FEDERAL SIGNAL
Safety and Security Systems

Model Eclipse8

Electromechanical omnidirectional, DC-powered Siren

Description, Specifications, Installation, and Service Manual

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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.

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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.

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 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, be 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 warn people indoors effectively.
- The sound output of sirens can cause 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 standards, regulations, and guidelines.
- 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 corrective 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 injuries. 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

- 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 and qualified 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.
- 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. Review and comply with any local or state noise control ordinances as well as OSHA noise exposure regulations and guidelines.
- 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 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 to 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 siren.

Operation

Failure to understand the capabilities and limitations of your siren 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 the equipment. Thoroughly discuss all contingency plans with those responsible for warning people in your community, company, or jurisdiction. A well-written contingency plan document is recommended.

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

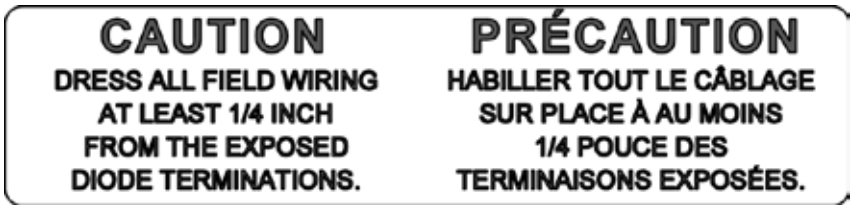
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

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

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

Pay careful attention to notices located on the equipment.

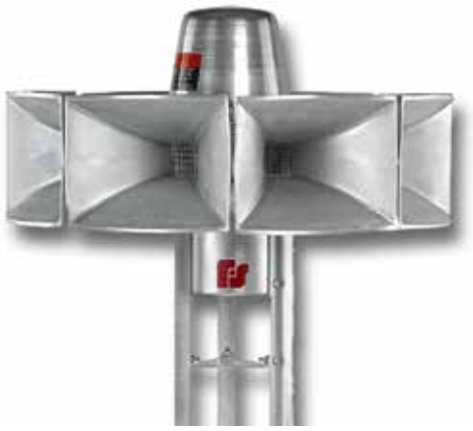


General Description

This manual describes the characteristics, specifications, installation, and preventive maintenance of the Federal Signal Eclipse8 siren.

The Eclipse8 siren is an electromechanical omni-directional, DC-powered siren capable of producing high-intensity warning signals over a large area. Its highly efficient design enables the siren to produce a high sound level while making moderate demands on the power source.

Figure 1 Eclipse8



Siren Description

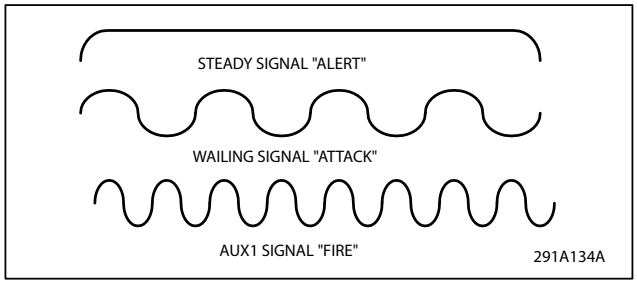
The Eclipse8 siren is a single-tone siren capable of producing a 115 dB sound level at 100 feet for a minimum of 15 minutes when using the 2001-AC or DCFC-based Controller with fully charged, standard, deep-cycle batteries. Fifteen-minute duty cycle operation is available with a 2001TRB/2001TRBP option, which supplies DC directly to the siren from a nominal 220/240 Vac line.

A single DC motor is used to produce the sound energy. The motor is attached to a stator with a rotor mounted on the motor shaft inside the stator. Each rotor and stator contains one row of ports. As the motor rotates the rotor, air is drawn into the rotor and passes through the rotor and stator ports in pulses. These pulses are produced when the rotor alternately opens and closes the stator ports. The pulses of air produce sound at a frequency (pitch) that depends upon the motor's rotational speed and the number of ports in the rotor-stator combination.

Signal Description

The Eclipse8 siren is capable of producing a steady signal, wailing signal, and a fast wail or fire signal. The steady signal is frequently used as a civil defense “Alert” signal. The wailing signal is often used as a civil defense “Attack” signal. The fast wail or fire signal is often used to summon the local fire department. You can use any of the signals for any desired application. These signals are shown graphically in the following figure.

Figure 2 Signal Characteristics



Features

The Eclipse8 siren has the following features.

- Omni-directional for 360˚ coverage
- Three distinct warning signals
- Can operate from batteries directly or using optional AC with battery backup
- Full battery operation or battery backup option
- High-efficiency design produces 115 dBc at 100 feet while making moderate power demands
- Optional roof mount stand
- 100% aluminum design

Specifications

Table 1 Specifications

Power Requirements	
Motor	46 Vdc (or full wave rectified AC) 112 A (nominal)
Wiring	2 AWG minimum
Motor Type	Series Wound DC 7 Hp
Effective Range at 70 dBc	2200 ft (670.6 m)
Dimensions (height x width)	63.4 in (161.0 cm) x 46.7 (118.6 cm) Including stand
Weight	
Siren Weight	255 lb (116 kg)
Shipping Weight	380 lb (173 kg)
Temperature	
Operating Temperature	-22 to 140ºF (-30 to +60ºC)
Material	Aluminum with stainless steel hardware

Table 2 Signal Information

Signal	**Frequency Range**	**Sweep Rate**
Steady	525 Hz	N.A.
Wail	500-330 Hz	10 s
Fast Wail	490-400 Hz	4 s
Signal Duration	3 min. (programmable)	
Sound Output (SPL)	115 dBc max. (on axis) at 100 feet (30.5 m)	

Installation Instructions

Determining a Suitable Location

⚠ WARNING

SOUND HAZARD: The output level of a siren is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren location and post warnings where excessive levels may be encountered. Refer to OSHA 29 CFR 1910.95 for safe exposure limits.

Do not expose personnel to sound levels above 123 dBC.

Careful consideration of the factors affecting the propagation of sound from the siren and the response of the human ear to the sound will optimize the ability of the siren to effectively warn the community. Follow Federal Emergency Management Agency (FEMA) guidelines when designing the warning system.

When choosing a siren installation site, it is important to consider the reduction of signal intensity as the distance from the siren increases and the minimum desired signal level at the fringe of the area to be covered. As the distance from the siren increases, sound level losses accumulate. These losses result from weather conditions, the terrain, obstructions in the sound path, the sound pitch, and the siren's height.

Optimum sound propagation conditions occur when no obstructions exist in the sound path, the terrain is hard and flat, and the air is blowing away from the source. Under these conditions, you can expect a 6 dB loss per distance doubled. A loss per distance doubled of 10 dB is typically experienced because the atmosphere is rarely calm, the terrain may not be flat, and buildings or other obstructions are frequently present in the sound path.

Assuming a typical 10 dB loss per distance doubled and a 70 dB minimum sound level required to warn a typical urban area, the effective range is as follows:

- Eclipse8 Siren is approximately 1,840 feet.

FEMA studies indicate typical ambient sound levels vary by location as follows:

- Industrial Areas: 70+ dBC
- Urban Areas: 60 dBC
- Rural Areas: 50 dBC

Optimum warning is obtained when the warning signal is at least 10 dB above ambient. Do not expose personnel to sound levels above 123 dBC.

Wind speed and direction often affect the propagation of sound from the siren. Consequently, the direction of the prevailing wind may be a significant factor to consider when selecting the installation site(s) of a small, one- or two-site siren system. For example, if the prevailing wind is from the west, installing the siren toward the western edge of the area to be covered may be desirable.

Other factors to consider when selecting the installation site(s) include the availability of suitable electrical power, access to and ease of installation and maintenance, the height of surrounding obstructions, and security against vandalism.

Figure 3 Siren Leg Assembly. (Shown with optional surface mounting plate, Model No. RME)

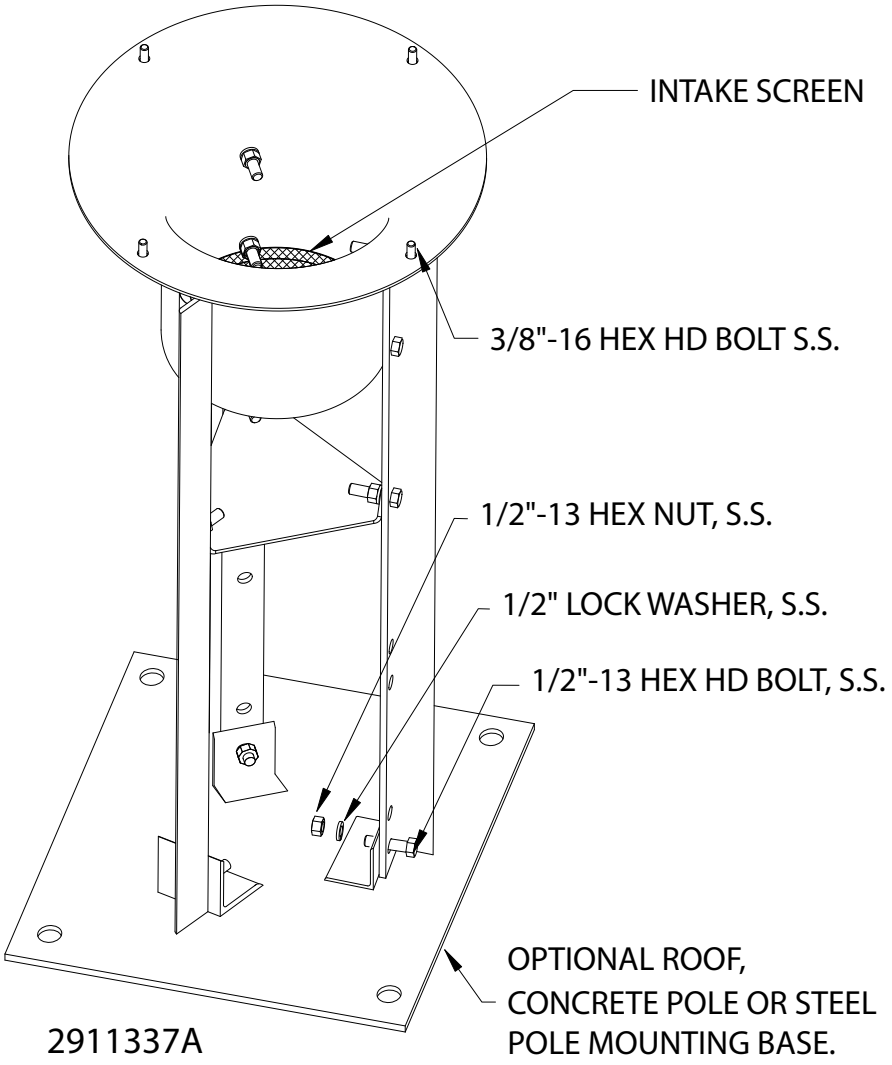


Figure 4 Typical Pole-mounted Installation

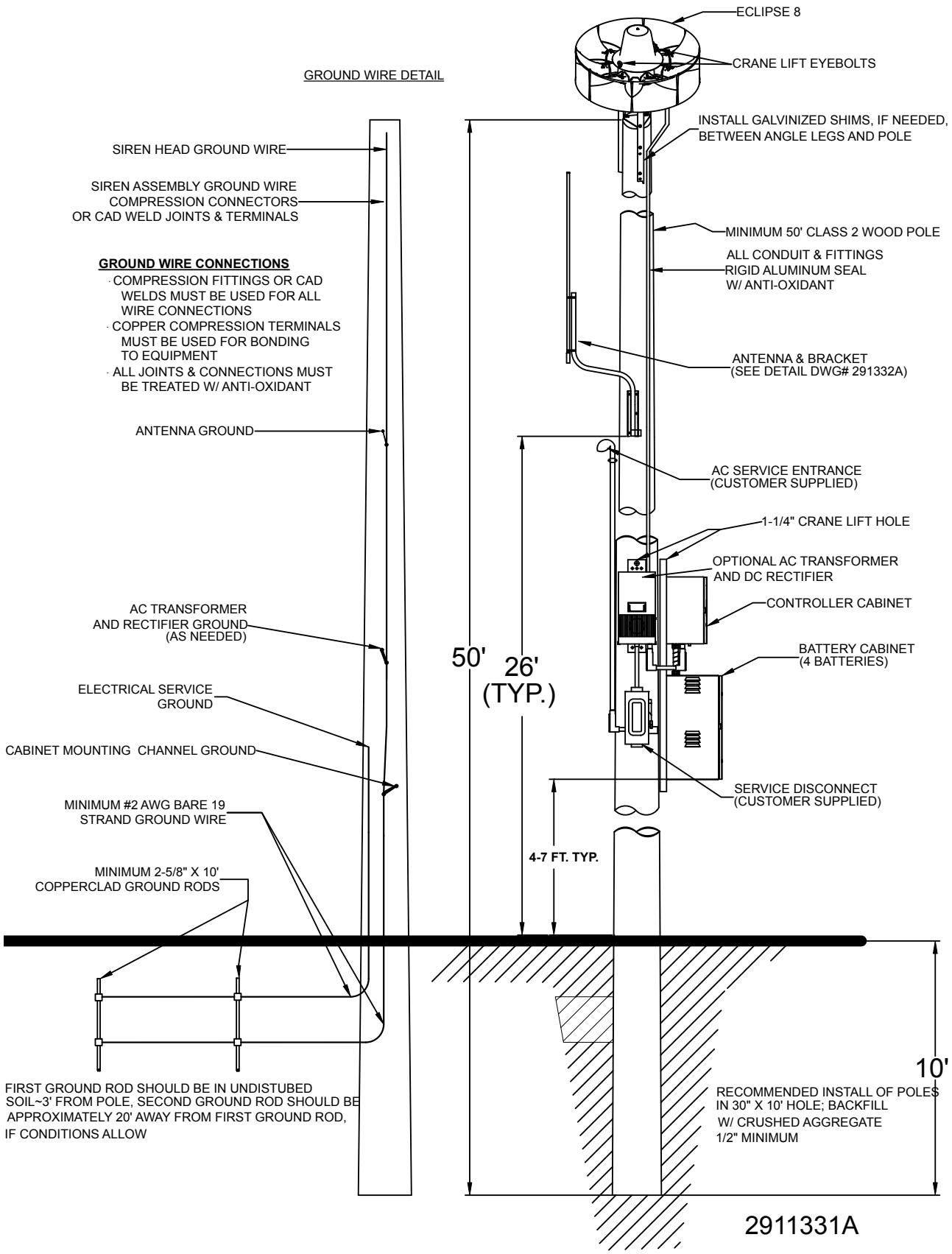
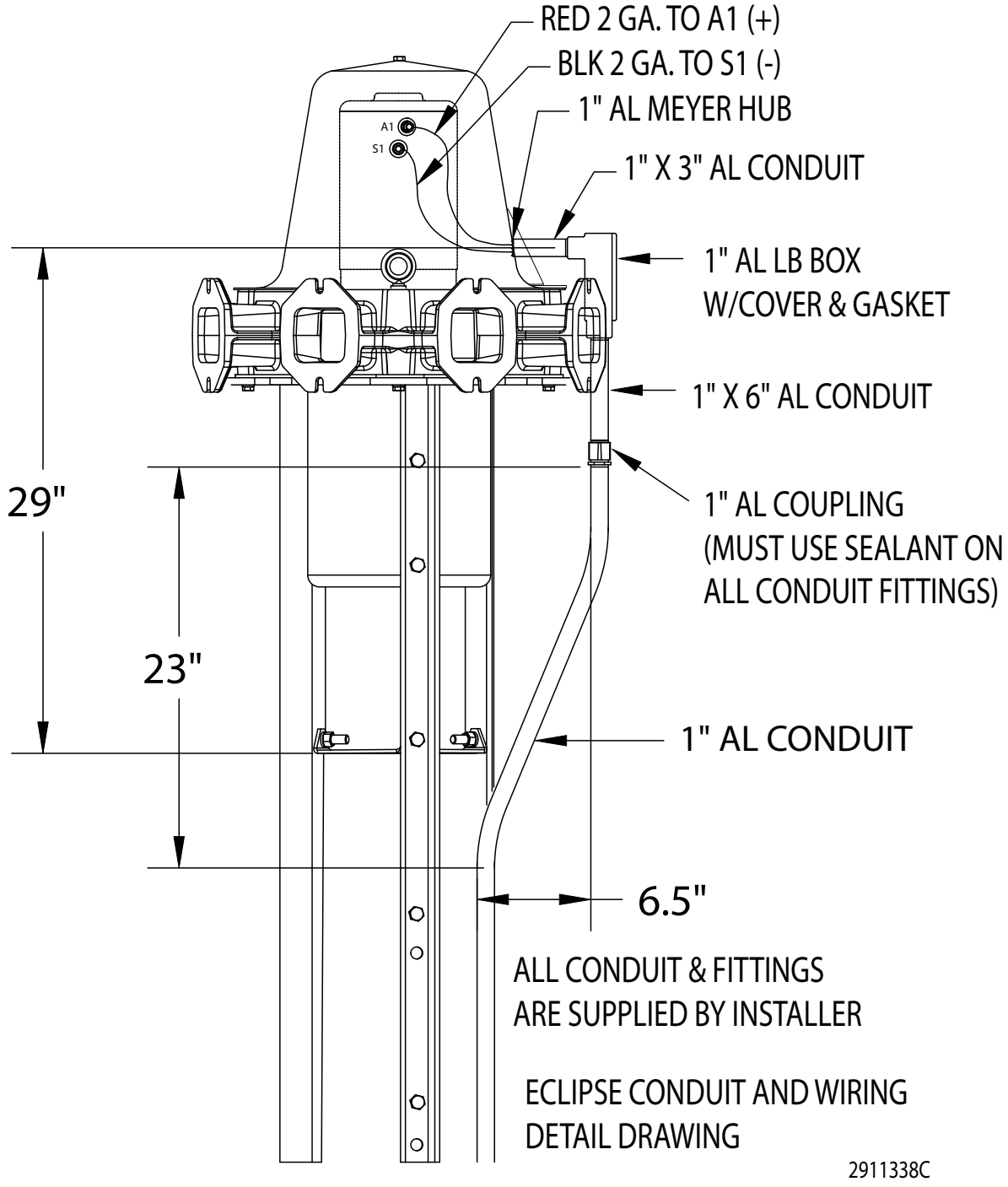


Figure 5 Conduit Connection and Wiring Detail



Installing the Sirens

⚠ DANGER

ELECTROCUTION HAZARD: Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, experienced electricians should perform installation per national and local electrical codes and ordinances, including any state or local noise-control ordinances.

Most siren installations are of two types: Pole Mount or Flat Surface Mount. These two configurations allow a siren to be installed in almost any situation. If the installations in this manual are unsuitable, modifying one of the configurations may be practical.

A siren is typically installed 40 to 50 feet above the ground. If the installation is located less than 40 feet above the ground, the sound intensity at close range may increase, but at the same time, the effective range of the siren may be reduced. Conversely, if the siren is located more than 50 feet above ground, the effective range of the siren may increase, but the sound may skip over areas closer to the siren. These variables may make it desirable to test the sound coverage of the siren at various heights and locations whenever possible.

⚠ WARNING

MOVING PARTS HAZARD: Moving parts could cause severe cuts or amputation. DO NOT reach into the siren openings.

To install the siren:

1. Uncrate the siren and remove the lag bolts that hold the siren on the shipping base. Lift the siren approximately 3-1/2 feet with a crane or hoist using the two eyehooks on the siren.
2. Install the siren legs to the siren using the four 3/8 inch-16 bolts and lock washers.

Pole Installation

A typical siren pole-mounted installation is shown in “Figure 4 Typical Pole-mounted Installation” on page 13. The siren is mounted on a Class 2 utility pole at least 40 feet above the ground. It is attached to the pole by means of legs, as shown in “Figure 3 Siren Leg Assembly. (Shown with optional surface mounting plate, Model No. RME)” on page 12.

⚠ CAUTION

INSTALLATION PRECAUTIONS: The lifting eyebolts do NOT have sufficient strength to support the combined weight of the siren and a utility pole. Therefore, do NOT attempt to erect the pole and siren together using the eyebolts as a lifting point.

To mount an Eclipse8 on a pole, use the 3-foot-long angle iron legs and a Class 2 utility pole:

3. Erect the utility pole by accepted practices. (Refer to the warning above.) Ensure the pole extends at least 40 feet above the ground.
4. Raise the siren to the necessary height and lower it over the pole.

5. Insert shims, if necessary, between the siren legs and pole.
6. Bolt the siren to the pole using two 5/8-inch lag bolts, at least four inches long for each leg.
7. Tighten all bolts.
8. Install the siren grounding as shown in “Figure 4 Typical Pole-mounted Installation” on page 13.
9. Refer to “Figure 5 Conduit Connection and Wiring Detail” on page 14 for running the conduit to the siren and follow the instructions provided with the siren controller for making electrical connections, omitting any references to rotation.

Flat Surface Mount

Before installation, ensure a qualified Professional Engineer approves mounting locations, materials, and methods.

A model RME mounting plate is required for mounting on flat surfaces, such as a building or the top plate of a steel or concrete pole. This installation configuration is practical for buildings with flat roofs. The siren can be anchored directly to the roof, on a platform as shown in Figure 6, or on a weight distribution mat like the one shown in “Figure 7 Weight Distribution Mat Construction” on page 18.

A mat is required when the siren mounting surface cannot support at least 280 pounds (127 kg) over a 1.5-square-foot area. The mat shown in Figure 7 distributes the siren weight over an 8-square-foot area. When installing the siren on a flat roof, ensure it clears the parapets or other obstructions by at least 10 feet.

To install an Eclipse8 on a flat roof or other flat surface:

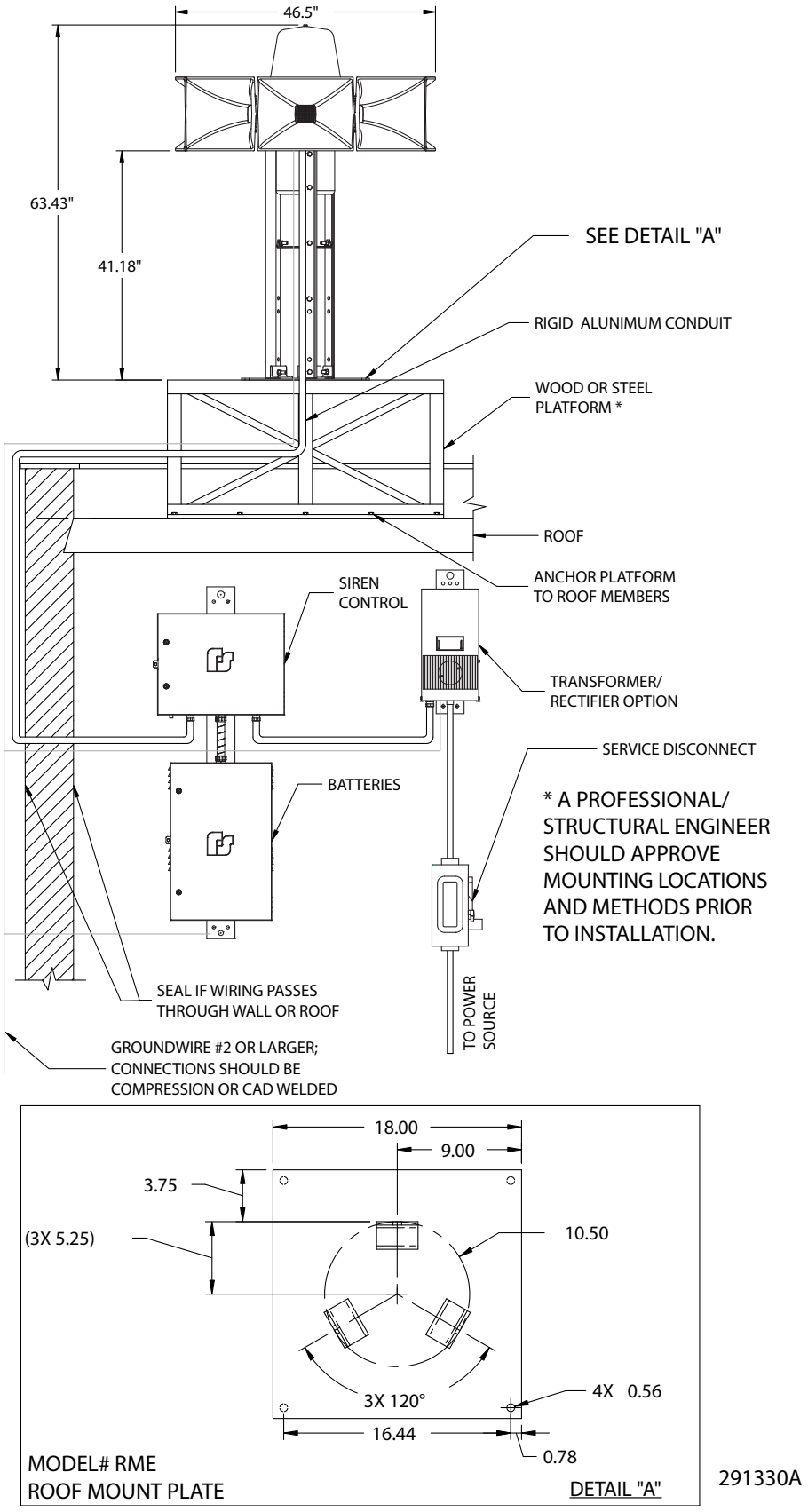
3. If required, construct a platform for mounting the siren, which must support at least 300 pounds (660 kg) and withstand a siren wind load of 110 mph. The platform must also be capable of distributing its weight plus the siren to a safe value for the mounting surface. Platform design and construction details are left to the installer. Locate the platform at the siren installation site. Using suitable hardware (not supplied), anchor the platform to the mounting surface.

⚠ CAUTION

INSTALLATION PRECAUTIONS: The lifting eyebolts do NOT have sufficient strength to support the combined weight of the siren and a utility pole. Therefore, do NOT attempt to erect the pole and siren together using the eyebolts as a lifting point.

4. Hoist the siren to the installation site using the two eyebolts as a lifting point (refer to the warning above).

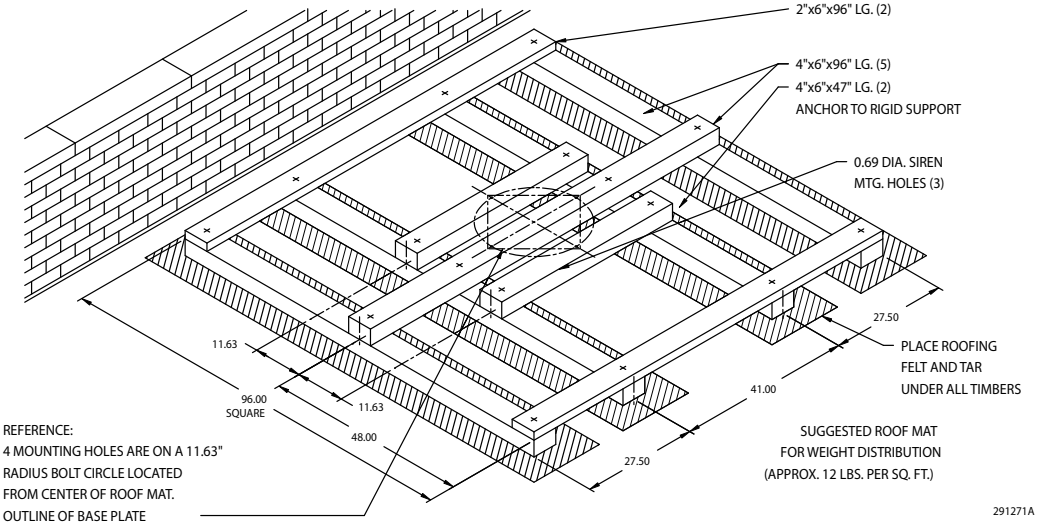
Figure 6 Typical Surface-mounted Siren Installation



5. As appropriate, anchor the siren to the mounting surface with 1/2-inch lag bolts or nuts and bolts through the mounting holes (one in each corner) in the siren base plate. (See Figure 6, detail A.) If the siren is mounted directly on a roof (without a platform or weight distribution mat), install waterproof joints at the points where the mounting bolts pass through the roof so that water does not enter the building.

6. See “Figure 5 Conduit Connection and Wiring Detail” on page 14 for running the conduit to the siren and follow the instructions provided with the siren controller for making electrical connections, omitting any references to rotation.

Figure 7 Weight Distribution Mat Construction



7. Either bolt down or add weight to a non-penetrating roof mount. If you add weight to a non-penetrating roof mount, have a qualified Professional Engineer check your weight distribution.

Pre-operation Checkout

After the siren has been completely installed, perform the following checks before putting the siren into service. This procedure is also recommended as a maintenance procedure.

⚠ DANGER

ELECTROCUTION HAZARD: Service should be performed by qualified personnel familiar with the siren, associated controls, and power sources being used. The siren has moving parts, high operating currents, explosive gases, and corrosive materials that could cause severe personal injury, electrocution, or death. Before servicing or maintaining, ensure that remote activation cannot occur, and disconnect power to the siren and its controls.

⚠ WARNING

SOUND HAZARD: The output level of this siren is capable of causing permanent hearing damage. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

Table 3 Pre-operation Checklist

Check	Action Item
	All air intakes and sound outlets are not obstructed.
	All connections in the Control Cabinet and Battery Cabinet are correct and properly tightened.
	The mounting structure is secure and all siren hardware properly attached and secure.
	All people and animals are at least 40 feet away from the siren in every direction to avoid hearing damage.
	Activate a siren function at the control panel and check for proper sound output.
	After the installation is complete and it has been established that the siren is operating properly, Federal Signal recommends that all control devices be padlocked to discourage tampering and vandalism.

Service and Maintenance

⚠ WARNING

SOUND HAZARD: Service or maintenance should be performed by qualified personnel familiar with the siren, associated controls, and power sources being used and in conjunction with the authorities having jurisdiction.

The sound output of sirens is capable of causing permanent hearing damage at short distances. Therefore, always wear hearing protection when performing tests or maintenance on the siren and avoid excessive exposure.

⚠ WARNING

MOVING PARTS HAZARD: The siren has moving parts, high operating current, explosive gases, corrosive materials, and high output sound levels, which could cause severe personal injury, electrocution, or death.

Qualified personnel familiar with the siren, associated controls, and power sources being used should perform service or maintenance.

Before servicing or maintaining, ensure that remote activation cannot occur and disconnect power to the siren and the associated control equipment.

Test the Eclipse8 siren for proper operation at least once a month. A daily test at noon, curfew, or another selected time is preferred. This not only enhances the siren's usefulness but also instills public confidence in the warning system's reliability.

An annual inspection is desirable to minimize the possibility of siren failure. If applicable, perform battery replacement approximately every 3-5 years. This schedule is only a suggested guideline. It may be necessary to vary the schedule if the siren is used frequently or in an extreme climate.

Inspecting and Servicing the Chopper Motor Brushes

The chopper motor is designed to be maintenance-free. Federal Signal recommends inspecting motor brushes and commutators every three years.

Accessing the Motor

To access the motor on the Eclipse8 siren: remove the cover from the top of the siren. The cover covers the entire motor.

Inspecting the Chopper Motor Brushes

You need the following equipment.

Table 4 Tools and Parts

	Description
	Compressed Air
	5/16 inch Nut driver
	Scotch-Brite® pad
	Replacement Brushes (includes four brushes) Part Number: K-BRSH2

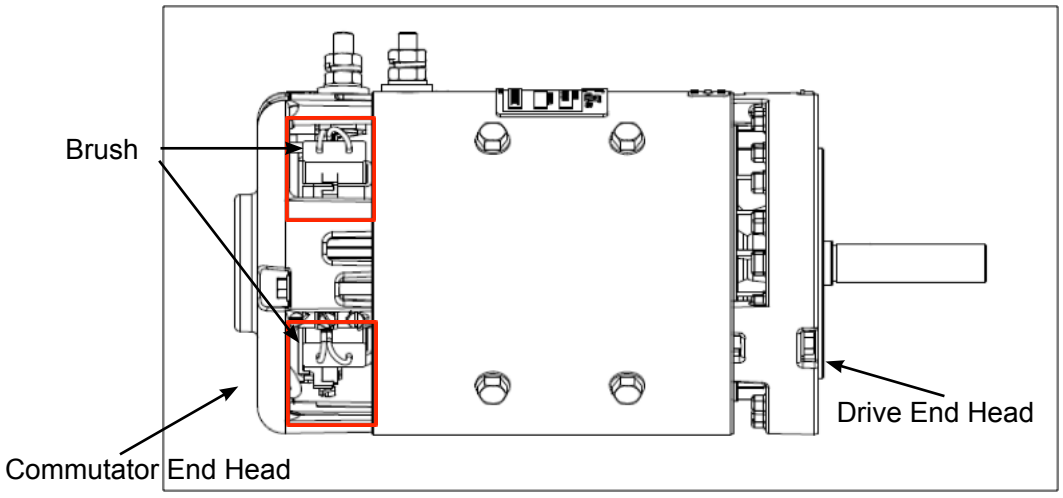
⚠ CAUTION

FLYING PARTICLES HAZARD: Wear appropriate eye protection during any maintenance operation.

To inspect the chopper motor brushes:

1. Refer to Figure 8 and become acquainted with the labeled motor components.

Figure 8 Motor Components



2. Locate the four openings that expose the brushes at the commutator end head of the motor. Figure 8 outlines two of the four openings in the commutator end head in red.

3. Visually inspect the motor at the commutator end head for excess brush dust. If excess dust is seen, use clean, oil-free, compressed air to carefully blow out accumulated brush dust and dirt from the commutator end head, frame, and field assembly.

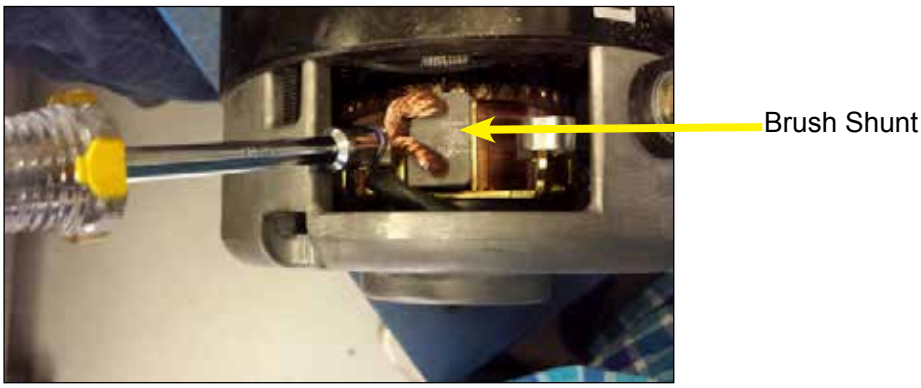
   NOTE: Carbon dust inside the motor can be messy when removed with compressed air.

⚠ CAUTION

FLYING PARTICLES HAZARD: When using compressed air, follow all safety instructions, including wearing eye and respiratory protection.

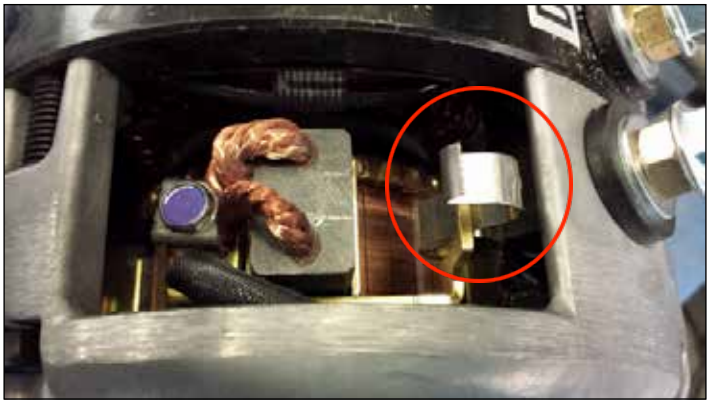
4. Continue using compressed air on the motor at all four openings in the commutator end head until brush dust is no longer visible exiting the motor.
5. After removing dust from the motor, measure the brush length by removing the brush from the motor. Remove all four brushes.
6. To remove the brushes, first remove the 8-32 x 0.5-inch bolt from the back of the brush shunt using a 5/16-inch driver (Figure 9).

Figure 9 Removing Brush Shunt Bolt



7. After the bolt is removed, pull back the brush spring. Pull the brush spring back and latch it on the post (Figure 10).

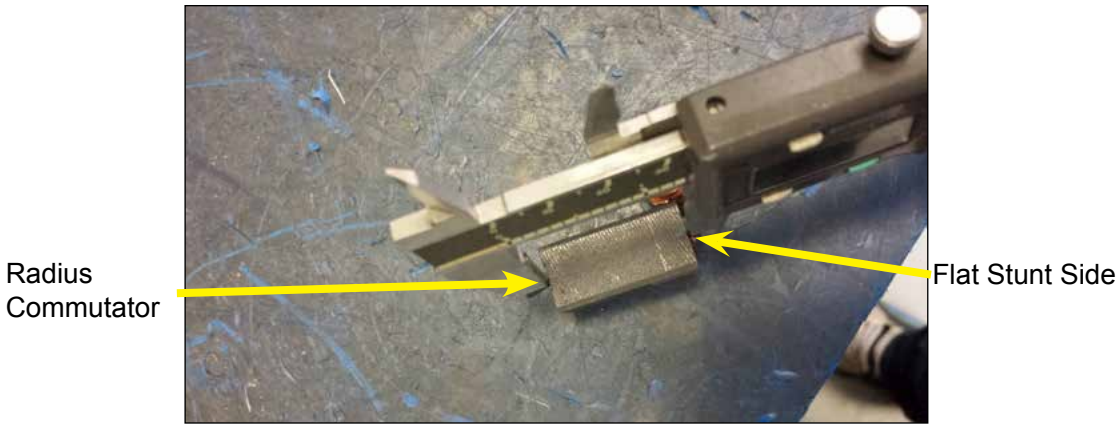
Figure 10 Brush Spring Latched on Post



8. Once the brush spring is secured on the post, the brush can be removed and measured.

9. To measure the brush length, use a caliper to measure from the radius of the commutator side of the brush to the flat of the shunt side (Figure 11).

Figure 11 Brush Spring Measurement



10. See minimum brush length in the table below.

Table 5 Brush Length

Maximum Brush Length	1.3 in (33 mm)
Minimum Brush Length	0.6 in (16 mm)

11. If brush lengths are less than the specified minimum length, remove and replace all brushes with new ones.

NOTE: If brushes are stuck in the brush holder, attempt to remove them from the brush holder. If you can remove the brushes, continue to inspect the commutator. Federal Signal recommends replacing all four brushes. If it is not possible to remove brushes, contact Technical Support.

Inspecting the Commutator

To inspect the commutator:

1. While the brushes are removed from the motor, visually inspect the commutator.
2. The commutator should have a uniform gray/charcoal colored film covering the copper bars where the brushes make contact.
3. Figure 25 displays an example of an acceptable commutator with uniform wear.

Figure 12 Uniform Brush Film

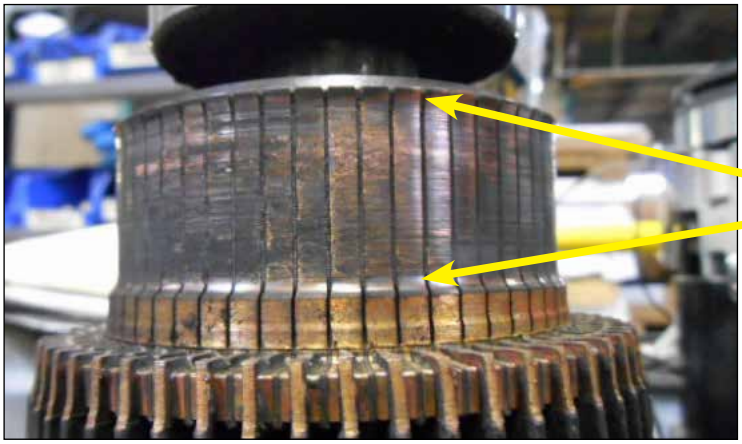
NOTE: Motors with limited field run time may exhibit streaks in the commutator's film. This is common on newer motors and will eventually become more uniform when the motor has more run time and the brushes become fully seated. Figure 13 depicts a commutator with streaky film due to limited run time.

Figure 13 Streaky Brush Film

4. Replace commutators that exhibit pitting or excessive wear. Figure 14 shows an example of a commutator with pitting, and Figure 28 shows an example of a commutator with excessive wear.

Figure 14 Pitting on Commutator

Figure 15 Commutator Wear



NOTE: If pitting or wear on the commutator is found, remove the motor from service and have an experienced motor rebuilder or manufacturer inspect and rebuild it.

Installing New Brushes

To install new brushes:

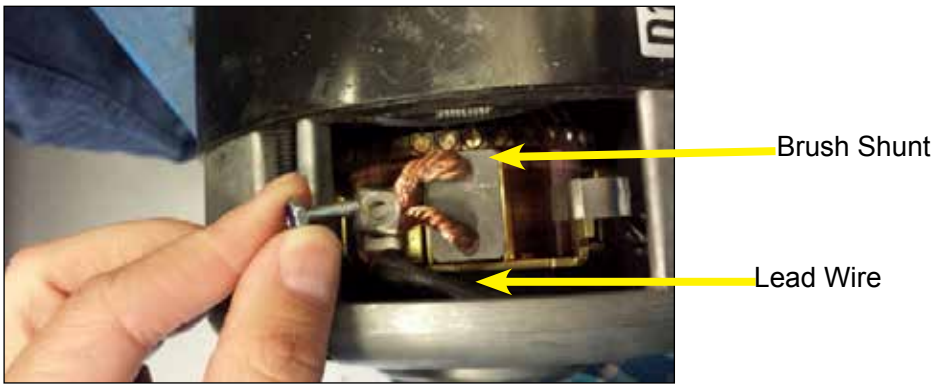
1. After removing each brush from the motor, carefully blow any remaining dust out of the brush holders on the brush box with clean, oil-free, compressed air.
2. Inspect the brush holder for any debris or contamination. If it is contaminated, use a Scotch-Brite® pad to clean it.
3. If you are reusing existing brushes, inspect them for contamination and replace them if they show any signs of contamination.
4. Verify all brush holders are clean and dust-free. Using a brush, ensure that the brushes can move freely in the holder.

⚠ CAUTION

FLYING PARTICLES HAZARD: When using compressed air, follow all safety instructions, including wearing eye and respiratory protection.

5. Blow out the remaining contaminates using clean, oil-free, compressed air.
6. Once the brush holders are clean, install brushes and the bolts that held the original brushes in place.
7. Place one brush into the brush holder.
8. Place one of the bolts through the hole in the brush shunt, the lead wire (if applicable), and the corresponding hole in the brush box (Figure 16).

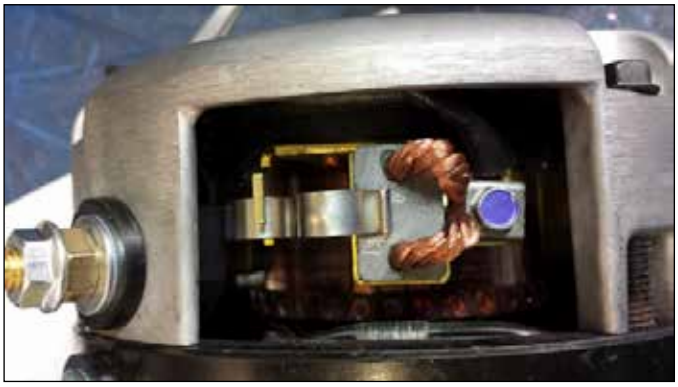
Figure 16 Replacing Brush Shunt Bolt



9. Tighten the bolt down using a 5/16-inch driver.
10. Unlatch the brush spring from the post to rest on the back of the brush.

    NOTE: Center the brush spring between brush shunts. Do not misalign or contact the shunts. This allows the brush to remain in contact with the commutator and wear consistently throughout the motor's lifespan (Figure 17).

Figure 17 Placing the Brush Spring



11. Repeat steps 7-10 with the remaining brushes.
12. Inspect the motor to ensure all brushes are installed, all bolts are present, and all brush springs are engaged.
13. Reinstall all covers and test the operation of the chopper motor.

Getting Technical Support and Service

For Technical Support, contact:

Federal Signal Technical Support
Phone: 800-524-3021 or 708-534-4790
Email: techsupport@fedsig.com
www.fedsig.com

For Customer Support, contact:

Federal Signal Customer Support
Phone: 800-548-7229 or 708-534-3400 extension 367511
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