

THUNDERBEAM[®]

RSH10A & RSH10B



SERVICE MANUAL

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SIGNAL DIVISION
Federal Signal Corporation

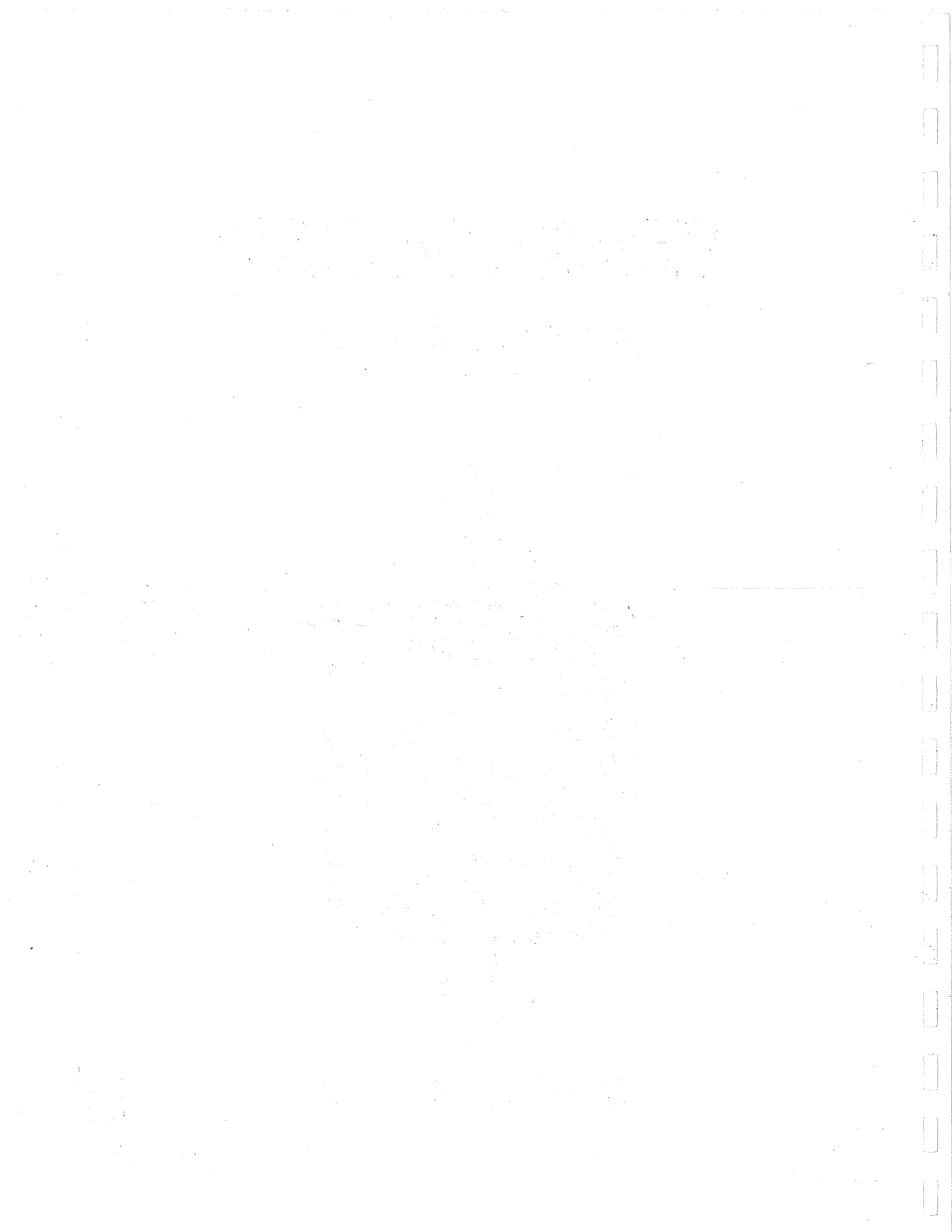


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Warranty

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.



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SECTION I

GENERAL DESCRIPTION

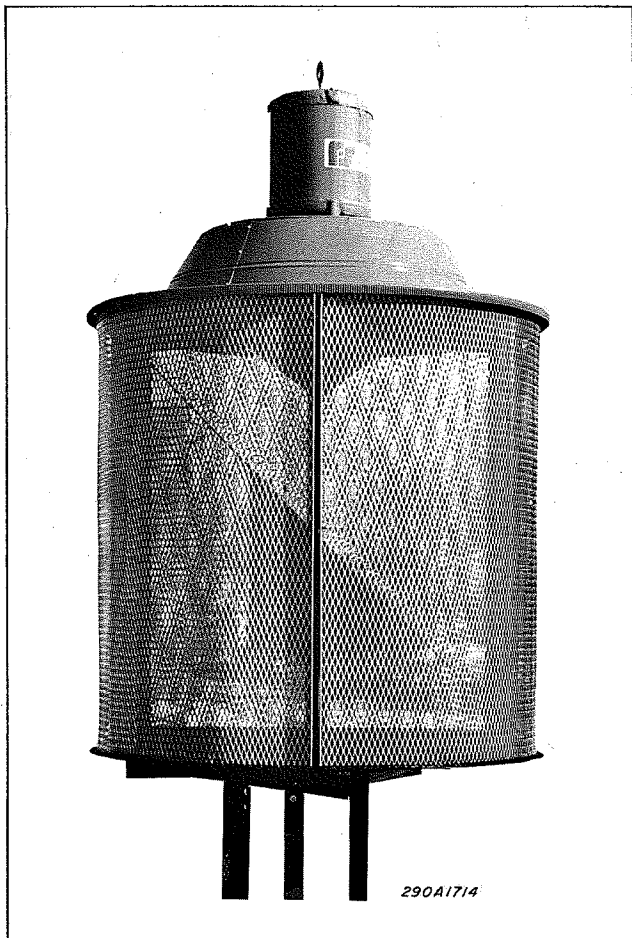


Figure 1-1 Federal Model RSH10 Siren

1-1 SCOPE OF THIS MANUAL

This Service Manual describes the characteristics, specifications, installation, controls, theory of operation and servicing of the Federal Models RSH10A and RSH10B ThunderBeam® Outdoor Warning Sirens. The difference between the two siren models is a three-phase motor for the Model A and a single-phase motor for the Model B.

1-2 GENERAL

The Federal Models RSH10A and RSH10B are directional sirens capable of producing high intensity warning signals over a large area.

Federal provides mounting equipment that enables the user to install a

siren on a utility pole. For mounting the siren on a roof or flat surface, a roof mount kit must be ordered from Federal. Thus the siren may be installed in almost any situation. The high efficiency of this siren enables it to produce a high sound level while making moderate demands on the power source.

1-3 SIREN DESCRIPTION

The Models RSH10A and RSH10B are electro-mechanical, integral-type vertical sirens which employ a single motor, rotor and starter to produce sound energy. It employs a direct-drive rotating acoustic lens system which gathers the sound energy and projects it in the horizontal plane. The rotating acoustic lens system includes a protective stainless steel mesh enclosure (see figure 1-1). The integral design requires only one motor starter for activation and requires no belts or drive chains, making it virtually maintenance-free and exceptionally reliable. The vertical design virtually eliminates winter freeze-ups, which is an inherent design problem of horizontal sirens.

The ThunderBeam sirens are single-tone sirens capable of producing a 128dB sound level at 100 feet. Refer to Specifications Section II.

1-4 MECHANICAL DESCRIPTION

The mechanism of the siren models covered in this manual consists of a vertically installed motor which has a stator attached to it, and a rotor mounted on the motor shaft concentric to the stator. The rotor and stator each contain one row of ports. As the motor rotates the rotor, air is drawn into the rotor and passes through the rotor and stator ports in pulses. These pulses are produced because the rotor alternately opens and closes the stator ports. The pulses of air produce sound at a frequency (pitch) that is dependent upon the rotational speed of the motor, and the number of ports in the rotor-stator combination.

1-5 CONTROL DESCRIPTION

The Model RC5 Motor Starter is basically a heavy-duty relay that is capable of controlling the starting and operating current of the ThunderBeam sirens. The RC5 is housed in a NEMA-1 enclosure for installation inside of a building. The starter is also available as the Model RC5W, which is housed in a weatherproof enclosure similar to the NEMA-3R enclosure for outdoor installations.

1-6 SIGNAL DESCRIPTION

The sirens described in this manual are capable of providing a sustained signal and a wailing signal. The steady signal is frequently used as a Civil Defense "Alert" signal. The wailing signal is often used as a Civil Defense "Attack" signal. The optional fast-wailing can be

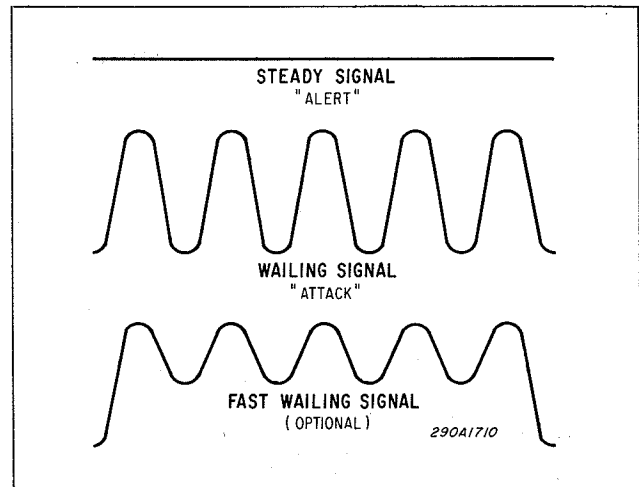


Figure 1-2 Signal Characteristics

used as a "Fire" signal or a needed third signal. However, any of the signals is capable of being used for any desired application. These signals are shown graphically in figure 1-2.

SECTION II SPECIFICATIONS

2-1 POWER REQUIREMENTS

A. Motor

Model RSH10A*240	208-240/480VAC 3 phase, 50/16Hz, 34/17A
Model RSH10B*240	240VAC, 1 phase, 60Hz only, 56A

2-2 PHYSICAL

Diameter (both models) 48" (121.9cm)

Height (both models) 68" (172.7cm)

Shipping Weight

RSH10A (pole)	670 lb. (304 kg.)
RSH10A (roof)	698 lb. (317 kg.)
RSH10B (pole)	685 lb. (310 kg.)
RSH10B (roof)	703 lb. (319 kg.)

2-3 MISCELLANEOUS

Sound Output 128dBC at 100 ft. (30.5m)

Motor Type

Model RSH10A 3 phase ball bearing induction dual voltage 208-240/480VAC

Model RSH10B Single phase repulsion-induction 240VAC

Power 10HP

Top Frequency (approx.) 675Hz (60Hz)
578Hz (50Hz)

2-4 ROTATOR ASSEMBLY

Gear Reducer 1592:1 reduction

Rotation Motor

Power 1/4 HP at 1800 RPM (nominal - both models)

Beam Rotation Speed 2 RPM



SECTION III

INSTALLATION

3-1 SIREN LOCATION

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

If the siren is being installed as part of a Civil Defense Warning system, ALWAYS follow Federal Emergency Management Agency (FEMA) recommendations.

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 10dB. For example, the sound level at 100 feet (30.5m) from a Model RSH10 is 138dB. At 200 feet (61m), the level drops to 118dB; at 400 feet (122m) the sound level drops to 108dB; etc. This is referred to as the "loss per distance doubled".

A loss per distance doubled of 10dB is usually experienced 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 res-

idential areas may be 10dB, and as high as 12dB in areas having tall buildings or other factors detrimental to sound propagation.

Experience indicates 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 10dB loss per distance doubled and a 70dB minimum sound level, the effective range of the Model RSH10 is approximately 5600 feet.

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.

3-2 SIREN ASSEMBLY

Before installing the siren in a pole-type or roof-type configuration, it is necessary to assemble the legs to the siren. See figure 3-1. Mount the legs to the siren support plate as shown, using 1/2-13 bolts, lockwashers and nuts.

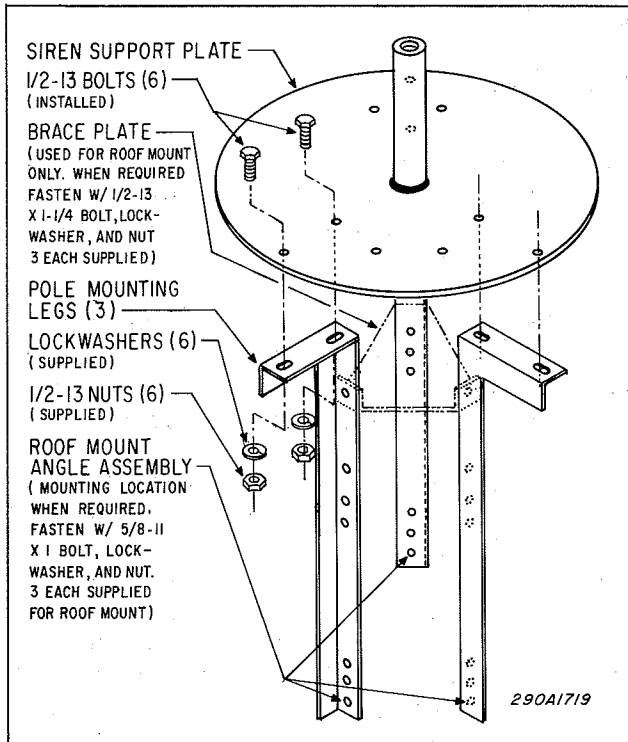


Figure 3-1 Siren Assembly

For roof-type installations only, then attach the braceplate to the legs, using 1/2-13 bolts, lockwashers and nuts. Then attach the roof angle assembly, using 5/8-11 bolts, lockwashers and nuts. (see figure 3-1).

3-3 PHYSICAL INSTALLATION

A. General

Most siren installations are one of two types: Pole Mount or Flat Surface Mount. These two configurations make it possible to install a siren 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 siren is typically installed 50 ft. above the ground. If the installation is located less than 50 ft. 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 ft. above ground, the effective range of the siren may increase, but the sound may skip over areas closer to the siren. These variables may make it desirable to test the sound coverage of the siren at various heights and locations whenever possible.

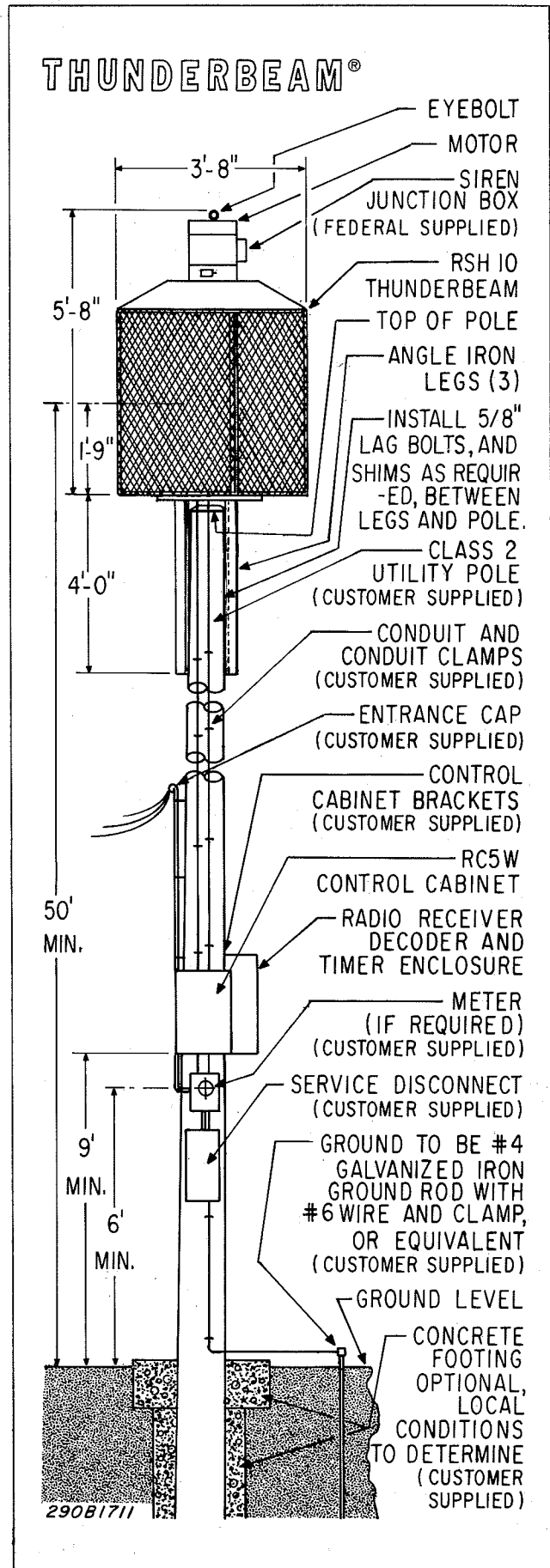


Figure 3-2 Typical Pole-mounted Siren Installation

B. Pole Mounting

A typical siren pole-mounted installation is shown in figure 3-2. The siren is mounted on a Class 2 utility pole 50 ft. above the ground. The siren is attached to the pole by means of a stand from Federal, as shown in figure 3-1.

The siren is mounted on a Class 2 utility pole by means of three angle iron legs, approximately 3 feet long. To attach the siren to the pole, proceed as follows (see figure 3-2).

(a) Uncrate the siren and remove the nuts that hold the siren on the shipping base. Lift the siren approximately 3-1/2 ft. with a crane or hoist.

(b) Install the three legs on the siren mounting plate. Use two 1/2"-13 nuts and 1/2" lockwashers (provided) for each leg. Do NOT tighten the bolts completely.

CAUTION

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

(c) Erect the utility pole in accordance with the accepted practice. Be sure the pole extends about 48 ft. above the ground (refer to CAUTION above).

(d) Raise the siren to the necessary height, and lower it over the pole.

(e) Adjust the three legs, tighten and insert shims, if necessary, between the siren legs and pole. Bolt the siren to the pole using two 5/8" lag bolts, at least four inches long for each leg, as shown in figure 3-2. Tighten all bolts.

(f) Install the motor starter and disconnect switch in a location readily accessible to service personnel, but in an area that discourages vandalism. The motor starter must be installed in a vertical position for proper operation. A Model RC5 or RC5W Motor Starter is required to control a Model RSH10.

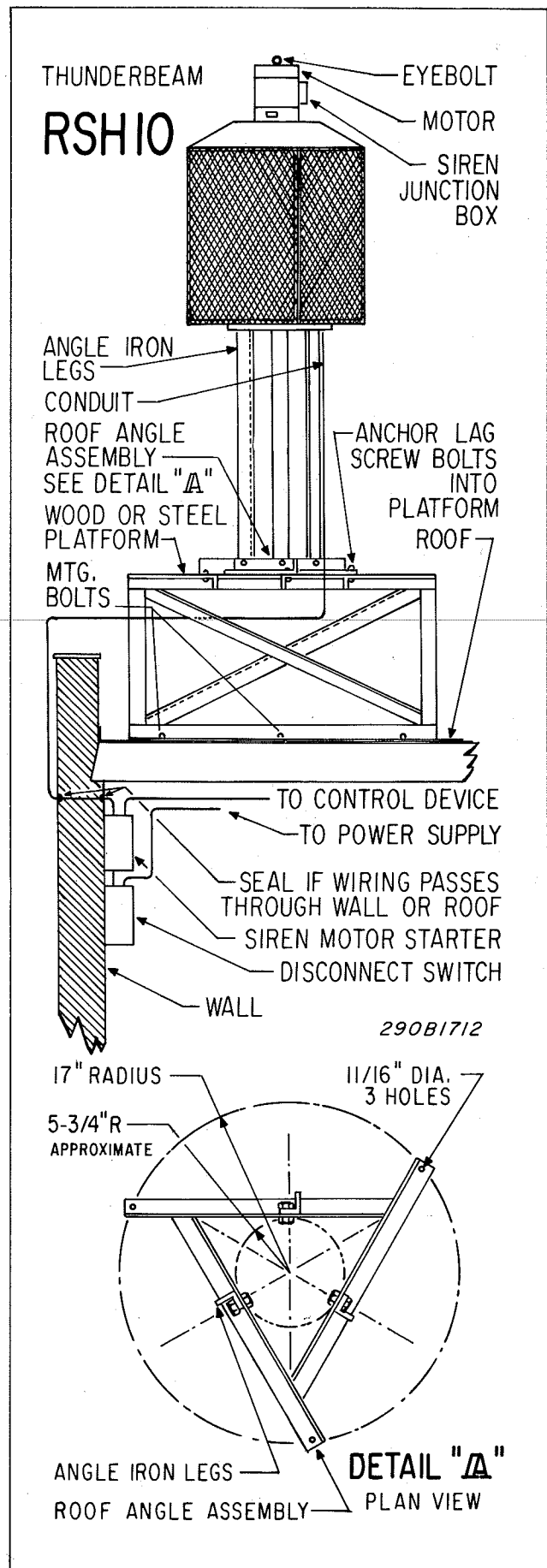


Figure 3-3 Typical Surface-mounted Siren Installation

Install the motor starter in accordance with NEC recommendations and local electrical codes.

C. Flat Surface Mount

This installation configuration is practical when the installation site is on a flat roofed building. The siren can be anchored directly to the roof, on a platform as shown in figure 3-3, or on a weight distribution mat like the one shown in figure 3-4.

The siren attaches to the mounting surface with an optional stand from Federal. The stand consists of 3 angle iron legs and a Roof Angle Assembly to be attached to the mounting plate that is located on the siren. The roof angle assembly can be anchored directly to the mounting surface.

When the siren is installed on a flat roof, a weight distribution mat (like the one shown in figure 3-4) may be necessary. This mat is required when the siren mounting surface is unable to support over 231 pounds per square feet (1127 kg. per square meter). If so, construct the weight distribution mat shown in figure 3-4. This mat distributes the siren weight to about 9.4 pounds per square foot (45.8 kg.).

To install a Model RSH10A or B on a flat roof or other flat surface, proceed as follows:

(a) If desired, construct a platform for mounting the siren, which must be capable of supporting at least 600 lbs. (272 kg.) as well as withstanding a siren wind load of 100 mph. The platform must also be capable of distributing its own weight plus the siren to a value that is safe for the mounting surface. Platform design and construction details are left to the installer.

CAUTION

The eyebolt and hoisting bracket do not have sufficient strength to support the combined weight of the siren and a platform. Therefore, do NOT lift the siren and platform together using the eyebolt as a lifting point.

(b) Remove the siren from the shipping base. Use a crane or hoist to lift the siren approximately 3-1/2 feet.

(c) Install the 3 legs on the siren mounting plate. Use two 1/2"-13 nuts and 1/2" lockwashers (provided) for each leg. Do NOT tighten the bolts completely.

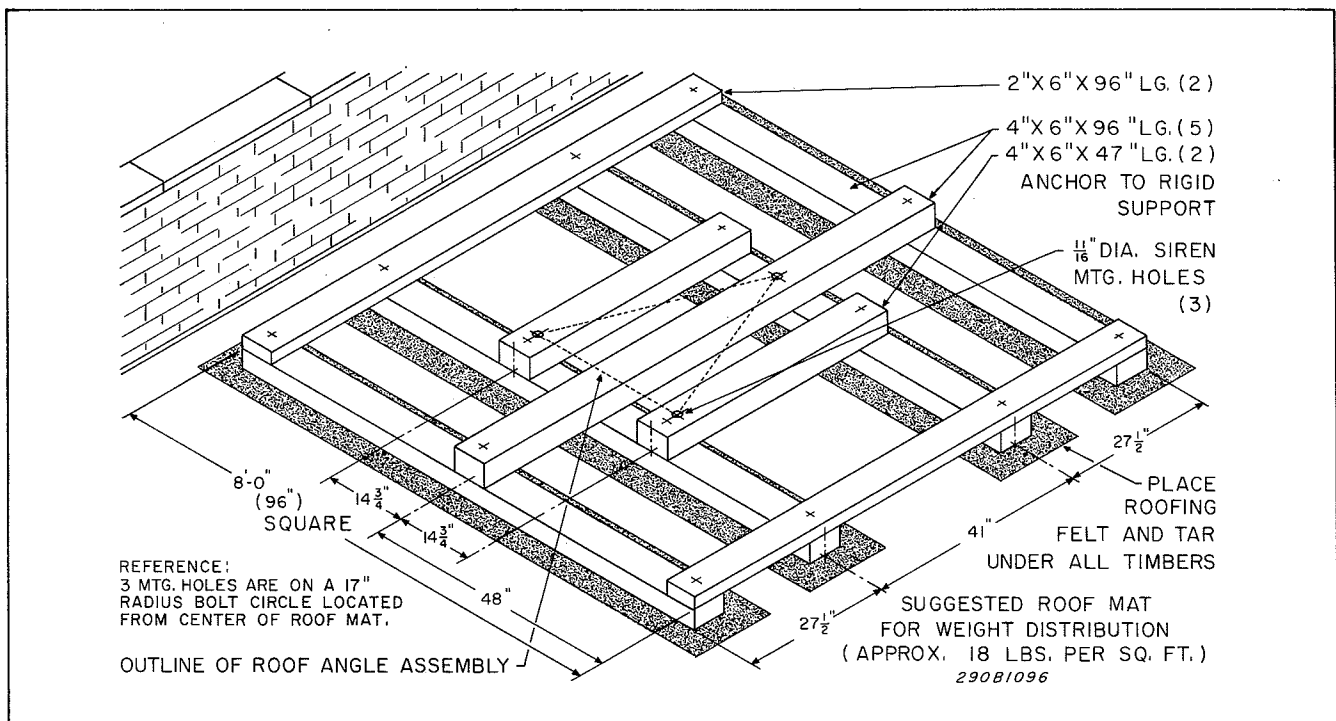


Figure 3-4 Weight Distribution Mat Construction

(d) Attach the braceplate to the legs using 1/2-13 bolts, nuts and lockwashers. Do NOT tighten the bolts completely.

(e) Install the roof angle assembly on the legs. Use one 5/8"-11 x 1" hex head bolt, 5/8" lockwasher and 5/8"-11 hex nut (provided) to attach each leg to the roof angle assembly. Tighten all bolts.

(f) Hoist the siren to the installation site using the eyebolt as a lifting point (refer to CAUTION between steps (a) and (b) of this paragraph).

(g) Anchor the siren to the mounting surface with 5/8" lag bolts or nuts and bolts, as appropriate through the 11/16" holes in the roof angle assembly (see figure 3-3, detail A). If the siren is mounted directly on a roof, (without a platform or weight distribution mat) be sure to install waterproof joints at the points where the mounting bolts pass through the roof so that water does not enter the building.

(h) Install the RC5 Motor Starter, a fused disconnect switch and

other control devices as close as practical to the siren, following local codes and NEC recommendations. If the siren is installed on the roof of a building, it may be desirable to install the RC5 and other control devices inside of the building. Install the RC5 on a vertical surface because the motor starter cannot operate properly unless it is installed vertically.

3-4 ELECTRICAL CONNECTIONS

The power and control circuitry of a typical siren installation is shown in figure 3-5. The wiring diagram of the Model RC5 Motor Starter is also shown in the figure. The Model RC5 or RC5W can be used to control all sirens.

The RC5 Motor Starter is provided with various size knockout holes. Some can accept 1/2" conduit fittings, others 3/4" conduit fittings, and still others 1" conduit fittings. These various sized knockout holes are provided because electrical wiring requirements are frequently unpredictable. The diameter of the conduit for the installation depends on the number of wires that must pass through the conduit (at least two wires for single phase, five for 3 phase).

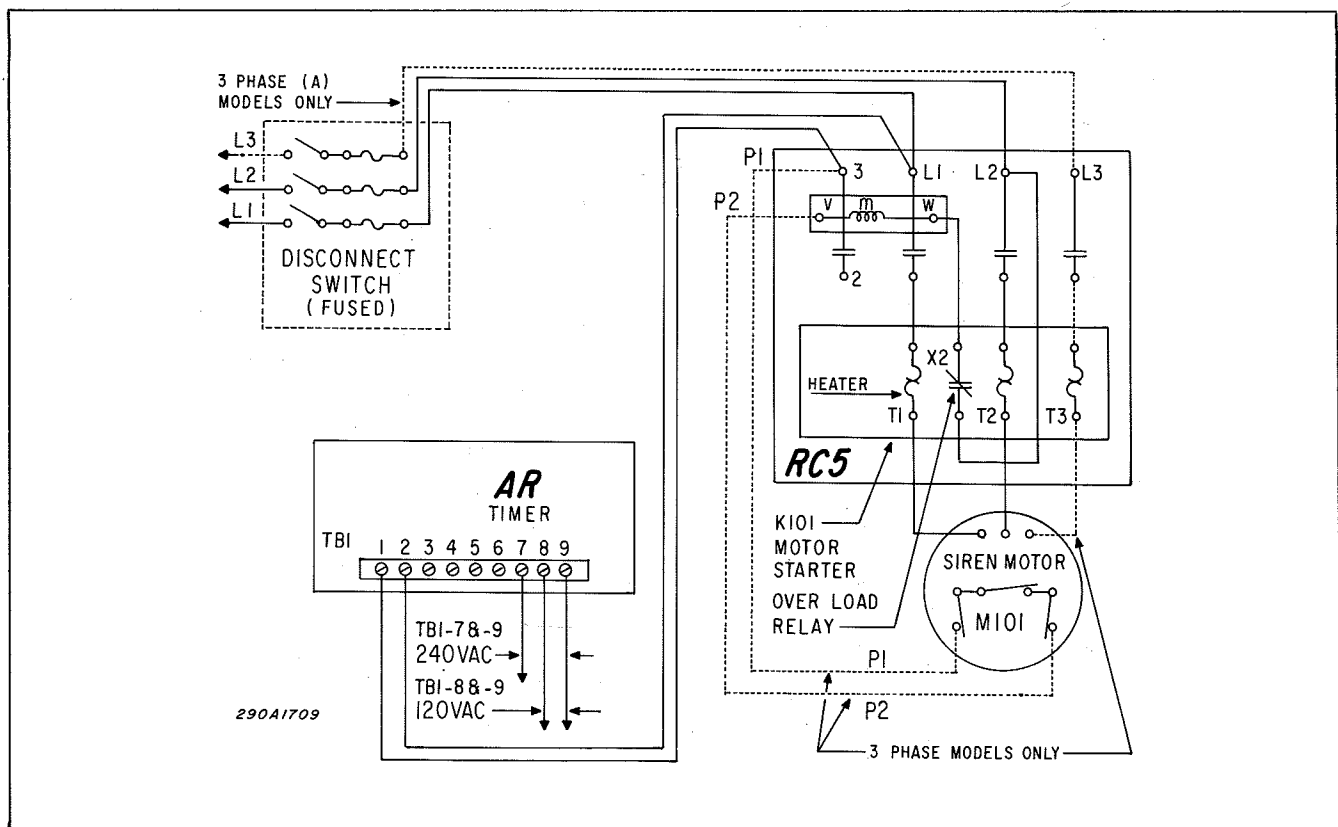


Figure 3-5 RC5 (Standard) Electrical Connections

The AWG size of the wiring (see Table 3-1) and the type of insulation used on the wiring should conform to local electrical codes. Therefore, be sure the conduit size selected will meet the installation's requirements.

The RC5W has a weather-proof housing that is not provided with knock-out holes. Therefore, the installer must drill or punch holes of the appropriate size to accommodate conduit fittings.

To connect the motor starter and siren to the power source and control circuitry, proceed as follows (see figure 3-5):

1. Route flexible conduit around the outside of the siren side screens to connect with the rigid conduit attached to the side of the pole.
2. Install conduit between the RC5 and the disconnect switch.
3. Install conduit between the electric power and the disconnect switch. If the siren is installed on a utility pole, add an entrance cap to the end of the conduit, as shown in figure 3-2.

4. Route three wires (2 wires for single phase B Models) of the proper size from T1, T2 and T3 (3 phase A Models only) to the motor leads in the junction box on the siren motor. See Table 3-1 for the proper wire size.

5. Three phase (A) models only. Route two 12AWG insulated wires from terminals V and 3 on the motor starter to P1 and P2 in the siren motor junction box. Disconnect the jumper wire between terminals V and 3 (see figures 3-5 and 3-6).

6. Route three wires (2 wires for single phase B Models) of the proper size from L1, L2 and L3 (3 phase A Models only) through the conduit to the power disconnect switch. Refer to Table 3-1 for the proper wire size.

7. Route three wires (two wires for single phase, B Models) of the proper size from the disconnect switch to the power source.

8. Connect terminals 1 and 2 of the AR Timer to terminals L1 and 3 in the motor starter. If it is desired to operate the timer from remote control

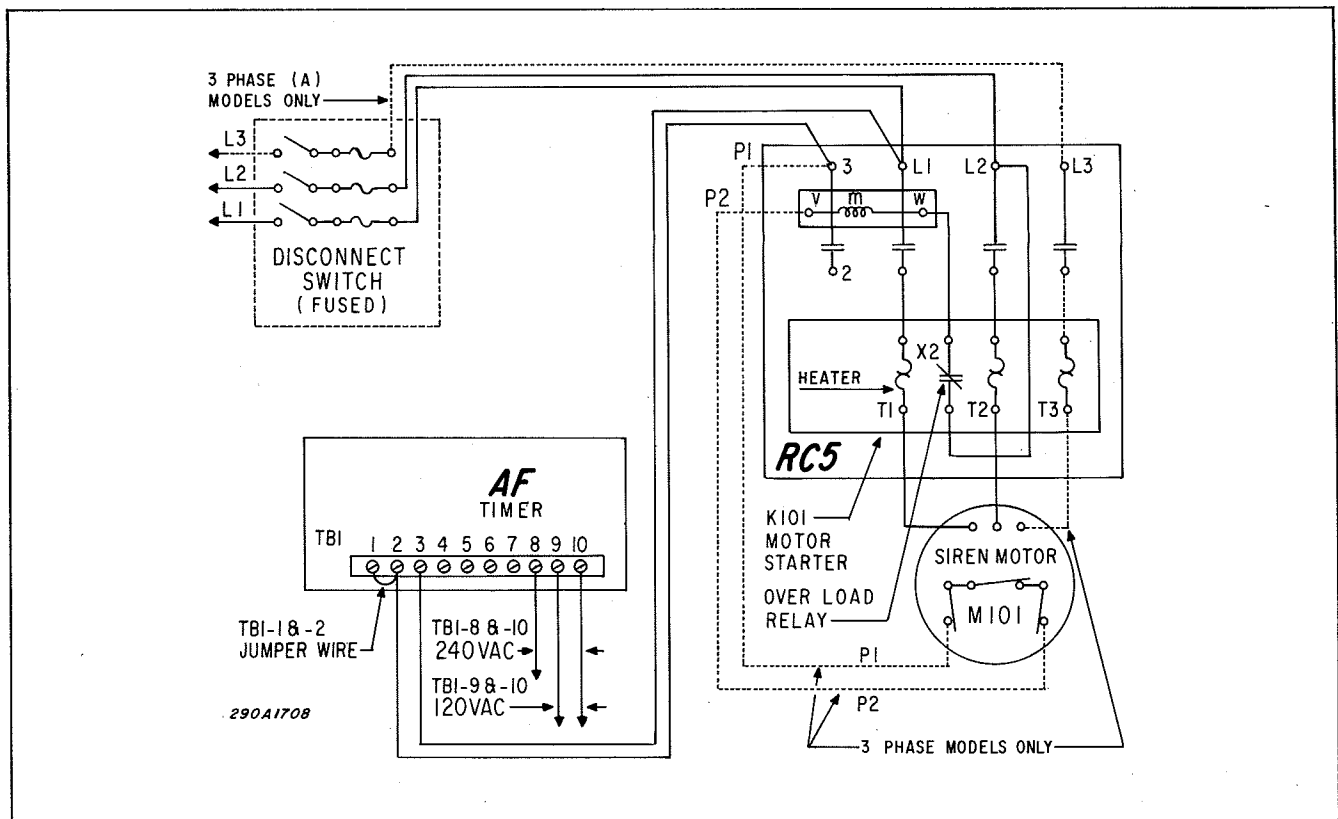


Figure 3-6 RC5 (Optional) Electrical Connections

<u>208-240 Volts - 3 Phase</u>			
	<u>Wire Length feet</u>		<u>(Meters)</u>
	<u>Less than 100 (30.5)</u>	<u>100-200 (30.5-61)</u>	<u>Over 200 (61)</u>
Control Cabinet to Motor	AWG 6	AWG 4	Use AWG wire size that drops less than 5% of line voltage between power source and the siren when the siren is drawing rated current.
Control Cabinet to Power Source	AWG 6	AWG 4	
Telephone (Control) Relay to Control Cabinet	AWG 14	AWG 14	
<u>240 Volts - 1 Phase</u>			
	<u>Wire Length - feet (meters)</u>		
	<u>Less than 100 (30.5)</u>	<u>100 - 200 (30.5-61)</u>	<u>Over 200 (61)</u>
Control Cabinet to Motor	AWG 4	AWG 2	Use AWG wire size that drops less than 5% of line voltage between power source and the siren when the siren is drawing rated current.
Control Cabinet to Power Source	AWG 4	AWG 2	
Telephone (Control) Relay to Control Cabinet	AWG 14	AWG 14	
<u>480 Volts - 3 phase</u>			
	<u>Wire Length - feet (meters)</u>		
	<u>Less than 100 (30.5)</u>	<u>100-200 (30.5-61)</u>	<u>Over 200 (61)</u>
Control Cabinet to Motor	AWG 10	AWG 8	Use AWG wire size that drops less than 5% of line voltage between power source and the siren when the siren is drawing rated current.
Power Source to Control Cabinet	AWG 10	AWG 8	
Telephone (Control) Relay to Control Cabinet	AWG 14	AWG 14	

Table 3-1 Wire Sizes

pushbuttons, install them at this time also. If the length of the wiring between the pushbutton and the timer exceeds 2,000 feet (610m), or the timer and the motor starter exceeds 2,000 feet (610m), install an SPST telephone relay, such as a Federal Model TRC*1020, between the pushbuttons and timer or timer and motor starter. If it is necessary to install one or more telephone relays, a power supply, as the Model PS from Federal, which will provide 48 or 96 volts, must be installed. This is necessary because the timer does not supply the telephone relays, which, along with the power supply, are NOT necessary when the control lines length is less than that already mentioned. It is recommended that all control wiring be routed through conduit.

3-5 SAFETY PRECAUTIONS

As a safety precaution to protect both personnel and equipment, it is highly recommended that the siren and all control devices 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 two feet (61 mm) into the ground, or as close as practical to the base of the pole. For maximum protection, use a separate, continuous 10AWG or larger, wire from the siren frame to ground and the cabinet of each control device to ground.

3-6 THREE PHASE MOTOR CONNECTIONS

A three phase motor can be operated from either 208-240 VAC or a 480 VAC source when the appropriate arrangement of electrical connections is used. The siren is shipped with the motor wired to operate at the voltage specified by the user. This voltage is stamped on the nameplate of the motor. However, if it is ever necessary to change the motor operating voltage, connect the wires in the appropriate arrangement as shown in figure 3-9.

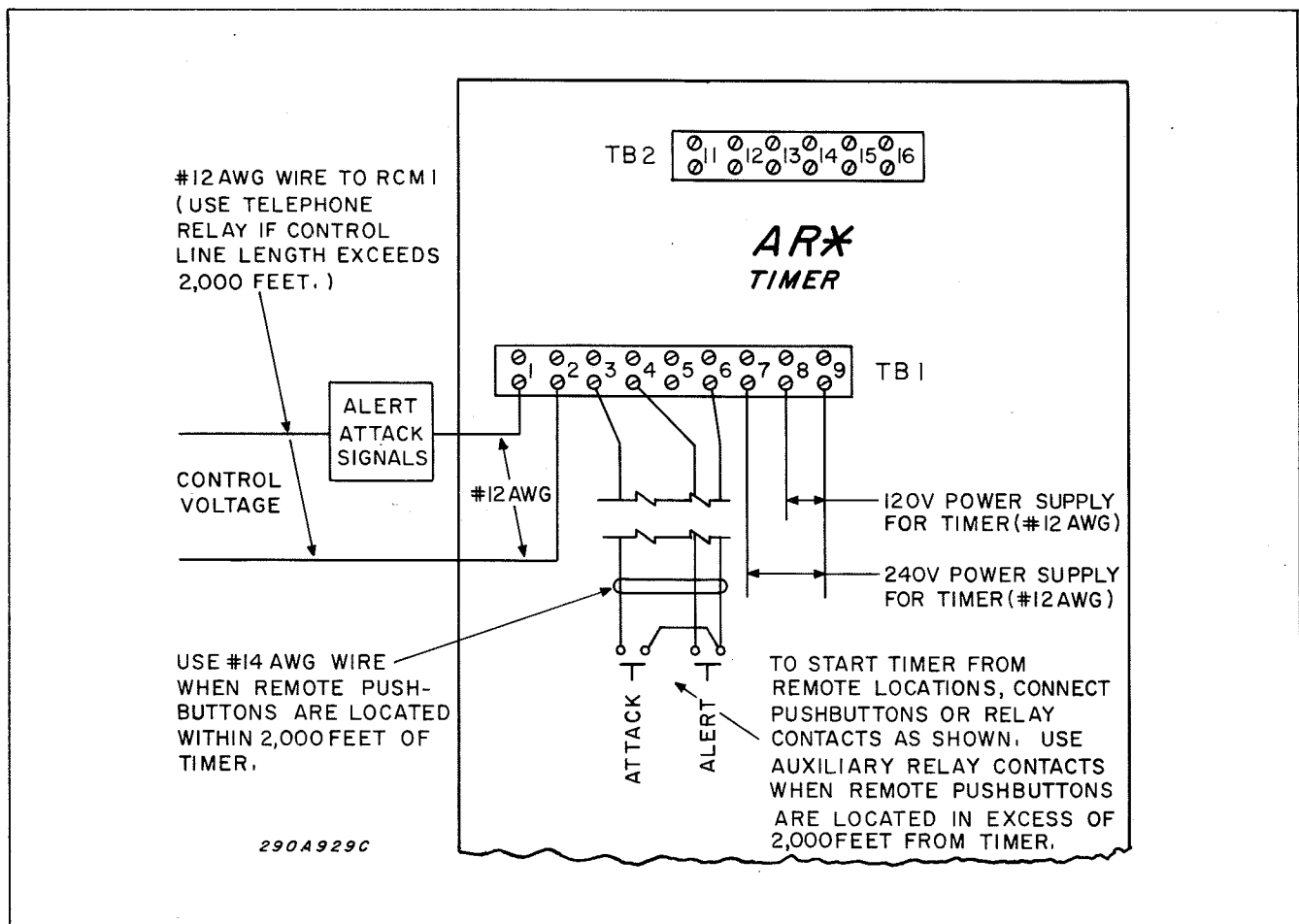


Figure 3-7 AR Timer Electrical Connections

3-7 PREOPERATION CHECKS

After the siren has been completely installed, perform the following checks before putting the siren into service.

WARNING

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

NOTE

If it is ever necessary to change the siren operating voltage, the controls must also be modified or exchanged.

A. Make sure that all air intakes and sound outlets are not obstructed.

B. Press the TEST pushbutton on the AR or AF Timer. The siren should produce a continuous signal until the pushbutton is released.

C. Check the operation of the control circuitry by initiating one or more signals from the AR or AF Timer. Cancel the signal if full duration of the signal is not required.

After the installation is complete and it has been established that the siren is operating properly, Federal recommends that all control devices be padlocked to discourage tampering and vandalism.

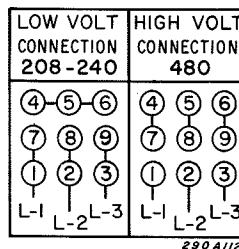


Figure 3-9 Three-phase Motor Power Connections

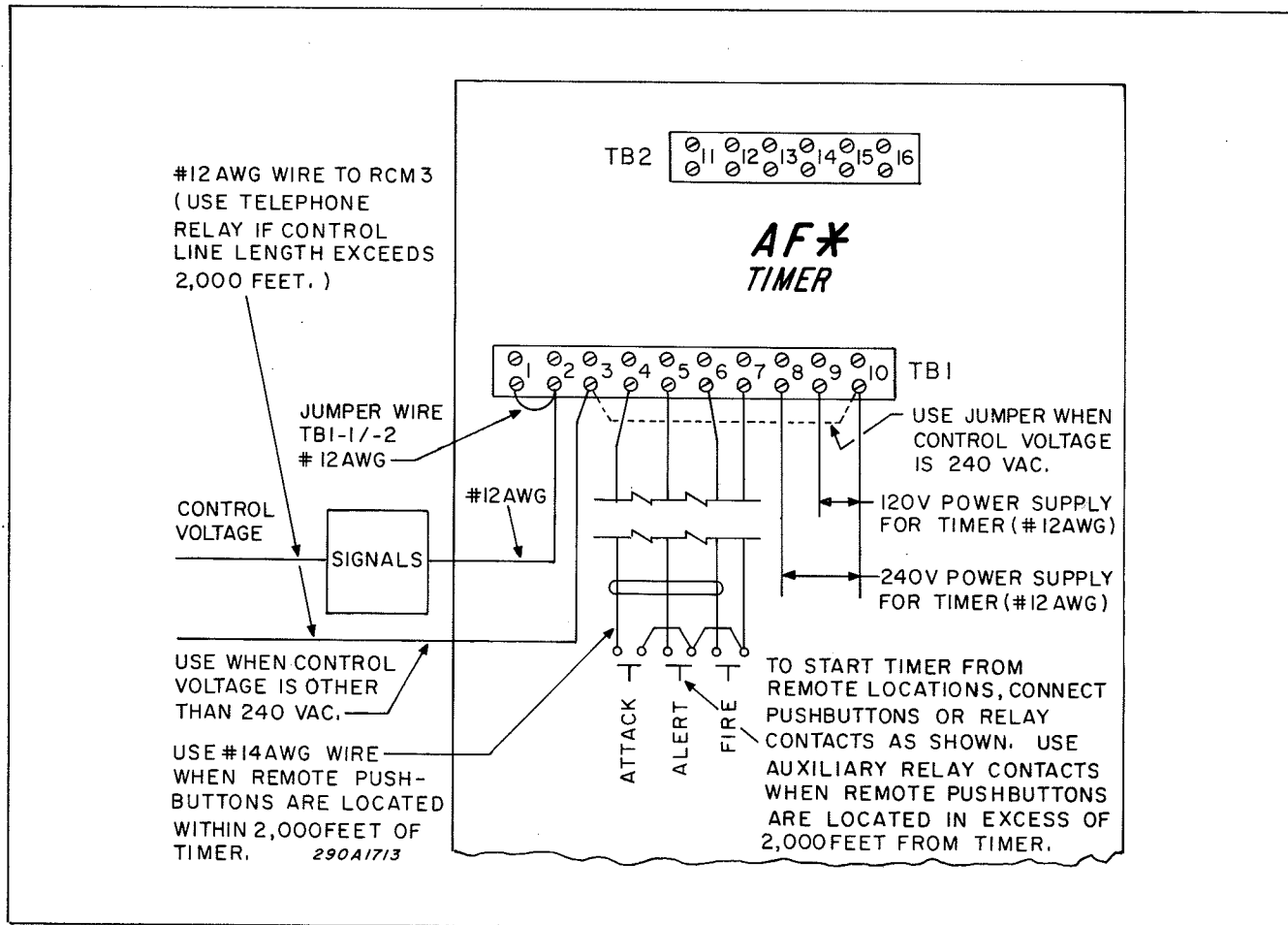


Figure 3-8 AF Timer Electrical Connections



SECTION IV

CIRCUIT DESCRIPTION

4-1 GENERAL

RSH10 installation includes an optional Model AF or Model AR Timer. An optional Model AF Timer is available to control the Model RSH10, if a third signal is required.

The Model RC5 and RC5W Control Cabinet contains the motor starter necessary for the RSH10.

Operation of the optional Models AR and AF Timers is nearly identical. Unless otherwise specified, all descriptions of timer circuits apply equally to both timer models.

4-2 TIMER CIRCUIT DESCRIPTION

The Model AR Timer (see figure 5-3) causes the Model RSH10 to produce a steady three-minute "Alert" signal and a three-minute, undulating up and down scale "Attack" signal. The Model AF Timer (see figure 5-4) causes the siren to produce a "Fire" signal as well as the "Attack" and "Alert" signals. The "Fire" signal is a three-minute fast "Wail".

The timers control the "Attack" signal by applying a series of eight second control contact closures separated by four-second opens to the control winding (coil) of the motor starter. The "Fast Wail" signal is a series of three-second contact closures.

Both timer models include a TEST pushbutton (S4 in the AR, S5 in the AF). The TEST pushbutton operates the control devices and the siren only while it is pressed. The timer is not activated because the TEST pushbutton is in the timer output circuit.

The CANCEL button (S3 in the AR, S4 in the AF) enables the siren operator to stop the siren in the event an error was made in the selection of a signal. If a signal is cancelled, the timer motor continues through the 3-minute cycle. If another signal is selected during the cycle, it will be produced only for the remainder of the signal cycle selected.

The AR and AF Timers may be operated from either 120 or 240 volt, 50-60 Hz. When properly connected to the power source, transformer T1 provides 120 volts to the 120 volt components.

The Federal Model AR and Model AF Timers contain the devices necessary for control of the Model RSH10. However, the timers do not include a power supply for the control circuits.

The output circuitry is electricaly independent of the timing circuit. Consequently, the output circuit can utilize up to 480V. The capacity of the microswitch contracts in the signal circuits is 15 amps AC or 1/4 amp DC.

The timer is activated by pressing the appropriate local or remote pushbutton for at least two seconds.

The red pilot light, DS2, on the front panel of the timer, indicates that the timer is cycling. The yellow pilot light, DS1, indicates that power is available to the timer.

When the ALERT, ATTACK or FIRE (Model AF Timer only) pushbutton is pressed, the respective relay energizes, establishing a holding circuit through the relay holding contacts. Simultaneously, the motor feed contacts apply operating voltage to the timer motor, M. The motor begins to rotate the cams. After the cams have rotated slightly, the motor feed cam contacts close, providing the timer motor a parallel circuit.

The control closures required for the production of the "Attack" and "Fire" signals are generated by cam-operated contacts in the Timer. These control closures are applied to the siren motor starter coil through the signal contacts of the selected relay in the timer. There are no cam-operated contacts for the "Alert" signal. As a result, when the "Alert" signal is selected, a sustained closure is applied to the siren motor starter coil, and the siren produces a signal having a constant level and pitch for three minutes.

Several seconds before the end of the three-minute timer cycle, the cam-operated hold contacts open momentarily, releasing the relay holding circuit. The timer control circuit closure to the motor starter coil opens, stopping the siren motor.

The "Attack" signal has priority over all other signals. If "Attack" is initiated while either "Alert" or "Fire" is sounding, "Attack" automatically overrides the signal sounded until the end of the timer cycle, or the CANCEL pushbutton is pressed. Similarly, "Alert" has priority over "Fire".

The CANCEL pushbutton can be used to override a higher priority signal. For example, to override "Attack" with "Alert", press the CANCEL pushbutton and then press the ALERT pushbutton.

4-3 SIREN CONTROL DESCRIPTION

The Model RC5 can be used to operate both siren models.

Application of a control signal to RC5 energizes the motor starter and applies power to the siren motor. To produce the undulating "Attack" signal, the timer closes the control circuit for eight seconds and opens the circuit for four seconds. When the control circuit opens the motor starter de-energizes, de-energizing the siren motor. As the siren coasts toward stop, the pitch of the sound and the sound level decrease. After approximately four seconds, the timer energizes the motor starter and the motor starter reapplies power to the motor; the pitch and sound level of the signal increase, and the cycle repeats.

The AR timer causes the siren to produce the continuous "Alert" signal by energizing the motor starter continuously for 3 minutes, causing the siren to produce a continuous steady signal.

As shown in figures 3-5 and 3-6, the motor starter includes an overload relay. The relay protects the motor starter and motor if excess current is drawn. The overload relay is activated when there is sufficient current through one or more of its heaters to cause the heater(s) to expand enough to open the relay contacts. The opening of the relay contacts opens the motor starter control circuit. As a result, the motor starter de-energizes, which protects the circuit against damage. After the motor starter de-energizes, the relay contacts reset automatically when the heater(s) cools. The overload relay can also be reset manually after about one minute.

4-4 THERMAL PROTECTION CIRCUIT (3-phase models only)

Three phase (A) motors should operate for a maximum of 15 minutes with at least 45 minutes between 15-minute operations. If the siren is operated longer, or the 45-minute off-time is not observed, the motor may overheat and be damaged. As a result, 3 thermal protectors are included in the motor; one for each field winding. These thermal protectors are electrically in series with the control winding (coil) of the motor starter in the RC5. If one or more of the field windings overheat, the associated thermal protector opens the circuit, de-energizing the motor starter coil and turning off power to the motor. After the motor cools, the protector(s) close and the siren can be re-energized.

The thermal production circuit is a secondary protection circuit not absolutely necessary for operating the siren. Also, thermal protectors are integrated parts of the motor. A faulty thermal protector cannot be replaced without replacing the entire motor. Therefore, if a thermal protector malfunctions (opens), connect a jumper wire between terminals V and 3 on the motor starter.

SECTION V

SERVICE AND MAINTENANCE

5-1 GENERAL

The ThunderBeam Siren is designed to require a minimum of maintenance. In addition, experience has shown that all Federal sirens are highly reliable devices. However, if a siren failure does occur, Federal will provide technical assistance with problems that cannot be handled satisfactorily and promptly locally. If assistance is desired, contact:

Service Department
Signal Division
Federal Signal Corporation
2645 Federal Signal Drive
University Park, Illinois 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.

5-2 PREVENTITIVE MAINTENANCE

A. Speed Reducer Lubrication

1. Turn off power to the siren.
2. Remove the side screen closest to the deflector bracket cover.
3. Remove the six (6) 10-32 screws holding the deflector bracket cover in place and remove the cover.
4. Remove the oil level plug from the speed reducer housing. If oil does not drip from the oil level hole, remove the oil breather plug and add Mobile-type 626 20W all-temperature oil, or its equivalent through the oil breather hole until oil begins to drip from the oil level hole. Replace both plugs, bracket cover and side screen.
5. In dusty and extremely worn and weathered areas, change the oil annually.

B. Direct Drive Couplings

Check nylon spider in the couplings for wear. Replace if necessary.

C. Paint

Check painted surfaces. Repaint if necessary.

5-3 ANNUAL INSPECTION and MAINTENANCE

It is highly recommended that the procedure in this paragraph be performed at least once a year. However, it may be necessary to increase the frequency of this procedure if the siren is used frequently or if it is used in an extreme climate. ALWAYS turn off the power to the siren at the disconnect switch before inspecting the siren.

Perform steps 1 through 3 on the single phase (B) models only.

1. Remove the inspection cover and inspect the motor brushes. Replace the brushes if they are 7/8 inch long or less. Refer to paragraph 5 -3B for brush replacement instructions.

2. Examine the motor commutator for burned spots, pitting and signs of excessive wear. If necessary, remove the motor brushes and use a fine grade of sandpaper to clean the commutator. Do NOT use aluminum oxide paper or emery cloth to clean the commutator.

3. After cleaning the commutator, use a small screwdriver or similar tool to clean the slots between the commutator segments. Use caution to avoid damaging the commutator surface.

4. Inspect all siren screens.

5. Inspect all electrical and mechanical connections. Make sure that all fasteners are properly tightened.

6. Inspect the siren installation to be sure that it is vertically oriented. Take corrective action if a pole mounted installation is more than 5° from vertical or a roof or flat surface mount is more than 10° from vertical to prevent lubrication losses and excessive motor bearing wear.

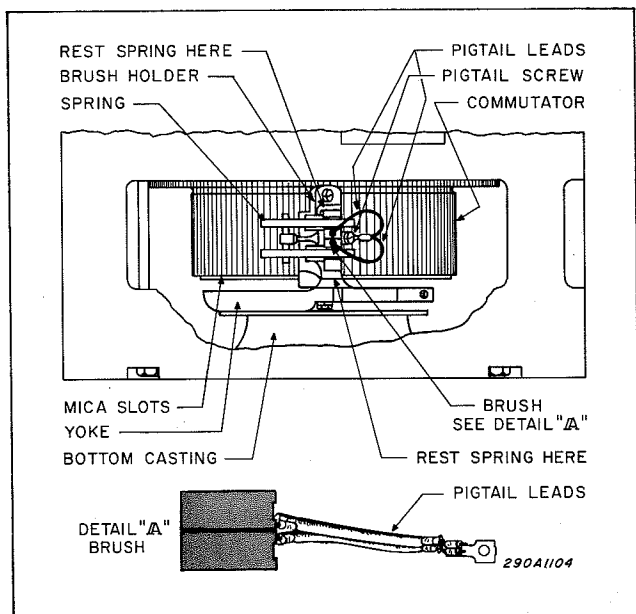


Figure 5-1 Single-phase Motor Brush Replacement

7. Examine all painted surfaces. Repaint as necessary.

5-4 CORRECTIVE MAINTENANCE

A. Troubleshooting

The Troubleshooting Chart (Chart 5-1) is provided to assist repair personnel when troubleshooting a siren malfunction. This section also includes diagrams that may be helpful if the siren or control devices need repair.

WARNING

Always turn off the power at the disconnect switch before performing any maintenance on the siren.

B. Motor Brush Replacement Single Phase (B) Model

1. Turn off the power to the siren at the disconnect switch.
2. Remove the inspection cover from the motor.
3. See figure 5-1 while performing steps 3 through 10 of this procedure. Remove the pigtail screw from the brush holder, and lift the pigtail leads away from the holder.

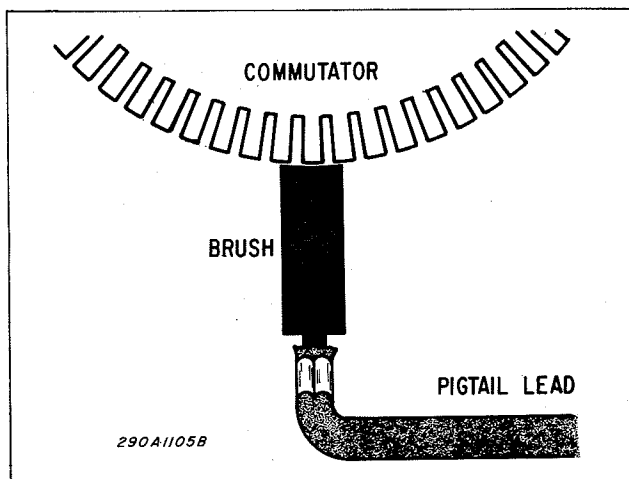


Figure 5-2 Replacement Brush Contouring

4. Carefully lift the springs away from the two-segment brush and allow each spring to rest on the brush holder next to the brushes, as indicated in figure 5-1.

5. Lift the worn brushes out of the brush holder. When replacing brushes, they must be contoured to the commutator. If the brushes are not contoured, the commutator may be damaged and the brushes may wear excessively. To contour the replacement brushes, proceed as follows:

6. Cut a strip of 000 sandpaper 1-1/2" wide by 13-1/4" long. Do NOT use aluminum oxide paper or emery cloth.

7. Insert one end of the sandpaper in one of the slots between the commutator segments and wrap the paper around the commutator.

8. Install the replacement brushes in the brush holder making sure that the pigtail leads are next to each other as shown in detail "A" of figure 5-1.

9. Connect the pigtail leads to the brush holder, using the pigtail screw.

10. Manually rotate the motor armature approximately ten turns in the direction the sandpaper is wrapped (see warning between 11 and 12).

11. Lift the brushes slightly and remove the sandpaper from the motor.

Clean all carbon dust out of the commutator. The brush should seat on the commutator as shown in figure 5-2. If the brush does not fully contact the commutator, as shown in figure 5-2, repeat steps 7 through 12 until the brushes seat on the commutator as shown in the figure.

WARNING

The rotor lends a significant amount of inertia to the siren motor armature. As a result, the rotor could cause severe injury when it is rotating at any speed. Do NOT rotate

the commutator by sticking anything in the stator ports and pushing on any part of the rotor at any time.

12. Manually rotate the siren motor by pushing on the commutator through the inspection port in the motor housing (see WARNING). Observe the operation of the brushes on the surface of the commutator. The brushes should slide smoothly on the commutator surface and should NOT shift position vertically or laterally. If the brushes do not slide smoothly or if they shift position, repeat steps 7 through 12.

TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	REMEDY
Siren motor inoperative.	Motor starter overload relay tripped.	Reset relay.
	Open circuit between motor starter and motor.	Check wiring for continuity.
	Rotor jammed.	Check rotor for free rotation. Remove material causing jamming.
	Siren motor defective.	Check motor and repair or replace, if necessary.
	Faulty Overload Heater(s).	Replace.
	Open thermal protector in motor.	Connect a jumper wire between TB104-P1 and P2.
Motor starter inoperative.	Faulty motor starter control winding.	Replace coil.
	Motor starter overload relay tripped.	Reset relay.
	Faulty Overload Heater(s).	Replace Heater(s).
	Open circuit between disconnect switch and motor.	Check wiring for continuity. Repair or replace wiring as necessary.
	Open circuit between control equipment and motor.	Check wiring for continuity. Repair or replace wiring as necessary.
	Faulty control device(s).	Repair or replace, as necessary.
Deflector does not rotate.	Loose or broken couplings.	Tighten or replace spider or complete coupling.
	Speed reducer jammed.	Turn drive shaft which is connected to the siren rotor (see warning on page 17) and locate source of binding. Repair or replace speed reducer.
	Deflector jammed by foreign objects.	Check deflector for free rotation and remove material causing the jamming.
Deflector rotates erratically.	Loose pressure plate tension.	Tighten the 4-3/8" pressure plate bolts evenly.
	Coupling or drive shaft slipping.	Tighten both coupling set screws.

Chart 5-1 Troubleshooting Chart

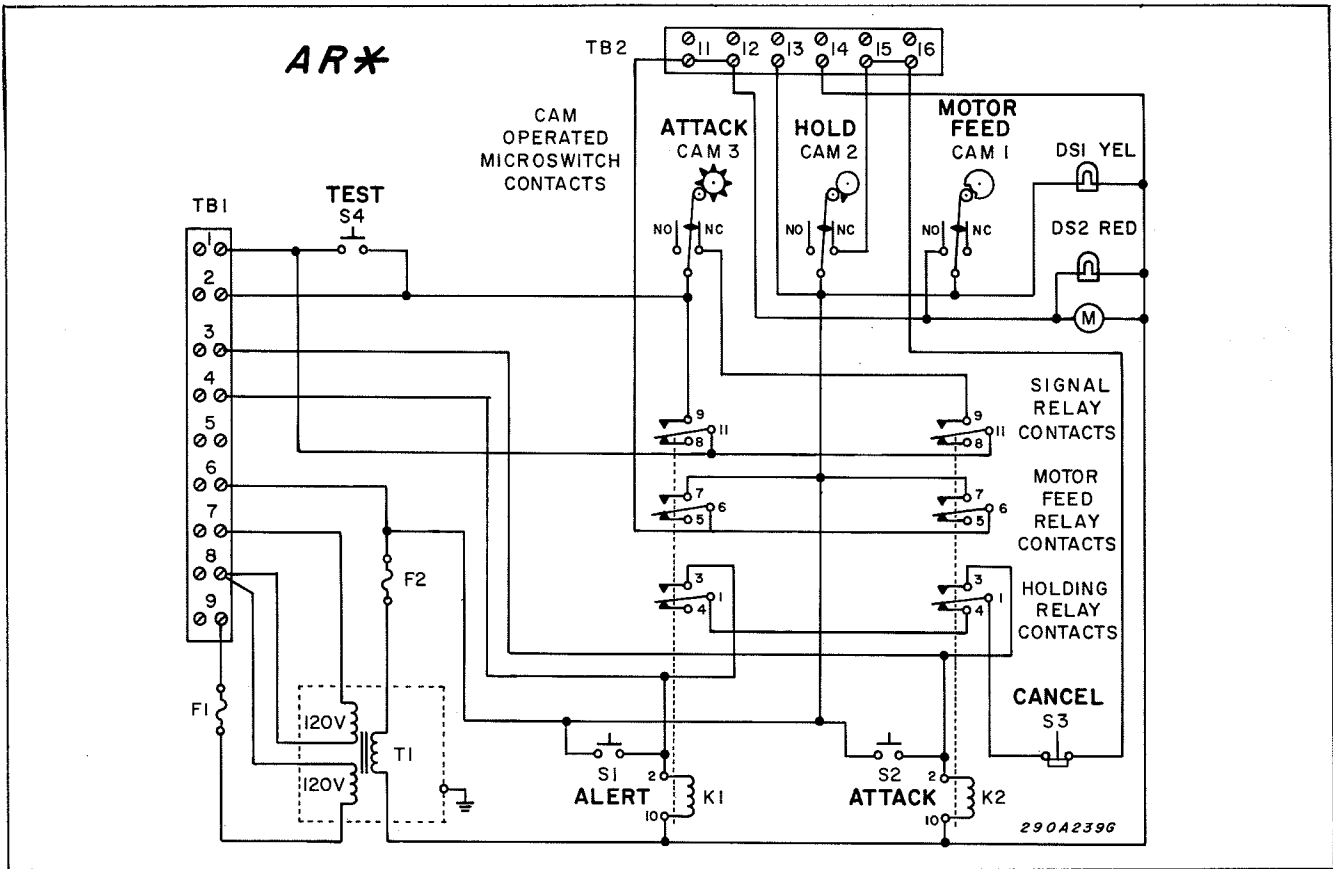


Figure 5-3 Model AR Timer Wiring Diagram

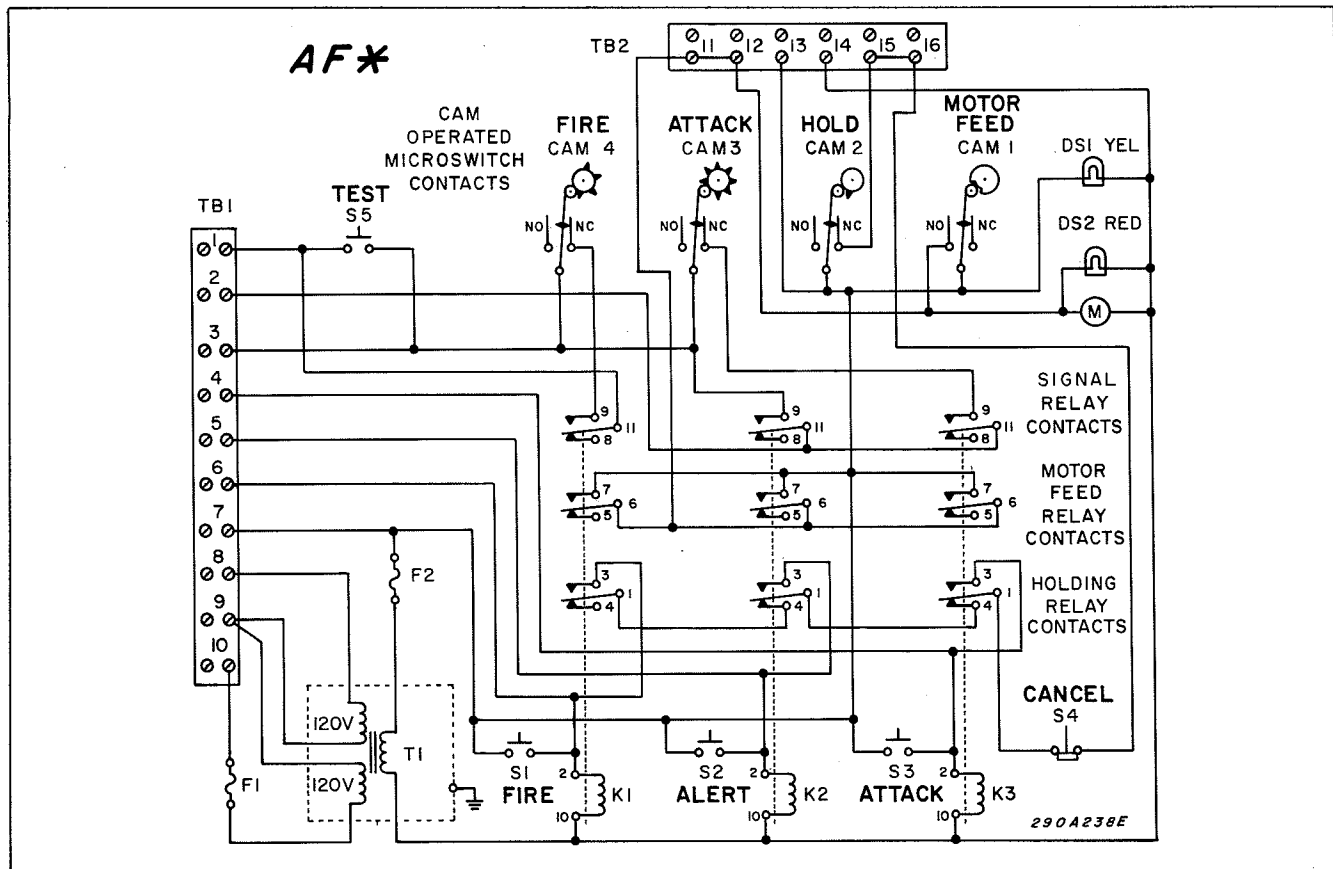
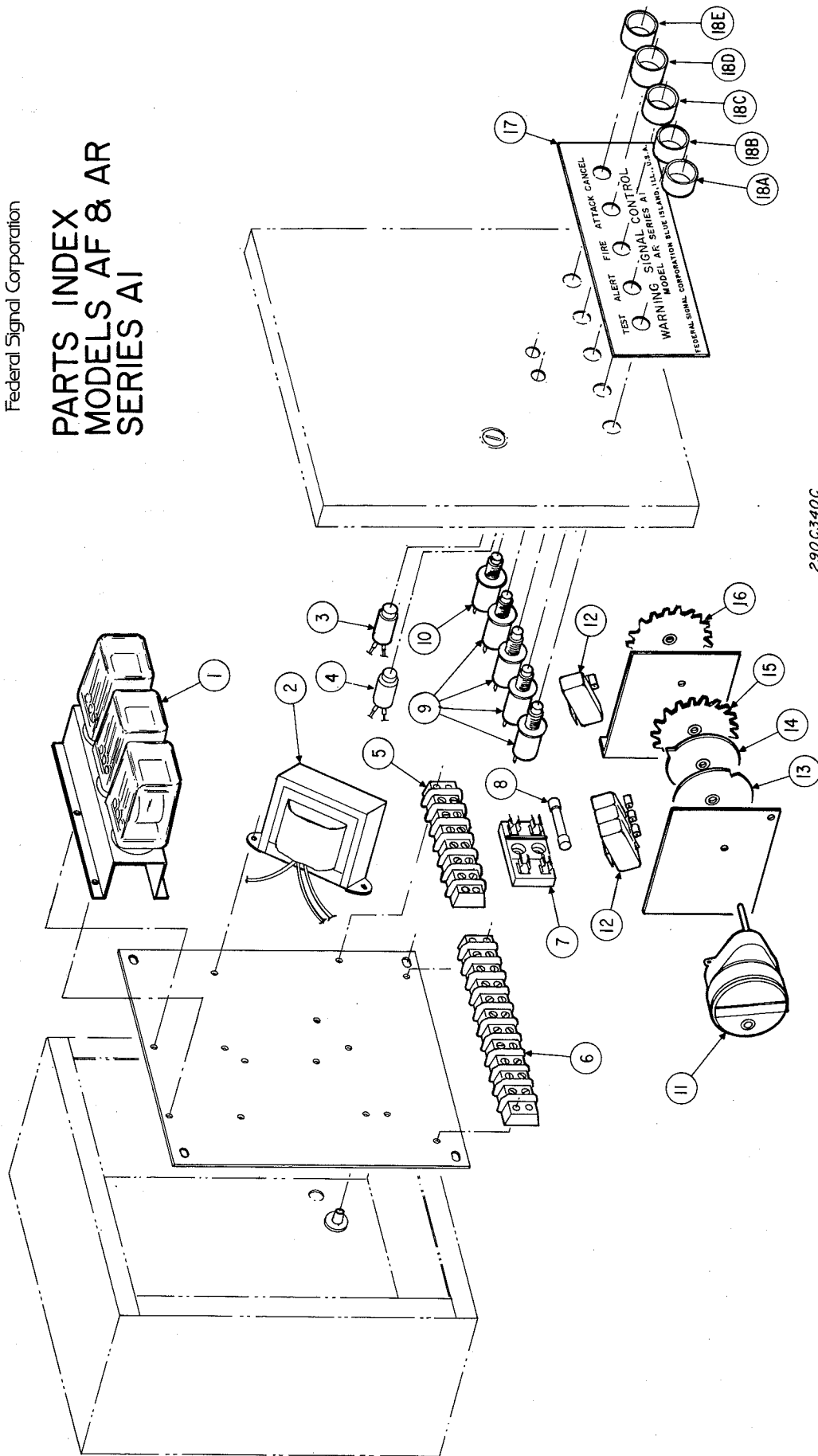


Figure 5-4 Model AF Timer Wiring Diagram

**PARTS INDEX
MODELS AF & AR
SERIES AI**



290C340C

Figure 5-5 Models AF and AR Parts Index

Index No.	Description	Part No.	Qty.
1	Relay (2 used on AR, 3 used on AF)	8217A082	AR
2	Transformer	8217A083	1
3	Motor Pilot Light Assembly	8217A087	1
4	Power Pilot Light Assembly	8217A213	1
5	Terminal Block, 6 terminal	8217A086	1
6	Terminal Block, 9 terminal (Model AR)	8217A173	1 AR
	Terminal Block, 10 terminal (Model AF)	8217A085	
7	Fuseholder	8217A091	1
8	Fuse, one ampere	8217A090	2
9	Switch, Red Push-button (3 used on AR, 4 used on AF)	8217A089	AR
10	Switch, Black Push-button	8217A088	1
11	Motor	8217A084	1
12	Microswitch (3 used on AR, 4 used on AF)	8217A081	AR
13	Cam Number 1	8217A092	1
14	Cam Number 2	8217A093	1
15	Cam Number 3	8217A094	1
16	Cam Number 4 (Model AF only)	8217A095	1 AR
17	Nameplate , Model AR	8146A331	1 AR
	Nameplate, Model AF	8146A330	
18A	Switch Guard, Silver	8217A097-05	1
18B	Switch Guard, Blue	8217A097-03	1
18C	Switch Guard, Red (Model AF only)	8217A097-01	1 AR
18D	Switch Guard, Yellow	8217A097-02	1
18E	Switch Guard, Black	8217A097-04	1

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

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

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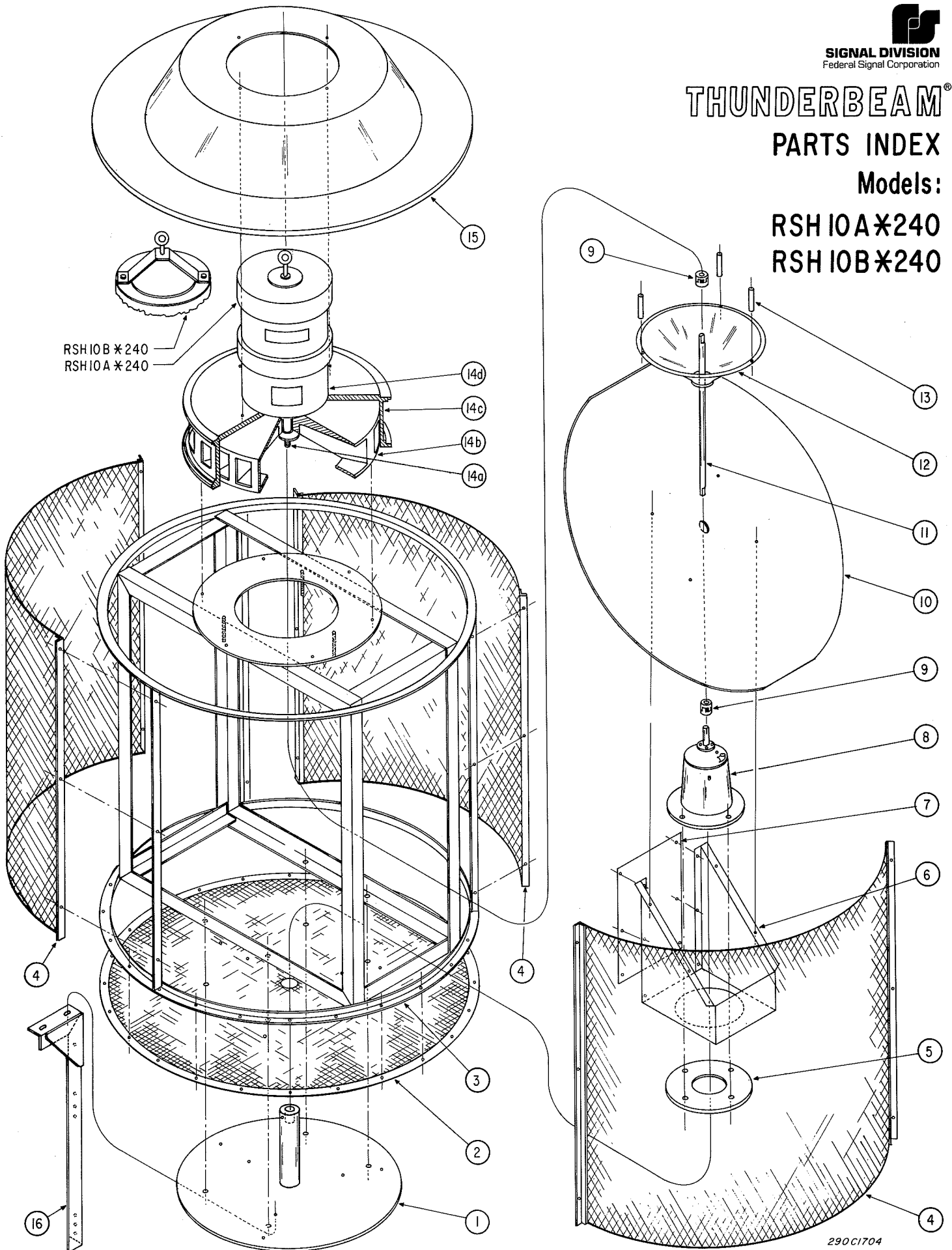
THUNDERBEAM[®]

PARTS INDEX

Models:

RSH 10A x 240

RSH 10B x 240



290C1704

Figure 5-6 Models RSH10A and RSH10B Parts Index

THUNDERBEAM®

Rotating Siren

PPL 0177
PARTS LIST

Models : RSH 10A , and RSH 10B

JULY 1984

Item No.	Description	Part No.	Qty.
1	Mounting Plate Assembly	8401C017	1
2	Screen , Bottom	8401C014	1
3	Frame , Siren Support	8401D008	1
4	Screen , Side	8401C013	3
5	Plate , Pressure	8401A009	1
6	Deflector Bracket Assembly	8401C019	1
7	Cover , Deflector Bracket	8401A010	1
8	Differential , Speed Reducer	8401B001	1
9	Coupling	8401A020	2
10	Deflector	8401C003	1
11	Shaft , Drive , 0.50 Dia. x 23" Lg.	8401B005	1
12	Deflector , Conical Tuning	8401B006	1
13	Spacer , High Pitch	8401A015	3
14	Siren Assembly , High Pitch		
	3 Phase , RSH 10A	8401C016	1 AR
	1 Phase , RSH 10B	8401C016-01	
14a-14d	(individual replacement parts)		
14a	Shaft , Hex	8401A007	AR
14b	Rotor , 21" , 12 Port	8454D004	AR
14c	Stator , 21" , 12 Port	8454D001-01	AR
14d	Motor , RSH 10A	8283B789	AR
	Motor , RSH 10B	8287B179	AR
15	Shroud	8401C002	1
16	Leg , Pole Mounting (shown)	8549A001	3 AR
	Roof Mount Kit (not shown)	TRMK*	1 AR
	includes the following :		
	Roof Angle		
	Braceplate		
	Miscellaneous Hardware		

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.

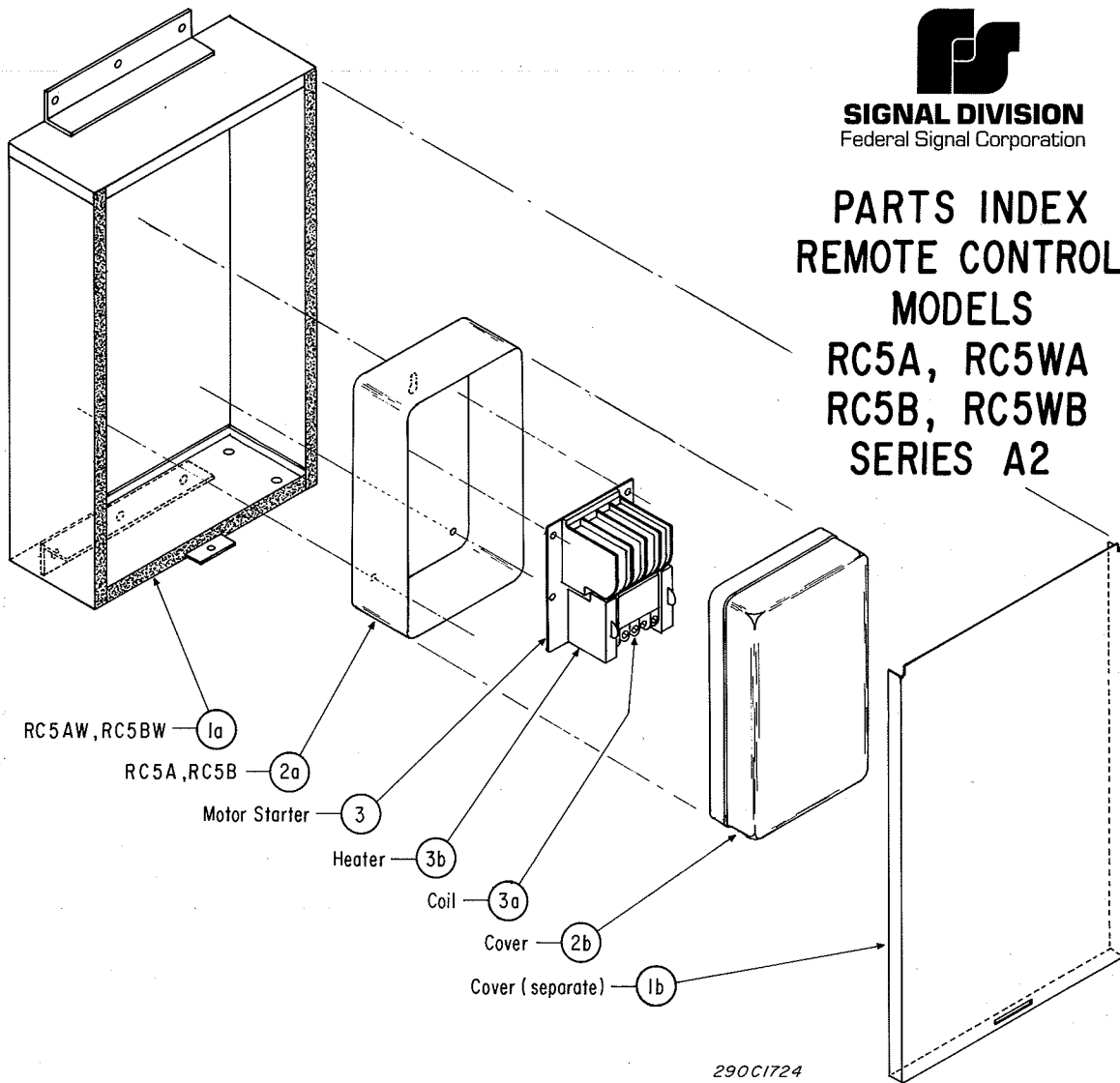
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SIGNAL DIVISION
Federal Signal Corporation

PARTS INDEX
REMOTE CONTROL
MODELS
RC5A, RC5WA
RC5B, RC5WB
SERIES A2



290C1724

PPL 0178
PARTS LIST

RC5A , RC5WA , RC5B , and RC5WB
Siren Remote Control

JULY 1984

Item No.	Description	Ref.	Part No.	3 Phase		1 Phase	
				A	WA	B	WB
1a	Cabinet , Weatherproof		8247D002	0	1	0	1
1b	Cover , Cabinet (separate)		8247D002-02	0	1	0	1
2	Housing , Nema 1 (see ref. column)						
3	Motor Starter , 240V	**	8217C180	1	0	0	0
	Motor Starter , 240V	*	8217C180-03	0	1	0	0
	Motor Starter , 240V	**	8217C211	0	0	1	0
	Motor Starter , 240V	*	8217C211-01	0	0	0	1
	Motor Starter , 480V	**	8217C180-02	1	0	0	0
	Motor Starter , 480V	*	8217C180-07	0	1	0	0
	Motor Starter , 550V	**	8217C204	1	0	0	0
	Motor Starter , 380V	**	8217C180-01	1	0	0	0
	Motor Starter , 380V	*	8217C180-05	0	1	0	0
	3a	Coil , 120/240V		8217C180-16	1	1	1
Coil , 240/480V			8217C180-17	1	1	0	0
Coil , 550/600V			8217C204-17	1	1	0	0
3b	Heater , 240V , 1 Phase, K77		8217C211-19	0	0	1	1
	Heater , 240V , 3 Phase, K72		8217C211-18	3	3	0	0
	Heater , 480V , 3 Phase, K58		8217C182-20	3	3	0	0
	Heater , 550V , 3 Phase, K58		8217C182-20	3	0	0	0
	Heater , 380V , 3 Phase, K63		8217C204-20	3	3	0	0

Reference : ** Complete w/Nema 1 housing, coil, and heater(s).
* Complete, open Type w/ coil, and heater(s).

DO NOT ORDER PARTS BY ITEM NUMBER.
Give model, series, voltage, description, and part number.
Refer to PARTS PRICE LIST (Part No. 1001) for prices of parts.

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Figure 5-7 RC5 Models Part Index