

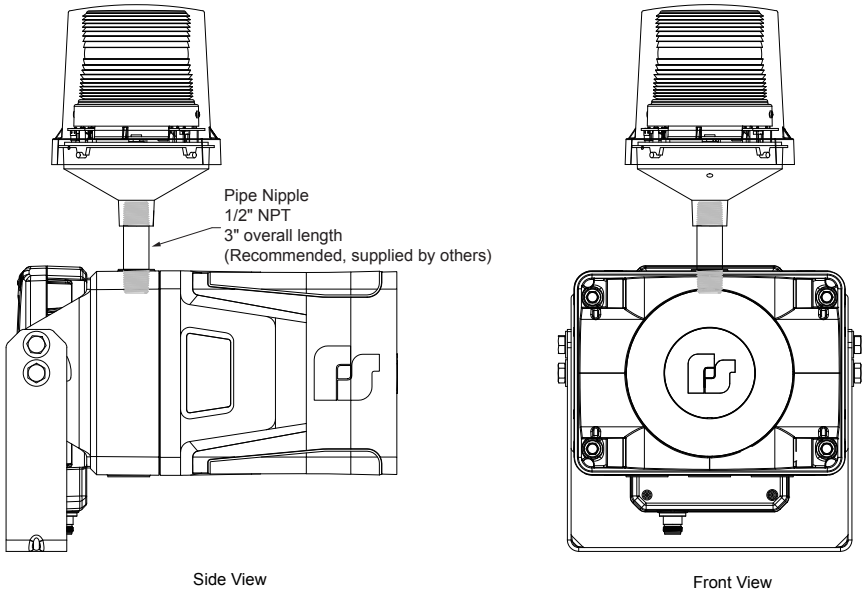
Figure 14 151XST Strobe with RF100X



For a 151XST Strobe, the following is recommended (customer supplied):

- 1/2-inch NPT Pipe Nipple
- 3/4- to 1/2-inch NPT Reducer
- 3/4-inch NPT Pipe Nipple (3 inches overall length)

Figure 15 225XST/225XL Strobe with RF100X



For a 225XST/225XL Strobe, the following is recommended (supplied by others): 1/2-inch NPT Pipe Nipple (3 inches overall length).

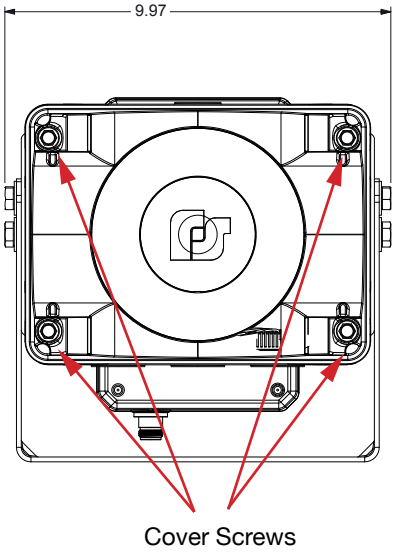
Opening the Housing

Tools required:

- 3/8-inch socket
- 6-inch extension

To open the housing, loosen the four cover screws while supporting the housing so it does not fall. (The cover screws are retained in the housing.) The front of the unit is heavy but it is attached to the rear housing with a pivot hinge to allow ease of service. If the unit requires service, replace the front housing, amplifier, and power supply (if equipped) as an entire unit.

Figure 16 Opening the speaker



Digital Voice Recording

The RF100X control board includes a microSD card capable of storing over 4,000 voice or tone messages that total up to 17 hours of total recording time. Federal Signal can provide custom or standard voice messages.

The RF100X comes from the factory with a standard set of voice and tone files loaded on the microSD card. To change the files, remove the microSD card from JP10 and use a PC to change, add, or delete files. Reinsert the microSD card back into JP10 before closing the RF100X.

The digital voice message file format is 8000 samples per second, 8 bit, mono. Siren sounds, horn sounds, and music should be at no more than 90% of the maximum level (-1 dB) to prevent them from overdriving the amplifier and overpowering the drivers. These can be normalized to set them at the maximum level and then reduced to 90% or -1 dB. This will deliver full nominal output power.

Save these messages with a DV#.wav naming format, or the messages are not recognized. This naming format results in messages DV1.wav through DV4093.wav. Federal Signal recommends using the Digital Voice Wizard.

You need to filter the files to reduce content below 300 Hz. This prevents low-frequency tones in a recording from saturating the output transformer and the speaker drivers.

NOTICE

SPEAKER DAMAGE: The speaker drivers cannot reproduce these frequencies and can be damaged by them.

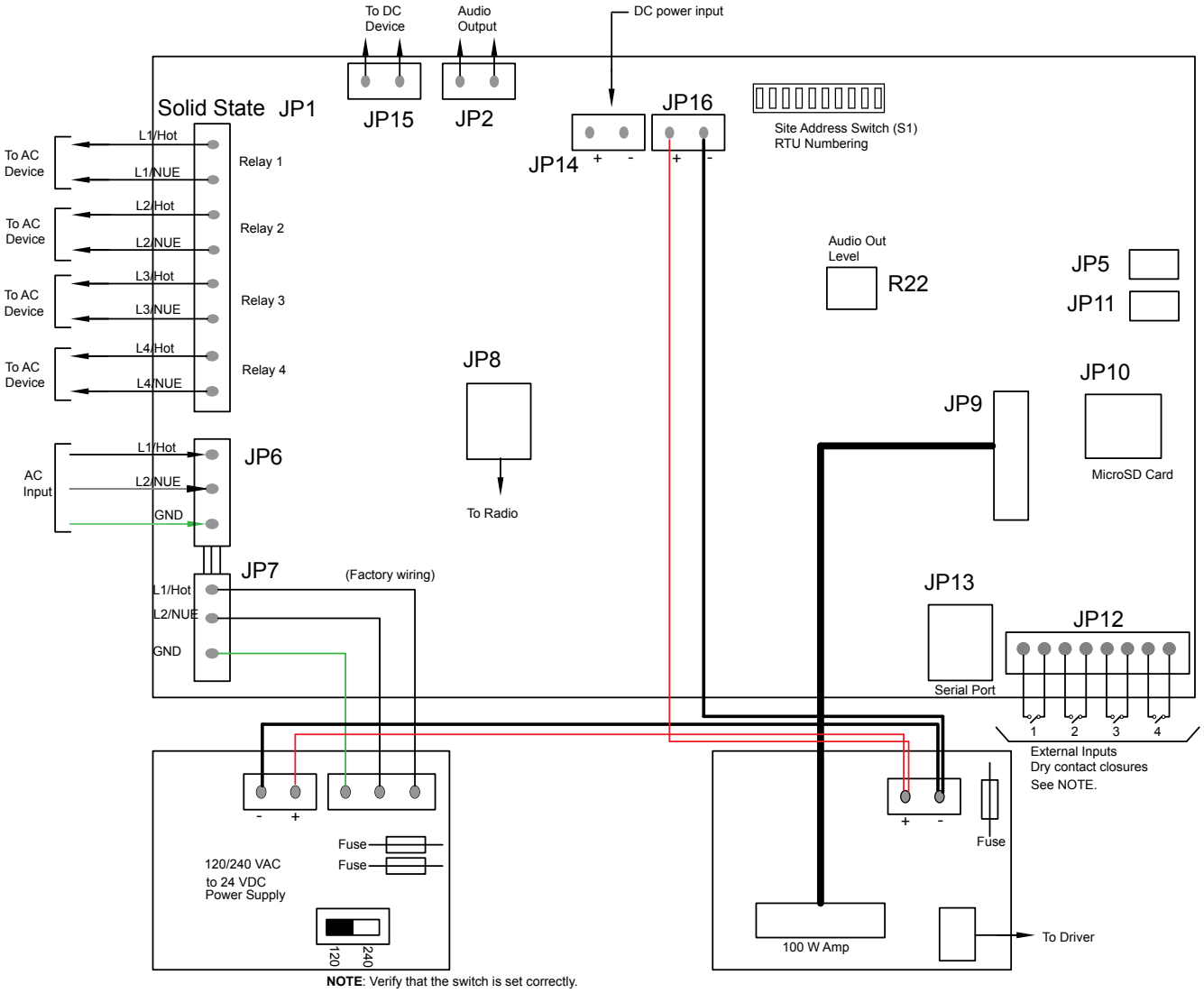
Wiring Power to the Control Board

JP6 and JP7 are connected in parallel. Federal Signal recommends using JP6 as the AC input to allow room for wires coming in from the 3/4-inch NPT opening. When power is supplied to JP6, it is connected through the PCB to JP7 and the four AC solid-state relay outputs on JP1. DC power is connected in the PCB to the DC solid-state relay output JP15. Use JP1 to wire external AC lights or strobes. Use JP15 to wire external DC lights or strobes.

NOTES:

- The current draw from any JP1 output must not exceed 1 ampere AC. The current draw from JP15 must not exceed 250 mA (5 amperes if powered from an external DC source). Do not exceed the current specification for JP1 and JP15. See “Table 8 Input and Outputs” on page 13.
- Verify the 120/240 Vac switch is set properly.

Figure 17 Controller Board



NOTE: Verify that the switch is set correctly.

Wiring to the Solid-State Relay Outputs

⚠ CAUTION

DO NOT EXCEED THE VOLTAGE AND CURRENT RATINGS: Do not exceed the voltage and current ratings listed in the Specifications section of this manual. Damage to the controller board may occur.

AC Solid-State Relay Outputs (JP1)

The solid-state relay outputs are designed to drive AC devices such as strobes or LED visual indicators. The circuit activates the output when the AC voltage is crossing at zero voltage. This circuit design minimizes inrush current. Each output can be controlled independently through the RF100X's software. The AC device should be wired to L1/Hot and L2/Neutral of JP1 (for relays 1, 2, 3, and 4). L2/Neutral is not switched. Only L1/Hot is switched.

NOTE: The solid-state relay leakage current will prevent voltage from going to 0 V when the relay is off.

Table 13 Electrical Characteristics at 25°C

Parameters Output Characteristics	Conditions	Symbol	Min	Typ	Max	Units
Off State Leakage Current	V_{DRM}	I_{LEAK}	-	-	10	µA

DC Solid-State Relay Output (JP15)

This output is activated when Relay 1 is activated via software. The design of this circuit also minimizes inrush current draw. The "+" is switched when Relay 1 is active and "-" is not switched.

Wiring to the Alarm Initiation Input Connections

The Alarm Initiation Inputs are activated by shorting the input to the ISO-GND next to it, usually through a normally open switch or normally open dry relay contact. The inputs are configured using Commander®. Any input can be assigned to a programmed function.

NOTES:

- Momentary mode: A momentary contact closure applied to the remote input, activates the associated preprogrammed function once each time the input is activated.
- Continuous mode: The preprogrammed function remains active in a loop for the duration of the contact closure. If more than one input is active, the functions associated with the input activate in a sequential loop while the inputs are active.
- The system can be configured to allow activation from normally closed contacts that activates the input when the contacts open.

Table 14 Alarm Initiation Inputs (JP12)

Alarm Initiation Inputs (JP12)	1	2	3	4
Isolated Ground	Pin 1	Pin 3	Pin 5	Pin 7
Input	Pin 2	Pin 4	Pin 6	Pin 8

Site Addressing and Encryption Configuration

The following tasks are performed while the cover is open:

- Setting the Site Address Switch (S1) (See “Site Address Switch–Located on the control board (S1)” on page 15.)
- Configuring the Security Code and Encryption Key (Optional): If you are using encryption and security codes, they can be installed during installation or setup. A PC with a serial interface or a USB Flasher is required to program the firmware. See the UltraVoice Compact Siren/Speaker Setup, Program, and User manual (part number 25500714) for more information.

Adjusting the RF100 Audio Output

The RF100 is designed to provide 0.2 V to 10 V level audio to other equipment, via JP2.

NOTICE

EQUIPMENT DAMAGE POSSIBLE: 10 Vac audio level may be too much for some equipment and may cause damage.

Measure JP2 and adjust R22 to the desired level, prior to connecting to other equipment. See “Figure 17 Controller Board” on page 31.

Adjusting the Receive Level and Radio Deviation

To adjust the receive level and radio deviation:

1. Ensure the Carrier Detect Polarity jumper, JP18, is set for (+) and the Fast DTMF jumper, JP4, is not jumpered unless fast DTMF is required.
2. Ensure D5, the green power LED, and D11, the ISO power LED (Isolated Power Supply), is on.
3. Ensure D1, the CPU LED, is blinking.
4. Connect the Ritron radio to a service monitor set to generate the receive frequency at 100 µV. D15, the Carrier Detect LED, should light.
5. Inject a 1 kHz signal at 1.5 kHz deviation.
6. Using R14, set the receive level until only green LED D37 is lit, not the yellow LED.
7. Change the service monitor to receive.
8. Short the transmit Deviation Set jumper JP17 and the unit will transmit a tone to the service monitor. D7, the Transmit LED, should light.
9. Using R28, the deviation set pot, set the transmit deviation to 1.5 kHz of deviation.

Closing the Housing

To close the housing:

1. Verify that the cover gasket is in the groove around the perimeter of the rear cover.
2. If the front of the unit was removed, lift the front of the RF100X to allow the hinge pin to be installed, align the front unit with the rear cover and attach the hinge pin with a retaining clip.

3. Attach the cable between the amplifier and rear cover PCB. Secure the cable using the two screw-down cable ties inside the rear cover.
4. If power was removed from the speaker, reattach.
5. Turn on the power to verify that the lights on the PCB are functioning. If the environment does not allow powering, proceed to the next step.
6. Verify all connectors are seated. Verify wires are not strained and are not impeding the ability to close the unit.
7. Lift the front of the unit and seat the front cover against the rear enclosure.
8. Tighten the cover screws hand tight, and then torque them in alternate pattern to 60 in-lb +/- 10 in-lb.

Installing the Antenna

⚠ DANGER

EXPLOSION HAZARD: Explosion hazards may exist due to flammable gases, flammable liquid-produced vapors, combustible liquid-produced vapors, combustible dust, or ignitable fibers/flyings.

Property damage, serious injury, or death could occur if the antenna is installed without complying with the following safety instructions.

There are three options for installing antennas in Class I/Class II, Division 2 hazardous locations:

1. Routing and remote installation of the antenna shall be in accordance with the appropriate regulations (such as NFPA70, Ch, 5 - Special Occupancies).
2. Install the antenna inside the RF100X Radio enclosure.
3. Use a separate listed CI,D1 rated antenna. Customer and AHJ must confirm the listed antenna is compatible with Federal Signal equipment and the area classification.

Installing the Antenna Outside Hazardous Locations

If the antenna is installed outside the Class I/Class II, Division 2 hazardous locations, routing and remote installation of the antenna wiring shall be in accordance with the appropriate regulations (such as NFPA70, Ch, 5 - Special Occupancies) when wiring is installed in Class I/Class II, Division 2 hazardous locations. The antenna may be routed properly and installed in a Safe Area free of combustible gas or dust. Please refer to appropriate regulations (such as NFPA70, Ch, 5 - Special Occupancies) for wiring practices related to hazardous locations boundaries.

Determining the Type of Antenna to Install

NOTICE

INSTALLATION PRECAUTIONS: The following types of antennas are to be installed outside of hazardous locations.

The following types of antennas may be installed outside of hazardous locations:

- Yagi external antenna type
- Omni external antenna type

The Yagi and Omni Antennas Installation manual is available for download at the Federal Signal website (part number 25500445).

IMPORTANT: Ensure that the antenna base is mounted more than 36 inches from the top of the RF100X.

The installation of the RF100X is complete. Federal Signal recommends polling your sirens to verify connectivity. For information on programming the siren, see the UltraVoice Compact Siren/Speaker Setup, Program, and User manual (part number 25500714).

Ordering Replacement Parts

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

Table 15 Replacement Parts

Description	Part Number
Service Kit, 20000478 PCBA Includes: Control PCB Only	Q2000478B
VHF Ritron® Radio	Q19902408A-01
UHF Ritron® Radio	Q19902408A-02
Radio Programming Software and Interface Cable Kit	Q19902536A
RF100 Lightning Surge Suppressor	Q19902535A
Small pole mount (2-3/8 to 4-1/2 inch diameter) for RF100 Speaker	I-IP100-PM
Large pole mount (6-inch diameter or larger) for RF100 Speaker	I-IP100-PMW
Antenna bracket for off-set wall mounting	AMB-W
Large pole side mount (6-inch diameter or larger), all antennas	AMB-P
UHF antenna bracket for large pole top mount (6-inch diameter or larger), includes bracket and bolts. Bands not included.	AMB-LP-U
VHF antenna brackets for large pole top mount (6-inch diameter or larger), includes two brackets and bolts. Bands not included.	AMB-LP-H
Yagi antenna bracket for large pole mount (6-inch diameter or larger), includes bracket and bolts. Bands not included.	AMB-LP-Y
UHF antenna bracket for small pole, includes bracket and bolts	AMB-SP-U
VHF antenna brackets for small pole, includes two brackets and bolts	AMB-SP-H
Yagi antenna bracket for small pole, includes bracket and bolts	AMB-SP-Y

Getting Service

If you are experiencing any difficulties, contact Federal Signal Customer Support at 800-548-7229 or 708-534-3400 extension 7511 or Technical Support at 800-524-3021 or 708-534-3400 extension 7329 or through e-mail at techsupport@fedsig.com. For instruction manuals and information on related products, visit http://www.fedsig.com.