Directional Speaker Arrays
Electronic Siren

Installation Manual
Limited Warranty

The Alerting and Notification Systems Division of Federal Signal Corporation (Federal) warrants each new product to be free from defects in material and workmanship, under normal use and service, for a period of two years on parts replacement and factory-performed labor (one year for Informer, EAS, and Federal software products) from the date of delivery to the first user-purchaser. Federal warrants every 2001, Eclipse and 508 Siren (Top of pole only) to be free from defects in material, per our standard warranty, under normal use and service for a period of five years on parts replacement.

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

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

This warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product, or labor charges for removal and re-installation of the product. The Federal Signal Corporation warranty shall not apply to components or accessories that have a separate warranty by the original manufacturer, such as, but not limited to batteries.

Federal will provide on-site warranty service during the first 60-days after the completion of the installation, when Federal has provided a turn-key installation including optimization and/or commissioning services.

This warranty does not extend to any unit which has been subjected to abuse, misuse, improper installation or which has been inadequately maintained, nor to units which have problems related to service or modification at any facility other than the Federal factory or authorized warranty service centers. Moreover, Federal shall have no liability with respect to defects arising in Products through any cause other than ordinary use (such as, for example, accident, fire, lightning, water damage, or other remaining acts of God).

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

Safety Message ........................................................................................................... 1
  Important Notice ....................................................................................................... 1
  Publications ............................................................................................................... 1
  Planning ................................................................................................................... 1
  Installation and Service ......................................................................................... 2
  Operation .................................................................................................................. 3

General Description .................................................................................................... 4
  Introduction .............................................................................................................. 4
  Features ................................................................................................................... 5

Specifications .................................................................................................................. 6

Installation Instructions ................................................................................................ 8
  Determine a Suitable Location .................................................................................. 8
  Installing the Sirens .................................................................................................. 10
    Installation Bracket Options .................................................................................. 10
    Pole Installation ..................................................................................................... 12
    Wood Utility Pole Installation ............................................................................. 13
    Concrete or Metal Pole Installation .................................................................... 13
    Wall Mount Applications ..................................................................................... 14

Obtaining Service ........................................................................................................... 16

Tables
  Table 1 DSA Specifications ..................................................................................... 6
  Table 2 Mounting Configurations and Horizontal Coverage ............................... 6
  Table 3 General Specifications .............................................................................. 6
  Table 4 Specify Mounting Kits ............................................................................... 7

Figures
  Figure 1 Two DSA4s with a DSAMK4 .................................................................... 4
  Figure 2 DSA Configurations ............................................................................... 7
  Figure 3 Top of pole mount using DSAMK4 .......................................................... 11
  Figure 4 Typical Pole Installation ........................................................................ 12
  Figure 5 Top view of DSAMK4 bolt hole pattern .................................................... 14
  Figure 6 Wall Mount Configuration ..................................................................... 15
  Figure 7 Typical DSA6 Assembly .......................................................................... 17
Safety Message

⚠️ 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.
Safety Message

- 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

- 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 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.

⚠️ WARNING

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

Pay careful attention to the following notice located on the equipment.
Introduction

This manual describes the features, specifications, and installation of the Directional Speaker Arrays (DSA). Refer to the *UltraVoice Electronic Siren Controllers Manual* for operating instructions.

The DSA is Federal Signal’s most adaptable siren array. It can be configured in many ways to customize to your site’s needs. Let Federal Signal design your DSA configuration. Contact Federal Signal through pre-sales at presalesupport-ans@federalsignal.com or contact your local sales representative.

The DSA is a flexible family of speakers that are capable of providing audible signals over a large area with the potential for satisfying varying signaling needs in four directions. An installation consists of between one and four arrays, which are designed to be powered by one of Federal Signal Electronic UV Controllers. A highly efficient design enables the speakers to produce a high sound level, while making moderate demands on the power source. Each array can contain between two and six individual speakers. (Figure 1 shows two DSA4s with a DSAMK4.)

*Figure 1 Two DSA4s with a DSAMK4*

DSA sirens comprise of fiberglass projectors and aluminum housings and 304 stainless steel mounting brackets. Each individual speaker provides 100 watts of signaling power.

Each DSA speaker array includes one DSAMK1, which is a wall mounting kit for one vertical stack that includes stainless steel brackets and mounting hardware.
Each array set covers one 90° quadrant. The dB(C) ratings at 100 feet on axis are shown below:

- DSA2 111 dB(C)
- DSA3 115 dB(C)
- DSA4 117 dB(C)
- DSA5 119 dB(C)
- DSA6 121 dB(C)

The DSA provides excellent voice reproduction and with the aid of the controller produces the following pre-programmed warning signals: Wail, Pulsed Steady, Pulsed Wail, Alternating Alert, Alternating Wail, and Westminster Chimes.

**Features**

The DSA has the following features:

- Maintenance Free
- Electronic Siren comprised of 1 to 4 vertical support structures with 2 to 6 re-entrant speakers
- Vertical support structure can be positioned at 90° or 180° intervals
- Each speaker contains a 100 watt driver
- The DSA provides excellent voice reproduction with the aid of the UltraVoice Controller
- Available in 5 models for a wide range of sound coverage
Specifications

Table 1 DSA Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>DSA2</th>
<th>DSA3</th>
<th>DSA4</th>
<th>DSA5</th>
<th>DSA6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Speakers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Watts</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>Sound output per individual stack, dB(C) at 100 feet</td>
<td>111</td>
<td>115</td>
<td>117</td>
<td>119</td>
<td>121</td>
</tr>
<tr>
<td>Effective Range at 70 dB(C)</td>
<td>1700 ft.</td>
<td>2200 ft.</td>
<td>2600 ft.</td>
<td>3000 ft.</td>
<td>3400 ft.</td>
</tr>
<tr>
<td>Height in inches</td>
<td>43.25</td>
<td>46.5</td>
<td>48.75</td>
<td>71</td>
<td>73.25</td>
</tr>
<tr>
<td>Net Weight (lbs)</td>
<td>43</td>
<td>80</td>
<td>95</td>
<td>110</td>
<td>125</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>One UV400 Amplifier</td>
<td>Two UV400 Amplifiers*</td>
<td>One UV400 Amplifier</td>
<td>Two UV400 Amplifiers*</td>
<td>Two UV400 Amplifiers</td>
</tr>
</tbody>
</table>

* Must at least be paired with another DSA3 or DSA5 speaker array so that the one 100 watt driver is wired in series with its pair. You must configure your DSA with even quantities of drivers.

NOTE: When calculating total power requirements, determine the total number of speakers that is needed in your installation and divide the total by four. The resultant number will be the quantity of amplifiers required. If the resultant is not a whole number, then round the number up to the next whole number. This number will be the number of amplifiers required for your installation.

For example, if your site needs 1200 watts then this is 12 speakers, because each individual speaker provides 100 watts of signaling power. Consider the following example.

\[
\frac{12 \text{ speakers}}{4} = 3 \text{ amplifiers}
\]

The above example shows that the power requirements are three 400 watt amplifiers.
Table 4 Specify Mounting Kits

<table>
<thead>
<tr>
<th>Kit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSAMK1</td>
<td>Wall mount for one vertical support (Each order includes one kit.) Refer to Figure 3.</td>
</tr>
<tr>
<td>DSAMK4</td>
<td>Mounting kit for one to four vertical stack(s) 90° or 180° apart (optional) Refer to Figure 3.</td>
</tr>
<tr>
<td>DSAMKSP</td>
<td>Mounting kit for steel poles, one vertical stack</td>
</tr>
<tr>
<td>DSAMKSPB45</td>
<td>4.5 inches mounting brackets for steel pole, bracket for one vertical stack</td>
</tr>
<tr>
<td>DSAMKSPB23</td>
<td>2.375 inches mounting brackets for steel pole, bracket for one vertical stack</td>
</tr>
</tbody>
</table>

Figure 2 DSA Configurations
Installation Instructions

Determine a Suitable Location

The information in this section provides guidelines to aid you in the selection of installation sites that make the best possible use of the speaker array siren.

⚠️ WARNING

The sound output level of some DSA sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan placement of sirens and post warnings.

⚠️ WARNING

Do not expose personnel to sound levels above 123 dBC.

⚠️ WARNING

When the sirens are used out of doors, people indoors may not be able to hear the warning signals. You may need separate warning devices or procedures to effectively warn people indoors.

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.

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

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 atmosphere is rarely calm, terrain may not be flat, and buildings or other obstructions are frequently present in the sound path.
Using a 10 dB per distance doubled loss factor, the following sound levels are predicted for the DSA6:

- 100 feet (30.5 m) the sound level is 121 dB
- 200 feet (61 m) the sound level is 111 dB
- 400 feet (122 m) the sound level is 101 dB
- 800 feet (244 m) the sound level is 91 dB

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 affects 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, it may be desirable to install the siren toward the western edge of the area to be covered.

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

Installing the Sirens

⚠️ DANGER

Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, installation should be performed by experienced electricians in accordance with national and local codes.

⚠️ WARNING

The sound output level of some DSA sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan placement of sirens and post warnings.

Most DSA siren installations are on poles. The arrays may also be installed on elevated vertical surfaces, such as walls, or on flat horizontal surfaces, such as roofs.

A siren is typically installed 40 to 50 feet above the ground. If a DSA siren is installed at 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 make it desirable to test the sound coverage of the siren at various heights and locations whenever possible.

Installation Bracket Options

Each DSA speaker array includes a DSAMK1, which is wall mounting kit for one vertical stack that includes stainless steel brackets and mounting hardware. This bracket will become the lower bracket in your installation. (Refer to Figure 3.) You can use all brackets on wood, concrete, or metal utility poles, and also use on interior and exterior wall structures.

Use the following table for bracket options.

<table>
<thead>
<tr>
<th>Number of DSAs</th>
<th>Mounting Bracket for Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single DSA mounted on either a pole or a vertical surface</td>
<td>Use a second DSAMK1 bracket (Refer to Figure 3.)</td>
</tr>
</tbody>
</table>
| Two DSAs installed on a pole                | Use any of the following optional upper brackets:  
  - Two DSAMK1s for any two array installation  
  - One DSAMK4 for installations where the arrays will be at 90° to one another |
| Three or four DSAs installed on a pole       | Use DSAMK4 for the upper bracket in the installation                                             |
**NOTE:** DSAMK1 is the only available mounting configuration for mounting on a vertical surface. Refer to Figure 6.

The DSAMK4 is designed to be mounted on top of the pole. Refer to Figure 3.

**Figure 3 Top of pole mount using DSAMK4**
Pole Installation

Install a utility pole in accordance with national and local acceptable practices. Determine the number of arrays to be mounted and the direction in which the array(s) is/are to be orientated.

**Figure 4 Typical Pole Installation**
Wood Utility Pole Installation

To install a wood utility pole, do the following:

1. Mount the upper DSA bracket, obtained as an option, at the top of the pole with the proper orientation. Secure the DSA bracket to the utility pole with three ½ inch x 4 inch long galvanized lag bolts and three ½ inch flat washers. (Bolts and washers are supplied by the installer.) Refer to Figure 3.

2. Measure 12 inches down the pole from the center of the upper bracket to the point that will be at the center of the DSAMK1 bracket.

3. Align the lower bracket, DSAMK1, so it is in vertical alignment with the upper bracket.

4. Mount the lower DSAMK1 bracket using three ½ inch x 4 inch long galvanized lag bolts and three ½ inch flat washers.

5. Remove and save the mounting bolts from the DSA.

6. Lift the array into position, with the cable coming out the bottom, and loosely secure it to the previously installed upper DSA bracket at the outer most bracket holes using the hardware previously removed.

7a. If the array is to be mounted facing in a horizontal plane, attach it to the DSAMK1 lower bracket in the outer most bracket holes using the hardware previously removed.

7b. If the array is to be mounted so that it is pitched downward at a 15° angle, attach it to the lower bracket at the inner most bracket holes using the hardware previously removed.

8. Tighten all array mounting bolts.

Repeat steps 1-8 for each array in the installation.

Concrete or Metal Pole Installation

When using a concrete or metal pole, you will provide adapter plates to mate to the DSA mounting brackets. Pay careful attention to the orientation of these attachments to the poles. Once in place, the speakers will project the loudest sounds in the directions that the brackets face.

A drawing of the DSAMK1 is provided in Figure 6 to show the bolt hole pattern that the new bracket must be attached to.

When the installation requires the use of DSAMK4 mounting bracket, you must make a circular plate and rigidly attached to the top of the pole. Figure 5 shows the required bolt hole pattern for those brackets.

**NOTE:** The pole top mounting holes are at a 45° angle to the horizontal center line of the speakers.
Installation Instructions

The balance of the installation is similar to that for a wooden utility pole installation except that the installer will provide grade 5 machine screws, washers, and nuts for attachment of the siren brackets to the pole brackets.

Figure 5 Top view of DSAMK4 bolt hole pattern

Wall Mount Applications

For wall mount installation, materials, and securing methods may vary depending on local and national electrical codes.

A structural engineer may be needed to determine the required mounting method.

You can wall mount the DSA speaker array either outdoors or indoors.
Figure 6 Wall Mount Configuration
Obtaining 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-ans@federalsignal.com. For instruction manuals and information on related products, visit: http://www.alertnotification.com/
Figure 7 Typical DSA6 Assembly

NOTES:
1. WRAP ANY EXPOSED WIRE LEADS WITH ELECTRICAL TAPE.
2. APPLY SMALL AMOUNT OF INSULATION TO INSIDE TERMINALS.

TOTAL 1