Public Service™

Public Service
Company of Colorado

2420 W. 26th Avenue, Suite 100D, Denver, Colorado 80211

April 14, 1986
Fort St. Vrain
Unit No. 1
P-86293

Federal Emergency Management Agency
Mr. Alton D. Cook
Denver Federal Center
P.O. Box 25267
Denver, CO 80225-0267

ATTN: Dr. Floyd Shoemaker

Docket No. 50-267

SUBJECT: Radiological Alarm in
Platteville, Colorado

Dear Mr. Cook:

In a recent phone conversation with Dr. Floyd Shoemaker he requested technical information on the subject siren we have installed in Platteville as a backup to the radio alert system. Rather than furnish a few bits of information I believe it is prudent to furnish all the information. Therefore I have enclosed a copy of the Siratone model EOWS manual for your use.

Please call if we can be of further assistance.

Very truly yours,

D. W. Warembourg, Manager
Nuclear Engineering Division

DWW/JRR:bb

Enclosure

cc: M. H. Holmes

A045
1/1

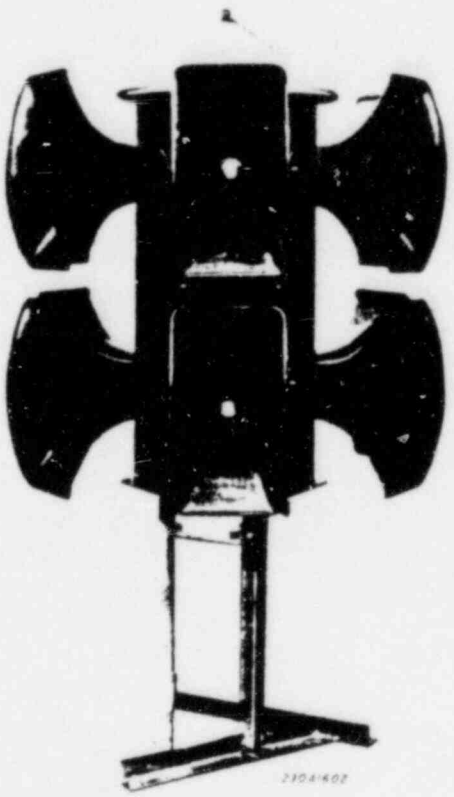
P-DISTRIBUTION
M.L. Gray (DH)
M.H. Holmes (DH)
J.A. Peasy (DH)
D.W. Warembourg (DH)
W.E. Niehoff (DH)
J. Stufflebeam, NFSC Clerk (DH)
J. Jones (DH)
L.M. McBride (DH)
D. Goss (DH)
J. Williams (DH)
J. Wright (DH) 2
D. Roopers (DH)
Denver Document Control (DH)
R. Klitzman (FSV)
J.W. Gahm (FSV)
F. Novaches (FSV)
T.J. Borst (FSV)
P. Collins, PORC Clerk (FSV)
M. Dalpiaz (FSV)
Tech Serv. Sr. Clerk (FSV)
C.H. Fuller (FSV)
B. Burchfield (FSV)
J. Gramling (FSV)
L.W. Singleton (FSV)
J. Eggebroten (FSV)
R. Craun (FSV)
M. Ferris (FSV)
S. Williford (FSV)
D. Evans (FSV)
J. Sills (FSV)
J. Switzer (FSV)
R. Hooper (FSV)
R. Rivera (FSV)
Farrell (NRC FSV)
Ken Heitner (NRC)
D. Ireland (NRC)
E.H. Johnson (NRC)
US NRC Document Control Desk
Independent Reviewer
D. Hoffman (Consultant)

Price $5.00

SIGNAL DIVISION
Federal Signal Corporation

Model EOWS

SiraTone™



INSTALLATION AND SERVICE INSTRUCTIONS

SIGNAL DIVISION
Federal Signal Corporation

256A569
REV.A 385
Printed in U. S. A.

SUPPLEMENT TO MODEL EOWS* INSTALLATION AND SERVICE INSTRUCTIONS

The following are changes that should be made to the Installation and Service Instructions to make the manual compatible with the equipment as presently shipped from the factory.

A. The EOWS rotator circuit has been changed to provide a greater range of available current for extremely cold weather. Disregard figures 4-3 and 7-1 in the Installation and Service Instructions and use the Control Unit wiring diagram included in this supplement. The changes that are reflected in the new diagram are:

1. The rotator fuse and fuseholder have been deleted.

2. The battery wire (+) that went to the fuseholder is now connected to the rotator relay socket, pin 8.

3. Pins 1 and 8 are jumpered together.

4. Pins 4 and 6 are not jumpered.

5. Pins 3 and 6 are jumpered together.

6. The 70-ampere main fuse (across battery) has been replaced with a 100-ampere.

B. The following changes should be made to the diagram and parts list on pages 7-4 and 7-5.

1. The value of the item 11 fuse should be changed to 100 amp., JJN100A (part no. 148A140A).

2. Delete fuseholder, item 36.

3. Add: Desiccant, part no. 288A339A, qty. 2.

4. Add: Vapor Capsule, part no. 288A340A, qty. 1.

C. Control of Condensation and Corrosion in the Control Unit Cabinet.

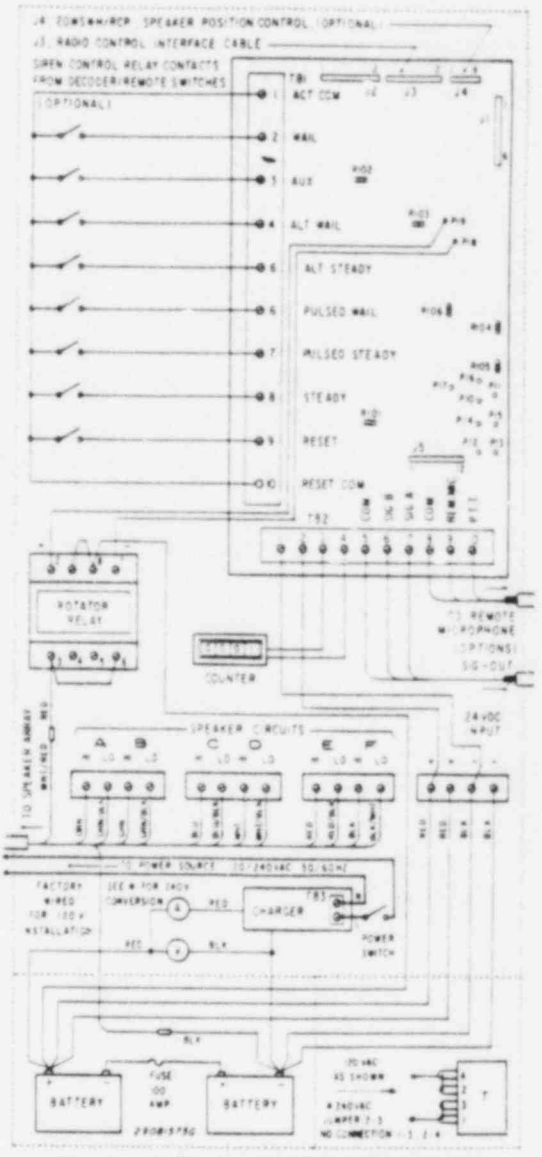
1. The two packets of desiccant should be placed in the bottom of the Control Unit Cabinet.

NOTE

The desiccant packs should be replaced or dried (per instructions on package) whenever the cabinet door is opened.

2. The vapor capsule has an adhesive backing and is to be installed on the inside of the cabinet door. At time of installation, the date should be written in the space provided on the capsule. The capsule has a maximum life of one year.

3. When possible, the service and inspection of the cabinet should not be done in inclement weather conditions. Prior to closing the door, all excess moisture should be removed.



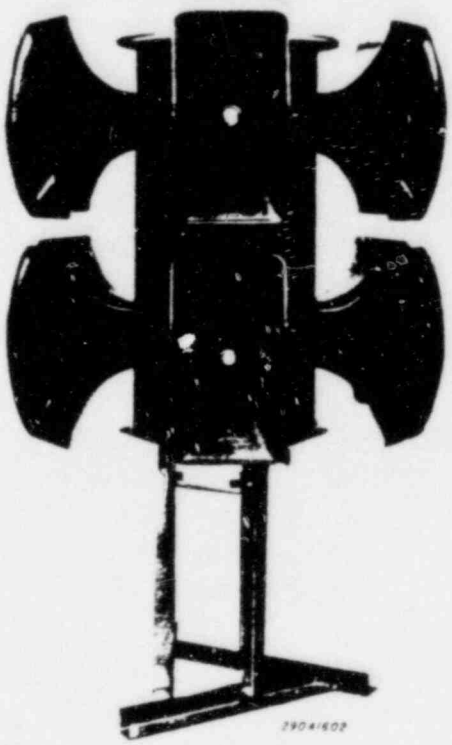
Control Unit Wiring Diagram.

SIGNAL DIVISION
Federal Signal Corporation

Model EOWS

SiraTone™

FSV SIREN MODEL
EOWS-612



INSTALLATION AND SERVICE INSTRUCTIONS

255A185F
1184

Printed in U.S.A.

Warranty

Federal Signal Corporation (Federal) warrants outdoor warning sirens of its manufacture to be free from defective material and workmanship at the time of delivery to the user. Federal will repair or replace, without charge to user other than transportation, removal and reinstallation costs, any of its outdoor warning sirens and controls, or part thereof which Federal shall determine, in its sole discretion, to be defective in material or workmanship provided written notice of such defect shall have been given to Federal within two years from the date of delivery as to such defects in electrical components, such as motors and controls, and within three years from date of delivery as to all other such defects, such as mechanical components. Additionally, Federal's obligations hereunder shall be conditioned upon the user, at its cost, making the outdoor warning siren available to Federal for its inspection at such location as Federal may designate. This warranty shall not extend to any outdoor warning siren which has been improperly installed or inadequately maintained according to instructions supplied by Federal or which has been subjected to misuse, negligence, accident, tampering or alteration. The sole remedy for breach of the foregoing warranty shall be repair or replacement as aforesaid, or in Federal's sole judgment, refund of the purchase price paid for such outdoor warning siren, and every other form of liability for direct or consequential damages, cost or loss is expressly excluded or denied. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED.

FEDERAL SIGNAL CORPORATION

290A1068B

TABLE OF CONTENTS

SECTION I
GENERAL DESCRIPTION

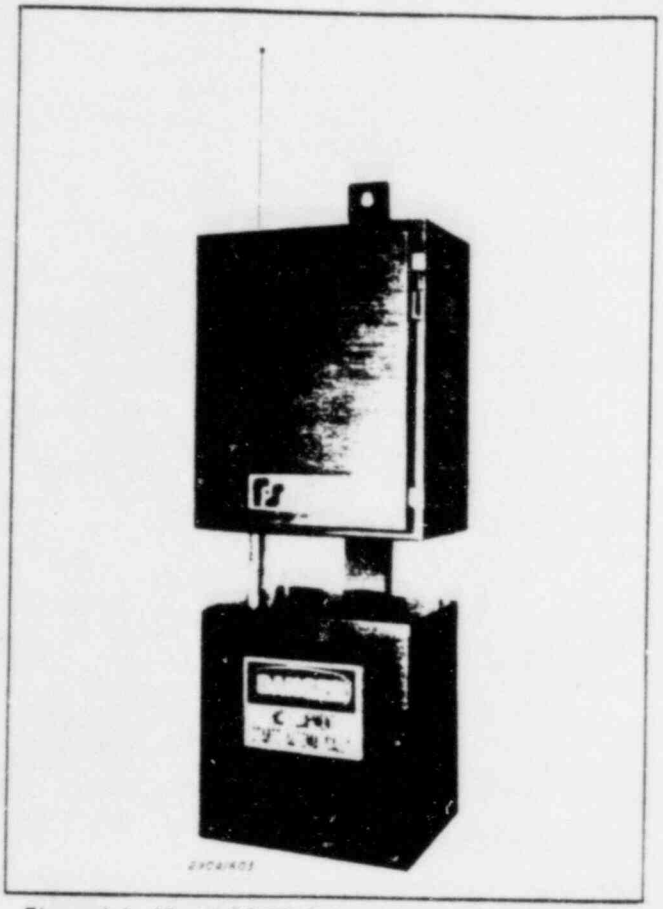


Figure 1-1. Model EOWS Control Unit and Battery Box.

1-1. GENERAL.

The Federal Model EOWS SiraTone (Electronic Outdoor Warning Siren) products are a family of dual-tone, electronic sirens that are capable of producing high intensity warning signals and voice communication over a large area. These electronically produced warning signals more nearly resemble the distinctive, penetrating sound of an electromechanical siren. A highly efficient circuit design and battery power system enable the siren to produce a high sound level, while making moderate demands on the user provided power source.

1-2. SIREN DESCRIPTION.

The SiraTone system consists of a high power Speaker Array and a Control Unit with batteries. Three types of speaker arrays are presently available. Models EOWS*115 and EOWS*1212 are stationary and omnidirectional. Model EOWS*612 is rotating, unidirectional.

The Model EOWS*C/B is the only control unit necessary. It comes equipped with batteries and six amplifiers.

A. Model EOWS*C/B Control Unit.

The Control Unit consists of two cabinets, channel mounted for ease of installation (see figure 1-1). The upper cabinet (NEMA 4 enclosure) houses all the necessary electronics and controls for producing and amplifying up to seven signals (six standard plus one optional) and public address (PA). It also contains a diagnostic testing circuit that allows system checkout without alarming the public, a command verification digital counter, signal length timer, automatic battery charger, manual siren controls, automatic speaker incrementing which automatically positions the speaker to the next zone after completion of a transmission and the optional Federal Siratrol radio control for remote activation of the siren. The Federal Siratrol is the subject of separate instructions. The tone generator circuitry (Control Module) and amplifier (Amplifier Module) are all modularly constructed for easy removal without disconnecting a large number of wires.

The lower cabinet, which complies to a NEMA 3R rating, houses two maintenance free, lead-calcium deep-cycle rechargeable batteries. The lower and upper cabinets are interconnected via conduit, which is sealed to prevent any harmful vapors from entering the control area. The batteries provide primary power to the siren, while the charger in the upper cabinet maintains the charge on the batteries. This arrangement

provides power to the siren in the event of a power failure and can provide thirty minutes of continuous signalling power to the siren.

B. Speaker Array.

Three different speaker arrays are available for use with the EOWS*C/B Control Unit. Each speaker array is supplied pre-wired, ready for installation with 50 feet of speaker cable. The speaker arrays have convenient eyebolts which provide an adequate lifting point for ease of installation. Each speaker array model is the subject of separate installation instructions. The general description of each speaker array is contained in the following paragraphs.

1. Model EOWS*115 (figure 1-2). This speaker array is a cluster of twelve exponentially flared re-entrant, fiberglass speaker projectors which are non-rotating, omni-directional. Two tiers of six speakers produce a uniform sound distribution to within ±3dB for a complete 360 degree radial perimeter. This speaker array is designed for low vertical sound dispersion while maximizing the uniform horizontal sound distribution.

2. Model EOWS*1212 (figure 1-3). This speaker array is a cluster of twelve exponentially flared re-entrant, spun aluminum speaker projectors which are non-rotating, omni-directional. Two tiers of six speakers produce a uniform sound distribution to within ±5dB for a complete 360 degree radial perimeter. This speaker array is designed for "long throw" wide area coverage.

3. Model EOWS*612 (figure 1-4). The Model EOWS*612 rotating uni-directional speaker array uses six exponentially flared re-entrant, spun aluminum speaker projectors. The rotator mechanism rigid bearing assembly, idler bearings, brush and collector rings and speaker drivers are all located in the sectional protective enclosure. This enclosure has sectional rear panels for easy servicing. Each speaker circuit has four brush contacts which provide continuous reliable energy transfer and stall free rotation of the array.

This speaker array is designed for "long-throw" wide area coverage. The dual-tone coverage of this unit provides an effective warning signal as well as necessary listening time.

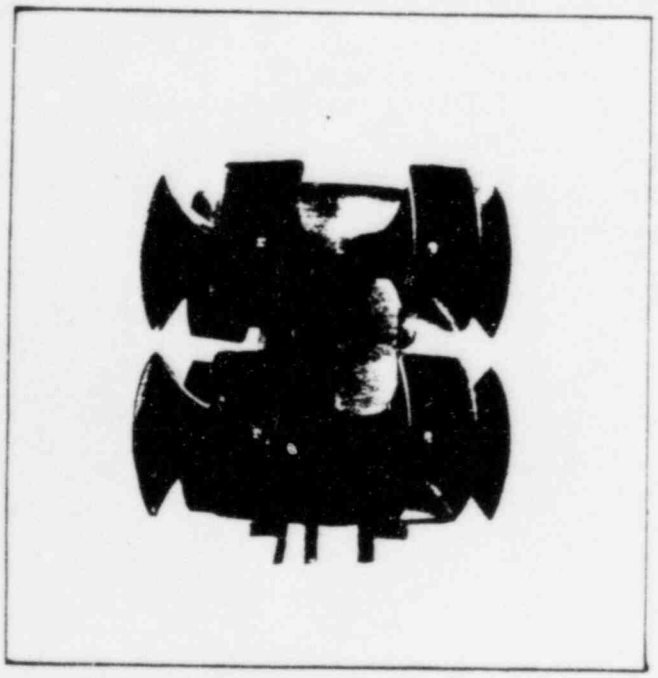


*Figure 1-2. Model EOWS*115 Speaker Array.*

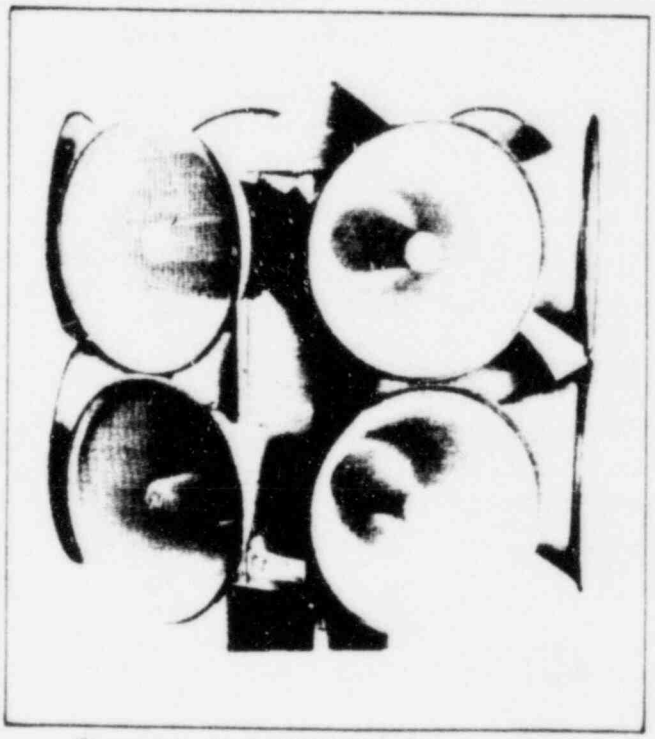


*Figure 1-3. Model EOWS*1212 Speaker Array.*

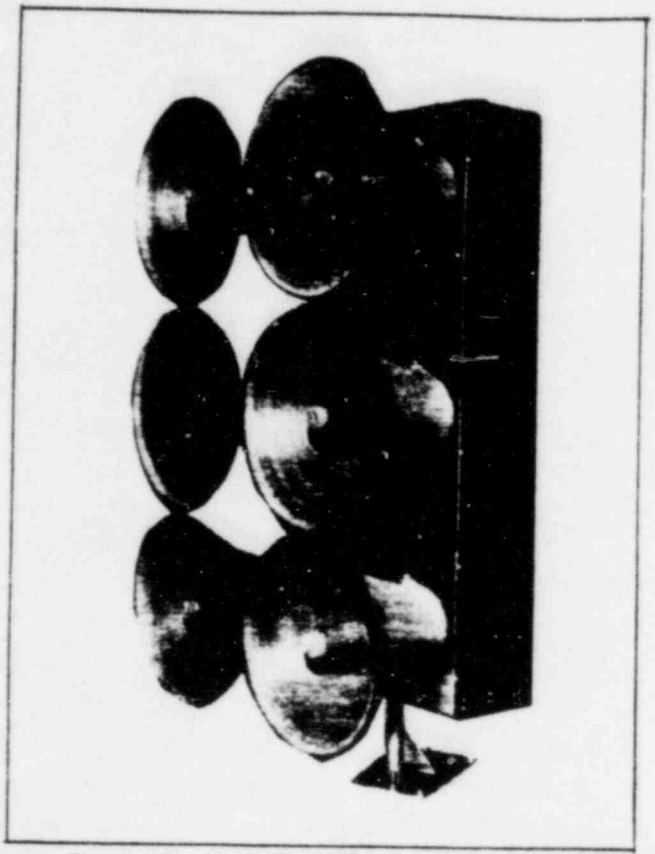


Figure 1-4. Model EOWS*612 Speaker Array.

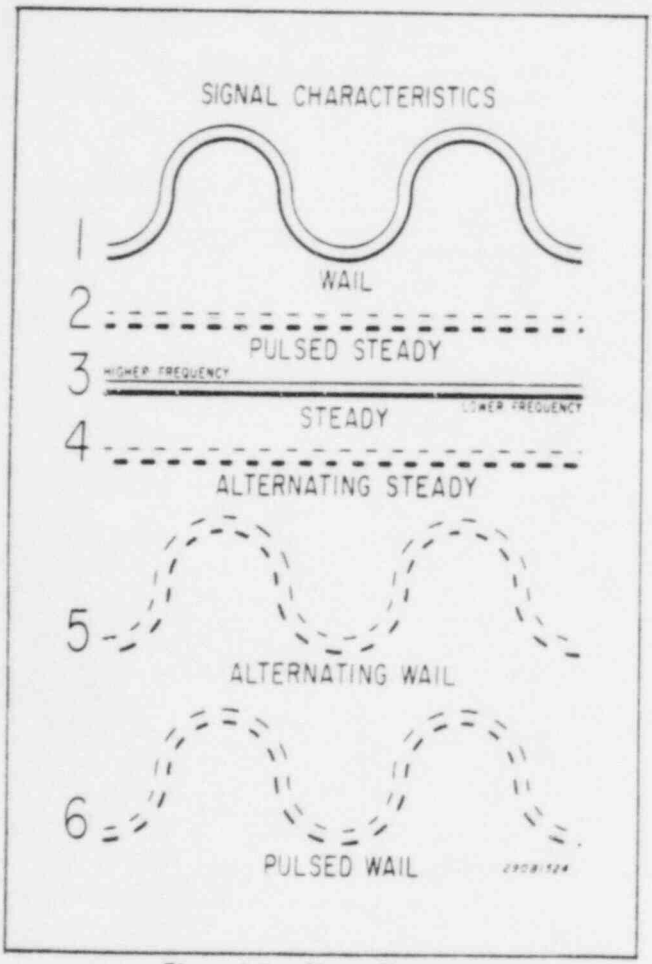


Figure 1-5. Signal Characteristics.

1-3. SIGNAL DESCRIPTION.

Model EOWS is capable of producing six standard signals plus one optional signal for a maximum of seven signals. A graphic representation of the six standard signals is shown in figure 1-5. As indicated in the figure, three of the six signals are either a wailing, dual-tone signal or a variation of a wailing dual-tone signal. Similarly, the remaining three signals are either a steady dual-tone signal or variations of the steady dual-tone signal. In some of the signals, both tones are produced simultaneously, while in others the tones are present alternately.

1-4. OPTIONS.

A. Auxiliary Tone.

If required, an optional seventh signal can be added to the SiraTone. The circuitry required for the production of the optional signal is contained in an easily installed tone module. A tone module can be factory installed in the Control Unit, or the module can be installed by the user. In addition, a tone module can be changed, if signalling requirements change. Optional tone modules available for use with the SiraTone are: Yelp, Yeow, Slow Whoop, *Temporal Slow Whoop, Bell, Gradual Horn and Westminster Chimes. Westminster Chimes is suggested as a pleasant method of daily scheduled SiraTone testing.

B. Radio Control.

The siren can be activated by a radio signal if an optional Federal SiraTone is incorporated into the Control Unit. Activation by radio control has the advantage that control lines are not required between the siren control site and the siren location. Public address and tone signals can be controlled by a Siratrol receiver with either Two-Tone Sequential or DTMF (Dual Tone Multiple Frequency) control. The Federal Siratrol is the subject of a separate instruction manual.

C. Home/Remote Control Positioning. (Rotating speaker array system only)

The rotating speaker array can be positioned to operate selected zones. Up to 8 zones can be selected and set at the time of installation. Radio or land-line activation can then position the speaker array to any desired zone for a specific area announcement. The standard automatic speaker incrementing function will still be operative and will move the speaker array to the next zone after completion of a transmission.

This option will also "Home" the speaker array to zone 1 (predetermined at installation) which could be a position away from the general direction of inclement weather or the position of primary signalling and/or PA announcements. Homing automatically occurs after four minutes of speaker array inactivity. The option can be factory installed or added to existing SiraTone systems.

*National Fire Protection Association recommended temporal pattern for the National Standard Fire Alarm evacuation signal.

SECTION II
SPECIFICATIONS

2-1. SYSTEM POWER.*

Operating Voltage . . . . . 120/240Vac, 47-440Hz, single phase

Current Requirements . . . . . 4 amps. at 120Vac
2 amps. at 240Vac

Operating Power*
- Operating Voltage 24Vdc
- Operating Current when used with:
  - EOWS*115 . . . . . 52 amps. (nom.)
  - EOWS*612 . . . . . 60 amps. (nom.)
  - EOWS*1212 . . . . . 60 amps. (nom.)
- Standby Current (Control, 6 amplifiers, Radio and Decoder) . 0.25 amps.

Operating Time . . . . . 30 minutes

Standby Time (with minimum 5 minute full signal reserve) . . . . greater than 168 hours (7 days)

2-2. CONTROL UNIT.

Output Power . . . . . 1200 watts (nom.)

Output Voltage (to speaker drivers) . 32Vrms (nom.)

Operating Temperature . . . . . -35°C to +85°C**

Dimensions (HWD) . . . . . 58" x 20" x 15"
(1473mm x 508mm x 381mm)

Weight (approx. incl. batteries) . . 240 pounds (109 kg)

Enclosures
- Upper (Control). . . . . NEMA 4
- Lower (Batteries) . . . . . NEMA 3R

2-3. CONTROL MODULE.

Signal	Dual-Tone Freq. Range	Sweep Rate
Wail	300/360-850/1020	13 sec.
Pulsed Wail	300/360-850/1020	1.5 sec/13 sec.
Alternate Wail	300/360-850/1020	1.5 sec/13 sec.
Steady	850/1020***	N.A.
Pulsed Steady	850/1020***	1.5 sec.
Alternate Steady	850/1020***	1.5 sec.

2-3. CONTROL MODULE (continued).

Signal Duration (Auto reset)	2-5 minutes
Input Impedance	
Local	5K Ohms
Remote	500 Ohms
Signal Output	
Tone	5Vrms
Audio	3.5Vrms
Audio Distortion for output level from 0.1 volt to full rated output	1% maximum
Frequency Response (300 to 4KHz)	±2dB (ref. 1KHz)
Maximum Load	50 Ohms
Activation, Minimum Contact Closure	200ms at 0 Ohms 300ms at 100 Ohms

2-4. AMPLIFIER MODULE.

Operating Current	8.75 amps. at 24Vdc
Input Impedance	33K Ohms
Bias Trigger Level (Max. sensitivity)	125mVrms
Signal Output	
Tone	32Vrms
Audio	22Vrms
Audio Distortion for output level from 2 volts to full rated output	3% maximum
Frequency Response (300 to 4KHz)	±2dB (ref. 1KHz)
Maximum Load	5 Ohms

2-5. POWER SUPPLY.

Charge Current	6 amps.
Battery Voltage (at full charge)	27.8Vdc
Batteries	
Number	2
Type	Deep discharge (lead-calcium maintenance free chargeable)
Load Test Current	360 amps.
Reserve Capacity	115 minutes at 25 amps.

*System power refers to power supplied to the system from user-supplied commercial power. The operating power is the self-contained primary and back-up power system.

**The siren can operate throughout this temperature range provided the battery temperature is maintained at -18°C or higher.

***Frequencies for steady, pulsed steady and alternate steady are peak frequencies. The signal itself includes "build-up" and "coast down", similar to a mechanical siren.

2-6. SPEAKER ARRAY-PHYSICAL.

Number of Speakers

EOWS*612 6

EOWS*1212 and EOWS*115 . 12

Dimensions (HWD)

EOWS*612 . . . . . 81.5" x 51.6" x 32.8"
(207cm x 131cm x 83cm)

EOWS*1212 . . . . . 58"H (88" incl.mtg. brckt) x 60" Dia.
(147.3cm x 152.4cm)

EOWS*115 . . . . . 55"H x 54" Dia.
(144cm x 137cm)

Weight

EOWS*612 . . . . . 480 lb. (218 kg)

EOWS*1212 . . . . . 540 lb. (245 kg)

EOWS*115 . . . . . 360 lb. (163 kg)

SECTION III
SYSTEM PLANNING

3-1. CONTROL UNIT.

The information in this paragraph provides the user with guidelines necessary for installation to achieve total benefit of the Control Unit's features.

Control Unit mounting location must first be considered. The Control Unit can be mounted indoors as well as outdoors. In order to avoid losses in speaker power, it is recommended that the speaker array and Control Unit be installed so that the 50-foot interconnecting cable (supplied) will not have to be lengthened. If it is necessary to make a longer cable run, increasing the wire size to 12AWG or larger is recommended.

Whether the Control Unit is installed indoors or outdoors, it should be located out of the reach of vandals. The control and battery enclosures are both supplied with hasp and staple for padlocking security.

The system is operated from 120 or 240VAC which necessitates minimal installation requirements.

Several methods of both signal and voice can be used to activate the Control Unit. Land-line control can be used through normally open contact switches. These connections should be made directly to the control module terminal block. The SiraTone can also be remotely activated via the optional Siratrol receiver. When this option is selected, the receiver is pre-wired and located in the Control Unit cabinet.

The entire Control Unit is shipped mounted on an aluminum channel with four mounting holes for 1/2-inch bolts. The total weight of the Control Unit/ Battery Box Assembly is approximately 240 poiunds (109kg.) including batteries. Therefore, insure that the mounting surface and fasteners can safely sustain the weight of the assembly.

3-2. SIREN LOCATION.

The information in this paragraph provides guidelines to aid the user in the selection of an installation site that makes optimum use of the siren.

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 the 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, the pitch of the sound and the height of the siren. Optimum sound propagation conditions exist when there are no obstructions in the sound path, the terrain is flat, and the air is calm. Under these conditions, each time the distance from the siren is doubled, the sound level decreases by approximately 8dB. For example, the sound level 100 feet (30.5m) from the siren is 115dB. At 200 feet (61m), the sound level drops to 107dB; at 400 feet (122m) the sound level drops to 99dB; etc. This is referred to as the "loss per distance doubled".

A loss per distance doubled of 8dB is seldom experienced. This is because buildings and other obstructions are frequently present in the sound path. In addition, the atmosphere is rarely calm, and the terrain may not be flat. As a result, a typical loss per distance doubled in residential areas may be 10dB, and as high as 12dB in areas having tall buildings.

Experience indicates that an individual with normal hearing will probably hear a warning signal whose intensity is at least as high as the ambient noise level. Experience has also shown that the ambient noise level in industrial districts is typically 90dB. Therefore, for a person to hear a warning signal in an industrial area, the sound level intensity of that signal must also be approximately 90dB. In this situation, any point receiving a signal having less than 90dB intensity is considered to be outside the effective range of the siren.

In business districts an ambient noise level of 80dB is common and in residential areas, 70dB of ambient noise is typical. Assuming a 70dB minimum sound level, the effective range of a Model EOWS*115 SiraTone is approximately 3000 feet (914m). (From 3000 to 6400 feet (914 to 1950m) depending on speaker array used.)

Wind speed and direction often affect the propagation of sound from the siren. Consequently, the direction of the prevailing wind may also be a factor to consider when selecting the installation site(s) of a small, one or two-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 before selecting the installation site include the availability of electrical power, the ease of installation and maintenance, and the height of surrounding obstructions.

SECTION IV
INSTALLATION

4-1. PHYSICAL.

A. General.

Most SiraTone installations are one of two types: Pole Mount or Flat Surface Mount. These two configurations make it possible to install the SiraTone in almost any situation. If neither of the installations in this paragraph is suitable, modification of one of the configurations described may be practical.

A SiraTone is typically installed 35 to 40 feet (11m. to 12m.) above the ground. If the siren is less than 35 feet (11m.) above the ground, sound intensity at close range may increase but the effective range of the siren is reduced. Conversely, if the siren is located more than 40 feet (12m.) above the 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 siren sound coverage at various heights and locations whenever possible.

B. Pole Mounting.

A typical SiraTone pole-mounted installation, using the Model EOWS*115 Omni-directional Speaker Array, is shown in figure 4-1. Depending upon the subsurface conditions at a particular speaker array installation site, it may be advisable to use a Class I timber utility pole. The stability of the footing may make the installation of guy wires to the pole necessary. To install the SiraTone on a timber utility pole, proceed as follows:

1. Install the timber utility pole in accordance with accepted standards and practices.

2. Mount the speaker array on the pole following the instructions supplied with the array. The Control Unit and Battery Box are attached to a length of 4" channel. There are five pre-drilled holes in the channel: one 1-1/4" hole and four 5/8" holes. The 1-1/4" hole provides

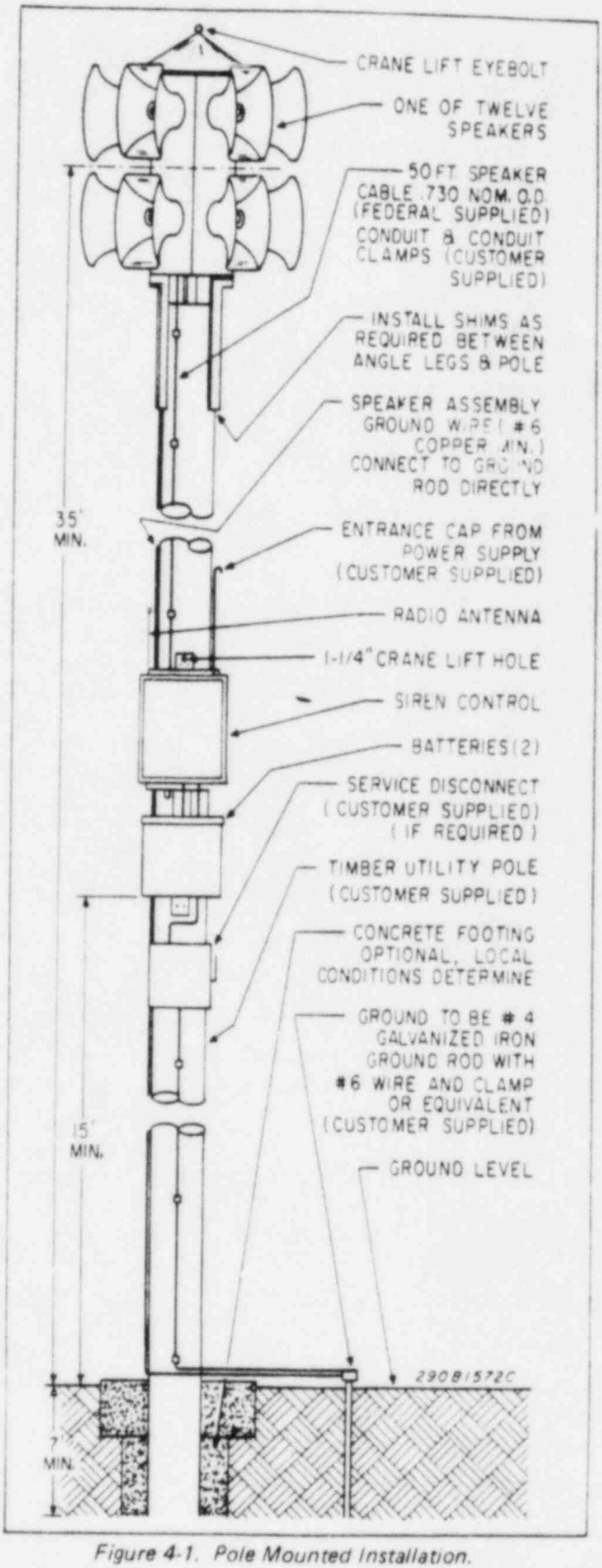


Figure 4-1. Pole Mounted Installation.

a convenient point for lifting the Control Unit/Battery Box assembly. The four 5/8" holes are for attaching the assembly to the pole. To attach the Control Unit/ Battery Box to the pole proceed as follows:

3. Use a crane to lift the Control Unit/Battery Box assembly to the desired height along the pole. It is recommended that the assembly be attached to the pole at a height that is accessible to service personnel, but discourages vandalism.

4. Use the crane to hold the Control Unit/Battery Box assembly against the pole. Using the four 5/8" holes in the channel as a template, locate four hole locations on the pole.

5. Drill a 3/8" hole at each of the four locations. Drill each hole at least 3-1/2" (90mm.) deep.

6. Attach the Control Unit/ Battery Box assembly to the pole, using four user-supplied 1/2" x 5" lag bolts. Slide a user-supplied 1/2" flat washer onto each bolt before threading the bolt into the pole.

7. Mount a user-supplied fused disconnect switch on the pole beneath or the opposite Control Unit/ Battery Box assembly.

C. Flat Surface Mount.

It may be practical to mount the siren on a flat-roofed building, depending on the location of the speaker array. When installing the siren on a flat roof, always be sure that the loudspeakers clear parapets or other obstructions by at least ten feet.

1. Install the speaker array on the roof, following the instructions supplied with the array.

The Control Unit and Battery Box are attached to a length of 4" channel. There are five pre-drilled holes in the channel: one 1-1/4" hole and four 5/8" holes. The 1-1/4" hole provides a convenient point for lifting the Control Unit/Battery Box assembly. The four 5/8" holes are for attaching

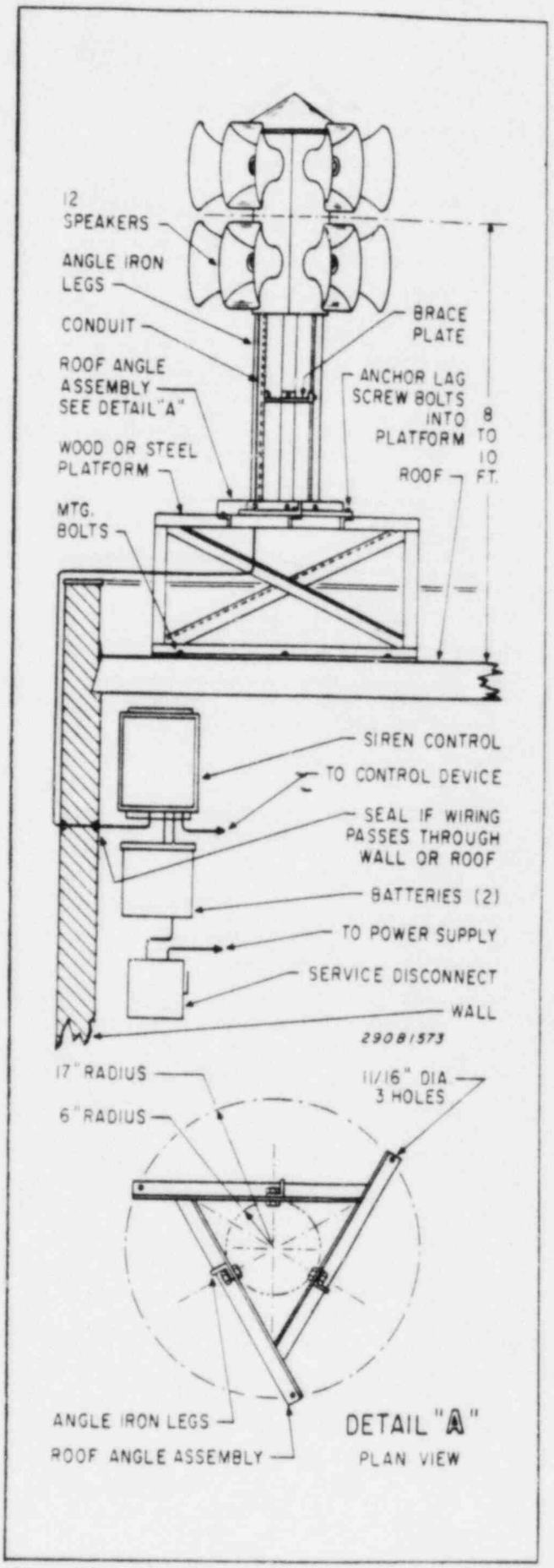


*Figure 4-2A. Flat Surface Mount with Platform (EOWS*115).*

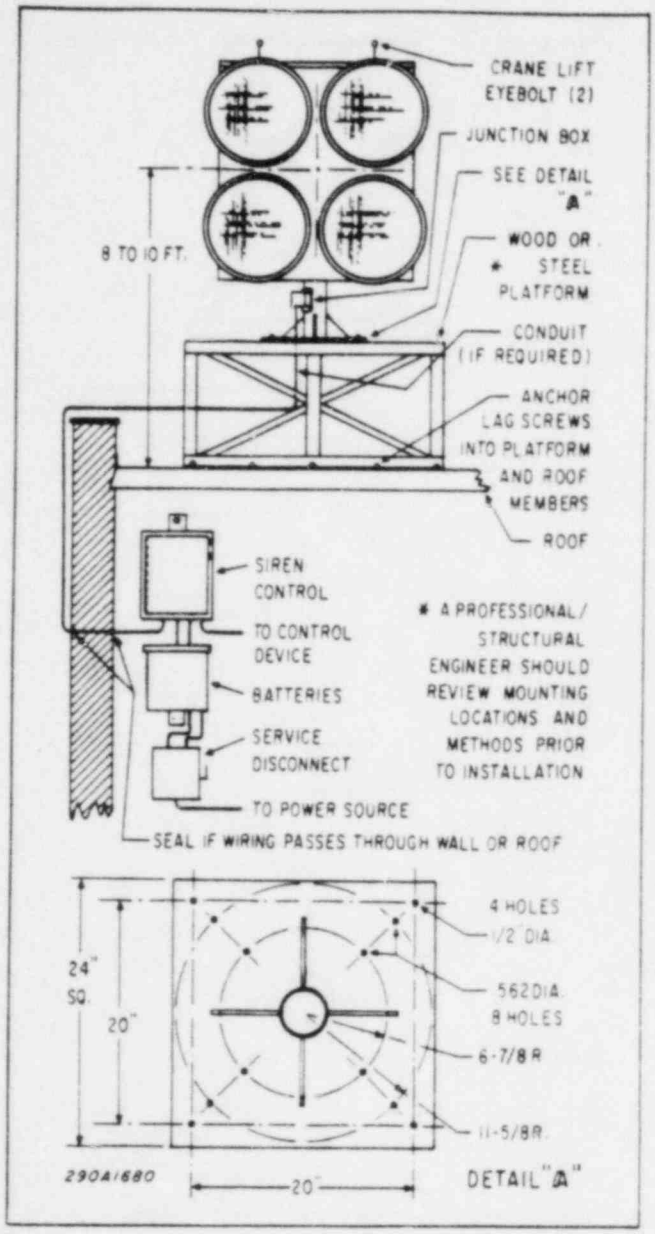


Figure 4-2B. Flat Surface Mount with Platform

the assembly to a wall or other substantial vertical surface. If the Speaker Array is installed on the roof of the building, it may be desirable to install the Control Unit/Battery Box inside the building, if practical.

Total weight of the Control Unit/Battery Box assembly is approximately 240 lb. (109 kg.) including batteries. Therefore, make sure that the mounting surface and mounting method selected can safely sustain the weight of the assembly. In addition, the mounting method used must be able to withstand external mechanical stresses that may be applied to the assembly.

2. Locate the Control Unit/Battery Box at the installation site. Attach the Control Unit/Battery Box assembly to the mounting surface, using the appropriate user-supplied hardware.

3. Install a user-supplied, fused, disconnect switch.

4-2. ELECTRICAL CONNECTIONS.

A. General.

Install the siren electrical system in compliance with local electrical codes and NEC recommendations.

As a safety precaution to protect both personnel and equipment, it is highly recommended that all siren units be solidly connected to an earth ground. If the siren is installed on a building, ground the system to a metallic object known to be grounded. For pole mounted installations, drive a metal rod or bar at least eight feet into the ground, as close as practical to the base of the pole. For maximum protection, use a separate, continuous 6AWG or larger wire from the siren frame to ground and from the cabinet of each siren unit to ground.

B. Signal Connections.

Connect the Speaker Array to the Control Unit, following the instructions supplied with the array.

C. Power Connections.

1. As shipped from the factory, the battery charger, in the Control Unit, is configured for 120Vac operation. However, the battery charger power input circuitry can be easily configured for 240Vac operation. If it is necessary to reconfigure the battery charger power input circuitry, proceed as follows:

(a) Turn off the power to the control unit. The charger is located behind the hinged doors of the upper enclosure. Remove the screws holding the doors closed and remove the four screws

that hold the battery charger to the bottom of the Control Unit enclosure. Retain the screws.

(b) Tilt the battery charger outward 90° so that the rear of the power transformer is accessible. Slide the charger back into the enclosure.

(c) Remove the jumper wires between power transformer terminals 1 and 3 and between terminals 2 and 4.

(d) Install a jumper wire between terminals 2 and 3 on the power transformer. DO NOT disconnect the input leads from terminals 1 and 4 of the power transformer.

(e) Remount the battery charger in the Control Unit enclosure.

(f) Replace the 5A fuse in the fuseholder with a user-supplied 2.5A 3AG fuse.

2. Route 1" conduit (steel preferred) between user-supplied, fused disconnect switch and the remaining conduit fitting in the bottom of the Control Unit enclosure.

3. Route two user-supplied wires through the conduit that was just installed between the Control Unit and the fused disconnect switch. Use wires no smaller thatn 14AWG. Do NOT connect the wires.

4. Connect the power wires and lightening protector (see figure 4-3 and 4-4) to the terminal strip directly in front of the charger (bottom) panel in the interior Control Unit. Close both panels, in the interior of the Control Unit, and replace the screws.

5. Remove the cover from the Battery Box enclosure. Remove the battery hold down bracket.

6. Install the batteries in the Battery Box, making sure that the positive terminal of both batteries is toward the front of the enclosure. It may be necessary to temporarily relocate the wiring in the enclosure before installing

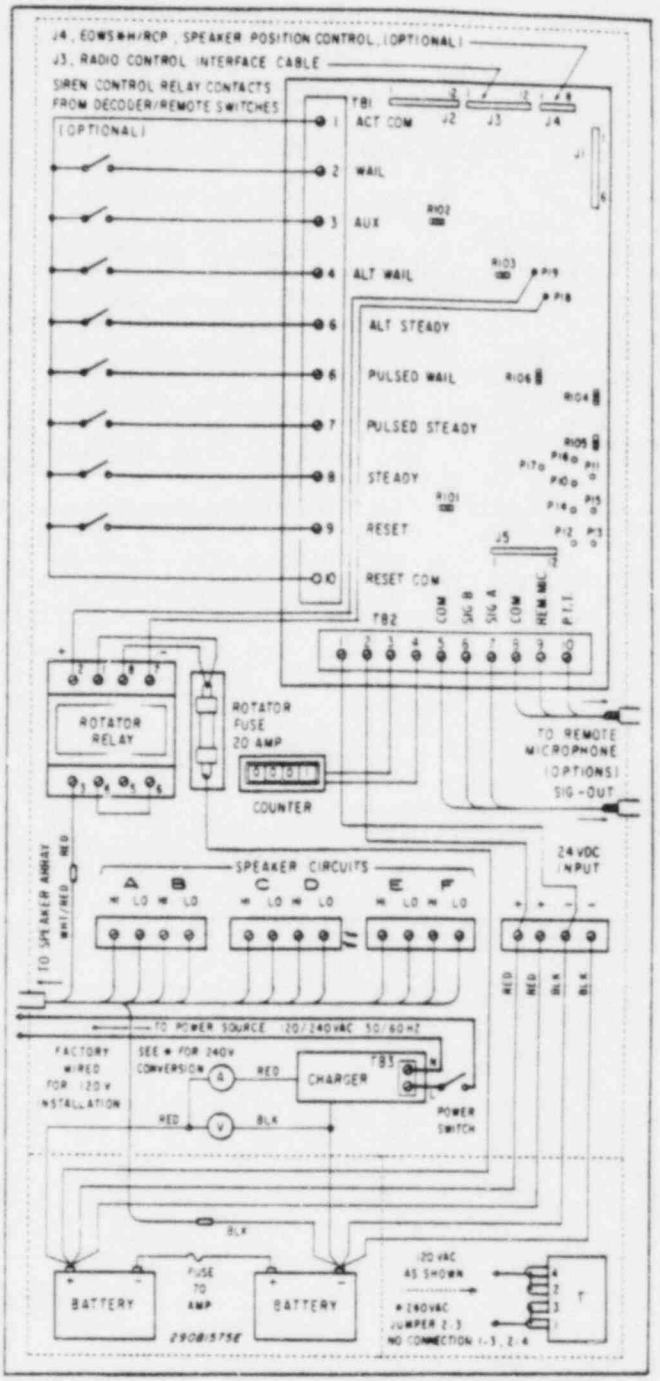


Figure 4-3. Control Unit Wiring Diagram.

the batteries. The polarity of the battery terminals is clearly marked on the battery case.

A fuse is mounted in back of the Battery Box enclosure. A length of red wire is connected to each side of the fuseholder. Each of these wires is equipped with a lug. The hole in one of the lugs is larger than the hole in the other. Connect the lug having the smaller hole to the negative (rear) terminal of the battery on the left by removing the wing nut and sliding the lug over

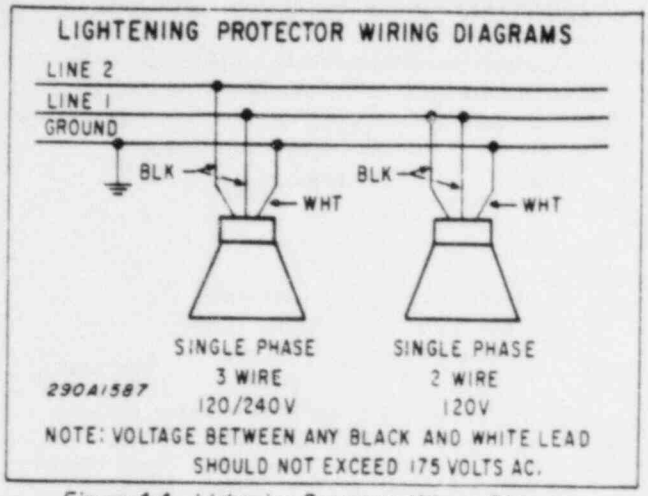


Figure 4-4. Lightning Protector Wiring Diagram.

the threaded battery terminal. Replace the wing nut and tighten securely. Similarly, connect the lug having the larger hole to the positive (front) terminal of the battery on the right. Make sure that both lugs are positioned so that they are not short circuited to any metal parts in the enclosure.

7. Four red wires and four black wires enter the Battery Box enclosure through the conduit at the upper left of the enclosure; two 10AWG and two 12AWG of each wire color. Connect the four red wires to the positive (front) terminal of the battery on the left. Similarly, connect the four black wires to the negative (rear) terminal of the battery on the right.

D. Control Connections.

1. All control interconnecting wiring can be accessed by sliding out the control module, located at the upper right in the Control Unit. To gain access to the wiring, proceed as follows:

a. Remove the screw which secures the control module.

b. Slide out the control module until it stops.

NOTE

All control module interconnecting wiring is routed through a grommeted hole at the rear of the control.

2. If desired, a user-supplied remote microphone can be connected to the SiraTone. Connect the microphone to TB2-8, 9 and 10, as shown in figure 4-3.

3. A user-supplied auxiliary audio amplifier, having an input impedance of at least 500 ohms, can also be connected to TB2 in the Control Unit. Connect the user-supplied amplifiers to TB1-5, 6, and 7, as indicated in figure 4-3.

4. If the SiraTone is to be landline controlled, install one user-supplied pushbutton switch, such as Federal Model SO, for each function, at the control site. If the siren control site is greater than 2000 feet (610m.) from the siren installation, install a SPST telephone relay, such as the Federal Model TRC*1020 between the two sites for each function, as indicated in figure 4-5. In addition, a 48Vdc power supply, such as the Federal Model PS, is required for telephone relay operation. Telephone relays and a power supply are NOT required if the length of the control lines is less than 2000 feet (610m.). Connect each push-button directly to the appropriate terminals of TB1, as shown in figure 4-3.

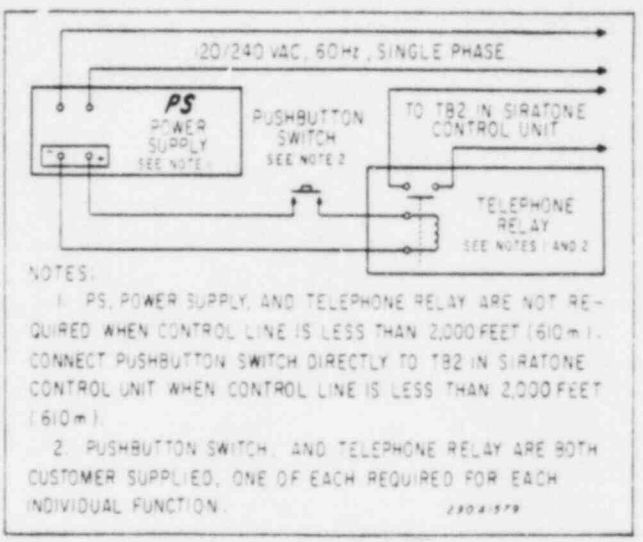


Figure 4-5. Landline Control Circuit.

The use of landline control is not necessary if the optional Federal Siratrol is incorporated into the SiraTone

Control Unit. J3 of the control module is dedicated to this purpose. If the optional Siratrol is included in the siren, all interconnections between the Siratrol and the SiraTone are pre-wired. However, the Siratrol antenna must be installed. When installing the antenna, make sure that the antenna is at least 3 feet (910mm) from all metal parts. On pole mounted installations, attach the antenna to the side of the pole closest to the control transmitter.

SECTION V
PRE-OPERATION CHECKOUT AND TEST

5-1. INITIAL CHECKOUT.

Temporarily remove the fuses from the front panel fuseholder on all amplifier modules. Connect the electrical wiring, previously installed in 4-2.C.3 to the fused disconnect switch. Apply power to the SiraTone. Turn on the charger power switch. The pilot light on the charger panel should illuminate. In addition, the voltmeter should indicate 24 volts and the ammeter should indicate some charging current. The amount of current indicated depends upon the battery charge level. If the pilot light is not illuminated, check the panel mounted fuse. Replace if defective.

If the fuse checks good, an electrical problem external to the Siratrol probably exists. If the pilot light is lit, check all Control Unit indicators (figure 5-1). Depress the PULSED STEADY pushbutton. The SIG. A and SIG. B indicators should flash and rotating speaker arrays should rotate. Depress the CANCEL pushbutton. The SIG. A and SIG. B indicators should light continuously for approximately eight seconds and rotating speaker arrays should stop rotating.

With an ohmmeter capable of measuring resistances of less than 10 ohms, depress the push-to-test pushbutton of each amplifier and measure the resistance at the output test points of that amplifier. The resistance should be approximately 2.7 ohms. A different reading indicates a possible wiring error or faulty driver in the speaker array. Since the speaker circuits are comprised of two speaker drivers in parallel, if one of the drivers in a circuit were to open, approximately 5.4 ohms would be measured.

Rotating speaker array systems have an option of either P-T-T override of tone signals during speaker incrementing (signal will not be activated as speaker travels to the next zone) or P-T-T override "on" only when P-T-T is held (dekeying of microphone will immediately sound emergency signal previously activated). The unit comes from the factory

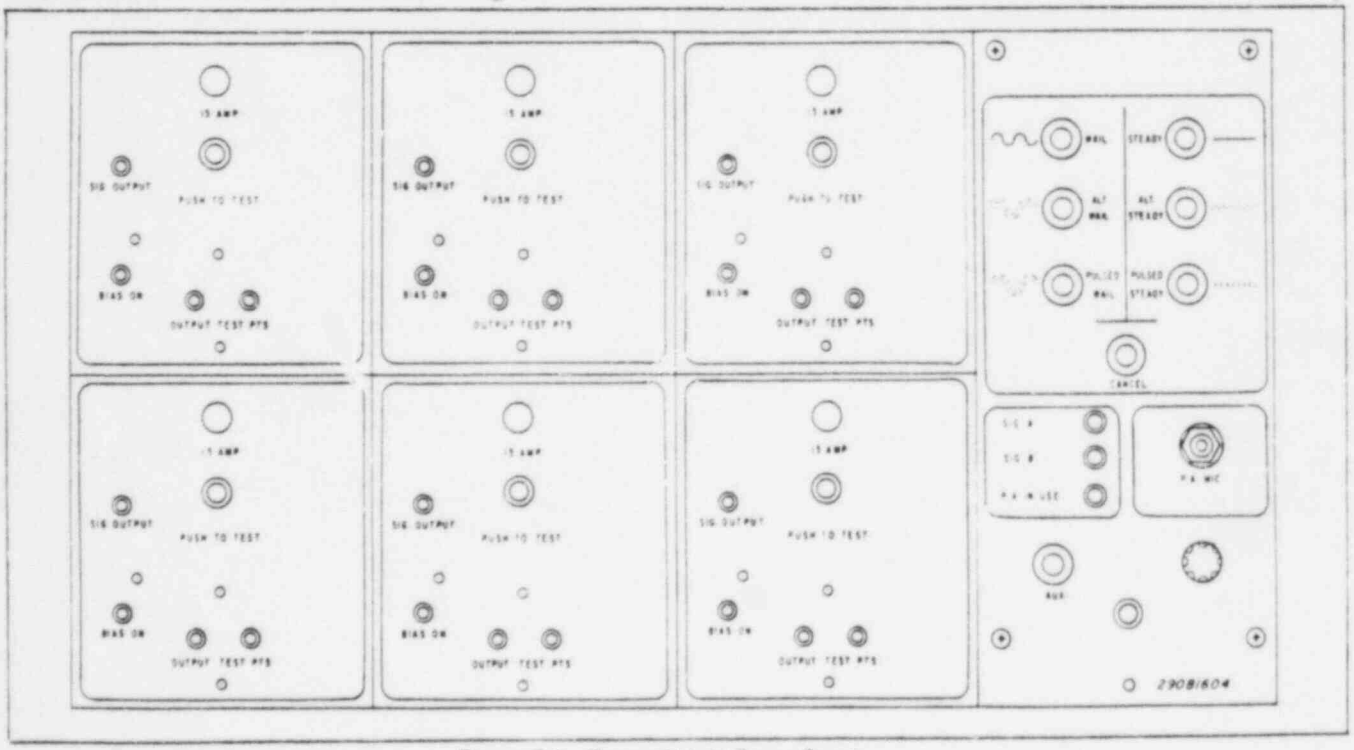


Figure 5-1. Control Unit Front Panel.

with tone signal override during incrementing. If P-T-T override only when P-T-T is held is desired, remove CR21 from control module printed circuit board (see figure 7-5). Replace the fuses in all amplifiers.

5-2. LEVEL ADJUSTMENT.

Signal duration, frequency, frequency cut-off, increment timing and microphone output level are adjustable from inside the control module. Frequency and frequency cut-off are factory set and should not be readjusted. Damage to the amplifiers may result.

To gain access to these adjustments, open the door of the Control Unit by loosening the screws holding the door clamps. Remove and retain the fuses from the front panel fuseholder on each of the amplifier modules. Most adjustments can be made without activating amplifiers and speakers. Remove and retain the 6-32 screw which secures the control module to the Control Unit. Slide the control module out until it reaches the stops.

For location of adjustments refer to figure 5-2. All adjustments involve setting a thumbwheel potentiometer and require no special tools.

A. Frequency.

R102 adjusts the frequency of output tone signals from the control module. The frequency is factory set, but if readjustment is necessary, proceed as follows:

1. Connect an audio range frequency counter to the SIG. A or SIG. B output.

2. Activate the steady signal and adjust the output tone signal frequency. SIG. A should be 1020Hz and SIG. B should be 850Hz.

B. Frequency Cut-off.

R103 adjusts the frequency at which the output signal will terminate upon cancelling or automatically resetting (time out) one of the six standard signals. This control is preset at the factory and should not be readjusted unless absolutely necessary. To adjust, proceed as follows:

1. Connect an audio range frequency counter to the SIG. B output.

2. Activate the steady signal and then cancel it. The counter should not indicate a frequency lower than 250Hz.

C. Signal Duration.

R101 adjusts the length of time a signal will continue once activated. Reactivation or activating another signal will automatically restart the time period.

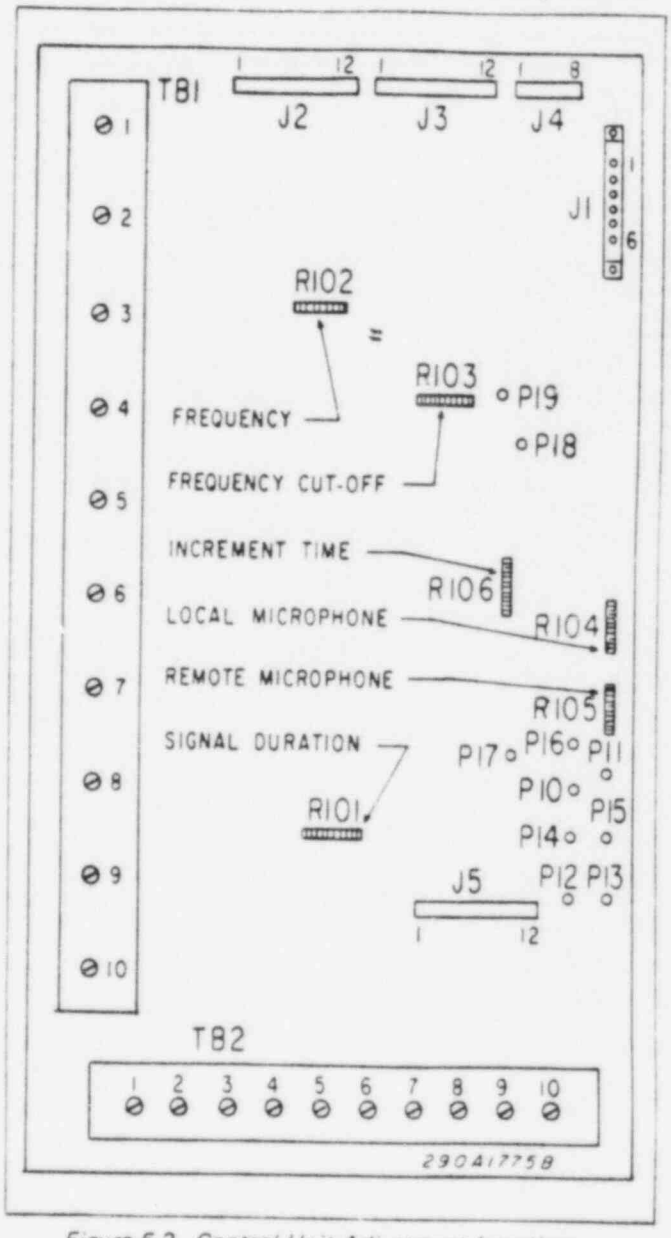


Figure 5-2. Control Unit Adjustment Locations.

To reset the time, activate the pulsed steady signal and observe that SIG. A and SIG. B indicators flash on the front panel. At the end of the signal cycle, both signal indicators will illuminate steadily for eight seconds. The steady illumination indicates that the signal is "coasting" down. If the signal duration is too long or too short, adjust R101 to increase or decrease the signal duration within the 2-5 minute range. Recheck adjustment by repeating this procedure.

D. Local and Remote Microphone.

R104 and R105 adjust the P.A. output levels for the local and remote microphones, respectively. The local microphone input is via the panel mounted microphone jack. In order to prevent audio feedback, this jack should only be used when the Control Unit is located in a building, audibly isolated from the speaker array. The remote microphone input is via TB2 terminals.

Adjustment of the P.A. output levels requires two people. An operator must be at the microphone location and a technician at the SiraTone site to perform the adjustments. Radio or telephone communication between the two sites will make the adjustment procedure easier to perform. To perform the adjustment, proceed as follows:

1. Depress the microphone push-to-talk switch and speak into the microphone in a normal voice. The P.A. IN USE indicator lamp will illuminate when the push-to-talk switch is depressed.

2. Adjust R104 or R105 (local or remote microphone inputs) to a level which will begin to cause the SIG. A and SIG. B indicators to flicker. The flickering indicators are an indication of the audio clipping level and should be minimal for low distortion. If any audio inputs are not used, they should be adjusted completely clockwise.

E. Increment Timing (rotating speaker arrays only).

R106 adjusts the time interval for the speaker array to rotate between P.A. announcements. The rotator control relay is activated each time the microphone push-to-talk switch is dekeyed. The relay is held for a period of 4 to 18 seconds while the speaker array rotates to another zone for another announcement.

The number of zones for P.A. announcement must be determined prior to makeing this adjustment (2,3, up to 8 zones). If the speaker array rotates beyond or short of the next desired zone, adjust R106 and repeat the procedure. A series of activations will best determine the accuracy of the adjustment.

The speaker array can be automatically "homed" and remotely activated to a desired zone by use of the Model EOWS*H/RCP option, subject to separate instructions.

Slide the control module back into the Control Unit and replace the screw that was previously removed. Replace all amplifier fuses.

5-3. FINAL TESTS.

WARNING

The output sound level of a SiraTone siren is capable of causing permanent hearing damage at short distances. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

If the siren is installed in an electrically noisy environment, one or more of the siren amplifiers bias circuits may be activated. Each siren amplifier contains solid-state circuitry to reduce standby current, by de-activating the bias current applied to the amplifier output stages, when signalling has stopped. The BIAS ON light emitting diode (LED) indicates when this circuit is activated, either by illuminating continuously or illuminating erractically while no siren signal or PA audio is being produced. This condition can be eliminated by reducing amplifier sensitivity by slowly rotating R2 (see figure 7-9) counterclockwise until the BIAS ON LED extinguishes. The LED extinguishes approximately 5 seconds after amplifier signal

detection ceases. To avoid excessive reduction of amplifier sensitivity, do not rotate R2 any further than absolutely necessary. If R2 is rotated too far, the amplifier may not be activated by a PA signal.

The SIG OUTPUT LED indicates that the amplifier output signal level is sufficient for siren signal operation.

If desired, all six siren signals can be tested at this time by momentarily depressing the appropriate pushbutton on the control module front panel. If an optional seventh signal is installed, it can be tested by momentarily pressing the AUX switch. The CANCEL switch causes all signals to "coast down" except for the optional auxiliary signal. The optional auxiliary ceases immediately.

Systems using rotating speaker arrays should note speaker rotation upon signal activation. Speaker rotation will halt, when the signal begins to "coast down", upon activation of the CANCEL switch. Momentarily grounding the P-T-T should cause the speaker array to rotate to the next zone.

If included, the optional radio interface should be tested at this time. Follow instructions supplied with the radio interface.

After the installation is complete, and it has been established that the siren is operating properly, Federal recommends that the Control Unit and battery box be padlocked to discourage vandalism.

SECTION VI
THEORY OF OPERATION

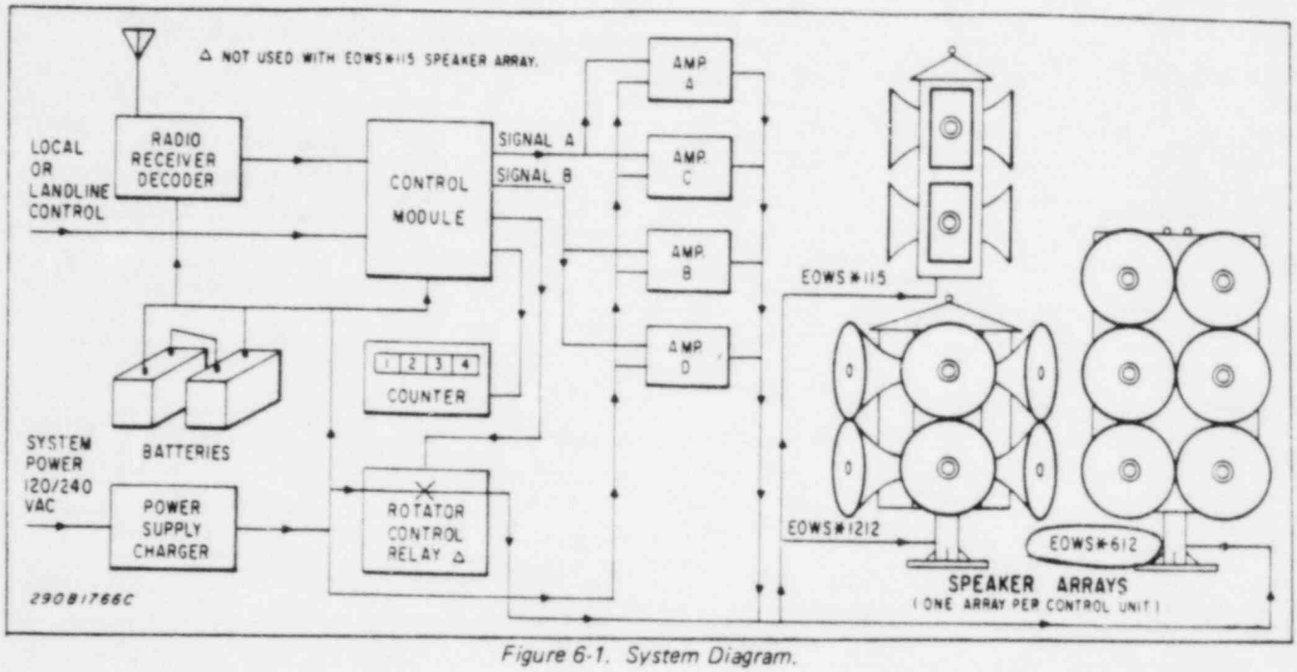


Figure 6-1. System Diagram.

6-1. GENERAL.

Figure 6-1 is a diagram of the SiraTone system.

The system is powered by two 12-volt deep cycle batteries which are maintained at full charge through a 24-volt power supply charger.

The control module is activated via land lines (normally open contacts), or optional Siratrol radio control. The control module supplies timing and signalling to the amplifiers as well as control output to the rotating speaker arrays. It also has front panel visual indicators which indicate signal output and P.A. in use. A counter indicates total number of activation and cancel inputs.

The amplifiers provide the necessary power to drive all of the speaker array drivers.

6-2. CONTROL MODULE.

The SiraTone can be remotely controlled by either radio (modulated with two-tone sequential or dual-tone multiple frequency) or momentary pushbutton switches. The pushbutton switches can be directly connected to the SiraTone or connected via land lines. Refer to the control module functional block diagram (figure 6-2) and schematic diagram (figure 7-4) when reading the following paragraphs.

RC networks C30-C36 and R76-R82 keep the signal activation inputs stable. When a signal input is grounded, one of the capacitors (C30-C36) discharges and input drivers (IC17 or IC18) activate the control encoder (IC8). The control encoder output activates the signal timer (IC2) and produces a binary code. IC2 is momentarily reset before each activation. Each time IC2 is reset, the counter is pulse driven by Q2 and Q3. During the time of signal activation, the binary code present at the control encoder is fed to three AND gates of IC13, which latch the signal code as long as the signal timer remains on. Diodes CR12, CR13, and CR14 serve as feedback information for these binary latches.

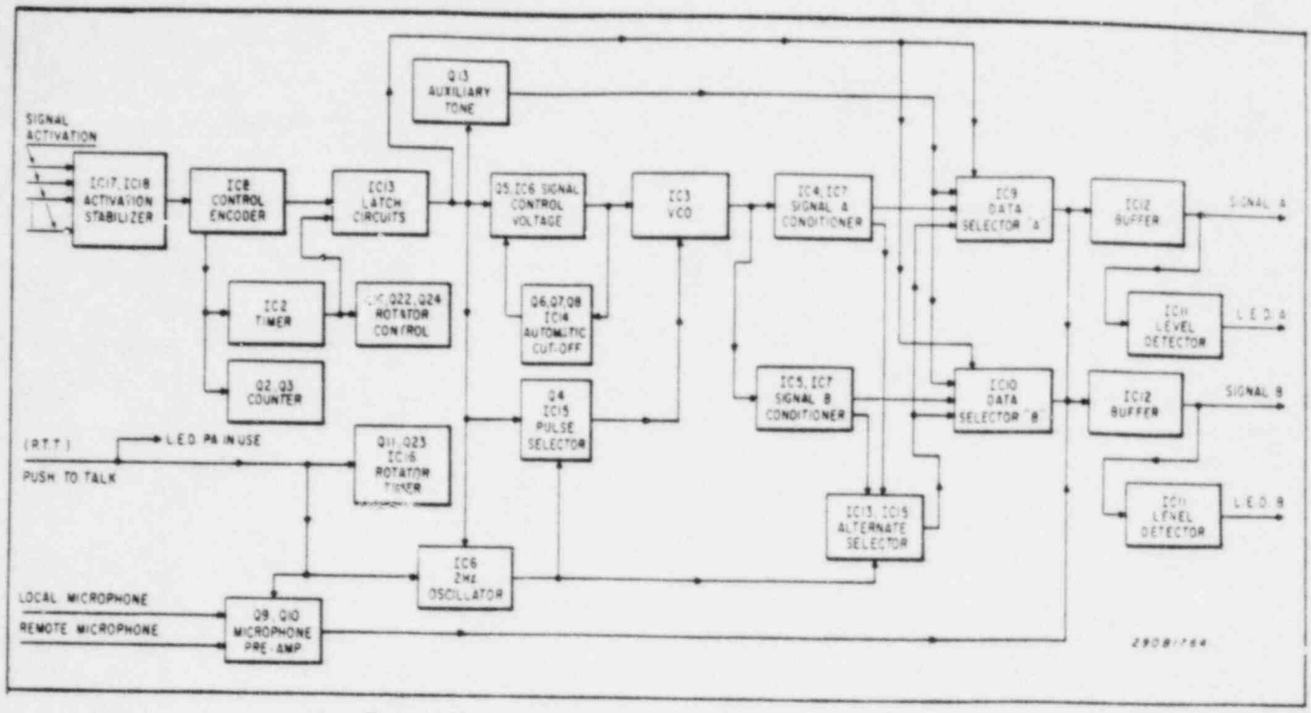


Figure 6-2. Control Module Functional Block Diagram.

The binary code held at pins 3, 4, and 10 of IC13 (referred to as control bits 0, 1 and 2) control several functions. These functions include signal control voltage, pulse selector, 2Hz oscillator, and signal selection. IC6 contains an operational amplifier (A) which functions as a 2Hz oscillator for HI-LO or pulsed signal timing. The other operational amplifier (B) serves as the control device for creating a sweeping voltage for wail signals. The rate at which C10 charges and discharges (R16 and R15, respectively) is controlled by the output of IC6(B). Voltage divider network R14, R18 and R19 set the level at which the transitions in the wail signal occur. Activation of and steady signal results in control bit 0 going high. Q10 turning on and charging C10 steadily; independent of the IC6 output.

The voltage across C10 is applied to VCO IC3. The RC network composed of R7, R102 and C8 set an output frequency at pin 4. This output frequency is fed to IC4 and IC5 which divides the frequency by 5 and 6. The output at pin 2 of the integrated circuits are applied to IC7, a dual J-K flip-flop, which divides the frequencies further (by 2) and creates a symmetrical waveform. The signals from pin 1 and 15 of IC7 form what is now referred to as Signal A and Signal B. These signals are now applied to IC9 and IC10 data selectors and two AND gates of IC15. The second input to these AND gates receives its input from the 2Hz oscillator and the 2Hz compliment via an inverter configuration at pins 2 and 3 of IC3. Pin 3 of IC15 pulses signal A ($\div$ 5) and pin 11 pulses signal B ($\div$ 6) alternately. These two signals are mixed and applied to IC9 and IC10, data selectors for HI-LO (alternate) signals. IC9 and IC10 pass one of the eight inputs to the preamplifiers, dependent upon the control bits at pins 9, 10 and 11.

Upon termination of one of the six standard signals, the signal output from the data selectors will return to selecting x_o signal which follows the discharge rate of C10 through R15. At this time, IC2 (555 timer) turns off. All latches are returned to zeros (IC13), C10 discharges through CR20 and Q8 turns on. Q8 is a source of voltage for the adjustment made at R103. This voltage is a reference voltage at pin 5 of IC14. The decaying voltage of C10 is buffered by operational amplifier IC14(A) and applied to pin 6 of the same IC. The output of pin 7 remains low as long as the voltage in the "-" input remains higher than the "+" input. When the voltage of C10 decreases to a point which produces an output frequency which is lower than desired, pin 7 goes

high and Q6 turns on discharging C10 quickly. At this point the VCO turns off and the output ceases. During standard signalling the base of Q7 is high, the emitter is low and the transistor is "on". This keeps Q6 from turning on and allows C10 to charge and discharge normally. When an auxiliary tone is activated, the emitter of Q7 goes high from the AND of IC15, pin 4 (all three control bits high) and Q7 remains off. Now Q6 remains "on" from the high output of IC14, pin 7 (operational amplifier B) and C10 is kept grounded. This also allows instant cutoff of standard siren signals, when the auxiliary signal is activated without a tone module.

Tone signals from the data selectors are fed to dual amplifier IC12 for final drive to the output pins and amplifiers. The outputs of IC12 (pins 2 and 13) have level detectors which half-wave rectify signals into an RC network. The output of each network is applied to the input of an operational amplifier (IC11) which functions as a comparator. The compared input is set by a divider network which has a level of a clipped sine wave signal. If the signal output exceeds the clipping level, the operational amplifier's output goes high and turns on the appropriate front panel SIG. L.E.D.

Both local and remote microphone inputs are capacitively coupled to two single transistor pre-amplifiers, Q9 and Q10. The bias to these pre-amplifiers remains off until the P-T-T circuit is grounded. When the P-T-T input is grounded, Q11 turns on and supplies bias to the microphone pre-amplifiers. Q11 also activates the inhibit lines of data selectors IC9, IC10 and VCO IC3. It also stops the 2Hz oscillator. This condition provides stable, undistorted transmission of audio to the same signal pre-amplifiers (IC12) as used by the tone signals.

Pins 18 and 19 provide a connection point for the rotator relay, used in Control Units for rotating speaker arrays. The relay is activated by either Q14 or Q22. The collector of Q14 goes to ground when the signal timer (IC2, pin 3) is high. It can be turned off by a P-T-T activation where Q24 bypasses the base current of Q14. The rotator relay can also be activated by another function via Q22. As the P-T-T circuit is activated (grounded) then returned to open, transistor Q23 turns off and then returns to the "on" state. When Q23 is off, the voltage across C39 is equalized via R92 and R95. As the P-T-T is de-keyed, Q23 immediately sources the negative side of C39 to ground. The positive side momentarily goes to ground and recharges through R92. This momentary ground activates IC16 (555 timer) and increments the rotating speaker arrays. The output of IC16, pin 3 drives the base of Q22 which energizes the rotator relay. The timing basis of IC16 is RC network R93, R106 and C38. The output of IC16 can also inhibit the tone signals, if CR21 is installed. CR21 provides a voltage source to data selector and VCO inhibit lines similar to P-T-T activated Q11.

The control board is powered by a regulator circuit which is composed of Q1, CR2 (11 volt zener diode) and associated components. CR1 provides reverse voltage protection.

Remote activation connections should be made via TB1 or J3. Signal lines and relay output should be connected to pins on the printed circuit board.

6-3. AMPLIFIER MODULE.

Refer to amplifier module functional block diagram (figure 6-3) and schematic diagram (figure 7-8) when reading the following paragraphs.

A. Amplifier Stages.

IC1 amplifies the input signal to a power level necessary and applies it to the primary of transformer T1. The output of IC1 is coupled through C9 and damping resistor R6 to the T1 primary. T1 provides a large voltage gain and a paraphase input to the push-pull amplifier stages. Driver transistors Q3 and Q4 and output transistors Q5 and Q6 provide the necessary current and power gain, coupled through transformer T2, to drive the speaker.

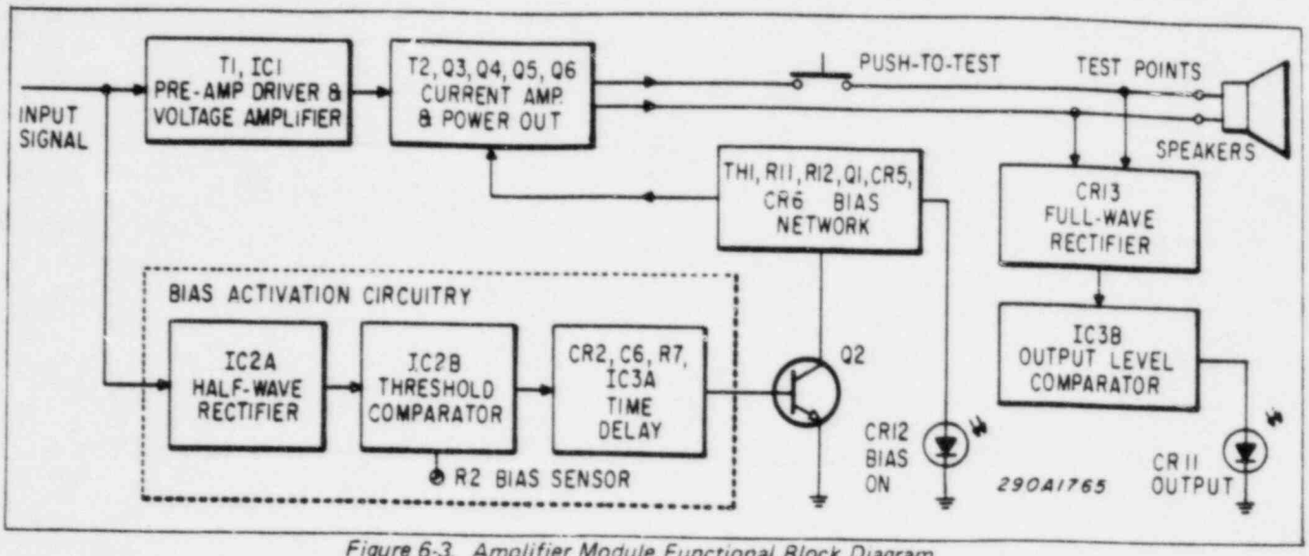


Figure 6-3. Amplifier Module Functional Block Diagram.

The network consisting of TH1, R11, R12, CR5, CR6 and Q1 is a biasing circuit which prevents any "crossover notch" by slightly turning on the driver and output transistors.

B. Bias Activation Circuitry.

Input signals are applied to IC2A. IC2A along with CR3 form a precision half-wave rectifier. Since the rectifier exhibits no breakover characteristic, small amplitude signals pass through. The rectified input signal is applied to threshold comparator IC3A which determines if the input is greater than the reference level set by R2. When the input signal exceeds the reference level, IC3A pin 1 goes high and immediately charges C6 through CR6.

CR2, C6, R7 and IC3B form a bias turn-off delay circuit. The discharge time constant set by C6 and R7 determines how long pin 5 of comparator IC3B remains greater than the reference level. Consequently, C6 and R7 determine how long IC3B pin 7 is high and the bias circuitry is active.

C. Signal Output Indicator.

IC2B compares a full-wave rectified sample of the output to a reference level set by R18 and R19. As long as the output sample's amplitude is greater than the reference, IC2B pin 7 is high and CR11 is energized. CR13, a full-wave bridge rectifier, is employed to isolate the speaker leads from the chassis.

6-4. POWER SUPPLY.

The power supply consists of two series connected deep cycle batteries and a charger. The output of the power supply is diode protected to prevent reverse current to the charger, when system power is off and the batteries are connected.

Servicing the power supply should be limited to replacing the complete charger. The power supply is adjusted at the factory to properly charge and supply voltage to the batteries and the system. Should re-adjustment be necessary, proceed as follows:

A. Turn off power to the Control Unit.

B. Open the battery box cover and charger door of the Control Unit.

C. Disconnect the fused link between the batteries.

D. Connect the negative lead of a voltmeter to the battery post with the black wires and the positive lead to the battery post with the red wires. Turn on power to the Control Unit. Set the VOLTAGE ADJUSTMENT control (see figure 6-4) for 27.8Vdc.

E. Disconnect voltmeter. Reconnect the fused link. Adjust the CURRENT LIMIT control (see figure 6-4) for a reading of 6 amperes on the front panel meter. NOTE: If the batteries are at full charge,

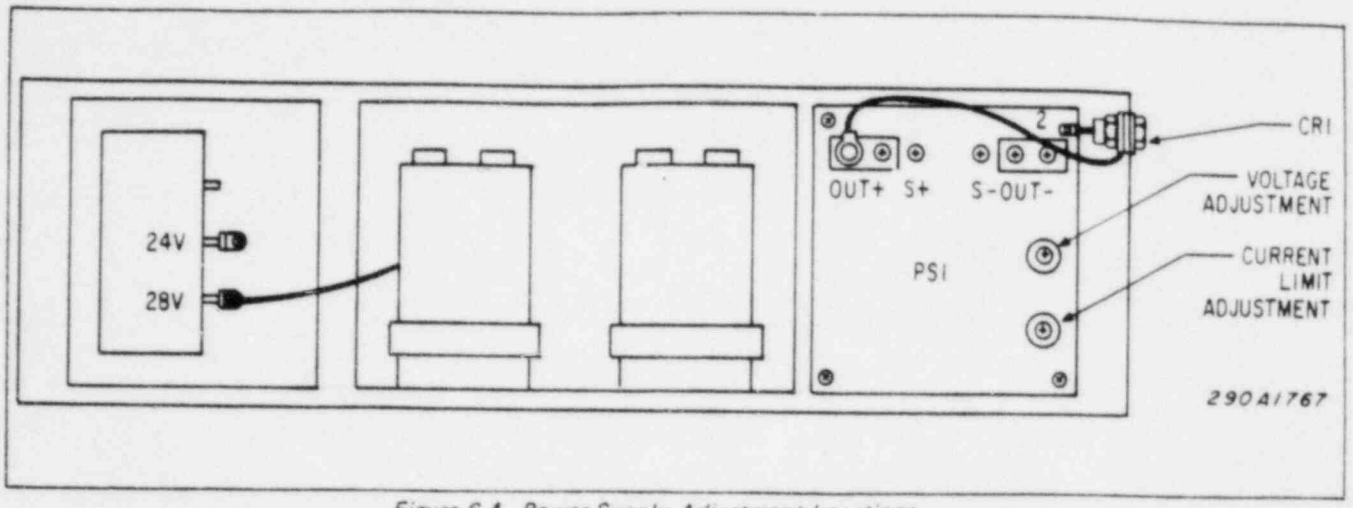


Figure 6-4. Power Supply Adjustment Locations.

this adjustment cannot be made unless the batteries are discharged enough to require charging.

F. Replace the battery box cover and charger door.

6-5. RADIO RECEIVER/DECODER.

The SiraTone can be remotely controlled by a radio signal modulated with a two-tone sequence or a dual-tone multiple frequency coded signal (DTMF).

When radio control is used, a user-supplied tone encoder and radio transmitter are located at the system control site. The purpose of the tone encoder is to generate the tone sequences for controlling siren signals and functions. Each siren signal and function is assigned a distinct and separate tone sequence. The tone encoder is connected directly to the radio transmitter.

A siren signal or function is initiated when the appropriate tone encoder control (s) is (are) operated. When the Siratrol receiver at a given SiraTone site receives the tone-modulated radio frequency signal, the decoder in the receiver decodes the tones. The decoded tones then produce the signal necessary to activate the appropriate timer control circuitry.

Refer to the Service Manual supplied with each Siratrol for a complete theory of operation.

6-6. MODEL EOWS*115 AND EOWS*1212 SPEAKER ARRAYS.

Both of these speaker arrays contain the necessary drivers and speaker projectors for producing the omnidirectional dual-tone siren sounds. Speakers are mounted on a series of six individual panels. Each panel has two speakers and two drivers parallel connected to an amplifier in the Control Unit. Signal lines are connected to the speakers in such a manner that adjacent speaker panels receive a different signal (Example: Panel B receives an amplified signal B and panels A and C receive amplified Signal A). A wiring diagram can be found in Section VII.

6-7. MODEL EOWS*612 SPEAKER ARRAY.

The Model EOWS*612 uses six projectors to broadcast the audible siren sounds. Each speaker uses two drivers. Dual-tone signals are connected in such a manner that signal A is applied to the right half of the speaker array and signal B is applied to the left half. Each signal and rotator power circuit is coupled through a slip ring and quad brush assembly which provides continuous stall-free speaker rotation. The speaker array rotates when 12 or 24 volts dc from the Control Unit is applied to the rotator motor. The rotator motor is belt coupled to the gear box which provides the necessary gear reduction to rotate the speaker array. A wiring diagram can be found in Section VII.

SECTION VII
MAINTENANCE

7-1. GENERAL.

Federal Electronic Outdoor Warning Sirens are designed to require a minimum of maintenance. However, if a siren failure does occur, Federal will provide technical assistance with problems that cannot be handled locally. A list of all Federal Authorized Service Centers is available from the Service Department. If assistance is needed, contact:

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

It is recommended that the siren be tested for proper operation at least once a month. However, a daily test of the siren at noon curfew, or other selected time, provides a more reliable test of system readiness. In addition, the daily test enhances the usefulness of the siren and instills public confidence in the reliability of the warning system.

It is recommended that a maintenance check be conducted within 30 days of siren installation. Thereafter, it is recommended that the maintenance checks be performed at least once a year. The following paragraphs describe the maintenance checks for the SiraTone system.

7-2. CONTROL UNIT.

A. Amplifier Output.

Each pair of speakers in the Speaker Array is driven by a power amplifier in the Control Unit. Each amplifier module and its associated speaker pair is designated A, B, C, D, E, or F. Each amplifier has test points for testing the resistance of its associated speaker pair.

To measure the resistance of a given speaker pair, proceed as follows:

1. Remove and retain the fuse from the appropriate amplifier.

2. Set an ohmmeter to its lowest resistance range, and connect the ohmmeter to the output test points.

3. Depress the PUSH-TO-TEST button and observe the dc resistance of the speakers. Normal dc resistance of a speaker pair is approximately 2.7 ohms. A dc resistance measurement of less than 2.5 ohms indicates that one or both of the speakers is probably shorted. A reading of approximately 5.4 ohms indicates that one of the speakers in the pair is open; a reading of infinity indicates that both speakers are open.

4. If a resistance is abnormal, perform resistance checks on each speaker individually at the Speaker Array.

If desired, an oscilloscope or digital multimeter (DMM) can also be connected to the amplifier module test points to observe amplifier output. NOTE: DO NOT press PUSH-TO-TEST button. However, do NOT connect a speaker across the test points because damage to the amplifier module could result.

WARNING

The output sound level of a SiraTone siren is capable of causing permanent hearing damage at short distances. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

B. Signal Operation Check.

1. Remove and retain fuses from all amplifiers.

2. Activate each of the signals and observe the signal indicators on the control module. Observe counter operation.

3. Insert one of the previously removed amplifier fuses. Depress the PUSH-TO-TEST pushbutton of the fused amplifier. Activate a signal and observe that SIG. OUTPUT and BIAS ON indicators illuminate, indicating amplifier operation. Cancel the signal and allow the signal to coast down and shut off. Release the PUSH-TO-TEST pushbutton and remove the fuse. Test the remaining amplifiers in the same manner.

4. Replace all amplifier fuses.

C. Check the batteries. The voltage of a fully charged set of batteries should be approximately 28Vdc. and charge current should be less than one ampere.

Each battery is equipped with a built-in hydrometer. When the hydrometer "eye" is green, the battery is charged. If the "eye" is dark, the battery needs charging. If the "eye" is light in color, the battery is low on fluid and should be inspected for leaks.

Check the battery terminals for corrosion. Clean connectors and terminals, if necessary.

D. Check rotator incrementation (EOWS*612 Speaker Array only). Activate the P-T-T circuit by momentarily shorting the P-T-T to ground. The Speaker array should rotate to the next speaker zone.

7-3. SPEAKER ARRAYS.

NOTE

Remove the control module fuse prior to checking the Speaker Array. This precaution will prevent any signal from sounding or the speaker arrays from rotating.

A. All Speaker Arrays.

1. Examine Speaker Array mounting for loose bolts or weak supports.

2. Examine cable and terminations for frayed insulation or corrosion.

B. Rotating Speaker Arrays Model EOWS*612.

Check rotator unit as follows:

1. Remove the Speaker Array upper panel.

2. Check brush alignment to insure that complete contact is made to the collector rings. Insure that the fastening bolts for the collector ring stack are securely fastened.

3. Check brush springs for normal tension. The brushes should move freely in the assembly.

4. Clean any contaminents or dirt from the collector rings. The four brushes can sufficiently maintain clean collector ring contact with regular system testing.

5. Check pulley set screws and belt tension. The belt should be relatively loose. Pinching the belt between the pulleys should draw it to within approximately one-inch of touching.

6. Check to ensure that the gear reducer and bearing housing mounting bolts are secure.

7. Observe the gear case for any leaks, especially around the high speed shaft. Check oil level by removing oil level plug (upper plug on gear ease). If oil level is low, replace with Meropa #2 or equivalent.

8. The motor has permanently lubricated sealed bearings. Remove the brush cap protector and examine the brush and spring assembly.

9. Check the idler bearings at the lower portion of the speaker array. The rollers should be adjusted so that the maximum clearance of any free rollers to the pole is approximately 1/32 inch. Free rollers should spin freely. Lubricate if necessary.

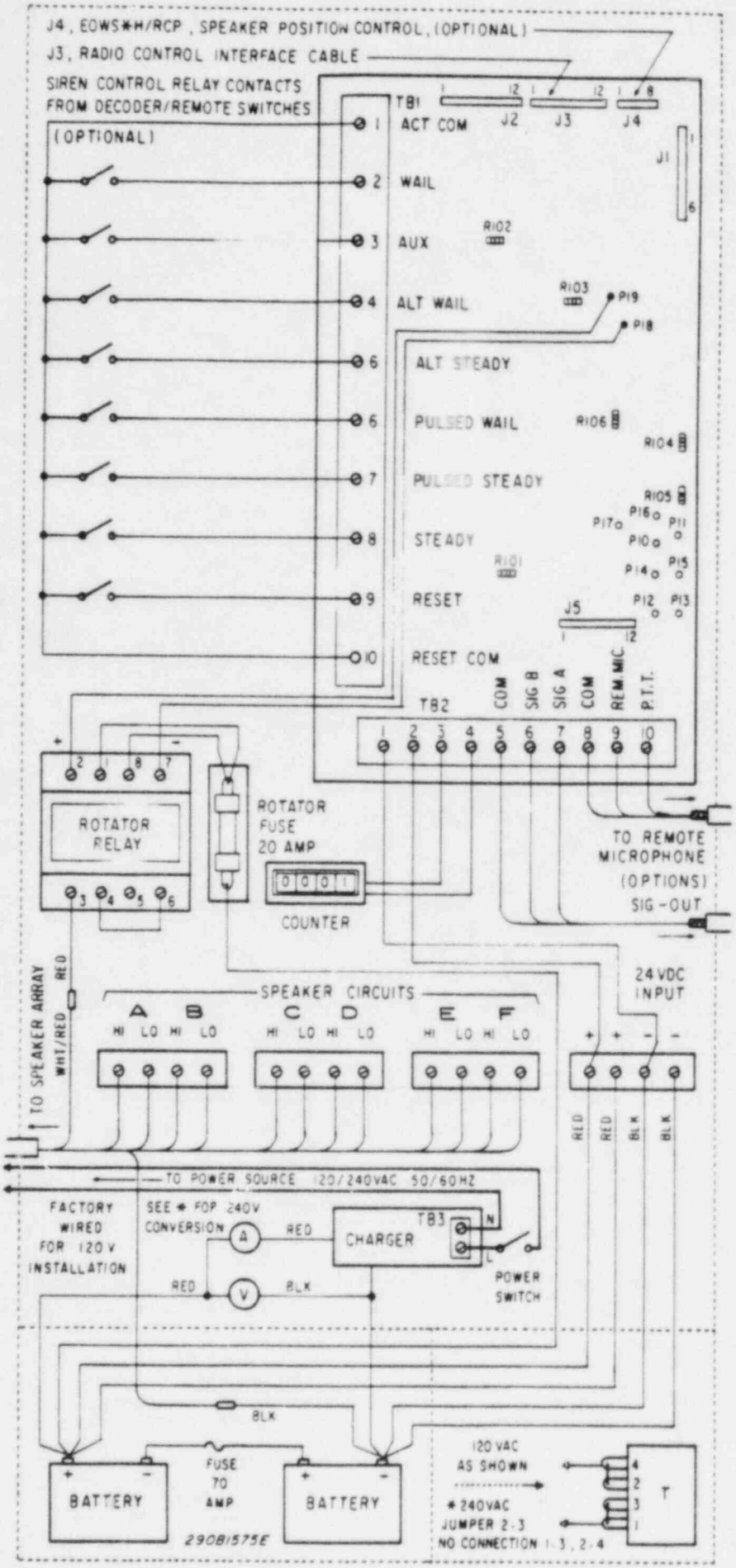


Figure 7-1. Control Unit Wiring Diagram.

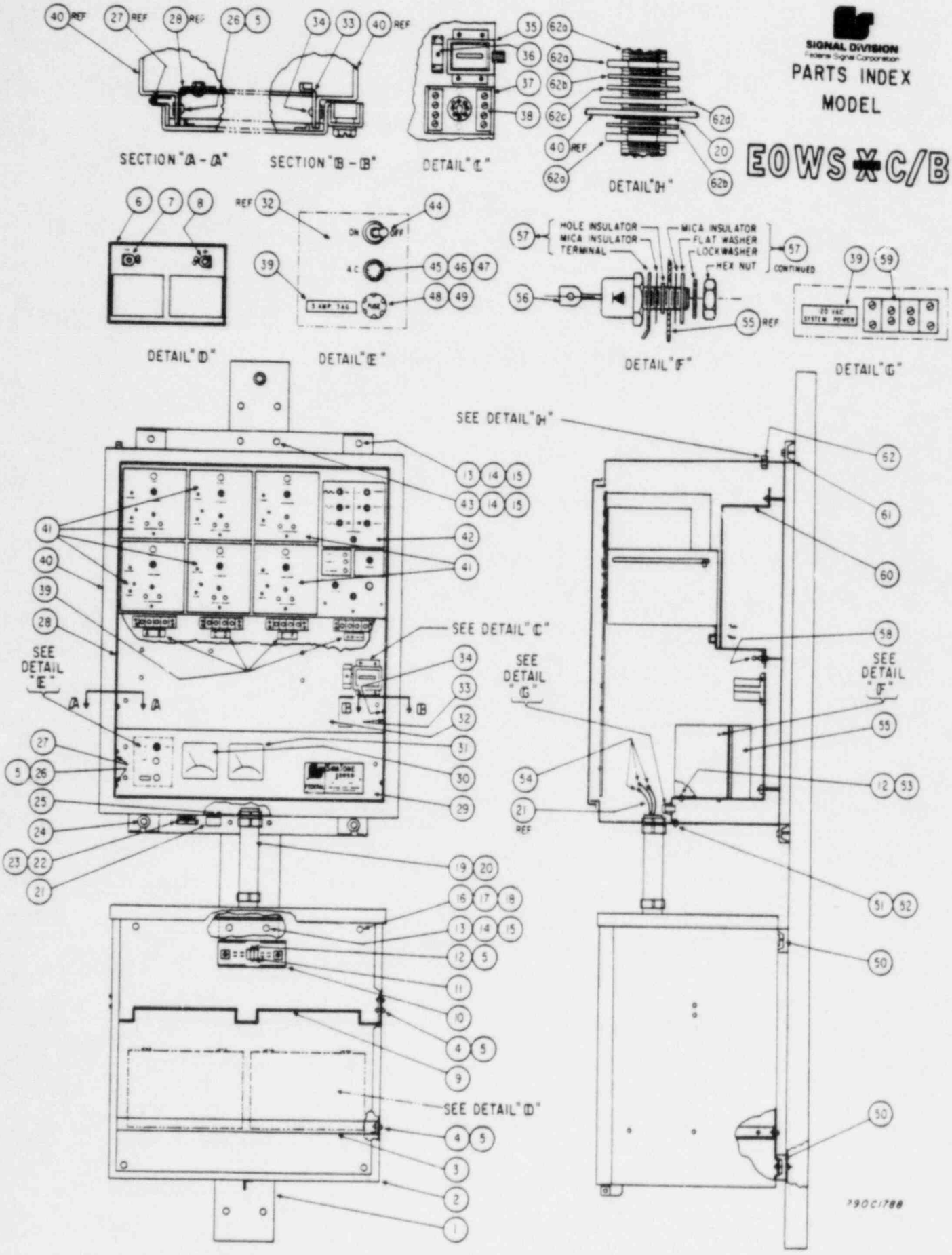


Figure 7-2. Control Unit Component Location Diagram.

ELECTRONIC OUTDOOR WARNING SIREN

EOWS*C/B

PPL 0183
PARTS LIST

OCTOBER 1984

Item No.	Description	Part No.	Qty
1	Bracket , Upright Support	8549B022	1
2	Cabinet , Battery , 18" x 18" x 12"	170C221	1
3	Shelf , Battery	8549C014	1
4	Screw , Pan Hd. , Phl. , Stl. , 8-32	7000A408-06	22
5	Nut , Hex , Ext. Keps , Stl. , 8-32	7058A022	27
6	Battery , 12V , Delco 1059 (seperate carton)	155A120	2
7	Terminal , Battery Post , To 5/16 (neg.)	233A143	2
8	Terminal , Battery Post , To 3/8 (pos.)	233A143-01	2
9	Bracket , Battery , Hold Down	8549B047	1
10	Holder , Fuse	143A115	1
11	Fuse , 70 Amp. Tron JJN70A	148A137	1
12	Screw , Pan Hd. , Phl. , Stl. , 8-32	7000A408-07	6
13	Bolt , Hex Hd. , SS , 3/8-16	7002A009-16	8
14	Nut , Hex , 3/8-16	7059A063	12
15	Lockwasher , Split , SS , 3/8 Scr.	7074A046	15
16	Screw , Hex Hd. , SS , 1/4-20	7000A311-16	4
17	Nut , Hex , Dbl. Chmf. , SS , 1/4-20	7059A020	4
18	Lockwasher , Split , SS , 1/4 Scr.	7074A016	4
19	Conduit , Thinwall , Steel , 1" x 5' Lg.	R007-03-03	1
20	Adhesive , RTV 1508 , Sil. Rubber , 3 oz. pkg.	R70-04-01	2
21	Protector , Lightning	288A256	1
22	Connector , Thinwall , 1"	8287A200	3
23	Lockwasher , Sealing , 1"	7065A033	3
24	Washer , Flat , SS , 0.406 ID x 1" OD x 0.063	7072A035	2
25	Locknut , Steel , 1 2	7065A021	1
26	Screw , Pan Hd. , Phl. , Stl. , 8-32	7000A408-05	13
27	Hinge , Charger Door	8549A027	1
28	Hinge , Radio Door	8549A026	1
29	Panel , Charger	8549B040	1
30	Meter , 30 Amp	288B253	1
31	Meter , 30 Volt	288B252	1
32	Panel , Radio	8549B023	1
33	Bracket , Panel , Stop Assembly	8549B031	1
34	Rivet , Alm. , Pop , Pan Hd. , 1/8 x 15/64	7099A103-15	5
35	Counter	8283B972-02	1
36	Fuse Mounting	143A104	1
37	Track , Relay	288B229-02	1
38	Socket , Octal , 8 Pin	135A131	1
39	Label : A-B , C-D , E-F , -- -- , 5Amp 3Ag , 120VAC	161A302	1
40	Cabinet , Control	170D223	1
41	Amplifier Assembly , EOWS*C/B	200D816	6 AR
	Amplifier Assembly , EOWS*C/B-4	200D816	4 AR
42	Control Assembly , EOWS*	8549D051	1
43	Bolt , Hex Hd. , SS , 3/8-16 x 1-1/4	7002A009-20	4
44	Switch , Toggle , SPDT	122A143	1
45	Lug , Solder , Lamp Body	147A102-01	1
46	Lens , White	147A102-02	1
47	Lamp , Neon	147A102-03	1
48	Holder , Fuse , 34002	143A106	1
49	Fuse , 5 Amp. , 3 Ag.	148A139	1
50	Bracket , Cabinet Mounting	8549B034	2
51	Screw , Pan Hd. , Phl. , Thd. Frm. , SS , No. 8	7011A101-12	2
52	Washer , Flat , Neopreme , 0.204 ID x 1/2 OD x 0.125	7072A070	2
53	Lockwasher , Split , Ex. Dty. , No. 8 Scr.	7074A007	4
54	Nut , Wire (on item 21)	8287A165	3
55	Charger Assembly , EOWS*	288B316	1
56	Diode , 368AR	115A311	1
57	Mounting Kit , Diode	124A033	1
58	Screw , Hex Hd. , SS , 1/4-20	7000A311-36	3
59	Board , Terminal	8442A032	1
60	Panel Assembly	8549D053	1
61	Bracket , Cabinet Mounting	8549B035	2
62	Kit , Adapter , Straight (includes)	124A020	1 AR
62a	UHF Adapter , Straight W/2.5 8 Hex Nuts	139A137-01	1
62b	Lockwasher , Int. Tth. , 5/8 Scr.	7075A038	2
62c	Washer , Flat , 5/8 Scr.	7072A039	1
62d	Gasket , Neopreme , 5/8 ID x 1" OD x 1/16	8351A012	1
Not Shown			
	Rotator Relay	131A137	1
	Manual, Installation and Service	255A185	1 AR
	Wire Set , EOWS*	310A821	1

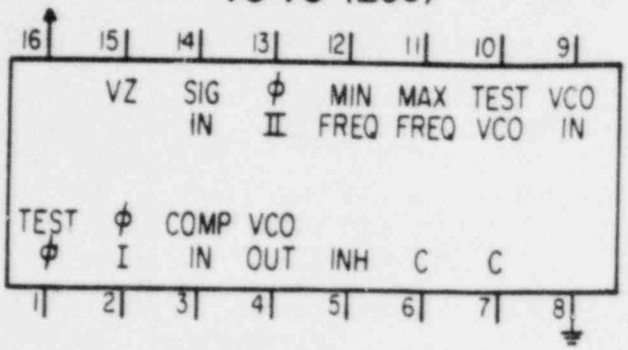
DO NOT ORDER PARTS BY ITEM NUMBER.
Give model , voltage, description, and part number.

Refer to PARTS PRICE LIST (Part No. 1001) for prices of parts.

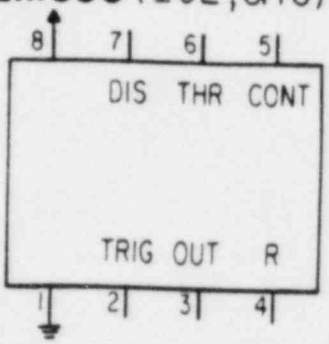
Printed in U.S.A.

Federal Signal Corporation
Signal Division
2645 Federal Signal Drive
University Park , Illinois 60466

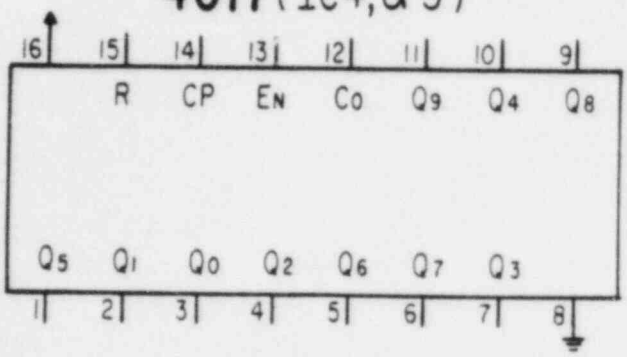
4046 (IC3)



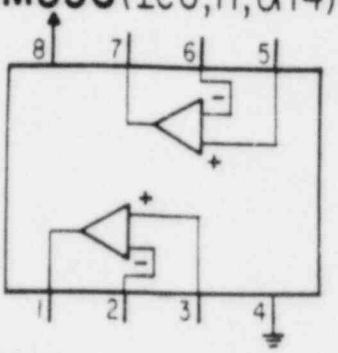
LM555 (IC2, & 16)



4017 (IC4, & 5)

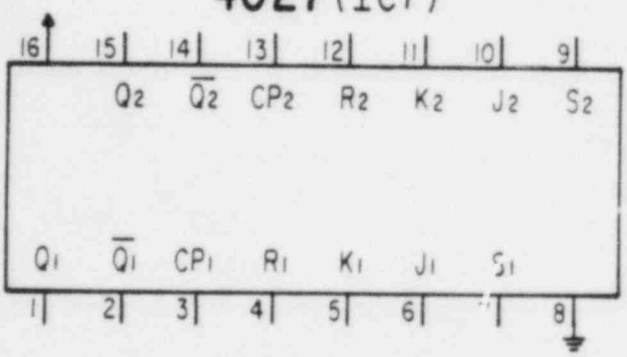


LM358 (IC6, 11, & 14)

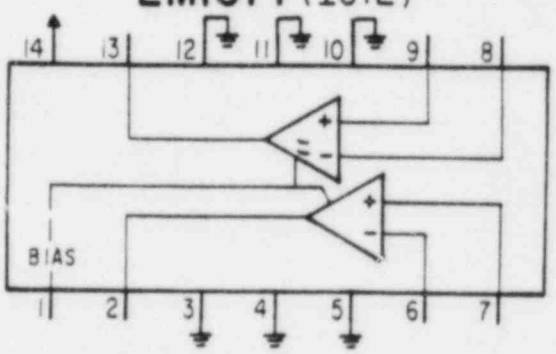


29081781

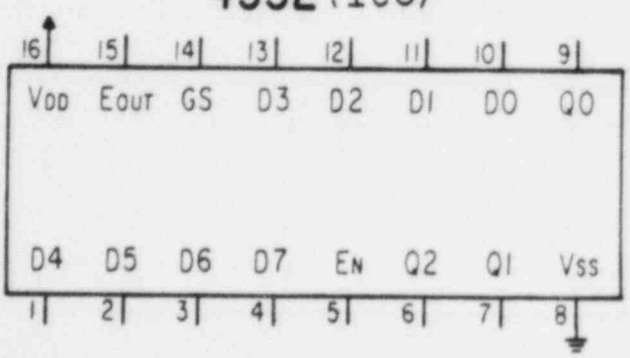
4027 (IC7)



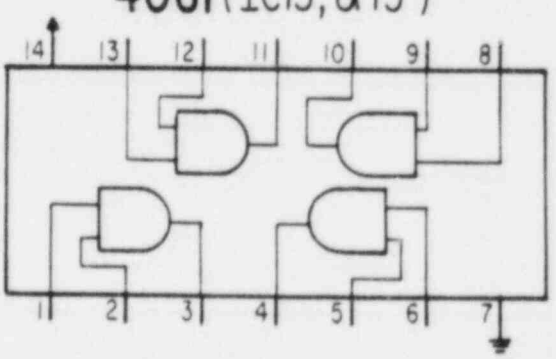
LM1877 (IC12)



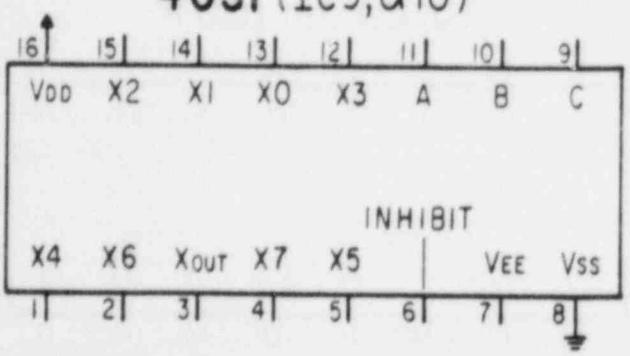
4532 (IC8)



4081 (IC13, & 15)



4051 (IC9, & 10)



4584 (IC17, & 18)

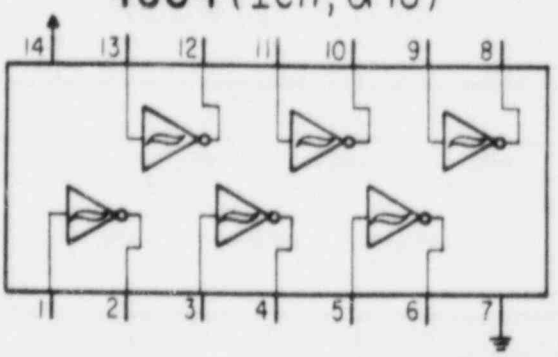


Figure 7-3. IC Pin Legend.

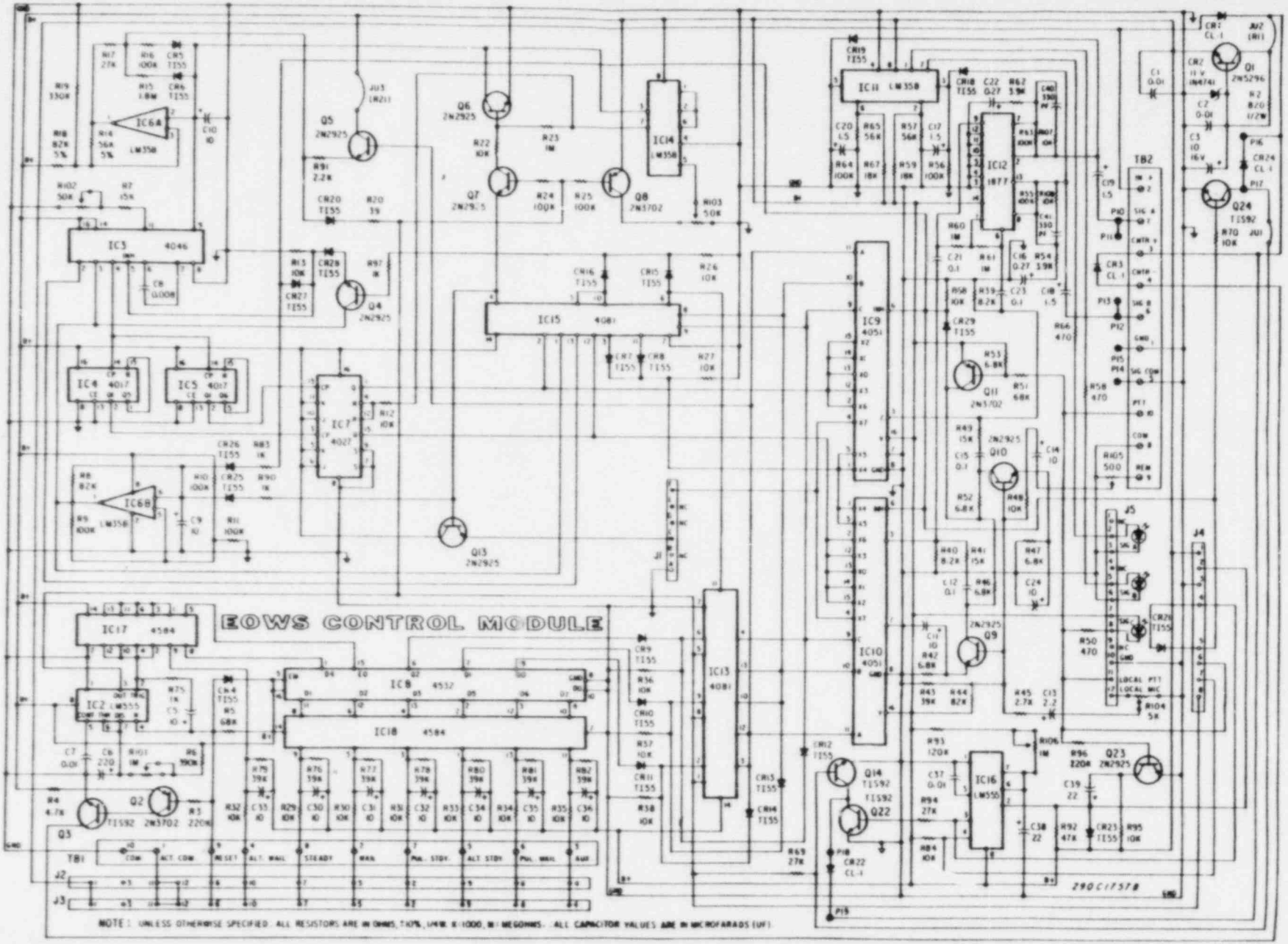


Figure 7-4. Control Module Schematic Diagram

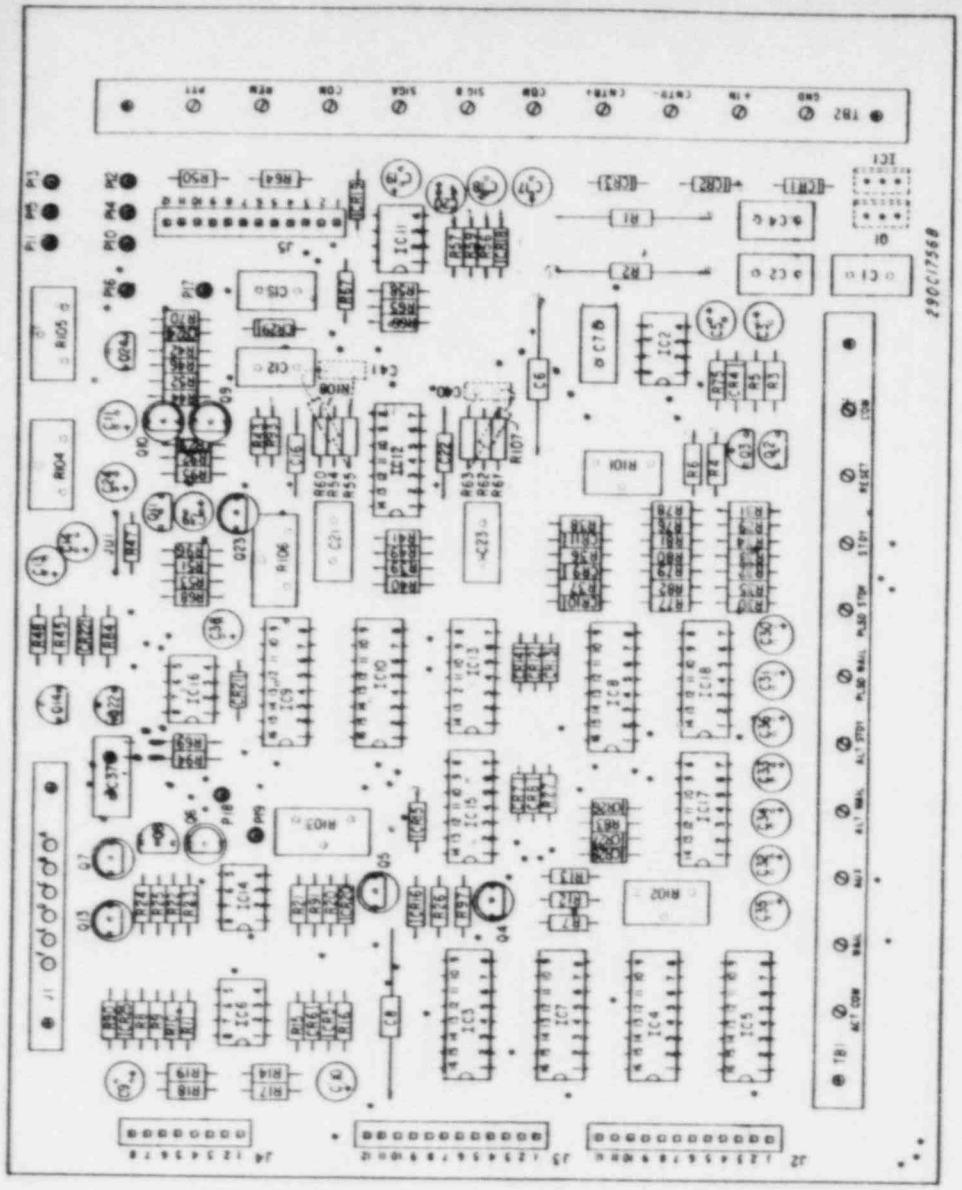


Figure 7-5. Control Module Component Location Diagram.

PARTS LIST
EOWS CONTROL MODULE ASSEMBLY

Schematic Symbol	Description	Part No.
R2	820 Ohm	100A403
R3,96	220K Ohm	100A213
R4	4.7K Ohm	100A224
R5,51	68K Ohm	100A235
R6	390K Ohm	100A218
R7,41,49	15K Ohm	100A203
R8,44	82K Ohm	100A230
R9,10,11, 16,24,25, 55,56,63, 64	100K Ohm	100A222
R12,13,22, 26,27,29 thru 38,48,68,70, 84,95,107,108	10K Ohm	100A207
R14	56K Ohm, 5%	100A704
R15	1.8 Megohm	100A768
R17,69,94	27K Ohm	100A254
R18	82K Ohm, 5%	100A750
R19	330K Ohm	100A212
R20	39 Ohm	100A286
R23,60,61	1 Megohm	100A215
R39,40	8.2K Ohm	100A268
R41,49	15K Ohm	100A293
R42,46,47, 52,53	6.8K Ohm	100A210
R43,76 thru 82	39K Ohm	100A214
R45	2.7K Ohm	100A206
R50,58,66	470 Ohm	100A255
R54,62	3.9K Ohm	100A273
R57,65	56K Ohm	100A229
R59,67	18K Ohm	100A204
R75,83,90, 97	1K Ohm	100A233
R91	2.2K Ohm	100A221
R92	47K Ohm	100A228
R93	120K Ohm	100A292
R101,106	1 Megohm Potentiometer	105A254
R102,103	50K Ohm, Potentiometer	105A242
R104	5K Ohm, Potentiometer	105A233
R105	500 Ohm, Potentiometer	105A241

*Unless otherwise specified, all resistors are fixed composition, 10%, 1/4 watt.

CAPACITORS

C1,2,7,37	0.01UF, 50V, Mylar	107A404
C3,5,9,10, 11,14,24, 30 thru 36	10UF, 16V, Electrolytic	108A143
C6	220UF, 15V, Tantalum	107A633
C8	0.008UF, 33V, Film	107A728
C12,15,21, 23	0.1UF, 100V, Mylar	107A406
C13	2.2UF, 20V, Electrolytic	108A142
C16,22	0.27UF, 35V, Tantalum	107A608
C17,18,19, 20	1.5UF, 35V, Tantalum	107A641
C38,39	22UF, 16V, Electrolytic	108A144
C40,41	330PF, 50V Mylar	107A304

SEMICONDUCTORS

Q1	Transistor, NPN, 2N5296	125B415
Q2,8,11	Transistor, PNP, 2N3702	125B113
Q3,14,22,24	Transistor, NPN, TIS92	125B132
Q4,5,6,7,9 10,13,23	Transistor, NPN, 2N2925	125A119
CR1,3,22,24	Diode, CL-1 (ED3002S)	115B301
CR2	Diode, Zener, 11V, 1N4741	115A245
CR4 thru 21,23,25 thru 29	Diode, T155	115B101
IC2,16	Integrated Circuit, LM555	128A043-02
IC3	Integrated Circuit, 4046	128A079
IC4,5	Integrated Circuit, 4017	128B072
IC6,11,14	Integrated Circuit, LM358	128A045
IC7	Integrated Circuit, 4027	128A044
IC8	Integrated Circuit, 4532	128A060
IC9,10	Integrated Circuit, 4051	128A062
IC12	Integrated Circuit, LM1877N-9	128A073
IC13,15	Integrated Circuit, 4081	128A077
IC17,18	Integrated Circuit, 4584	128A059

MISCELLANEOUS

P10 thru 19	Terminal, Male	233A106
J1	Connector, 6 pin	139A151
J2,3,5	Connector, 12 pin	140A195
J4	Connector, 8 pin	140A170
TB1,2	Terminal Block, 10 pin	229A136
	Circuit Board (without parts)	130D276C
	Circuit Board (with parts)	293D813C
	Jack, Phone, (w/mtng. hardware)	142A115
	Fuseholder	143A106
LED A,b,C	Pilot Light, Red (3)	147A112-01
	Fuse, 1/4 ampere	148A121
	Switch, Pushbutton, Red (1)	8469A067
	Switch, Pushbutton, Black (7)	8469A067-01
	Housing, Control and Clip Assembly	8549C049
	Panel, Front Control	8549C052
	Control Housing and P.C. Board Assembly	8549D051

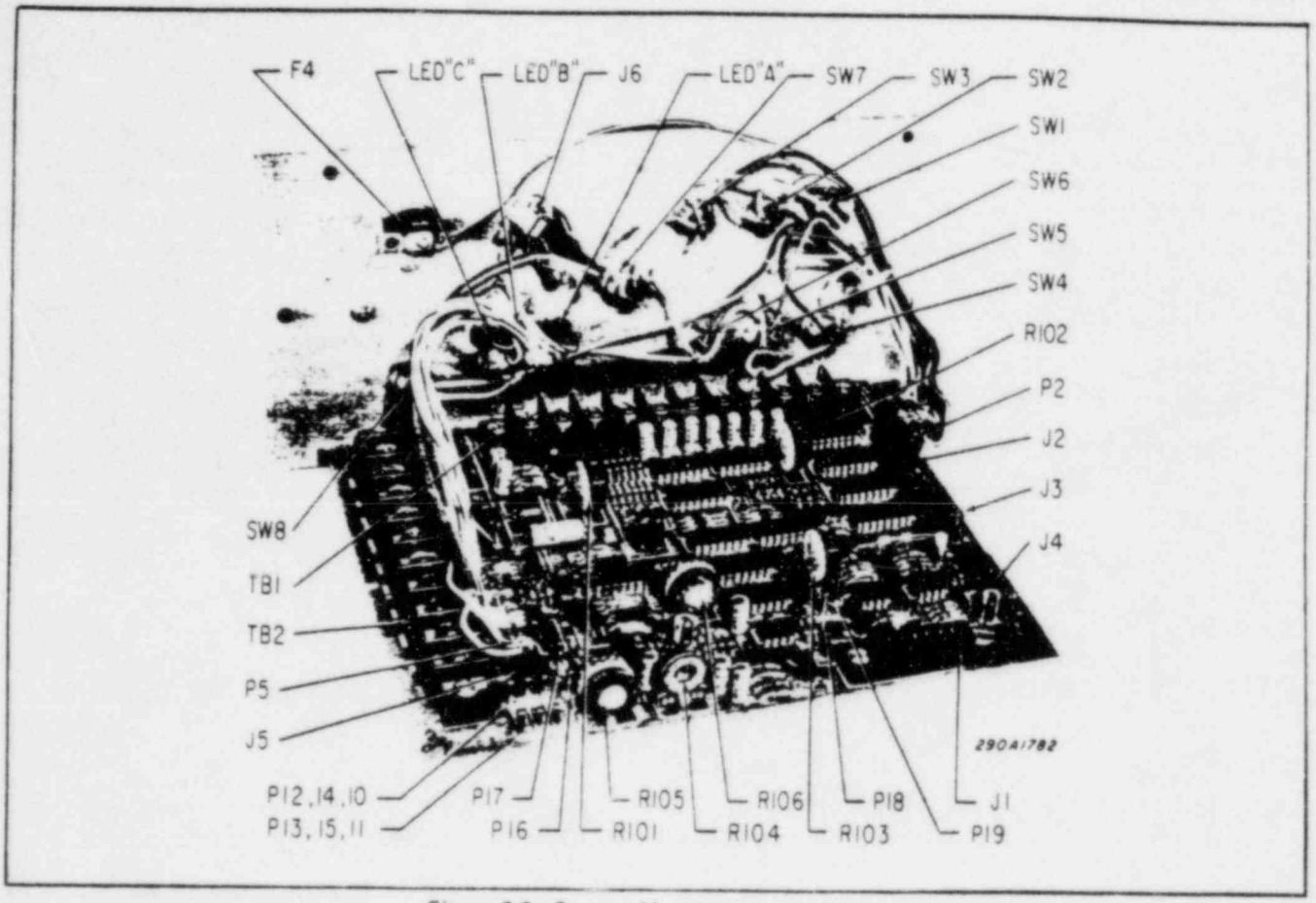


Figure 7-6. Control Module Internal View.

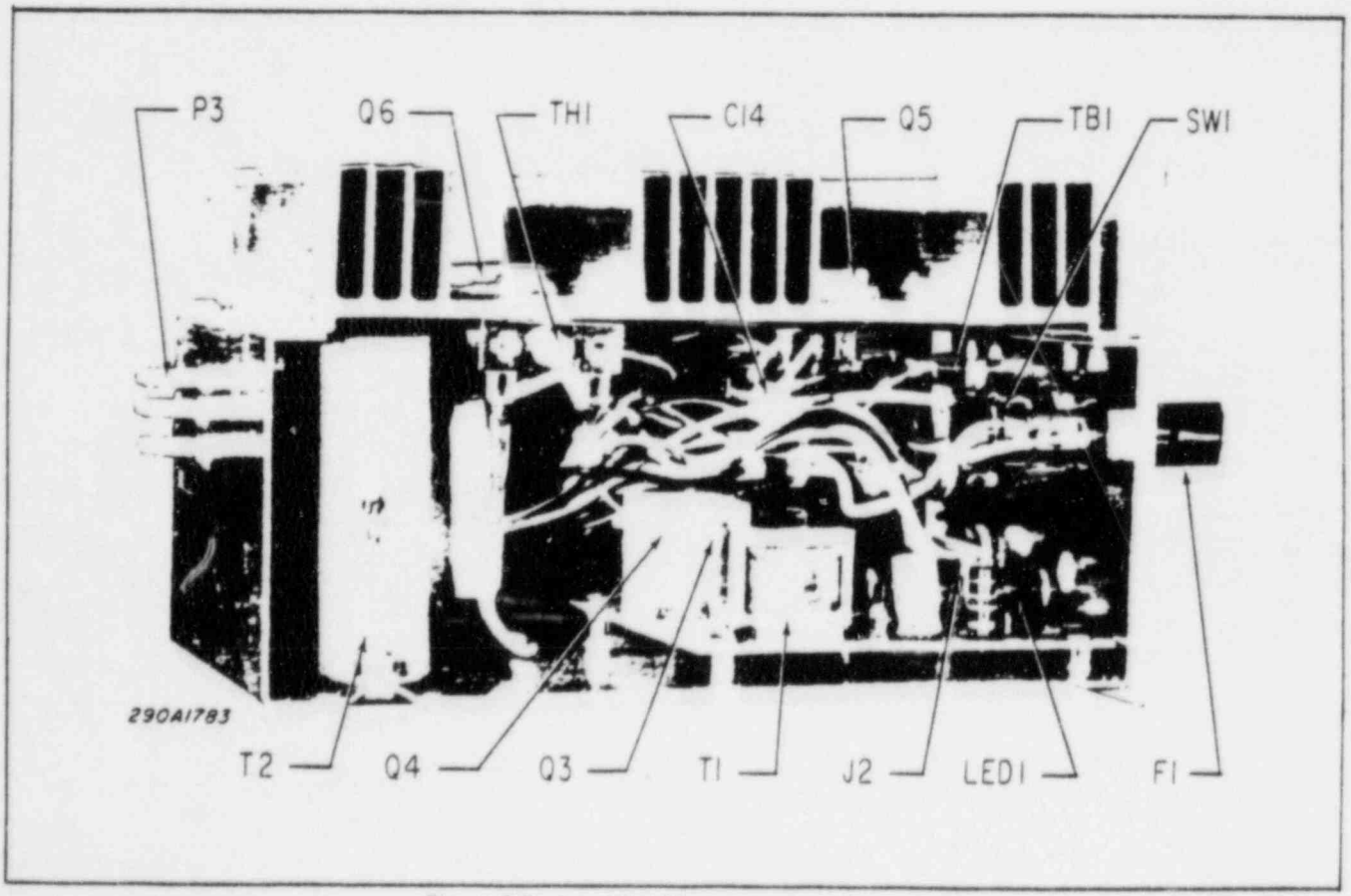


Figure 7-7. Amplifier Module Internal View.

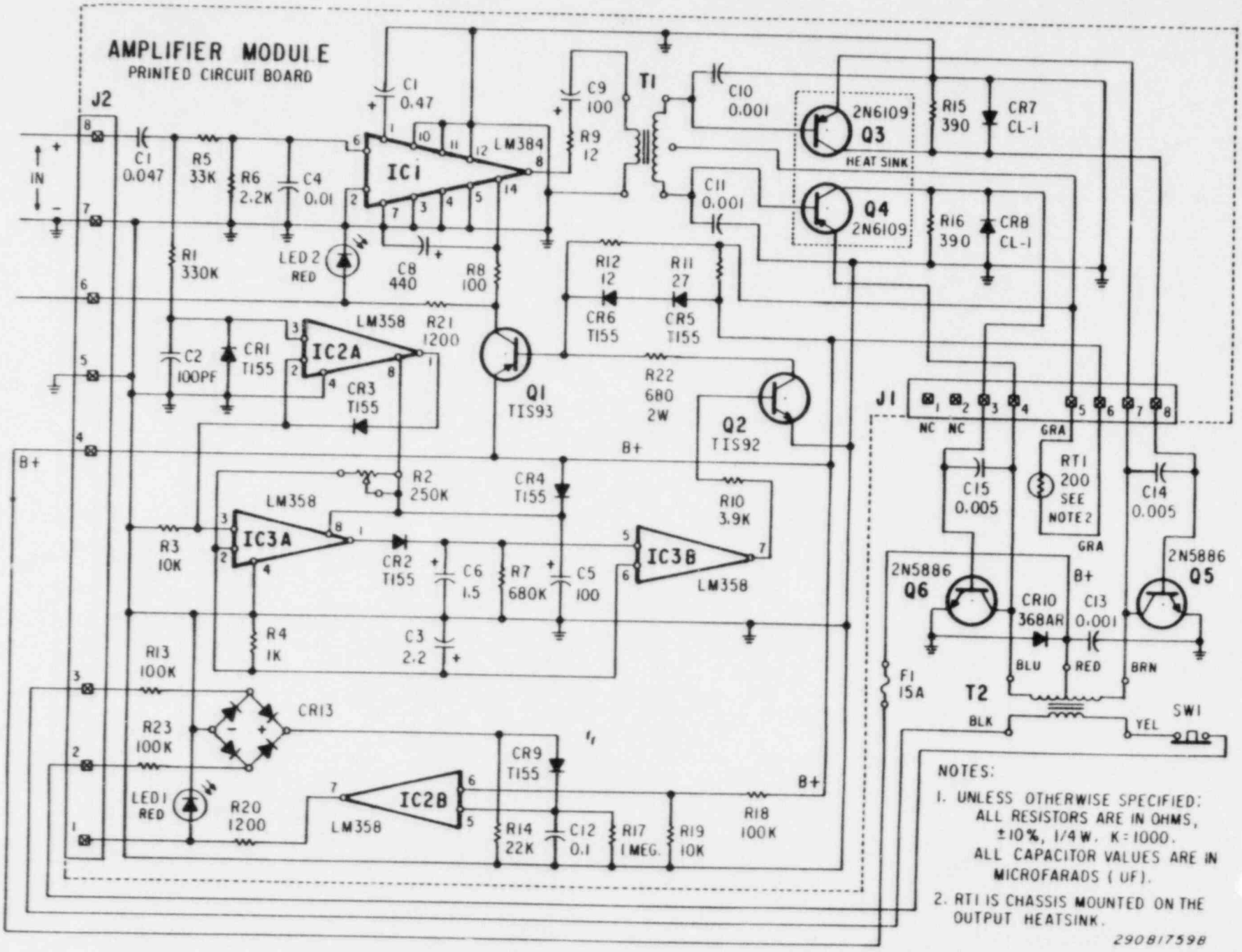


Figure 7-8 Amplifier Module Schematic Diagram.

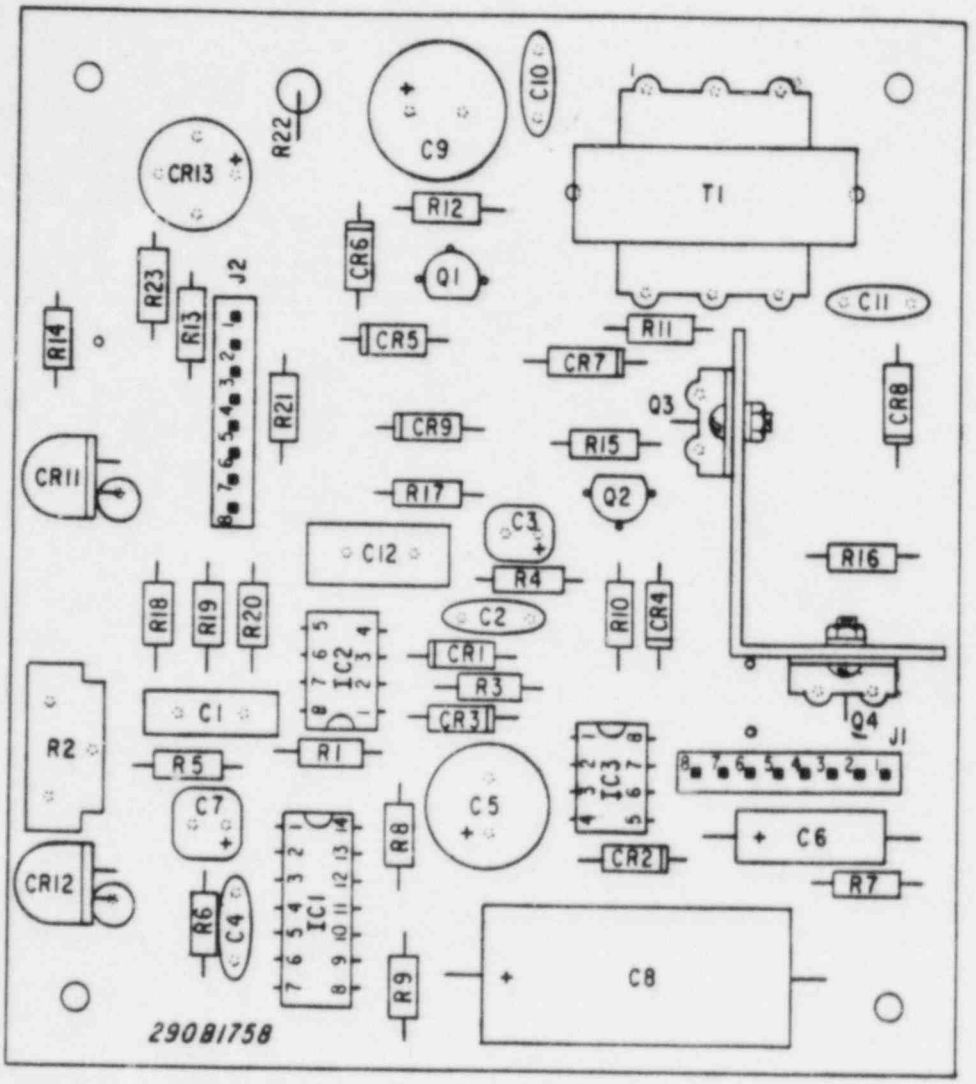


Figure 7-9. Amplifier Module Component Location Diagram

PARTS LIST
EOWS AMPLIFIER MODULE ASSEMBLY

Schematic Symbol	Description	Part No.
	*RESISTORS	
R1	330K Ohm	100A212
R2	250K Ohm, Potentiometer	105A253
R3,19	10K Ohm	100A207
R4	1K Ohm	100A233
R5	33K Ohm	100A211
R6	2.2K Ohm	100A221
R7	680K Ohm, 20%	100A252
R8	100 Ohm	100A236
R9,12	12 Ohm,5%	100A782
R10	3.9K Ohm	100A273
R11	27 Ohm, 5%	100A290
R13,18,23	100K Ohm	100A222
R14	22K Ohm	100A208
R15,16	390 Ohm	100A283
R17	1 Megohm	100A215
R20,21	1.2K Ohm	100A295
R22	680 Ohm, 2 watt, WW	103A117
	*Unless otherwise specified, all resistors are fixed composition, 10%, 1/4 watt.	
	CAPACITORS	
C1	0.47UF, 50 V, Mylar	107A418
C2	100PF, 100V, Disc	107A235
C3	2.2UF, 20V, Tantalum	107A636
C4	0.01UF, 50V, Disc	107A213
C5	100UF, 50V, Electrolytic	108A214
C6	1.5UF, 35V, Tantalum	107A616
C7	0.47UF, 35V, Tantalum	107A645
C8	440UF, 50V, Electrolytic	108A204
C9	100UF, 25V, Electrolytic	108A133
C10,11,13	0.001UF, 500V, Disc	107A263
C12	0.1UF, 200V, Mylar	107A406
C14,15	0.005UF, 100V, Disc	107A211

Schematic Symbol	Description	Part No.
	SEMICONDUCTORS	
Q1	Transistor, PNP, TIS93	125B133
Q2	Transistor, NPN, TIS92	125B132
Q3,4	Transistor, PNP, 2N6109	125B431
Q5,6	Transistor, NPN,2N5886	125A433
CR1,2,3 4,5,6,9	Diode, TI55	115B101
CR7,8	Diode, CL1 (ED3002S)	115B301
CR10	Diode, Rectifier, 368AR	115A311
LED 1,2	Pilot Light, LED, Red	147A112-01
CR13	Rectifier, Bridge	115A602
IC1	Integrated Circuit,LM384	128A046A-01
IC2,3	Integrated Circuit,LM358	128A045
	MISCELLANEOUS	
T1	Transformer, Driver	120B145
T2	Transformer, Output	120B159
J1,2	Connector, Wafer	140A170
F1	Fuse, 15-ampere, 3AG	148A107
S1	Switch, Pushbutton	122A201
RT1	Thermistor, 200 Ohm	104A111
	Heat Sink (Q3,Q4)	236A110
	Insulator (Q5,Q6)	235A124
	Spacer,Plastic (Q5,Q6)	230A151
	Socket,Transistor(Q5,Q6)	138A125
	Jack, Banana, Red	142A116A-01
	Jack, Banana, Black	142A116A-02
	Fuseholder	143A106
	Circuit Board (without parts)	130A272B
	Circuit Board (with parts)	200D801
	Front Panel	8549C041
	Amplifier Assembly	200D816

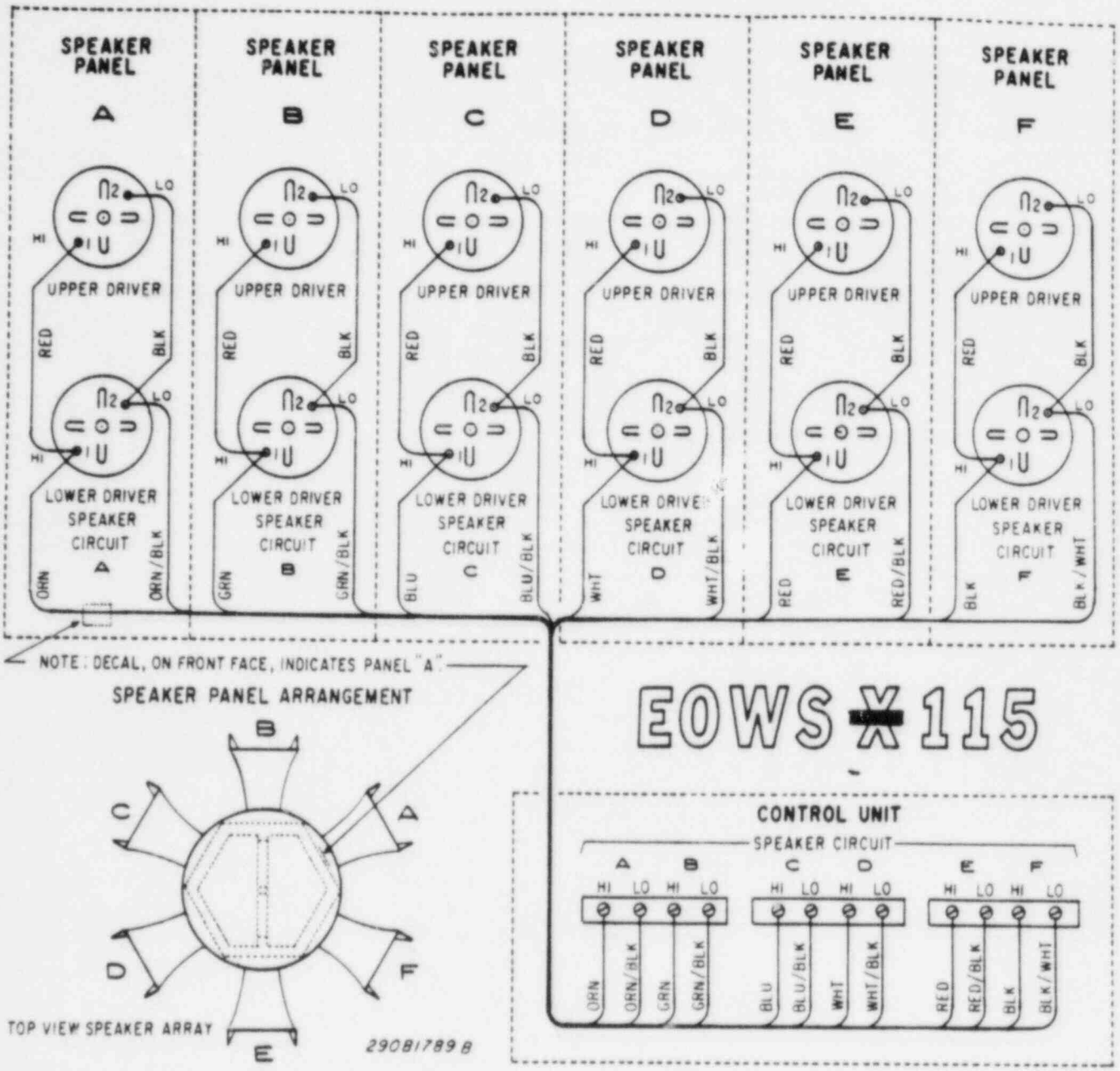


*Figure 7-10. Model EOWS*115 Wiring Diagram.*

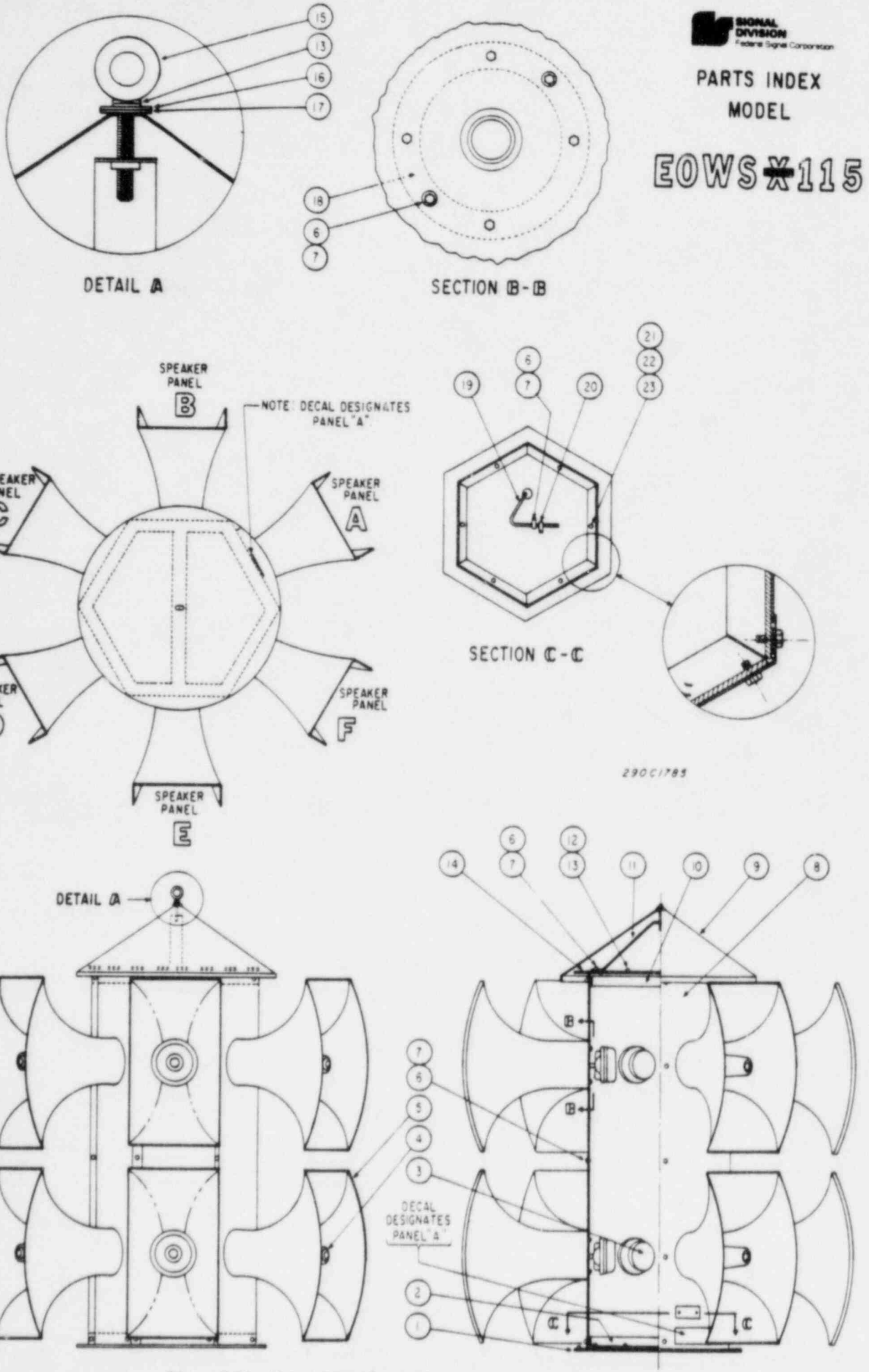


*Figure 7-11. Model EOWS*115 Component Location Diagram.*

ELECTRONIC OUTDOOR WARNING SIREN

EOWS*115

PPL 0180
PARTS LIST

OCTOBER 1984

Item No.	Description	Part No.	Qty.
1	Plate , Base Assembly	8549B012	1
2	Frame , Support , Welded Assembly	8549B010	1
3	Driver , 100 Watt , Gray	8287B321	12
4	Nameplate , Cone	8146A282-01	12
5	Projector , Atlas CJ-46	132B133	12
6	Screw , 1/4-20 , Hex Hd.	7000A311-14	118
7	Lockwasher , Split , 1/4 Scr.	7074A016	118
8	Panel Assembly , Speaker Mtg.	8549B029	6
9	Cover , Top Assembly	8549B005	1
10	Frame Support , Welded Assembly	8549B010-01	1
11	Bracket , Hoisting , Welded Assembly	8549A008	1
12	Screw 1/2-13 , Hex Hd.	7000A320-20	2
13	Lockwasher , Split , 1/2 Scr.	7074A025	3
14	Plate , Cover	8549B007	1
15	Bolt , Eye , 1/2-13	7003A003	1
16	Washer , Flat , Stl. , 1/2 ID x 1-3/4 OD x 1/16	7072A095	1
17	Washer , Flat , Rbr. , 9/16 ID x 1-3/4 OD x 1/8	7072A038	1
18	Gasket (supplied with projector, item 5)		
19	Wireset , Speaker Array , EOWS*	310A816	1
20	Clamp , Thinwall Conduit 1/2	150A129	2
21	Bolt , Hex Hd. , 3/8-16 x 1-1/4	7002A009-20	6
22	Lockwasher , Split , 3/8 Scr.	7074A046	6
23	Nut , Hex , 3/8-16	7059A063	6
Not Shown			
	Bracket , Pole Mtg. Assembly	8549A170	3
	Bracket , Brace , Pole Mtg.	8451C037	1

DO NOT ORDER PARTS BY ITEM NUMBER.
Give model, voltage, description and part number.

Refer to PARTS PRICE LIST (Part No. 1001) for prices of parts.

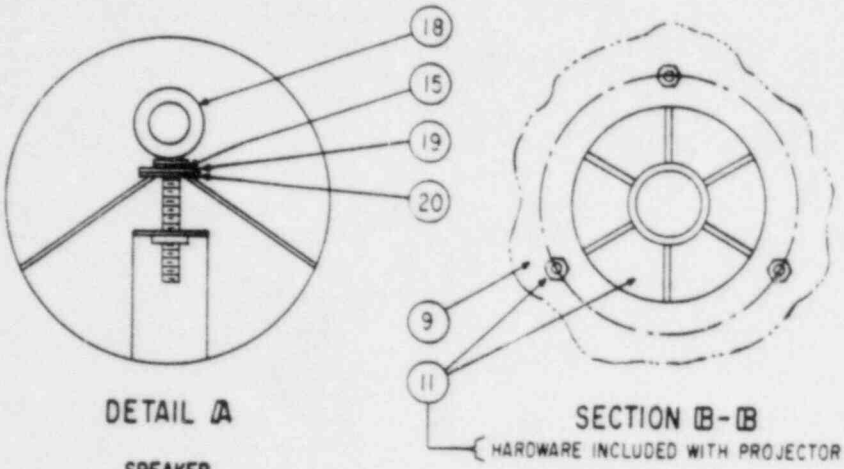
Federal Signal Corporation
Signal Division
2645 Federal Signal Drive
University Park , Illinois 60466

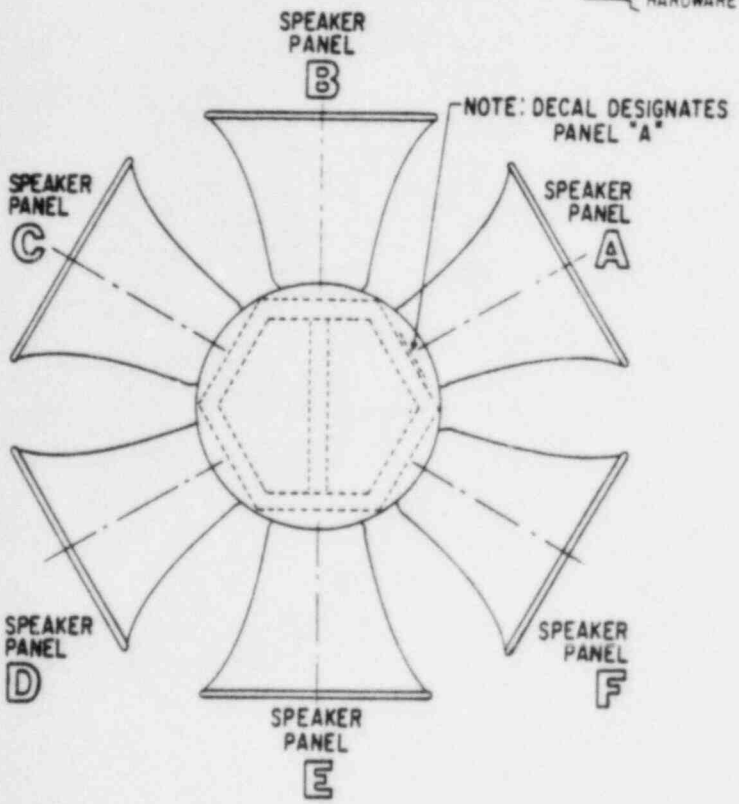
Printed in U.S.A.

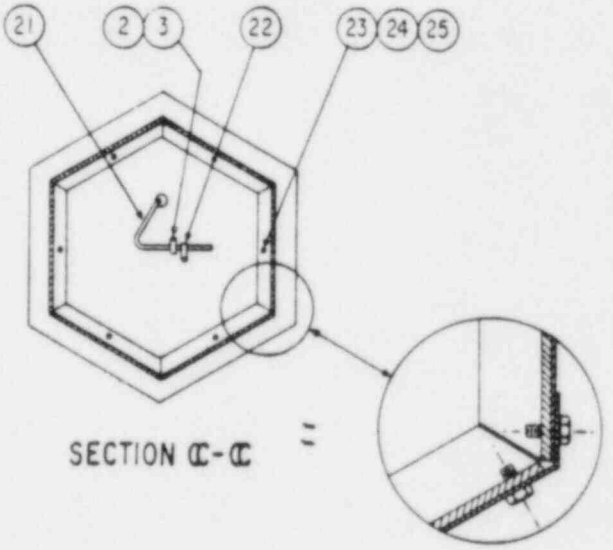
SIGNAL DIVISION
Federal Signal Corporation

PARTS INDEX
MODEL

EOWS*1212







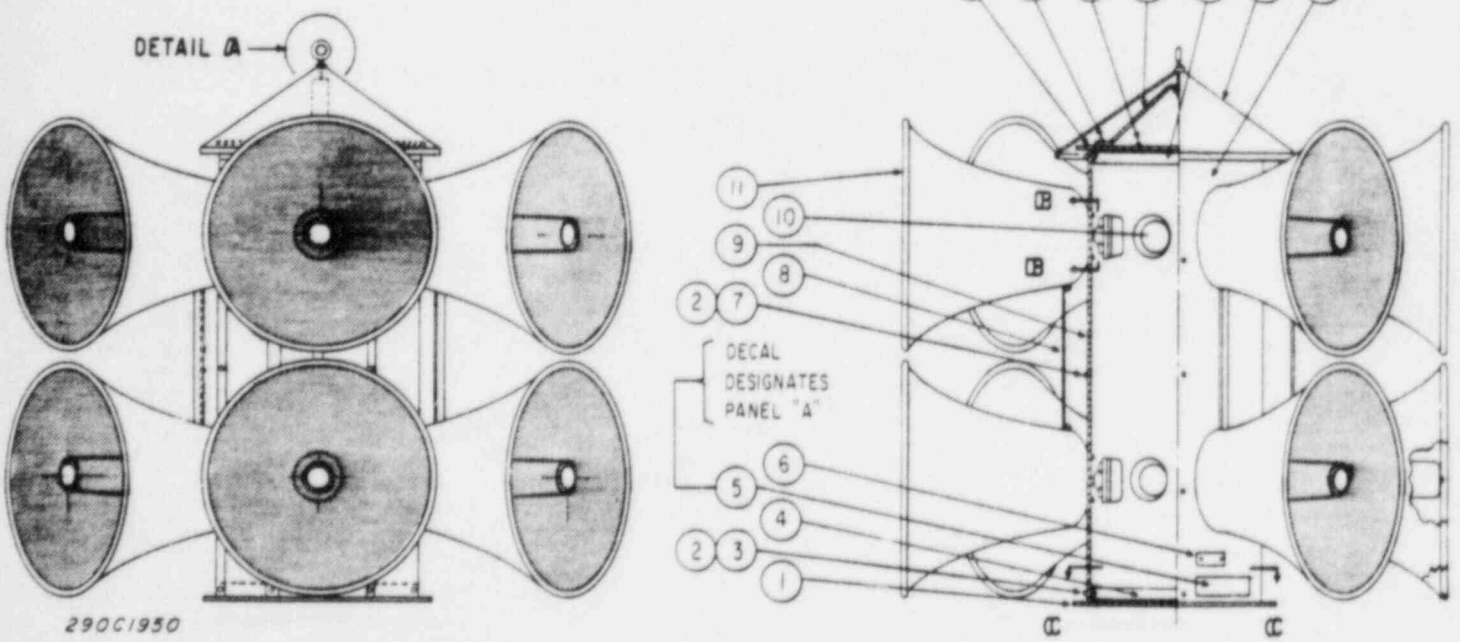


*Figure 7-12. Model EOWS*1212 Component Location Diagram.*

ELECTRONIC OUTDOOR WARNING SIREN

EOWS*1212

PPL 0199
PARTS LIST

OCTOBER 1984

Item No.	Description	Part No.	Qty.
1	Plate , Base Assembly	8549B012	1
2	Lockwasher , Split , 1/4" Scr. , S.S.	7074A016	46
3	1/4-20 x 7/8 Scr. , Hex Hd. , S.S.	7000A311-14	28
4	Frame , Support , Welded Assembly (base)	8549B010	1
5	Decal (indicates panel " A ")	8146B062	1
6	Nameplate , EOWS * 1212	8146A829-08	1
7	1/4-20 x 7/16 Scr. , Hex Hd. , S.S.	7000A311-07	18
8	Brace , Speaker , Middle	8549A116	6
9	Panel Assembly , EOWS * 1212	8549B174	6
10	Driver , 100 Watt , Gray	8287B321	12
11	Projector and Cone , Machined Assembly (complete with screen , label , and hardware)	8549C081	12
	Screen (for replacement only)	8549C060	AR
12	Cover , Top Assembly	8549B005	1
13	Frame , Support , Welded Assembly (top)	8549B010-01	1
14	Bracket , Hoisting , Welding Assembly	8549A008	1
15	Lockwasher , Split , 1/2" Scr.	7074A025	2
16	1/2-13 x 1-1/4 Scr. , Hex Hd. , Unslot Indt.	7000A320-20	2
17	Plate , Cover	8549B007	1
18	1/2-13 x 3-1/4 Bolt , Eye , Pltd.	7003A003	1
19	Washer Flat , 1/2 ID x 1-3/4 OD x 1/16	7072A095	1
20	Washer , Flat , Rubber 9/16 ID x 1-3/4 OD x 1/8	7072A038	1
21	Wireset , Speaker Array , EOWS * 1212	310A816	1
22	Clamp , Thinwall , 1/2" Conduit	150A129	2
23	Nut , Hex , 8-18 , S.S.	7059A063	6
24	Lockwasher , Split , 3/8" Scr. , S.S.	7074A046	6
25	3/8-16 x 1-1/4 Bolt , Hex , S.S.	7002A009-20	6
Not Shown			
	Angle Assembly , Roof , Egyptian Gray	8540C017-03	1
	Plate , Brace , Egyptian Gray	8541C037-02	1
	Bracket , Pole Mtg. , Welding Assembly	8549A170	3
	Accessory Kit , Mtg. Hardware	8549A055	1

DO NOT ORDER PARTS BY ITEM NUMBER.
Give model, voltage, description, and part number.

Refer to PARTS PRICE LIST (Part No. 1001) for prices of parts.

Printed in U.S.A.

Federal Signal Corporation
Signal Division
2645 Federal Signal Drive
University Park , Illinois 60466

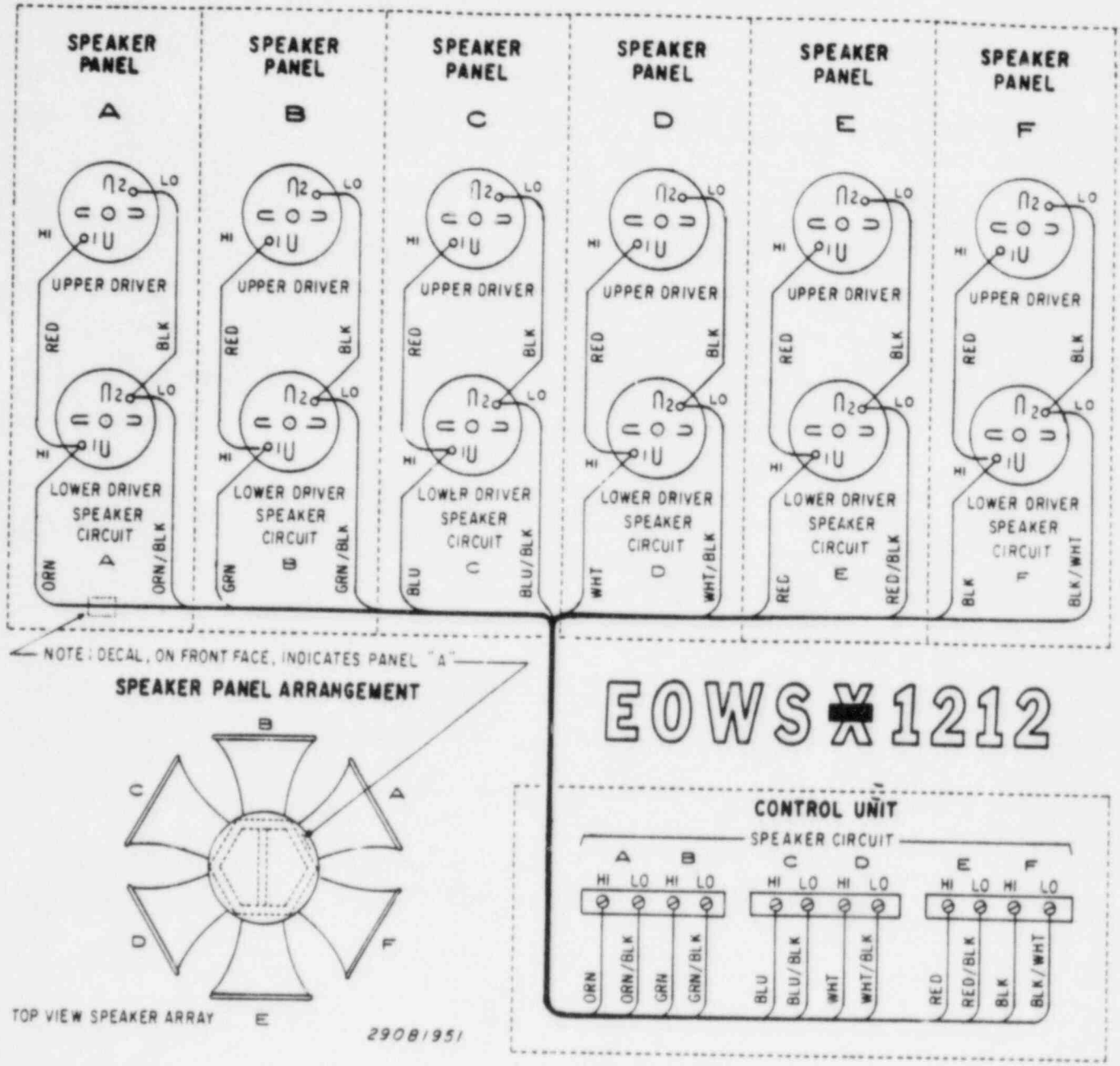


*Figure 7-13. Model EOWS *1212 Wiring Diagram.*

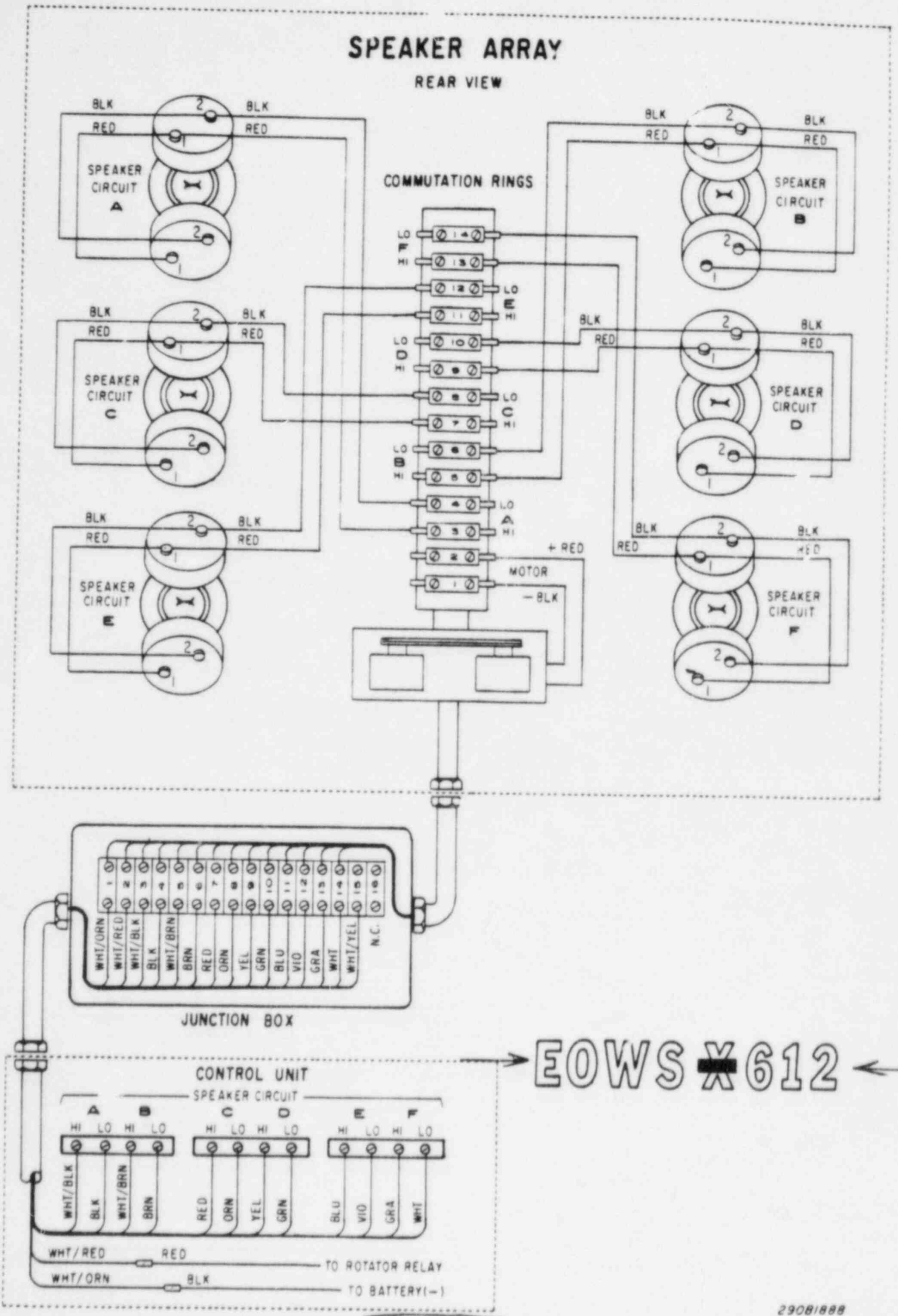


*Figure 7-14. Model EOWS*612 Wiring Diagram.*

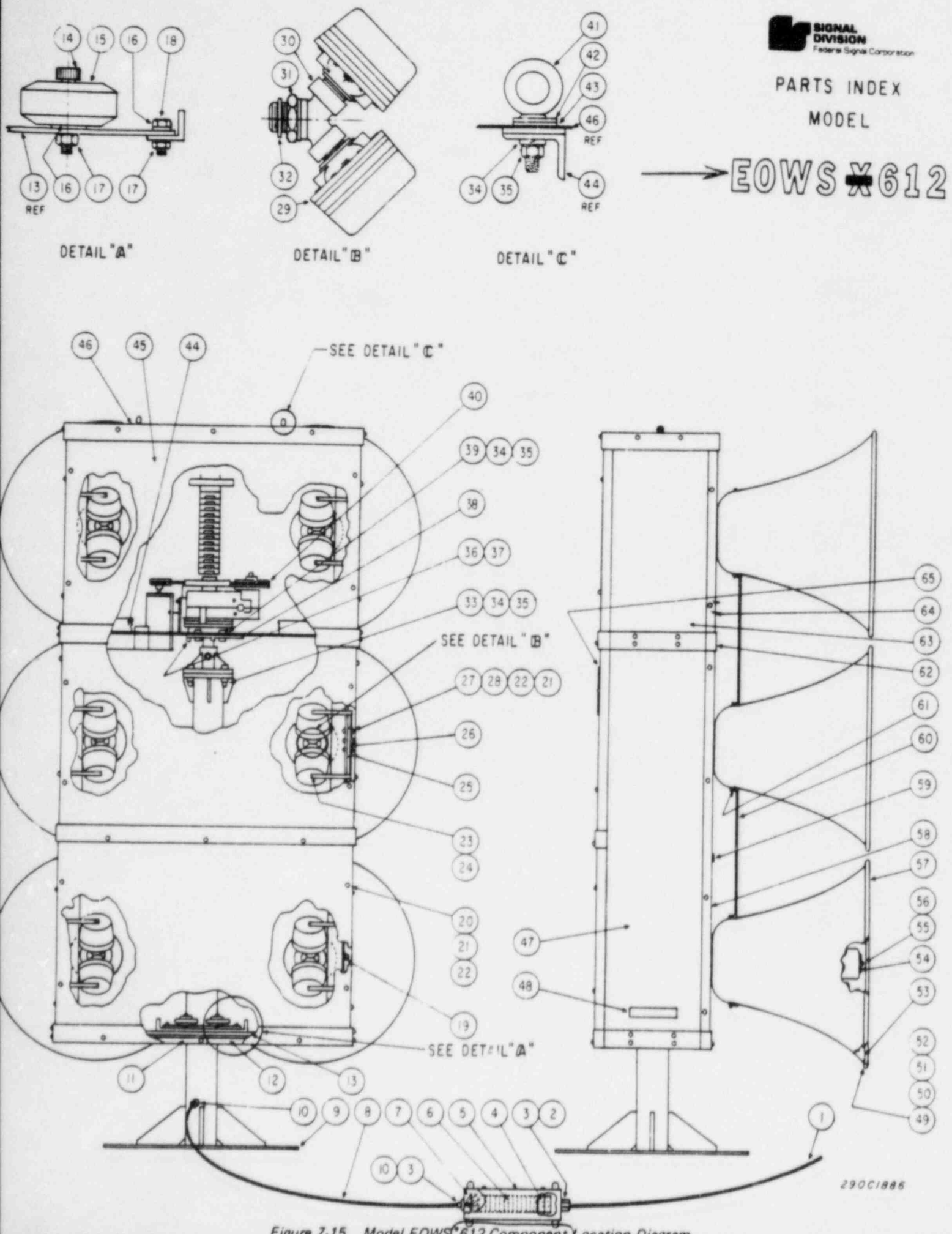


Figure 7-15. Model EOWS 612 Component Location Diagram.

ELECTRONIC OUTDOOR WARNING SIREN

PPL 0191
PARTS LIST

---> EOWS*612 <---

OCTOBER 1984

Item No.	Description	Part No.	Qty.
1	Wire Set , Spkr. Cable EOWS*812	310A870	1
2	Connector , Cord Grip 1"	140A198	1
3	Locknut , Sealing , 1"	7065A033	2
4	Screw , 10-32 , Rd. Hd. , Slt.	7000A068-08	4
5	Junction Box Assembly EOWS*	170B239	1
6	Terminal , 16 Pos.	229A120	1
7	Lug , 6 Spade Crimp Term.	224A117	14
8	Conduit , Flexible , Liquatite , 3' Lg.	R92-10-04	1
9	Pipe Base , EOWS*612	8549C167	1
10	Connector , 1 " , Liquid-Tight	8549A108	2
11	Panel , Bottom Left Assembly EOWS*	8549C163	1
12	Panel , Bottom Right Assembly EOWS*	8549C163-01	1
13	Plate , Roller Adjust	8549B074	2
14	Screw , Shld. , 3/8-16 , Allen Hd.	7017A028-28	4
15	Roller	8549A076	4
16	Washer , Flt. , SS , 0.406 ID x 1.0 OD x 0.063	7072A035	12
17	Nut , Esna , Hex , 3/8-16	7058A012	12
18	Bolt , Hex Hd. , SS , 3/8-16 x 1-1/4	7002A009-20	8
19	Washer , Flt. , Stl. , 0.344 ID x 7/8 OD x 0.125	7072A032	6
20	Screw , Hex Hd. , SS , 1/4-20	7000A311-07	75
21	Washer , Flt. , SS , 0.266 ID x 11/16 OD x 0.063	7072A024	93
22	Lockwasher , Split , SS , 1/4 Scr.	7074A016	93
23	Screw , Hex Hd. , Slt. 5/16-18	7000A319-12	12
24	Nut , Hex , Dbl Chm. , SS , 5/16-18	7057A027	12
25	Bracket Driver	8549A148	12
26	Bracket , Dual Driver	8549A149	6
27	Screw , Hex Hd. , SS , 1/4-20	7000A311-16	18
28	Nut , Hex , 10-32	7059A020	18
29	Driver , 100 Watt , Gray	8287B321	12
30	Coupler , Driver	8542A108	6
31	Nut , Jam , Hex , 1-3/8-18	8542A167	6
32	Washer , Fiber	8283A451	36
33	Screw , Cap , Hex Hd. , 1/2-13	7002A013-28	4
34	Lockwasher , Split , 1/2	7074A025	10
35	Nut , Hex , Cad. Plt. , 1/2-13	7059A077	10
36	Screw , Cap , Hex Hd. , 3/8-16	7002A007-16	3
37	Lockwasher , Split , 3/8	7074A023	3
38	Plate , Mounting , Rotator	8549B153	1
39	Screw , Cap , Hex , 1/2-13	7002A016-24	4
40	Rotator Mechanism	8549C147	1
41	Bolt , Eye , 1/2-13	7003A007	2
42	Washer , Flat , 1-3/8 OD x 0.562 ID	7072A115	4
43	Washer , Flat , Rubber , 9/16 x 1-3/4 x 1/8	7072A038	2
44	Frame , Angle , EOWS*612	8549D164	1
45	Panel , Back , Assembly	8549B161	3
46	Panel , Top	8549C155	1
47	Panel , Side , Assembly	8549B162	2
48	Decal , Siren 2	8146B062	2
49	Washer , Flat , SS , 0.203 x 7/16 x 0.032	7072A015	24
50	Screw , Rd. Hd. , Slt. , 10-32	7000A070-08	24
51	Lockwasher , Split , SS , #10 Scr.	7074A010	24
52	Nut , Hex , 10-32	7059A016	24
53	Screen , Projector	8549C060	6
54	Nameplate , FS , Flat	8146A767	6
55	Rivet Nut , 10-32 x 1/2	7065A000	6
56	Screw , Rd. Hd. , Slt. , SS , 10-32	7000A070-16	6
57	Projector and Cone , Machined	8549B176	6
58	Panel , Front , Lower , Assembly	8549C165	1
59	Nameplate , EOWS*612	8146A829-07	1
60	Brace , Speaker	8549A151	4
61	Brace , Speaker , Horizontal	8549A150	4
62	Flange , Side Panel	8549B143	4
63	Panel , Side , Top Assembly	8549B162-01	2
64	Panel , Front , Upper Assembly	8549C160-01	1
65	Sign , Danger Equipment Starts Automatically	8287A398	1
Not Shown			
	Bracket , Pole Mtg. , Welding Assembly	8549A170	4
	Accessory Kit Mounting Hardware	8549A083	1
	Accessory Kit , EOWS*408/812	8549A122	1
	Wire Set , Drivers EOWS*612	310A905	1

DO NOT ORDER PARTS BY ITEM NUMBER.
Give model, voltage, description, and part number.

Refer to PARTS PRICE LIST (Part No. 1001) for prices of parts.

Printed in U.S.A.

Federal Signal Corporation
Signal Division
2645 Federal Signal Drive
University Park , Illinois 60466