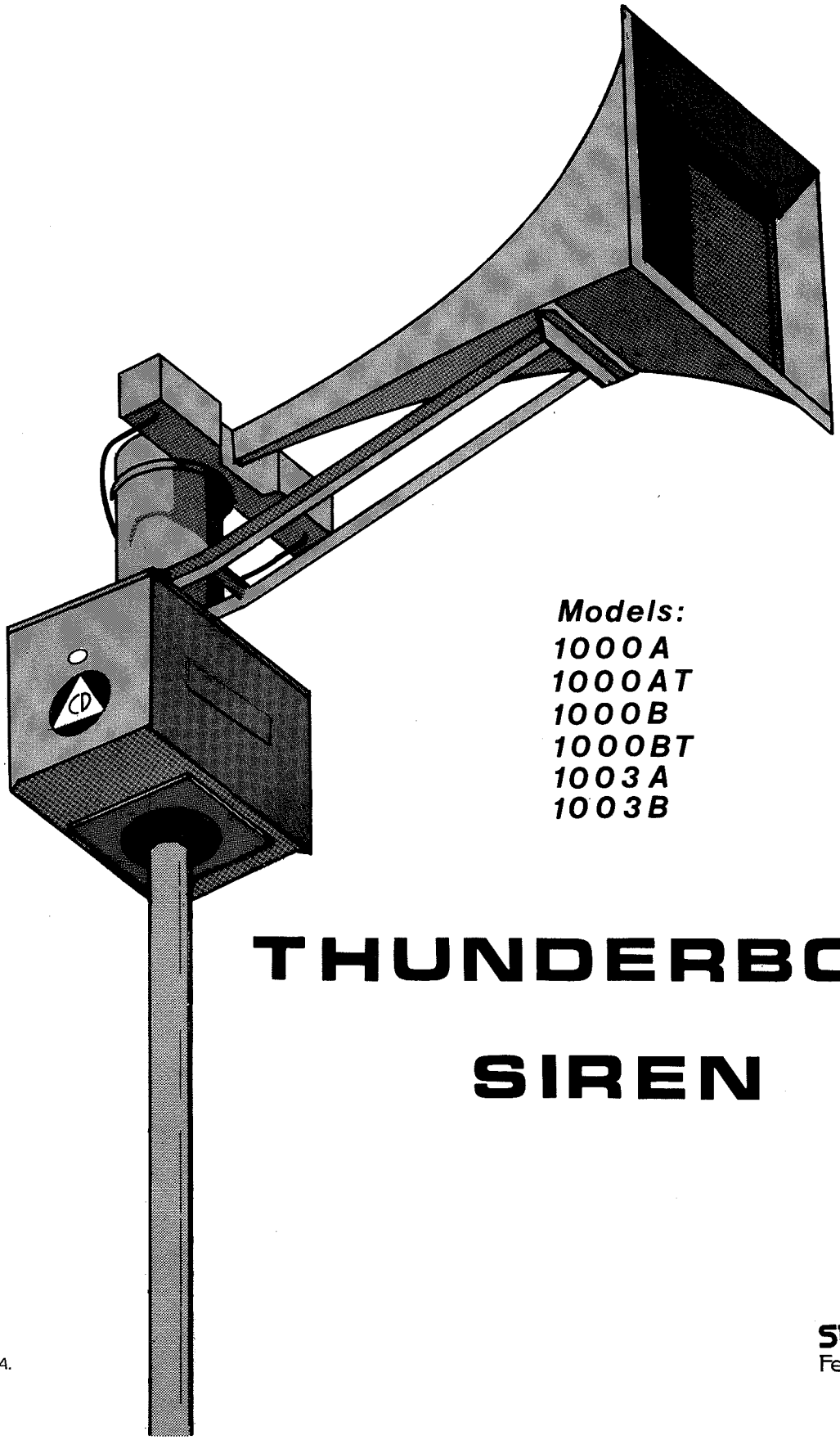
Service Manual



Models:
1000A
1000AT
1000B
1000BT
1003A
1003B

THUNDERBOLT

SIREN

8400A177G
182

Printed in U. S. A.

SIGNAL DIVISION
Federal Signal Corporation

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

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SECTION I
GENERAL DESCRIPTION

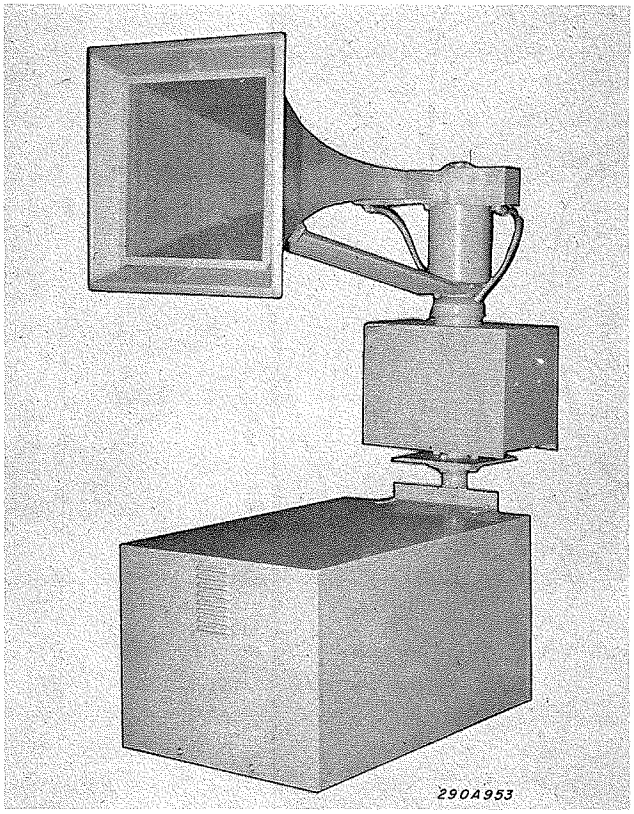


Figure 1-1. Federal's Thunderbolt Siren.

1-1. GENERAL.

The Federal Thunderbolt® Siren (figure 1-1) is a rotating-beam siren that disperses high-intensity warning signals over a large area. Thunderbolt sirens produce a substantially uniform sound level over a wide frequency range. The siren produces a distinctive sound that is readily distinguishable from other warning sounds such as vehicle sirens. The Thunderbolt can be installed in a variety of situations. High efficiency enables the siren to produce a high output while making moderate demands on the power source.

1-2. SIREN DESCRIPTION.

A. General.

The Model 1000 Thunderbolt Siren consists of three major assemblies; the Chopper Assembly, Rotator Assembly and Blower Assembly. The Rotator Assembly and the Chopper Assembly are connected to the Blower Assembly by the standpipe.

The Model 1003 Thunderbolt is similar to the Model 1000 except that the Solenoid Assembly is added to the siren. The Solenoid Assembly is mounted on the Chopper Assembly at the throat of the Exponential Horn.

B. Chopper Assembly.

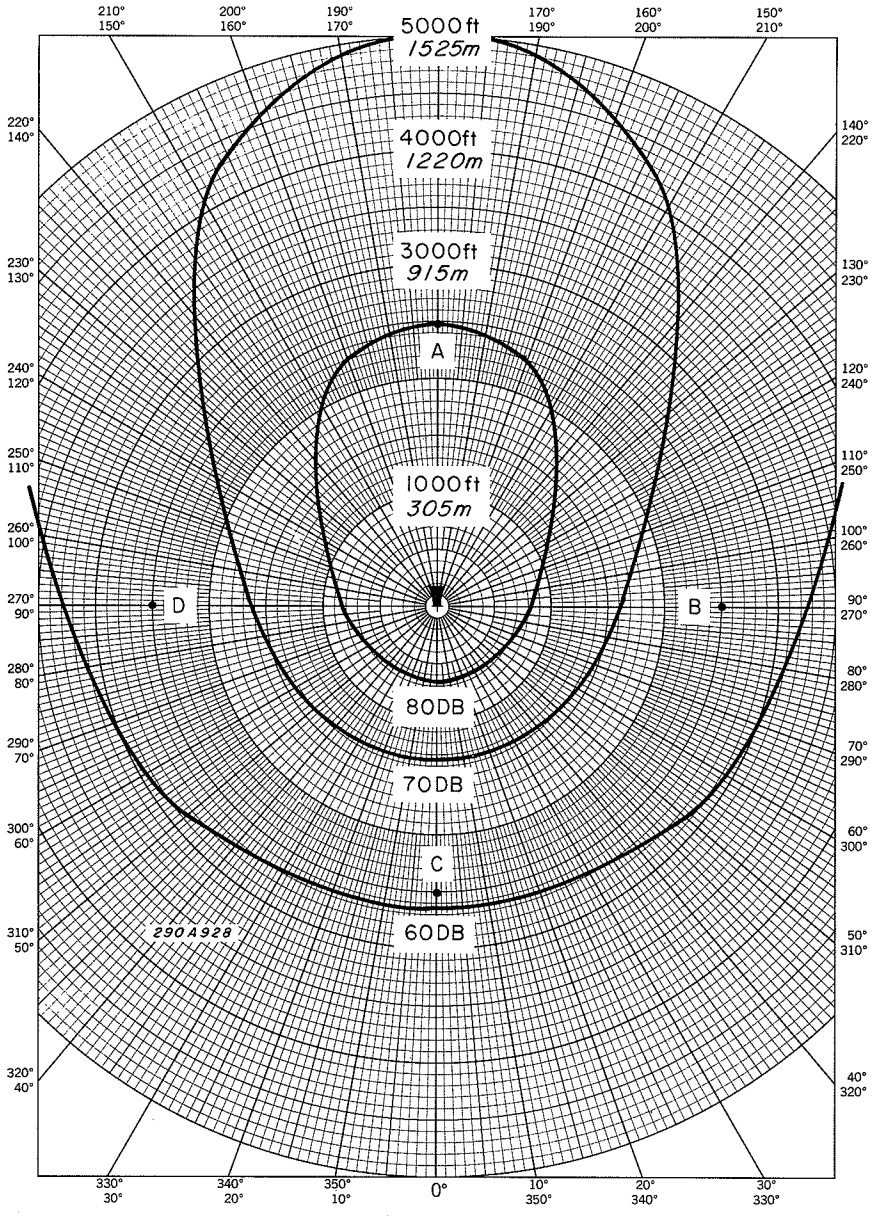
Low pressure air from the Blower Assembly is piped through the Chopper Assembly to the throat of the Exponential Horn. The Chopper Assembly consists of three major parts; the chopper motor, the rotor, and the stator. The rotor is a high speed axial fan that is driven by the chopper motor. The rotor alternately opens and closes the throat of the stator-mounted horn, causing the air to enter the horn in pulses. These pulses of air produce sound waves at a frequency that is dependent on the rotational speed of the chopper motor and the number of ports in the rotor.

The rotor has two rows of ports in those siren models that have dual-tone capability. The number and spacing of the ports in each row is different. Therefore, each row of ports produces a different siren tone. In the Model 1003 Thunderbolt, the airflow through the chopper to the horn is controlled by two solenoid-operated slide valves. These slide valves control the airflow through the appropriate ports of the chopper stator at the appropriate time to produce the desired signal. The rotational speed of the chopper is adjustable so that the pitch of the siren tone(s) can be changed in all Thunderbolt models.

C. Rotator Assembly.

The exponential horn, which is part of the Chopper Assembly, projects the sound waves in a directional pattern. This directional pattern of sound propagation enables the Thunderbolt to produce a sound level equivalent to that of an omnidirectional siren having 6 to 8 times the output power.

Graph 1-1 is a polar graph of the sound propagation pattern of the siren at a loss per distance doubled of 10dB ("Loss per distance doubled" is discussed in paragraph 3-1 of this manual). As indicated by the



Graph 1-1. Thunderbolt Coverage Pattern.

graph, an individual at point A receives the signal at an intensity of 80dB. At points B and D, approximately 65dB of sound can be heard, and at point C, the sound level is slightly greater than 60dB.

The sound level at points B, C and D is not ordinarily sufficient to alert an individual that a dangerous or emergency condition exists. Therefore, the horn is rotated by the Rotator so that sound is dispersed in all directions. The rotation of the horn has the added advantage that it imparts a "sound-in-motion" effect to the siren tone, greatly enhancing the attention attracting characteristics of the siren signal.

D. Blower Assembly and Standpipe.

The Blower Assembly contains all of the machinery necessary to deliver a large volume (250 cubic ft. per min. -7080 liters per min.) of low pressure air (5-6 lb per sq. in. - .35 - .42kg per sq. cm.) through the standpipe to the Chopper Assembly. The standpipe also provides vertical support for the Rotator and Chopper Assemblies.

When the siren is being tested, the blower may be operated with power to the chopper shut-off. Consequently, the airflow to the horn may be cut off by the chopper. As a result, the blower could cause excess air pressure to build up in the standpipe. This excess pressure would probably overload the blower. Therefore, to prevent blower overload, the relief valve, located in the Blower Assembly, relieves the air pressure in the standpipe if the pressure exceeds approximately 6.5 pounds per square inch (.46kg per sq. cm.).

1-3. MODEL AND SIGNAL DESCRIPTION.

A. Models 1000A and 1000B.

Models 1000A (3 phase) and 1000B (single phase) Thunderbolt Sirens are capable of producing a steady single-tone signal, and a wailing single-tone signal. The steady signal is frequently used as a Civil Defense "Alert" signal and the wailing signal is used as a Civil Defense "Attack" signal. These two signals are shown graphically in figure 1-2.

B. Models 1000AT and 1000BT.

The Models 1000AT (3 phase) and 1000BT (single phase) Thunderbolt Sirens produce a steady, dual-tone signal and a wailing, dual-tone signal. The frequencies of the tones that comprise the signal have a ratio of 6:5. For example, if the frequency of the higher-pitched tone at a given time is 600Hz, the pitch of the lower-pitched tone is 500Hz. Both tones in each of the signals are produced simultaneously, lending a very distinctive sound to the siren warning signals. The steady signal is usually used as a Civil Defense "Alert" signal and the wailing signal is usually used as a Civil Defense "Attack" signal. These two signals are illustrated graphically in figure 1-2.

C. Models 1003A and 1003B.

The Model 1003A (3 phase) and Model 1003B (single phase) Thunderbolt Sirens are capable of producing coded signals, as well as the same dual tone signals as Models 1000AT and 1000BT. As shown in figure 1-2, there are four possible coded signals. All of the coded signals require the use of a Model AF Timer. The ratio of the two frequencies in the coded signals is 6:5. One of the coded signals is usually used as a "Fire" signal.

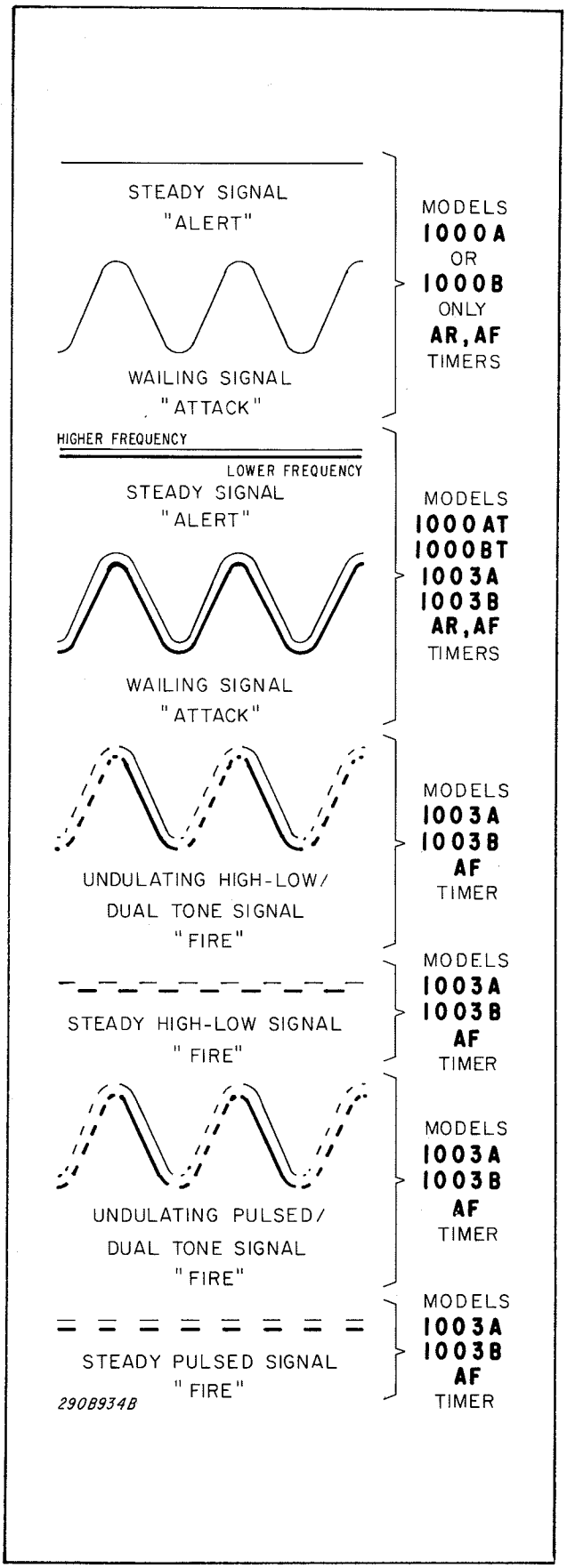


Figure 1-2. Thunderbolt Signal Characteristics.

SECTION II
SPECIFICATIONS

2-1. BLOWER ASSEMBLY.

Blower Motor

Power . . . . . 10 H. P., 3 phase
7.5 H.P., single phase at
1800 RPM

Power Requirements

Volts (AC)	Frequency (Hz)	Phase	Current (A)
208-240	60	3	26
480	60	3	13
240	50	3	31
480	50	3	16
380	50	3	20
240	60	1	40

Blower

Type . . . . . Positive displacement, rotary

Capacity (approx.) . . . . . 250 cubic ft. per min. (7080 liters per min.) at 5 - 6 psig (.35 - .42 kg per sq. cm.) at 2770 RPM

Standpipe . . . . . 3-inch galvanized, schedule 40

2-2. ROTATOR ASSEMBLY.

Gear Reducer . . . . . 60:1 reduction

Rotator Motor

Power . . . . . 1/3 hp at 1800 RPM
(nominal - all models)

Power Requirements

Volts (AC)	Frequency (Hz)	Phase	Current (A)
480	60	3	0.8
240	50	3	1.5
480	50	3	0.6
380	50	3	0.8
240	60	1	3.0

NOTE: A. 208 - 240V, 3 phase, 60Hz sirens use the 240V, 1 phase rotator motor.
B. 3 phase rotator motors are used in all 50 Hz sirens

2-3. CHOPPER ASSEMBLY.

Chopper Motor

Type	Universal Series
Power	2HP
Power Requirements	240Vac , 1 phase , 7 A (all sirens)

2-4. SOLENOID ASSEMBLY (Model 1003 only).

Solenoids (2)

Power Requirements	240Vac 50/60Hz, 1 phase, 1.9/1.6 A each

2-5. MISCELLANEOUS.

Sound Output

Single Tone	127dBC at 100 ft (30.5m)
Dual Tone	126dBC at 100 ft (30.5m)
Frequency Range	128-700Hz (approx.)

Horn

Type	Exponential
Cut-Off Frequency	128Hz (approx.)
Angle of Dispersion	40^{o} x 40^{o} (approx.)
Rotation Speed	2,4, or 8 RPM (nominal)

Weight

Total (approx.)	1000 lb. (454 kg.)
Blower Assembly	585 lb. (266 kg.)
Rotator Assembly	185 lb. (84 kg.)
Chopper Assembly	37 lb. (17 kg.)
Solenoid Assembly	25 lb. (11 kg.)
Horn and Bracket	86 lb. (39 kg.)
RCM1 Control Cabinet	70 lb. (32 kg.)
RCM3 Auxiliary Control Panel	42 lb. (19 kg.)

Dimensions (LWH)

Blower Assembly	56"x33"x30" (142.2 cm x 83.8 cm x 76.2cm)
Rotator Assembly	22"x15"x36" (55.9 cm x 38.1 cm x 91.4 cm)
Chopper Assembly	9-3/4" diameter (24.8 cm)
Solenoid Assembly	23-$\frac{1}{2}$"x4-5/8"x4-$\frac{1}{4}$" (59.7cm x 11.8cm x 10.8cm)
RCM1 Control Cabinet	27" x 18$\frac{1}{2}$" x 9 (68.6cm x 47cm x 22.9cm)
RCM3 Auxiliary Control Panel	27" x 18$\frac{1}{2}$" x 9 (68.6cm x 47cm x 22.9cm)
Horn	54$\frac{1}{4}$"x27$\frac{1}{2}$"x27 3/8" (137.8cm x 69.8cm x 69.5cm)

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.

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 126dB. At 200 feet (61 m), the sound level drops to 118dB; at 400 feet (122 m), the sound level is 110dB; 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 generally 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 a single-tone Thunderbolt is approximately 5120 ft (1560 m) and 4800 ft (1463 m) for a dual-tone Thunderbolt.

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. PHYSICAL INSTALLATION.

A. General.

This paragraph suggests several practical installation configurations. The configurations suggested make it possible to install the Thunderbolt in most situations. However, if none of the installations in this paragraph are suitable, modification of one of the configurations discussed may be practical.

In all configurations, it is suggested that the shipping crate base (blower base skid) be used as a permanent mounting base for the siren. Therefore, when uncrating the siren, do not remove the Blower Assembly from the blower base skid.

After the siren has been uncrated, perform the following checks before installing the siren:

1. Thunderbolt Sirens are properly lubricated prior to shipment. However, lubricant losses may occur in transit. Therefore, to ensure that the siren is properly lubricated, perform the lubrication procedure in paragraph 5-3A of this manual.

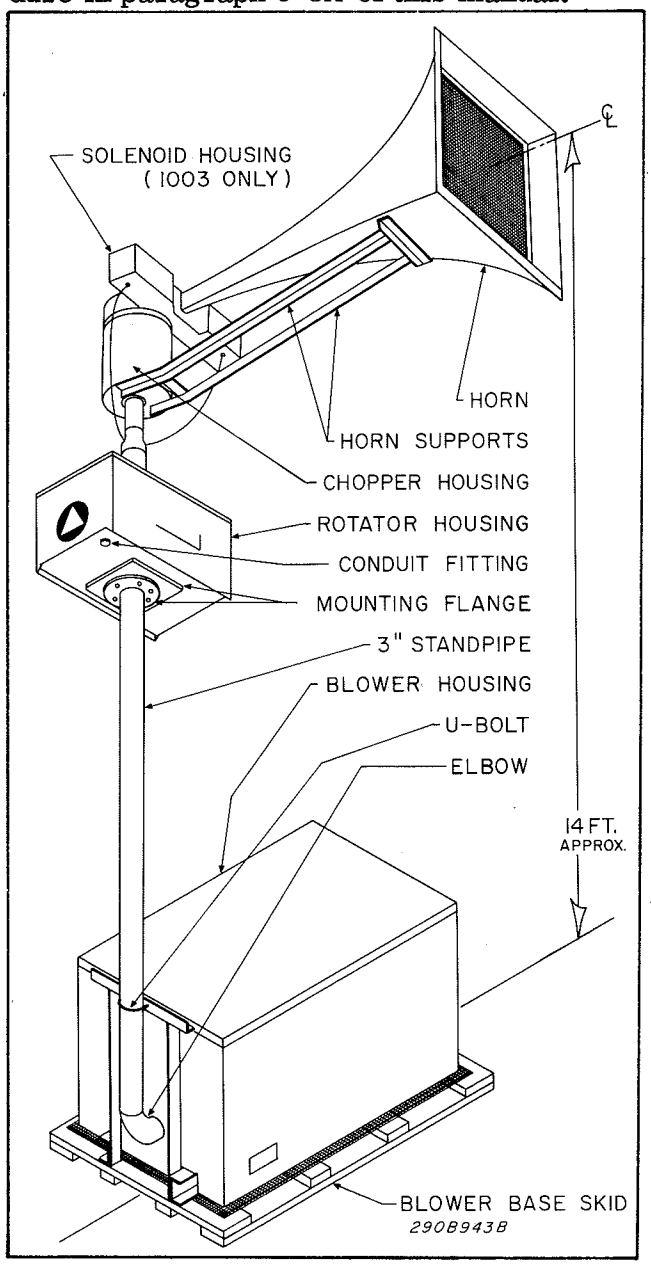


Figure 3-1. Basic Thunderbolt Installation.

2. Rotate the blower by hand. It should rotate freely.

3. Rotate the gear reducer pulley by hand. It should rotate freely.

B. Basic Installation Requirements.

A typical basic Thunderbolt installation is shown in figure 3-1. This installation uses an 8-1/2 foot (2.6 meter) 3-inch, Schedule 40, user-supplied standpipe, a user-supplied 3" coupling, and the 18" (45cm) long standpipe adapter (supplied). When this 10 foot (3.05m) standpipe is installed, the centerline of the horn (℄ in figure 3-1) is approximately 14 feet (4.3 meters) above the mounting surface. Add additional 3-inch, Schedule 40 pipe when more than 14 feet of horn elevation is required. If additional 3-inch Schedule 40 pipe is required to increase the standpipe length, always install the standpipe adapter at the end of the pipe closest to the Rototor and Chopper Assemblies. When the standpipe is 10 feet or more in length, use guy wires or chains to stabilize the Rototor and Chopper Assemblies (see figure 3-2). Installations like those shown in figures 3-1 and 3-2 are practical when the installation site is on a flat-roofed building.

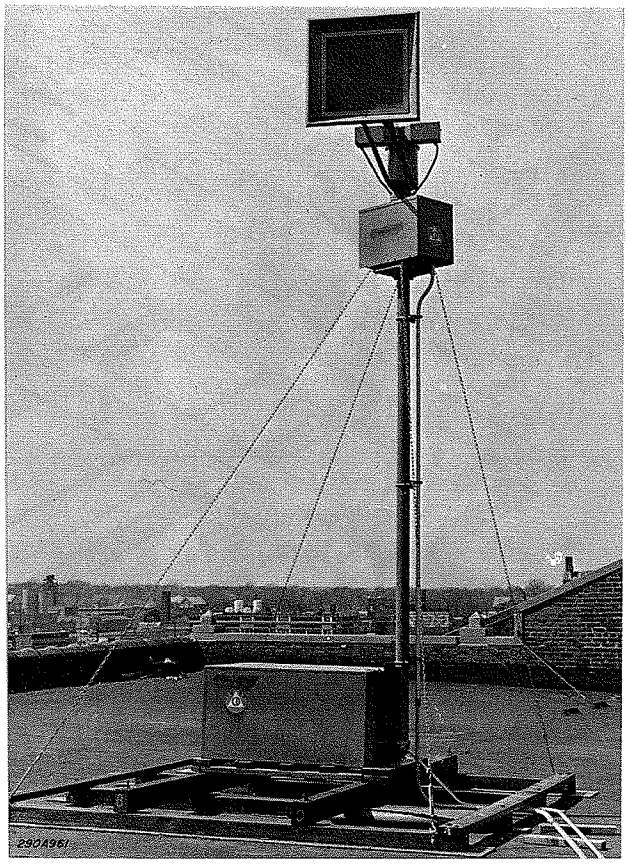


Figure 3-2. Thunderbolt Roof Installation With Weight Distribution Mat.

In the installation shown in figure 3-2, the siren is mounted on a weight distribution mat. This mat is required when the siren mounting surface is unable to support weights in excess of 88 pounds per square foot (430kg per square meter). Therefore, if the mounting surface cannot support more than 88 pounds per square foot (430 kg per sq.m.), construct the weight distribution mat shown in figure 3-3. This mat distributes the siren weight to approximately 18 pounds per square foot (88kg per square meter).

To install the siren as shown in figure 3-1 or 3-2, proceed as follows:

1. If necessary, construct the weight distribution mat shown in figure 3-3. Locate the mat at the installation site.

2. Uncrate the Blower Assembly. Do not remove the blower base skid from the Blower Assembly.

3. Locate the Blower Assembly in its final position, secure it to the mounting surface and erect the siren. To erect the siren, proceed as follows:

(a) Screw the 3-inch (76mm) Schedule 40 pipe included with the siren into the elbow on the rear of the Blower Assembly. Add longer lengths of 3-inch (76mm) Schedule 40 pipe and couplings as required.

(b) Lay the Rotator and Chopper Assembly on its side at a distance from the blower that is approximately equal to the length of the standpipe. Ensure that the conduit fitting is in the position shown in figure 3-4.

(c) Lay the standpipe on its side as shown in figure 3-4. Connect the pipe flange to the mounting flange with the four 5/8" bolts and gasket provided. See figure 3-5.

(d) Raise the Rotator and Chopper Assembly until it is in a vertical position. It may be helpful if a rope is tied to the Rotator and Chopper Assembly and used to pull the assembly into an erect position.

(e) Secure the standpipe in position with the U-bolt provided with the siren. If the standpipe is more than 10 feet (3.05m) in length, install guy wires or chains, as shown in figure 3-6.

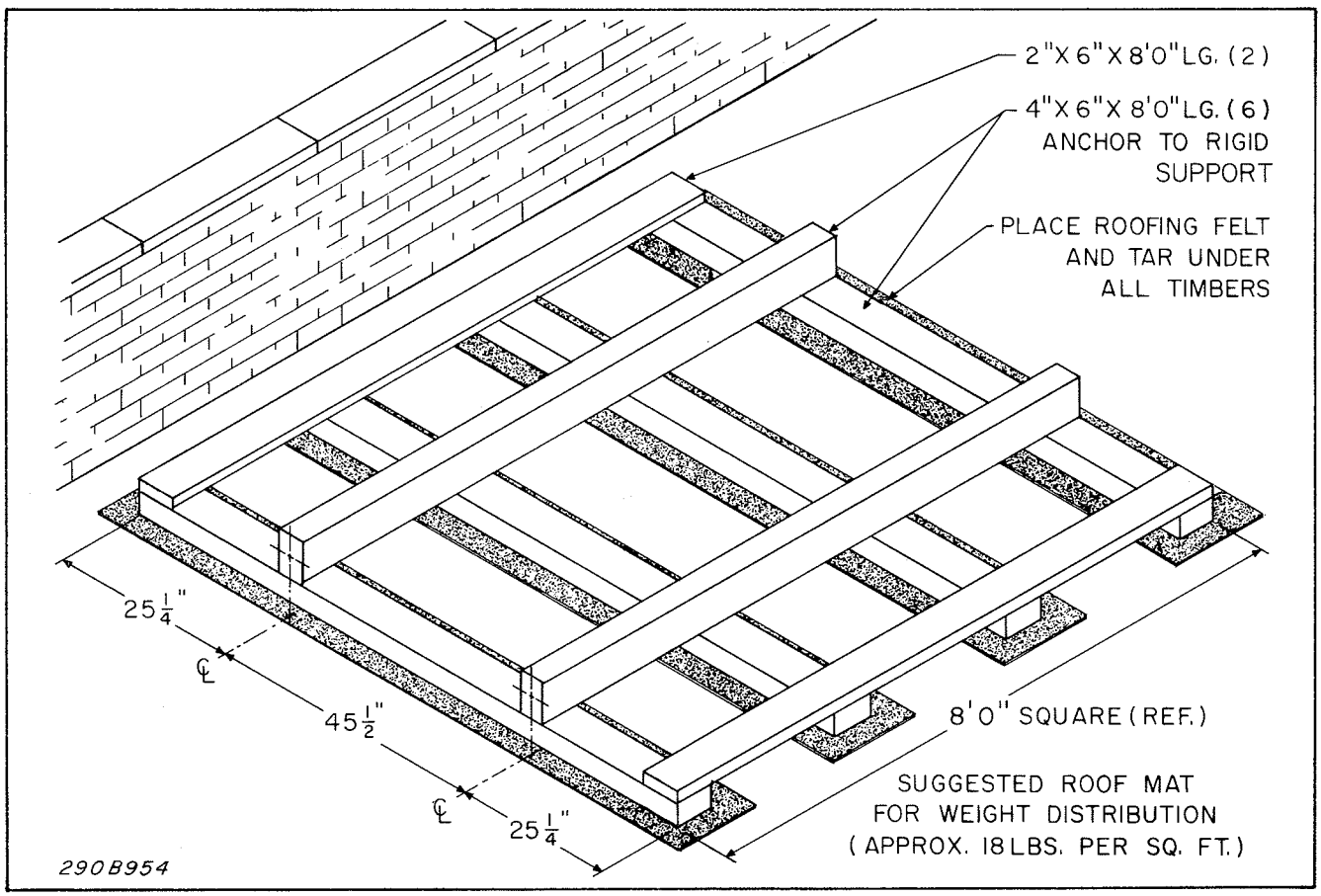


Figure 3-3. Weight Distribution Mat Construction.

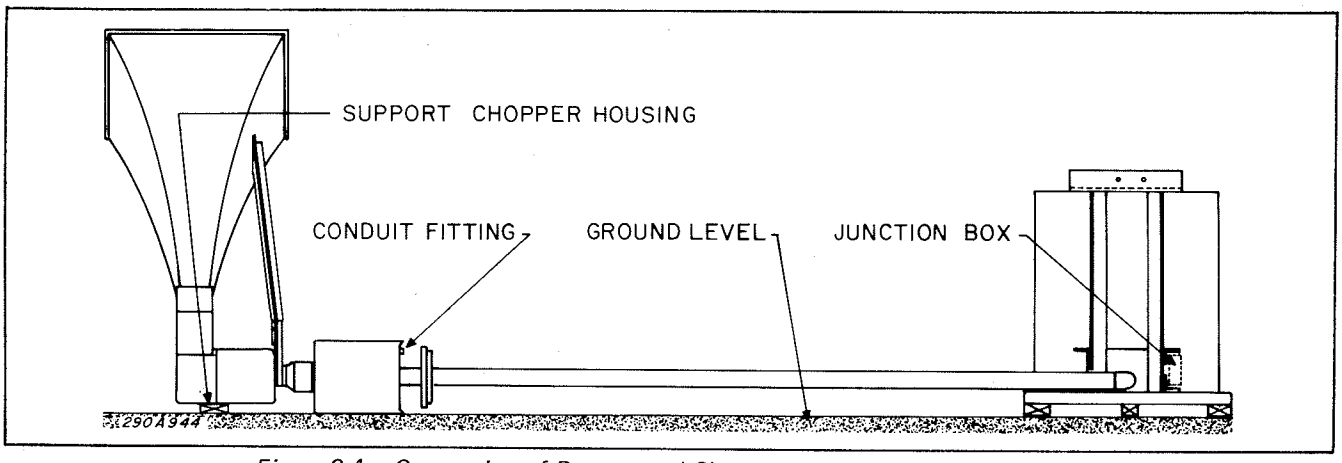


Figure 3-4. Connection of Rotator and Chopper Assemblies to Standpipe.

(f) Unscrew the two bolts from the top of the blower housing and lift off the housing. Remove the fastening wire that holds the relief valve in place during shipment (see figure 3-7). Replace the blower housing.

C. Utility Pole Installation (1).

Another installation configuration is shown in figure 3-8. In this installation, the Blower Assembly and the Rotator and Chopper Assemblies are installed on a Class 2 utility pole. This type of installation is frequently used in areas where there are few tall buildings.

As shown in figure 3-8, the Blower Assembly is mounted on a platform. A detailed view of this platform is shown in

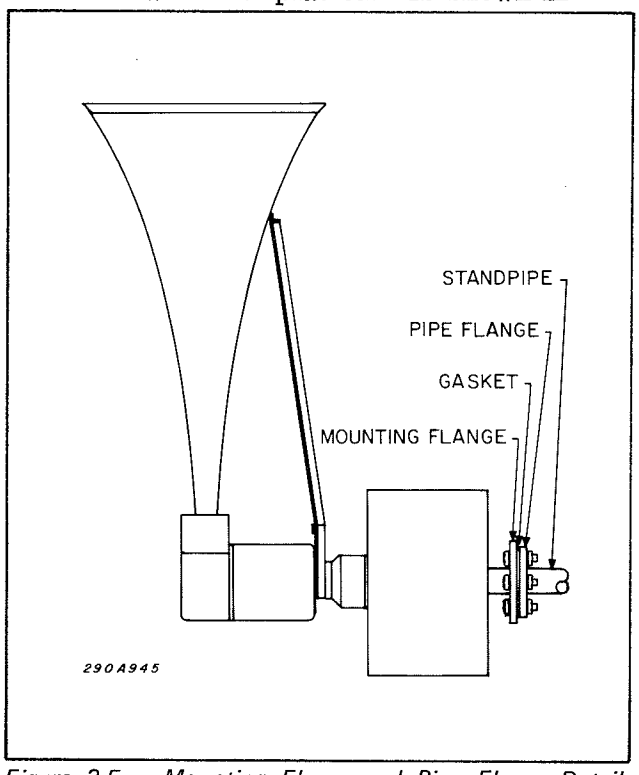


Figure 3-5. Mounting Flange and Pipe Flange Detail.

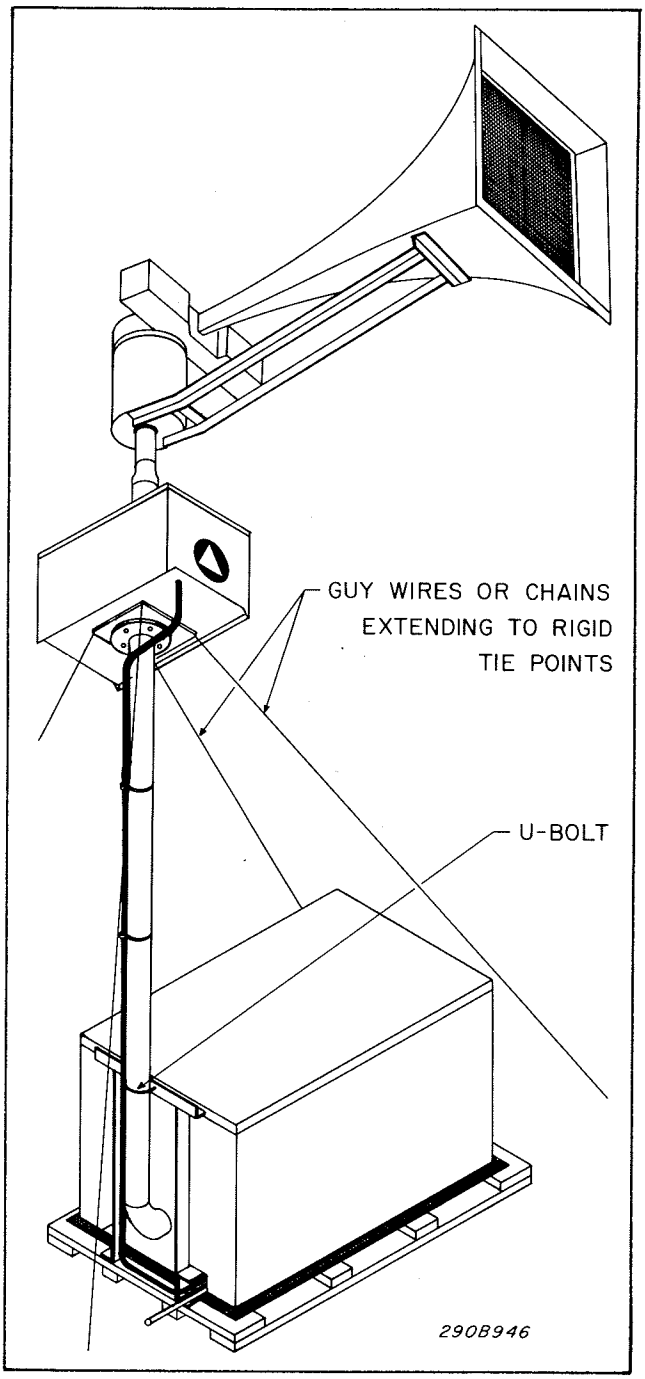


Figure 3-6. Guy Wire Installation.

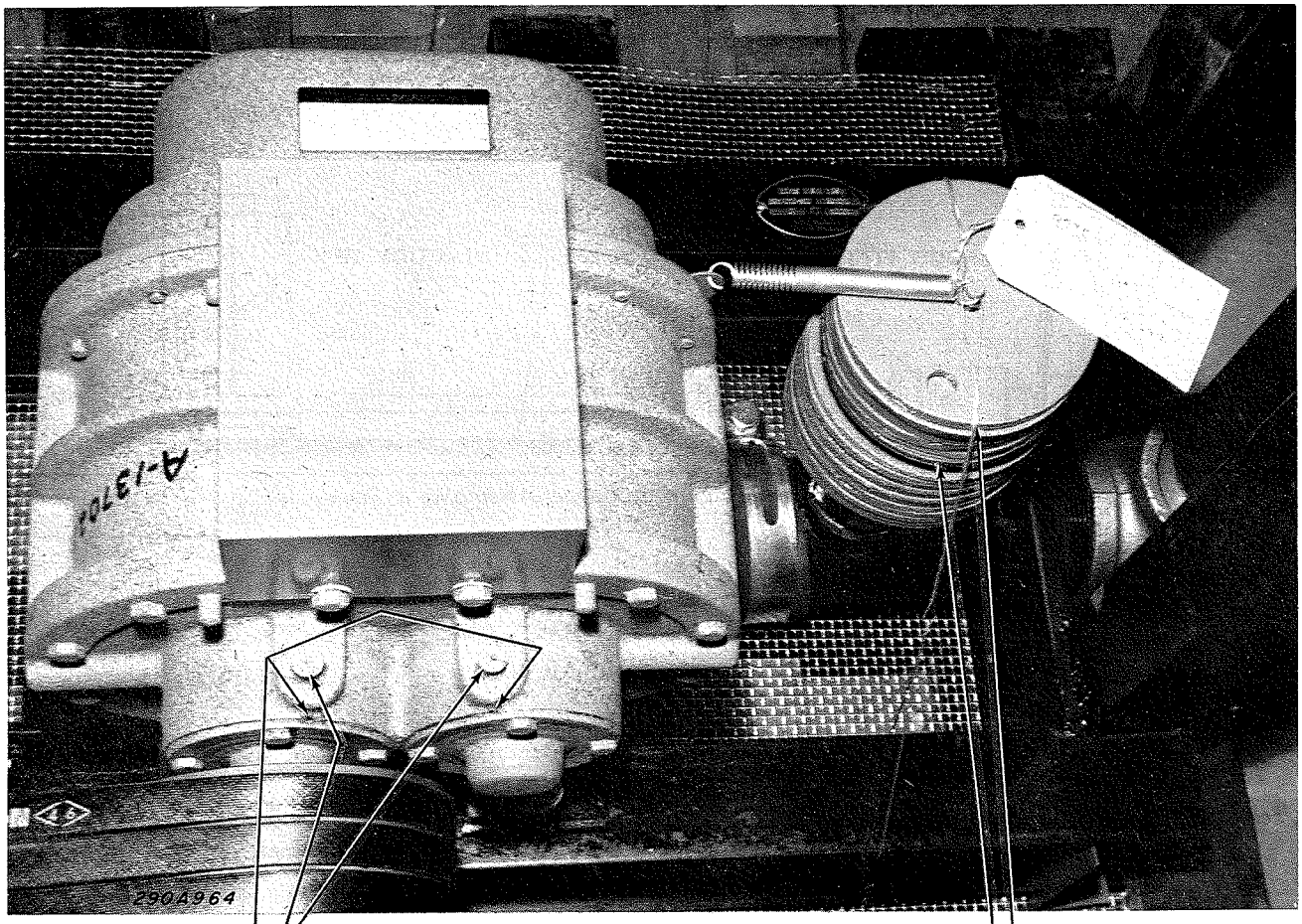


Figure 3-7. Blower Assembly Interior View.

figure 3-9. The dimensions and the materials needed for the construction of this platform are shown in figure 3-10.

If the Blower Assembly is separated by more than 10 feet (3.05 m) from the Rotator and Chopper Assembly, install additional 3-inch (76 mm) Schedule 40 pipe between the assemblies. Three-inch pipe may be purchased locally. Fabricate support brackets from U-bolts and steel bar stock as shown in figure 3-11. Install these support brackets approximately every four feet (1.2 m) along the pole to support the pipe.

D. Utility Pole Installation (2).

Figure 3-12 shows a pole-mounted installation similar to the one shown in figure 3-8. However, in figure 3-12 the Blower Assembly is mounted on a concrete base at ground level. When pouring the concrete mounting base, ensure that the top surface of the base is at least six inches (152 mm) above the ground. Install support brackets like those shown in figure 3-11 every four feet (1.2 m) along the utility pole to support the standpipe.

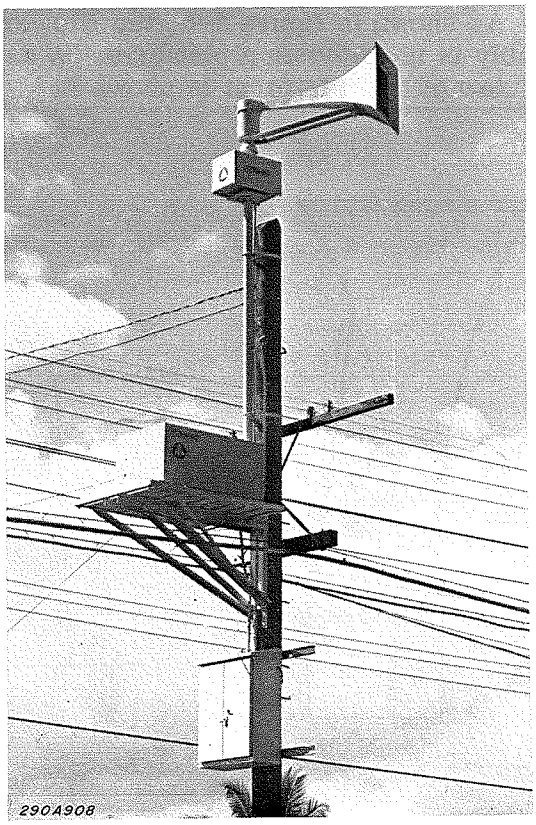


Figure 3-8. Pole-Mounted Thunderbolt (1).

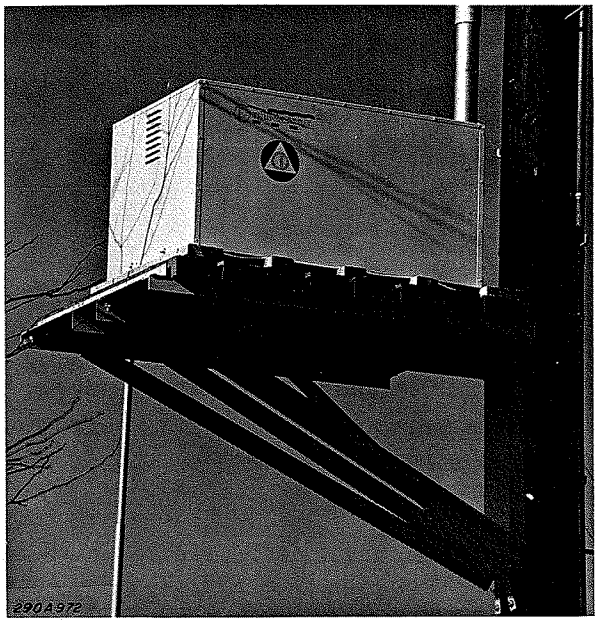


Figure 3-9. Mounting Platform Closeup View.

If this installation configuration is used, it may be desirable to enclose the installation with a fence to discourage vandalism.

E. Wall-Supported Installation.

The siren standpipe is supported by a wall in the installations shown in figures 3-13 and 3-14. Either of these installations may be used when the siren is installed on a flat-roofed building that has high parapets.

An installation like the one shown in figure 3-14 may be used when it is impractical to have the standpipe rise directly from the Blower Assembly. The length of the pipe has a relatively minor effect on the siren output sound level. Every 100 feet (30.5 m) of pipe causes a reduction of 1dB in the sound output level.

F. Interior - Exterior Installation.

Figure 3-15 shows the Blower Assembly installed on the inside of a building with the standpipe passing through the roof. The Rotator and Chopper Assemblies are outside of the building. This installation includes an air intake pipe to conduct air from the outside of the building to the blower air

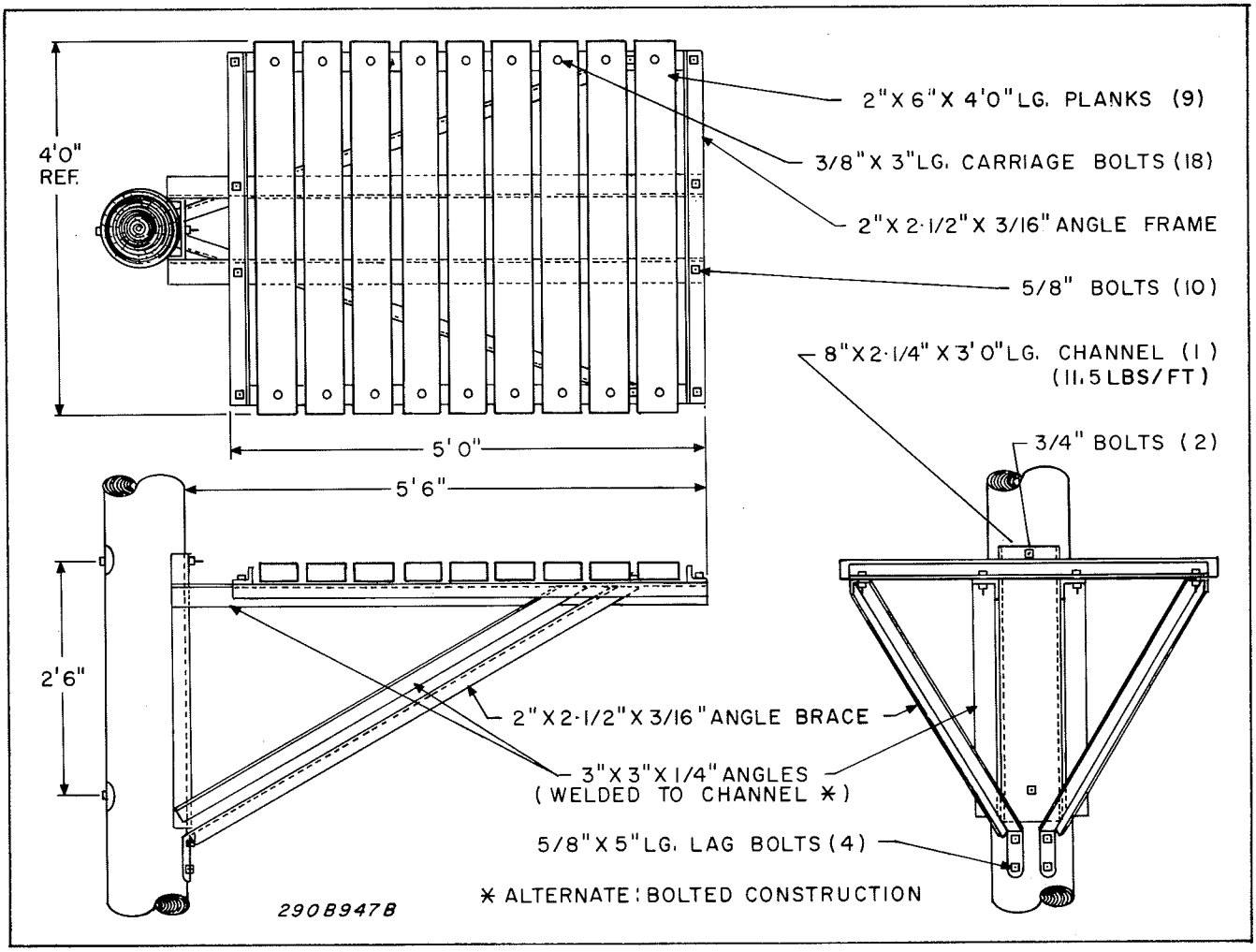


Figure 3-10. Blower Platform Construction.

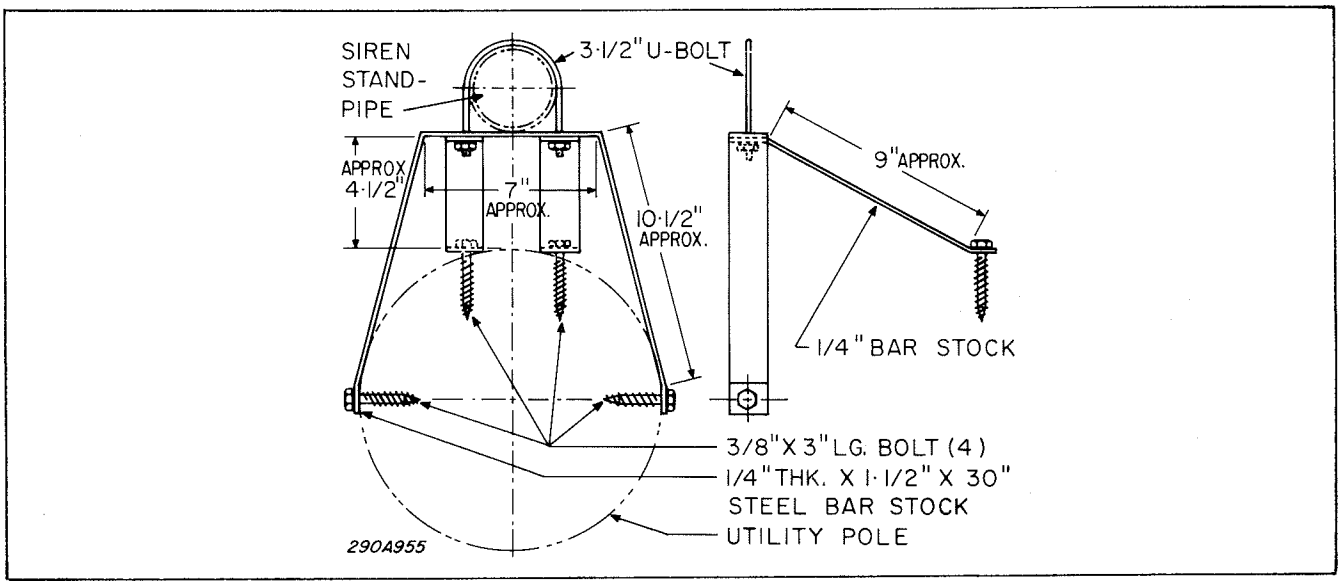


Figure 3-11. Support Bracket Construction.

intake. The air intake pipe is especially important in climates where the winter weather becomes cold enough to cause the temperature of the parts in the Rotator and Chopper Assembly to go below freezing. If an air intake pipe similar to the one shown in figure 3-15 is not installed, air from inside of the building will enter the blower air intake. The air from the interior of a building may contain sufficient humidity that if this air was to come in contact with the cold chopper parts, condensation could form on the chopper and freeze. This would lock the chopper, and could cause the Chopper Motor to burn out.

When installing the intake pipe, connect a 3" to 2-1/2"(76mm to 64mm) reducing elbow to the blower intake, as shown in figure 3-16. Use 3" (76mm) Schedule 40 pipe for the remainder of the intake pipe installation. Install waterproof joints where the air intake pipe and siren standpipe pass through the roof so that water cannot enter the building. As shown in figure 3-15, direct the end of the pipe downward to prevent rain and snow from falling into the pipe. Install the pipe so that the intake end of the pipe is above the highest expected snow level. To prevent obstructions from entering the pipe, install a screen on the intake end of the pipe. Fabricate the screen using material such as 20 gauge hardware cloth with 1/4"x1/4"mesh (6.4mmx6.4mm).

G. Hose or Thin-Wall Tubing.

If desired, flexible hose or thin-wall tubing may be used to conduct air from the Blower Assembly to the Rotator

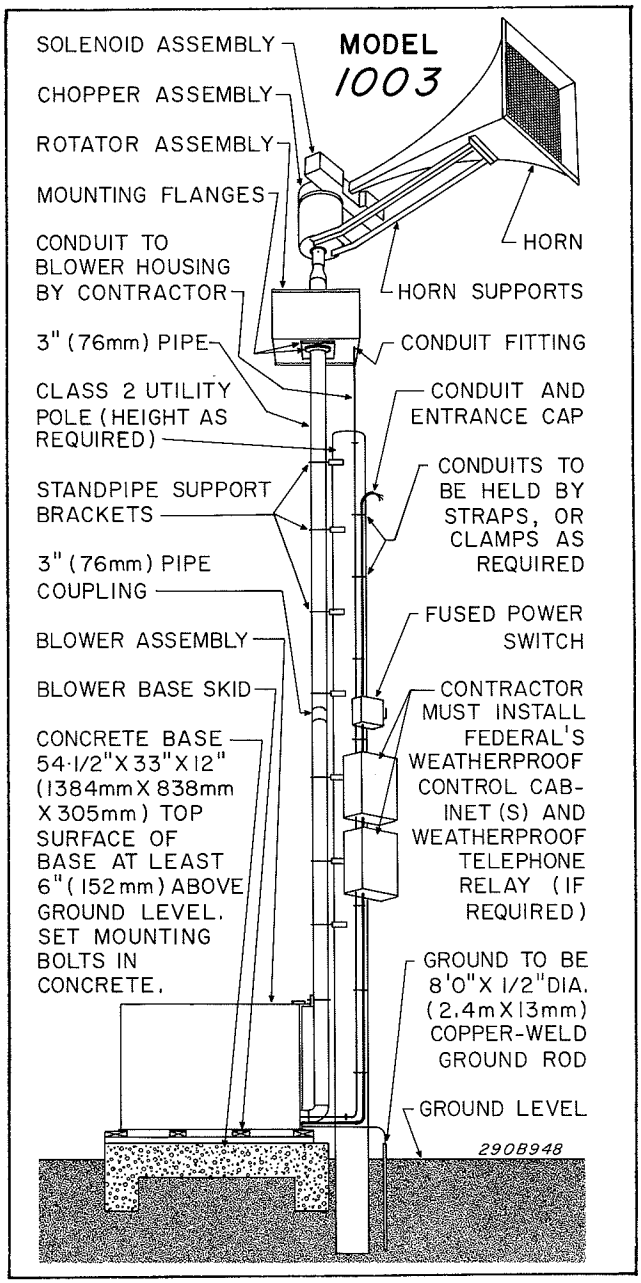


Figure 3-12. Pole-Mounted Thunderbolt (2).

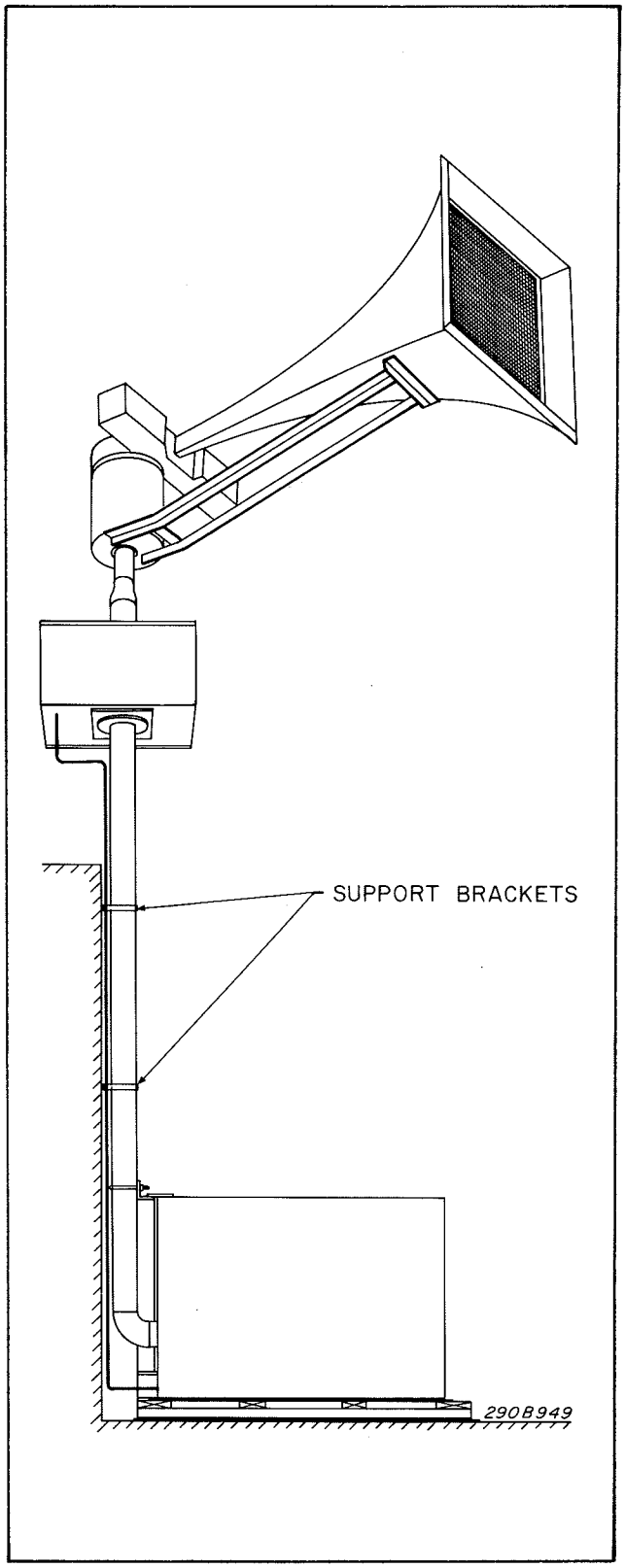


Figure 3-13. Wall-Supported Thunderbolt (1).

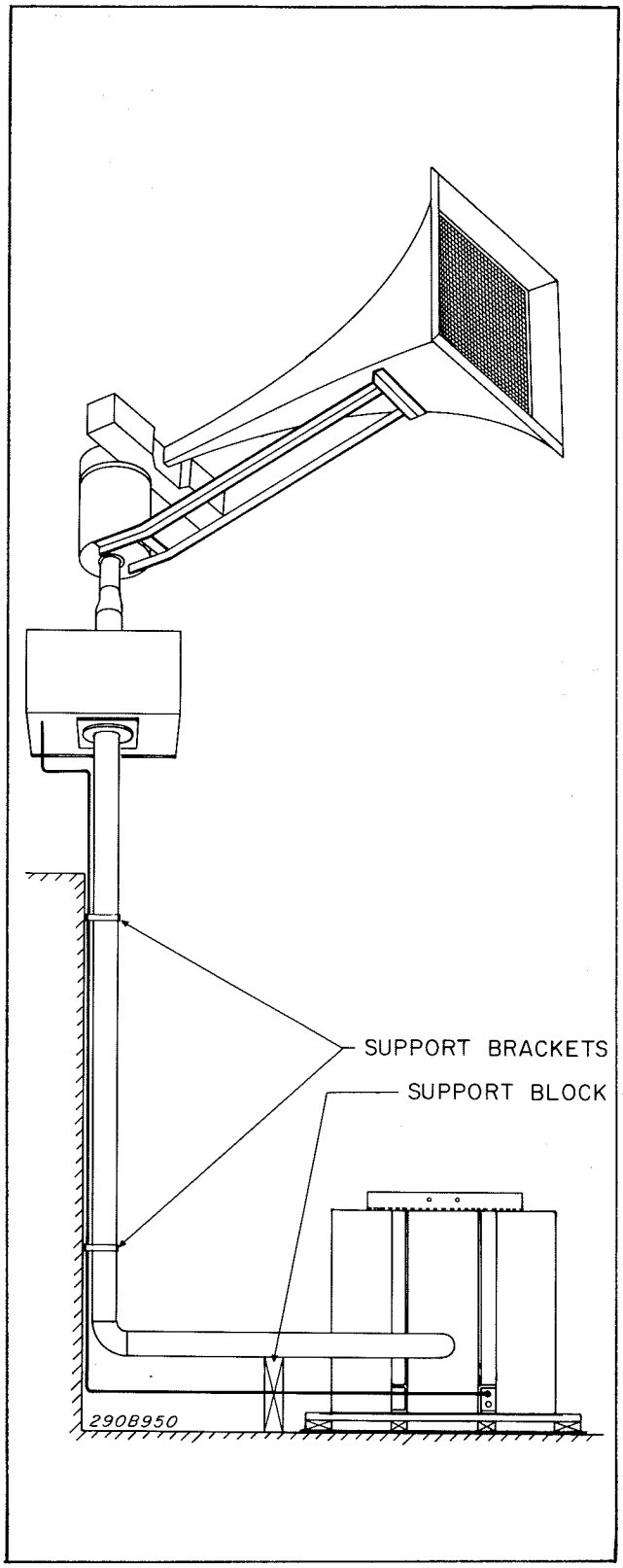


Figure 3-14. Wall-Supported Thunderbolt (2).

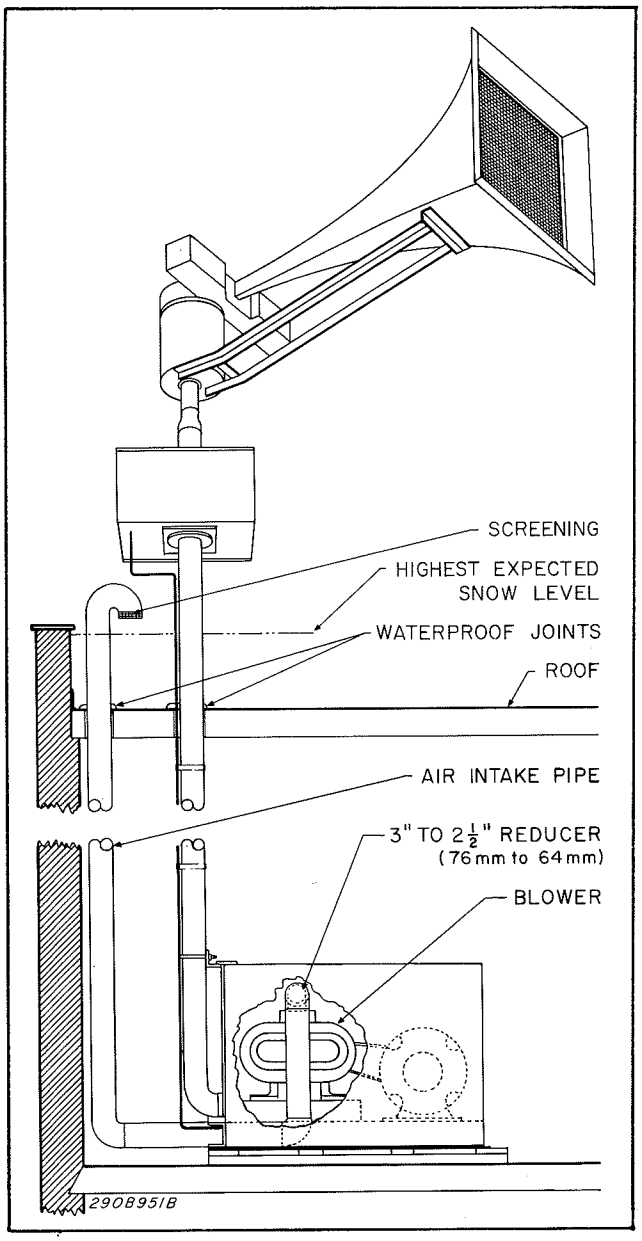


Figure 3-15. Interior-Exterior Thunderbolt Installation.

Assembly. The tubing or hose must be capable of withstanding pressure of at least 10 pounds per square inch (0.7kg per square centimeter). When tubing or hose is used, a structural frame similar to that shown in figure 3-17 is required. The legs of the frame can be bolted directly to the mounting flange.

When installing the hose or tubing, attach approximately one foot (30cm) of 3-inch,, Schedule 40 pipe to the blower assembly. Attach the standpipe adapter to the rotator and chopper assemblies. A detail of the standpipe adapter is shown in figure 3-18. Clamp the ends of the hose or tubing to these pipes as indicated in figures 3-17.

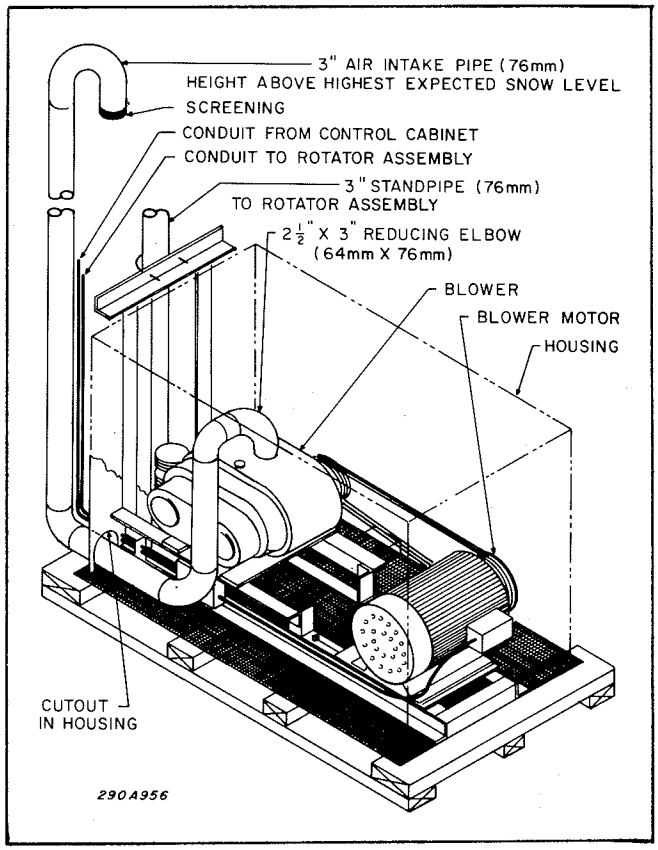


Figure 3-16. Air Intake Installation Detail.

3-3. ELECTRICAL CONNECTIONS.

A. Model 1000 Thunderbolt.

The power and control circuitry of a typical Model 1000 Thunderbolt Siren installation is shown in figure 3-19. The wiring diagrams of the RCM1A (3 phase) and RCM1B (single phase) Control Cabinets are shown in figures 5-15 and 5-16, respectively.

To connect the Control Cabinet and siren to the power source, proceed as follows:

1. Mount the Control Cabinet on a vertical surface as close as possible to the Blower Assembly. The motor starters cannot operate properly unless the Control Cabinet is in a vertical position.

2. Punch or drill a 7/8" (22mm) hole and a 1-1/8" (29 mm) hole in the sheet metal angle as shown in detail "A" in figure 3-20.

3. Install 3/4" (19mm) conduit between the Blower Junction Box (see figure 3-20) and the Rotator Assembly conduit fitting. Pass the conduit through the 7/8" (22 mm) hole in the sheet metal angle as indicated in figure 3-20.

Table 3-1. Wire Sizes.

208-240 Volts - 3 Phase Wire Length - feet (meters)			
	Less than 100 (30.5)	100 - 200 (30.5 -61)	Over 200 (61)
Control Cabinet to Blower 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.
Control Cabinet to Chopper Motor	AWG 14	AWG 12	
Control Cabinet to Rotator Motor	AWG 14	AWG 14	
Power Source to Control Cabinet	AWG 6	AWG 4	
Control Relay to Control Cabinet	AWG 14	AWG 14	
Control Cabinet to Solenoids*	AWG 14	AWG 14	

240 Volts - 1 Phase Wire Length - feet (meters)			
	Less than 100 (30.5)	100 - 200 (30.5 - 61)	Over 200 (61)
Control Cabinet to Blower 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 Chopper Motor	AWG 14	AWG 12	
Control Cabinet to rotator motor	AWG 14	AWG 14	
Power source to Control Cabinet	AWG 4	AWG 2	
Control relay to Control Cabinet	AWG 14	AWG 14	
Control Cabinet to Solenoids*	AWG 14	AWG 14	

480 Volts - 3 phase Wire Length - feet (meters)			
	Less than 100 (30.5)	100 - 200 (30.5-61)	Over 200 (61)
Control Cabinet to Blower 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.
Control Cabinet to Chopper Motor	AWG 14	AWG 12	
Control Cabinet to Rotator Motor	AWG 14	AWG 14	
Power Source to Control Cabinet	AWG 6	AWG 4	
Control relay to Control Cabinet	AWG 14	AWG 14	
Control Cabinet to Solenoids*	AWG 14	AWG 14	

*Model 1003 Only

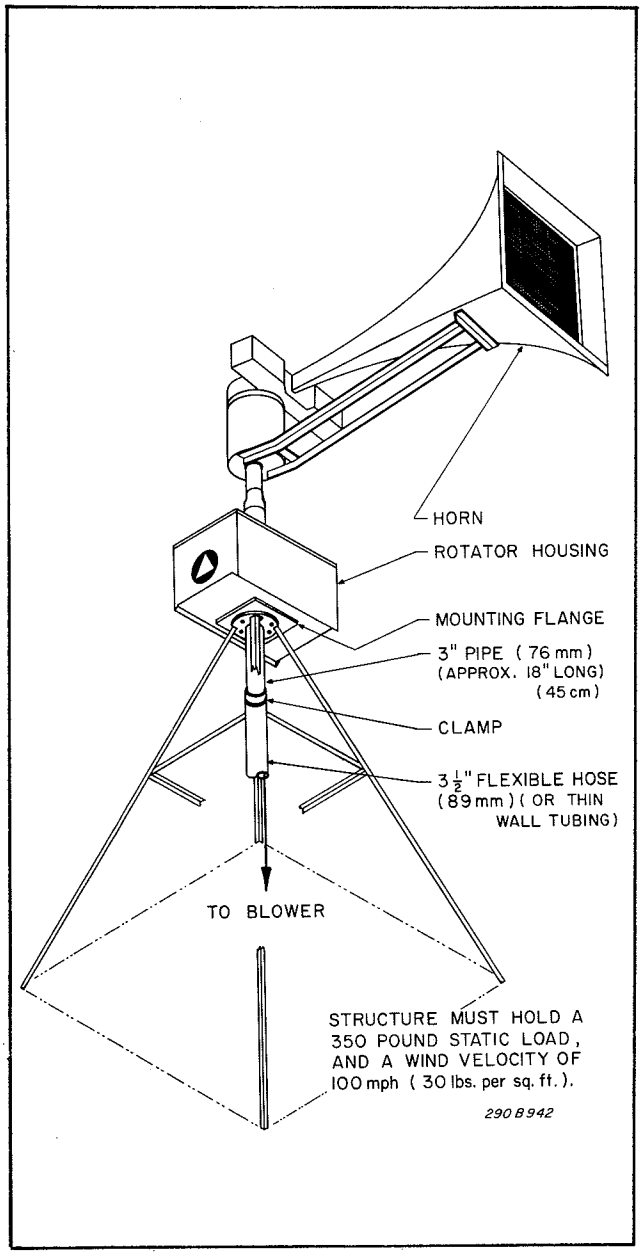


Figure 3-17. Flexible Hose Installation Detail.

4. Install 1" (25mm) conduit between the control cabinet and the blower junction box. Pass the conduit through the 1-1/8" (29mm) hole in the sheet metal angle, as indicated in figure 3-20.

5. Route wires of the proper size from TB103 and TB105 in the Control Cabinet through the 1" conduit, the blower junction box and through the 3/4" conduit to the Chopper and Rotator Motors. Two wires are required for each motor (Three wires are required for the rotator motor in 480 VAC, 3 phase and all 50Hz model sirens). The size of the wires required for each motor in the siren depends on the operating current and the length of wire between the Control Cabinet and the motor. Refer to Table 3-1 for the correct wire sizes.

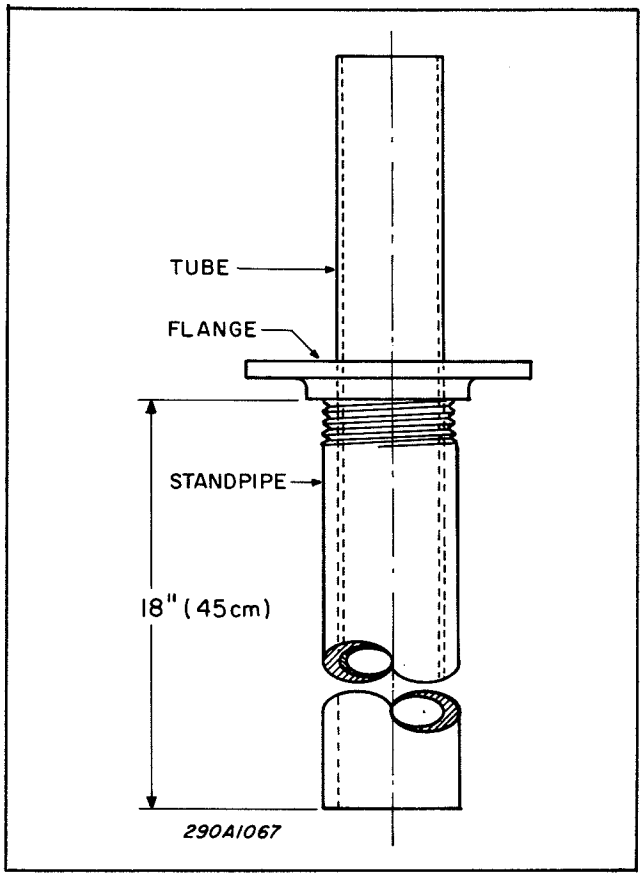


Figure 3-18. Standpipe Adapter Detail.

6. Route the necessary wires from TB 104 through the 1" conduit to the blower junction box and through the flexible conduit to the solderless lugs on the blower motor. Connect the wires to the lugs and insulate.

7. Install the AR timer or other control device (see figure 3-21). Connect the control device to TB102 in the RCM1. If it is desired to operate the timer from remote control pushbuttons, install them at this time also. If the length of the wiring between the pushbuttons and the timer exceeds 2000 feet (610m.), install an SPST telephone relay, such as the Federal Model TRC*1020, between each pushbutton and the timer. If it is required to cancel a signal from a remote location, remove the jumper between TB2-15 and TB2-16 and connect the normally closed contacts of the switch or relay to TB2-15 and 16 (see figure 5-18).

B. Model 1003 Thunderbolt

Figure 3-22 shows the wiring diagram of the power and control circuitry of a typical Model 1003 Thunderbolt Siren installation. The wiring diagrams of the RCM1A (three phase) and RCM1B (single phase) Control Cabinets are shown in figures 5-15 and 5-16, respectively. The wiring diagram of the RCM3 Auxiliary Control Panel is shown in figure 5-17.

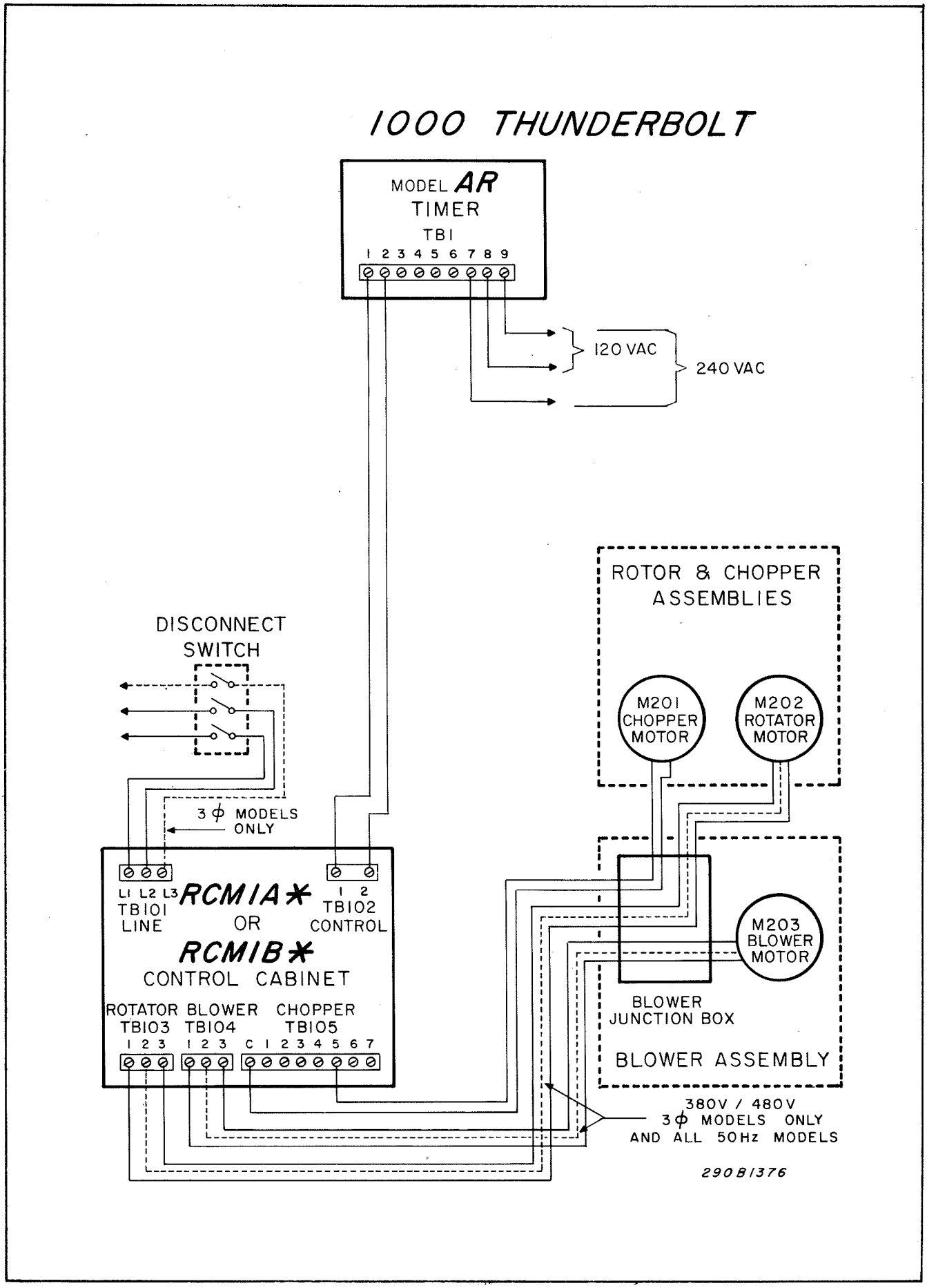


Figure 3-19. Model 1000 Electrical Connections.

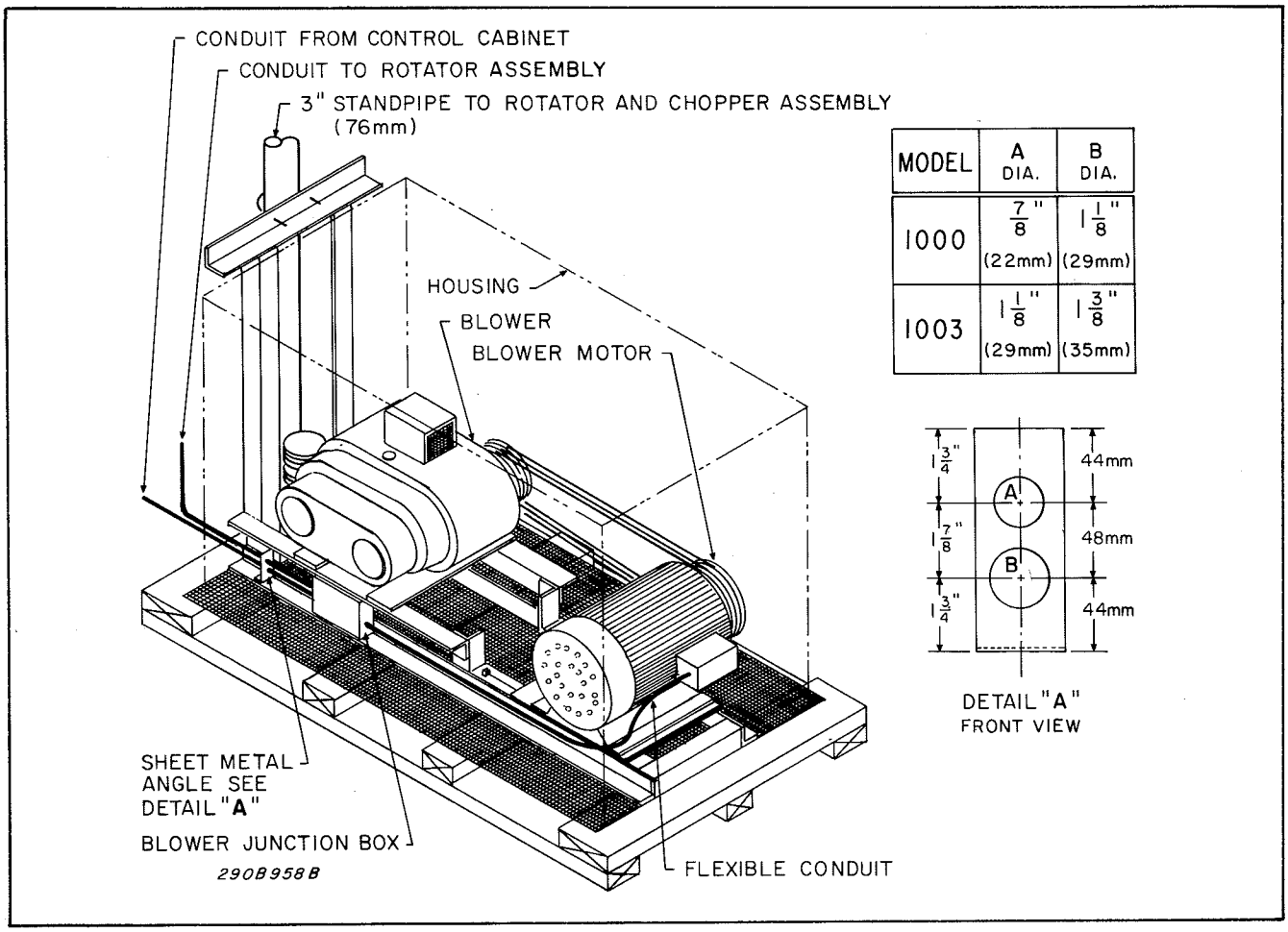


Figure 3-20. Conduit Installation.

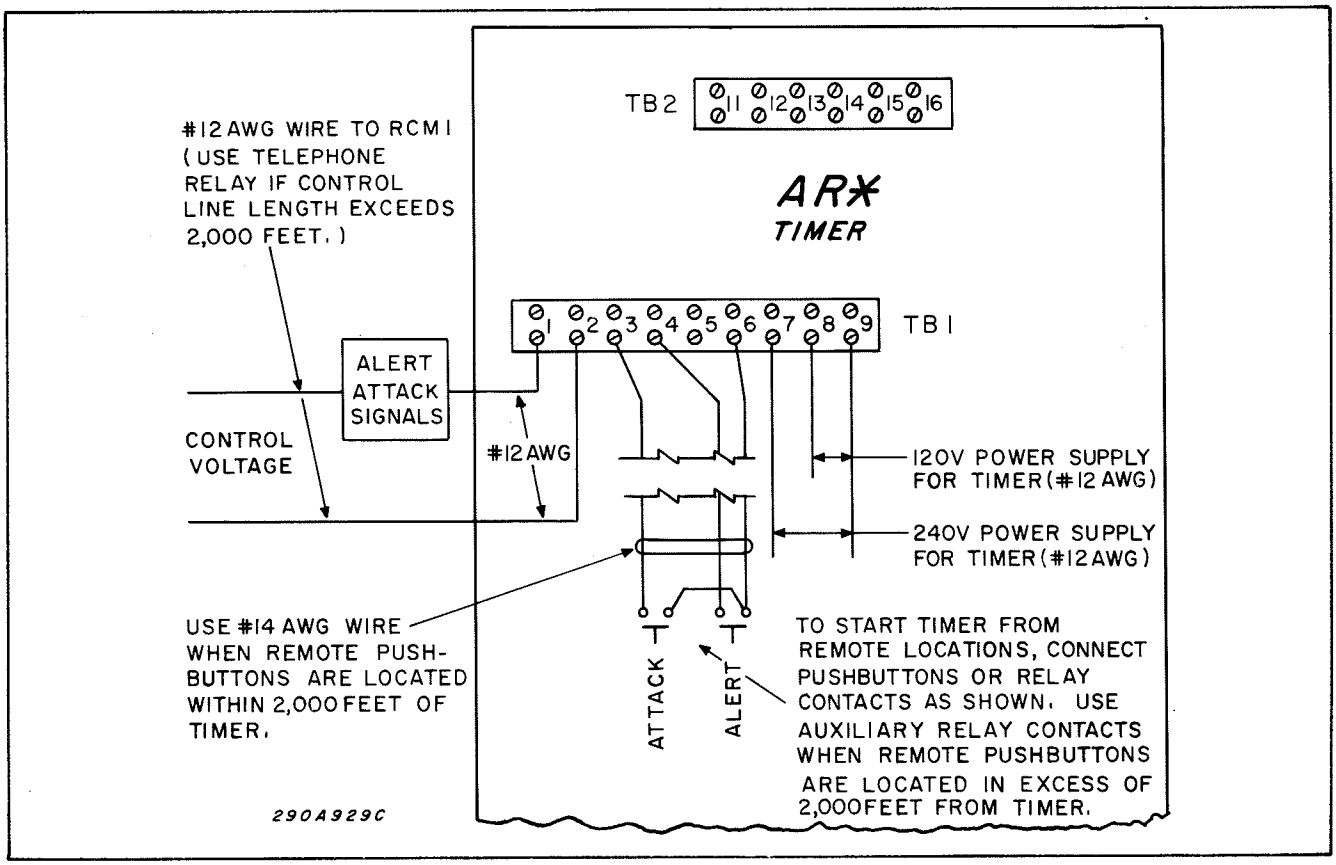


Figure 3-21. AR Timer Electrical Connections.

To connect the Control Cabinet and siren to the power source (See figure 3-22):

1. Mount the Control Cabinet and Auxiliary Control Panel on a vertical surface and as close as possible to the Blower Assembly. The motor starters cannot operate properly unless the Control Cabinet is in a vertical position.

2. Drill or punch a 1-1/8" (29 mm) hole and a 1-3/8" (35mm) hole in the sheet metal angle. The location of the sheet metal angle is shown in figure 3-20. Drill or punch the holes as indicated in Detail "A" of figure 3-20.

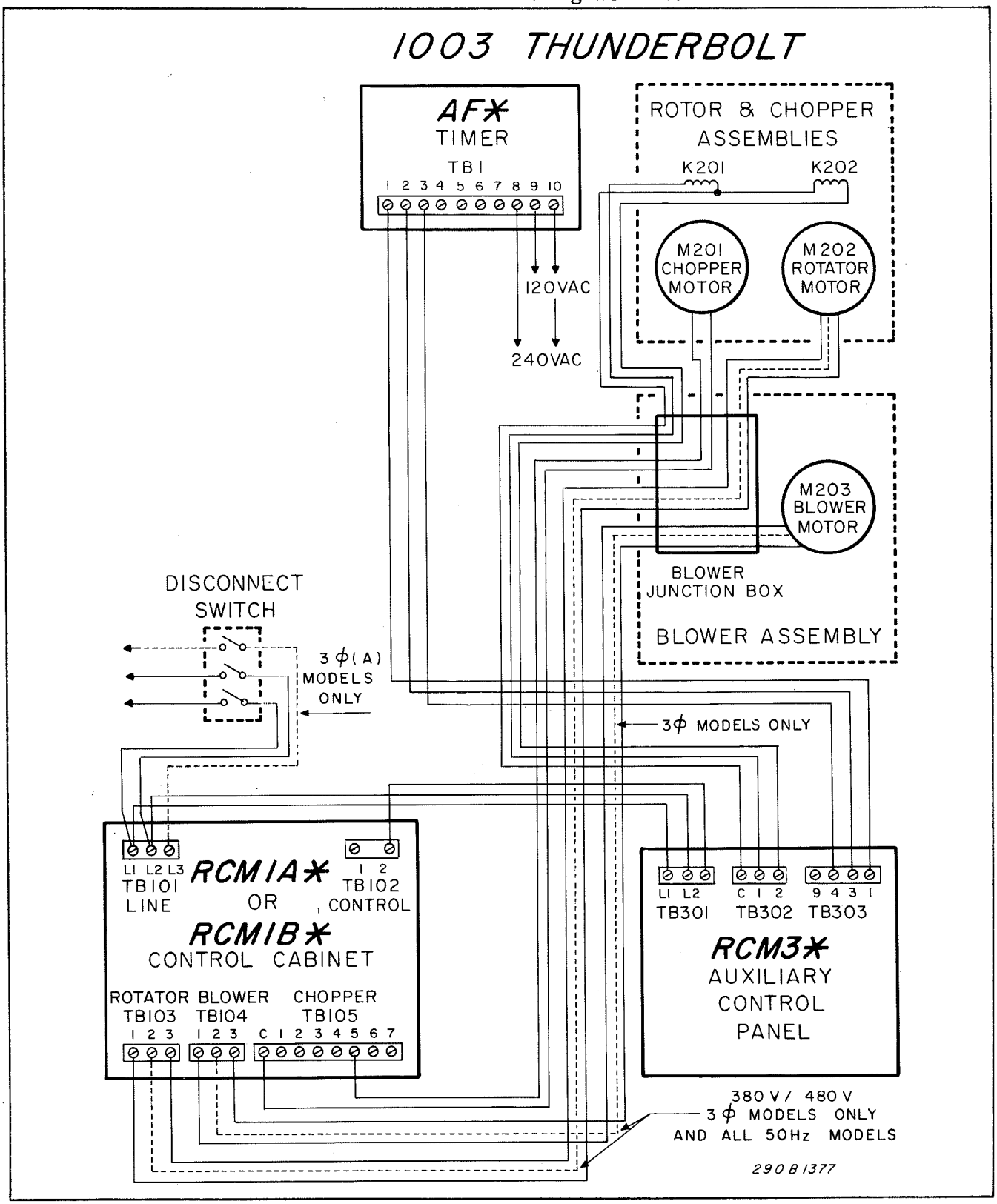


Figure 3-22. Model 1003 Electrical Connections..

3. Install 1" (25 mm) conduit between the blower junction box (see figure 3-20)and the conduit fitting on the Rotator and Chopper Assembly. Pass the 1" conduit through the 1-1/8" (29mm) hole in the sheet metal angle, as shown in figure 3-20.

4. Install 1-1/4" (32mm) conduit between the Control Cabinet and the blower junction box. Pass the conduit through 1-3/8" (35mm) hole in the sheet metal angle.

5. Install 1" (25mm) conduit between the Control Cabinet and the Auxiliary Control Panel.

6. Route three wires from TB302 in Auxiliary Control Panel through the conduit to the Control Cabinet. These three wires must be long enough to reach the solenoid-operated slide valves on the Rotator and Chopper Assembly.

7. Route two AWG 14 wires from TB101 to TB301 and one AWG 14 wire from TB102 to TB301.

8. Route wires of the proper size from TB103 and TB105 in the Control Cabinet and the three wires from the Auxiliary Control Panel through 1-1/4" (32mm) conduit to the blower junction box and through the 1" (25mm) conduit to the Rotator Assembly.

The wire sizes for the motors in the siren depends on the operating current and the length of the wires between the Control Cabinet and the respective motor. Refer to Table 3-1 for the correct wire sizes.

Two wires are required for each motor. (Three wires are required for the Rotator Motor in 480VAC Sirens and in all 50Hz models. Connect the three wires from the Auxiliary Control Panel to the SOLENOID terminal block inside the rotator housing.

9. Route the necessary wires from TB 104 through the 1-1/4" conduit to the blower junction box and through the flexible conduit to the solderless lugs on the blower motor. Connect the wires to the lugs and insulate.

10. Install the AF Timer or other control device (see figure 3-23). If it is desired to operate the timer by means of remote pushbuttons, install them at this time. If the length of the wires between the pushbuttons and the timer exceeds 2,000 feet (610m), install an SPST relay, such as the Federal Model TRC*1020 between each pushbutton and the timer. If it is required to cancel a signal from a remote location, remove the jumper between TB2-15 and TB2-16 and connect the normally closed contacts of the switch or relay to TB2-15 and 16 (see figure 5-19).

The timer can also be activated by a radio signal if the timer is incorporated into the Federal Siratrol. The use of the Siratrol has the advantage that control lines are not required between the siren control site and the siren location.

3-4. THREE PHASE MOTOR CONNECTIONS.

A three phase motor can be operated from either a 208-240VAC or a 480VAC 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 customer. This voltage is stamped on the nameplate of the motor. However, if it is

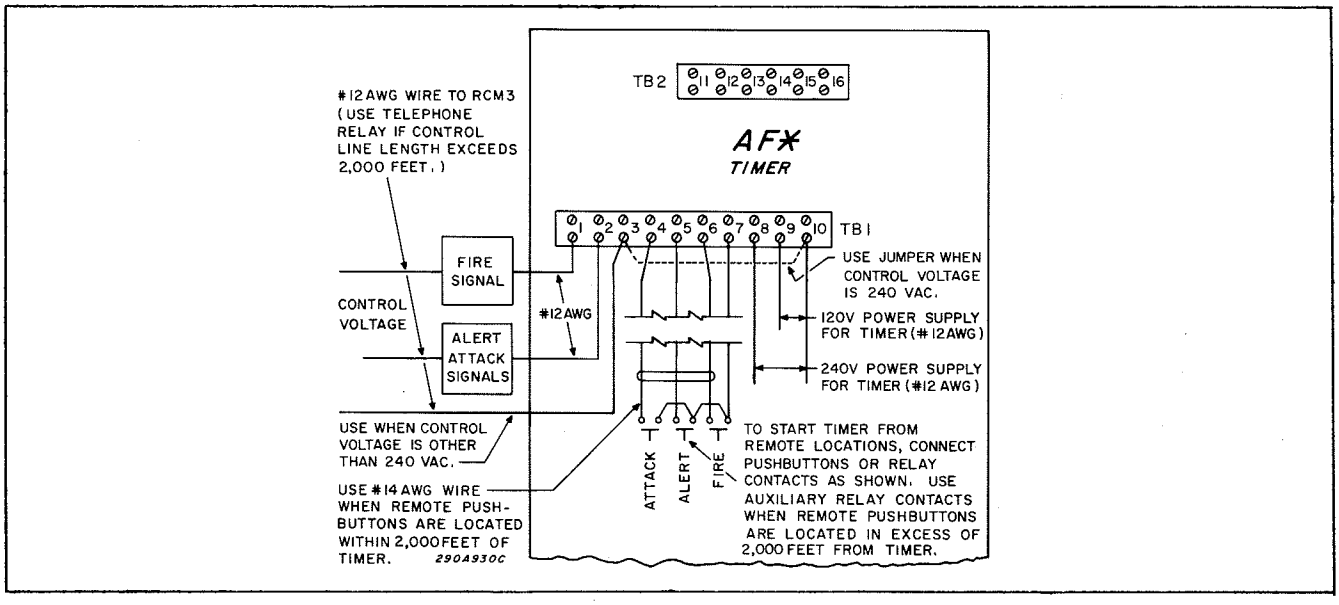


Figure 3-23. AF Timer Electrical Connections.

ever necessary to change the motor operating voltage, connect the wires in the appropriate arrangement as shown in figure 3-24. NOTE: If it is ever necessary to change the siren operating voltage, the controls must also be modified or exchanged.

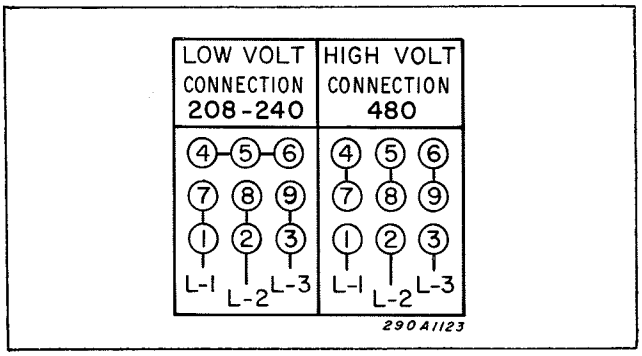


Figure 3-24. Three Phase Motor Power Connections.

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 2 feet (61mm) into the ground, as close as practical to the base of the pole. For maximum protection use a separate, continuous 10AWG or larger, wire from the blower frame to ground and from the cabinet of each control device to ground.

3-5. PREOPERATION CHECKS.

After the siren has been completely installed, perform the following checks before operating the siren:

1. Ensure that all control circuits are open and set all toggle switches in both the RCM1 and RCM3 (Model 1003 only) to the AUTOMATIC position. Apply power to the Control Cabinet.

2. Set the BLOWER switch to the TEST position. Observe the blower shaft from the pulley end. The shaft should be rotating in a counterclockwise direction. If the direction of rotation is incorrect, turn off the power to the siren and reverse two of the blower motor power lead connections. (3 phase motors, only). Energize the blower motor again and observe the blower shaft for proper operation. After completing this test, return the BLOWER switch to the AUTOMATIC position.

3. Set the ROTAT OR switch to the TEST position and ensure that the horn rotates. The direction of rotation is unimportant.

4. Set the CHOPPER switch to the TEST position while the horn is rotating. However, do not turn on the blower. After the chopper has reached top speed, return the CHOPPER switch to AUTOMATIC and allow the chopper to coast to a stop. Very low level sound should be generated. Repeat this test several times and return both the ROTATOR and CHOPPER switches to AUTOMATIC.

5. Set the CONTROL switch to TEST. Initiate a siren signal from the siren control device. Only the Time Delay Relay K102 and the Chopper Motor Starter, K103, should energize. If a Model AR or AF Timer is installed with the siren, the chopper motor starter should be energized for about four seconds and de-energized for about eight seconds. This is a silent test of the control circuits; the siren should not produce any sound. After this test is complete set the CONTROL switch to AUTOMATIC.

WARNING

The output sound level of a Model 1000 or 1003 Thunderbolt is capable of causing permanent hearing damage, especially at short distances. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

When ALL switches are set to AUTOMATIC, the siren is ready for operation. Test the siren for full sound output by operating the timer or manual code switch. The siren may also be tested locally by setting the BLOWER and ROTATOR switches to TEST and using the CHOPPER switch to operate the siren up and down scale.

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.

SECTION IV
CIRCUIT DESCRIPTION

4-1. GENERAL.

Most Thunderbolt Siren installations include a Model AF or Model AR Timer. The Model AR Timer is usually installed with a Model 1000 Siren. In order to utilize the full capability of the Model 1003 Thunderbolt, a Model AF Timer is required.

The Models RCM1A and RCM1B Control Cabinets contain the motor starters necessary for the Models 1000 and 1003 Thunderbolt Sirens. The Model RCM3 Auxiliary Control Panel is used with the Model 1003 only. The Auxiliary Control Panel controls the solenoid-operated slide valves in the Solenoid Assembly of the Model 1003.

The operation of the Models AR and AF Timers is nearly identical. Therefore, unless otherwise specified, all descriptions of the timer circuits apply equally to both timer models.

4-2. TIMER CIRCUIT DESCRIPTION.

The Federal Model AR and Model AF Timers contain the devices necessary for the control of the Model 1000 and 1003 Thunderbolt Sirens, respectively. However, the timers do not include a power supply for the control circuits. Therefore, the user must provide an external power supply, such as the Federal Model PS, in the siren control circuitry (see figure 3-21 or figure 3-23).

The Model AR Timer (see figure 5-18) causes the Model 1000 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 5-19) causes the Model 1003 to produce a "Fire" signal as well as the "Attack" and "Alert" signals. The "Fire" signal is a two-minute, undulating, rapidly alternating high and low pitched signal, up scale, and a continuous, dual-tone signal down scale.

The timers control undulating signals ("ATTACK" and "FIRE") by applying a three-minute series of eight-second control contact closures separated by four-second opens at TB102 in the RCM1 (Model 1000) or TB303 in the RCM3 (Model 1003).

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 for the time that 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 three-minute cycle.

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

The output circuitry is electrically independent of the timing circuitry. Consequently, the output circuit can utilize up to 480V. The capacity of the microswitch contacts in the signal circuits is 15 amperes AC, or 1/4 ampere 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, and the motor begins to rotate the cams. After the cams rotate slightly, the motor feed cam contacts close to provide a parallel circuit to the timer motor.

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 Control Cabinet or auxiliary control panel 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 Control Cabinet or auxiliary control cabinet and the siren produces a constant level signal 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 control circuit closure to the Control Cabinet or auxiliary control panel opens, and the motor feed cam contacts open, stopping the timer 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 being 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 "Alert".

4-3. CONTROL CABINET CIRCUIT DESCRIPTION (See figures 5-15 and 5-16).

Application of a control signal to the Control Cabinet energizes the Chopper Motor Starter, K103, starting the chopper motor. Simultaneously, the Time Delay Relay, K102, energizes, activating the Blower Motor Starter, K101, and the Rotator Motor Starter, K104. These starters then apply power to their respective motors.

As shown in figures 5-15 and 5-16, each motor starter includes a thermal overload relay. Each of these relays protect their respective motor starters and associated motor in the event that excess current is drawn.

An overload relay is activated when there is sufficient current through one or more of its heaters to produce enough heat to open the relay contacts. The opening of the relay contacts opens the control circuit of the associated motor starter. As a result, the motor starter deenergizes, protecting the circuit against damage. After the motor starter deenergizes, the heater(s) reset automatically after the heaters and contacts cool sufficiently. The overload relays can also be reset manually.

The siren produces the "Attack" or "Fire" (Model 1003 only) signal because the timer opens the control circuit periodically. When the control circuit opens, K102 and K103 deenergize, deenergizing the chopper motor. As the chopper motor coasts toward a stop, the pitch of the sound from the siren decreases. At the end of the adjustable time delay, K102 reapplies control voltage to K103, reenergizing the chopper motor. The blower motor and rotator motor starters drop out and immediately pull in again. However, the motors do not detect the resulting brief power interruption and they continue to run. As the speed of the chopper motor increases, the pitch of the siren tone(s) increases. The alternate energizing and deenergizing of the chopper motor causes the siren to produce a wailing signal.

When the "Alert" signal is selected, all three of the siren motors are energized continuously during the entire three-minute timer cycle. As a result, the "Alert" signal is a three-minute signal having constant frequency and sound level.

The speed of the chopper determines the top frequency of the siren. The rotor is driven by a universal series motor whose rotational speed is determined by the voltage applied to it. Autotransformer, T101 allows the user to change the pitch of the siren signal by changing the chopper motor speed.

Four toggle switches, S101, S102, S103 and S104 are located in the Control Cabinet. These switches allow individual testing of the siren motors and control circuits. When the CONTROL switch, S101 is set to the TEST position, the siren control circuit can be tested without sounding the siren. When S101 is set to TEST, the siren does not sound because the autotransformer, T101, the blower motor, and the rotator motor control circuits are open. Consequently, the motor starters do not energize their respective motors when a closure is applied to TB102 in the Control Cabinet. The time delay relay and chopper motor starter circuits are unaffected when S101 is set to TEST. Therefore, when a closure is applied to TB102 in the Control Cabinet, the time delay relay and the chopper motor starter energize to provide an indication that the siren control device is operating.

Only the chopper motor starter and the chopper motor energize when S102 is set to TEST. Similarly, when the BLOWER switch, S103, is set to TEST, the blower motor starter and the motor are energized. The ROTATOR switch, S104, energizes the rotator motor starter and rotator motor when S104 is set to the TEST position. Always set S104 to its Center-OFF position before performing maintenance on the rotator assembly.

4-4. AUXILIARY CONTROL PANEL CIRCUIT DESCRIPTION (See figure 5-17).

The Model RCM3 Auxiliary Control Panel is used with the Model 1003 Thunderbolt only. The Auxiliary Control Panel controls the solenoid-operated slide valves, K201 and K202, in the Solenoid Assembly, so that an alternating high-low signal is produced by the siren when the "Fire" signal is selected.

When the "Fire" signal is initiated by the Model AF Timer, a series of Control closures is present across TB303-1 and 4. This series of closures is then applied to the Control Relay, K301, energizing K301. K301 then energizes the Tone Modulator M301, causing M301 to rotate. As M301 rotates, it alternately actuates cam-operated contacts S304 and S305; when S304 is open, S305 is closed, and vice versa. S304 and S305 control power to K201 and K202 respectively, in the Solenoid Assembly. As a result of the alternate opening and closing of S304 and S305, the solenoid operated slide valves alternately open and close the two ports in the chopper stator. As the valves open and close the ports, they allow air from each row of chopper ports to alternately enter the throat of the horn. This causes the siren to produce an alternating high-low tone.

At the end of approximately four seconds, the chopper motor deenergizes and the chopper begins to coast to a stop, decreasing the pitch of the siren signal. Simultaneously, the timer deenergizes K301, M301 and both of the solenoid-operated slide valves.

SECTION V
SERVICE AND MAINTENANCE

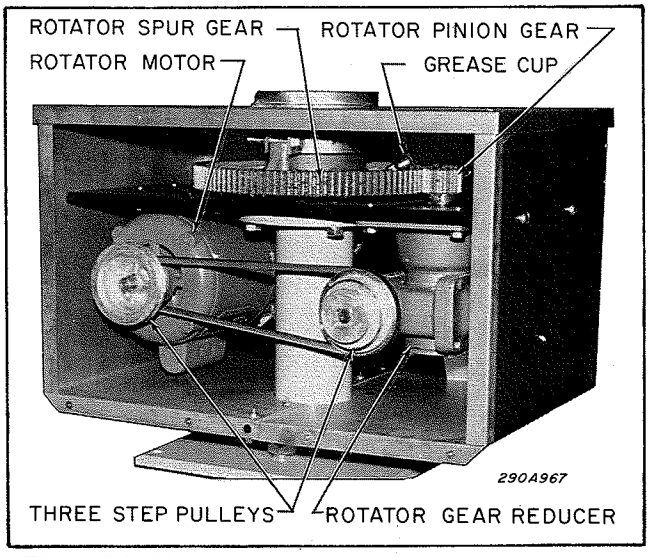


Figure 5-1. Model 1000 Rotator Assembly Interior View.

5-1. GENERAL.

The Models 1000 and 1003 Thunderbolt Sirens are designed to require a minimum of maintenance. Experience has indicated that the failure rate of Thunderbolt Sirens is extremely low. However, if a siren failure does occur, Federal will provide technical assistance with problems that cannot be handled locally. If assistance is desired, contact:

Service Department
Federal Signal Corporation
2645 Federal Signal Drive
Park Forest South, IL 60466

WARNING

The output sound level of a Model 1000 or 1003 Thunderbolt is capable of causing permanent hearing damage, especially at short distances. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

5-2. ADJUSTMENTS.

A. Horn Rotation Speed and Rotator Belt Replacement.

Unless otherwise specified by the customer, all sirens are shipped with the horn rotation speed set to 2 RPM. However, the rotating mechanism can also be set to rotate the siren horn at speeds of approximately 4 and 8 RPM.

To change the rotation speed of the horn, proceed as follows:

1. Turn off the power to the siren at the disconnect switch.
2. Remove the large panel opposite the conduit fitting on the rotator housing.
3. See figure 5-1. Pull the top part of the rotator belt toward you using the right thumb while rotating the motor pulley clockwise with the left hand. Use caution to avoid pinching your thumb between the belt and the rotator pulley. If necessary, repeat this step until the belt can be removed or is in the desired pulley grooves.

B. Siren Tone Frequency.

To change the siren tone frequency:

1. Turn off the power to the Control Cabinet at the disconnect switch.
2. Move the chopper motor power lead connected to one of the numbered terminals on TB105 to one of the other terminals.

As indicated in figure 5-2 the larger the terminal number, the higher the pitch of the siren tone.

5-3. PREVENTIVE MAINTENANCE.

A. Lubrication.

1. Blower Assembly (figure 5-3)

To check the oil in the Blower, turn off the power to the siren, lift off the blower housing, and remove the oil level plug at the end of the blower. If oil does not drip from the opening, add a heavy duty oil, such as SAE10W40, through the oil fill plug until dripping begins. Do not continue to add oil after it begins to drip from the opening, because overlubrication may cause hard starting and oil leakage. Replace both plugs.

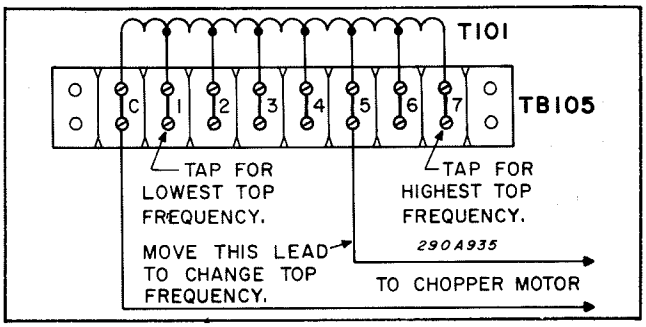


Figure 5-2. Siren Tone Frequency Adjustment.

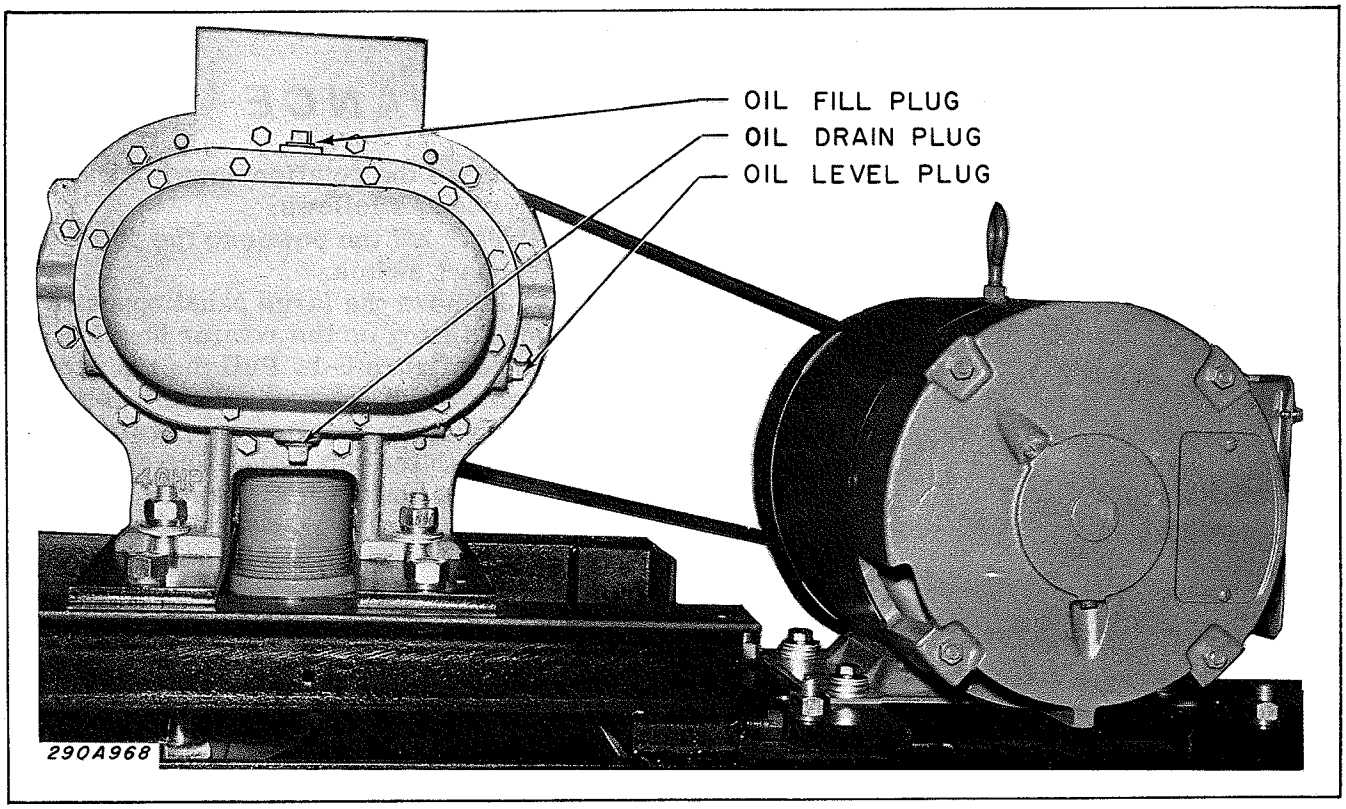


Figure 5-3. Blower Lubrication.

The bearings at the drive (pulley) end of the blower are packed with grease before the siren is shipped. Add or renew grease through the two grease fittings; one on each bearing at the drive end of the blower (see figure 5-4). The old grease is forced out of the vents as new grease is added.

To lubricate the relief valve, lift the weights from the valve. Clean all machined surfaces and cover them with a film of SAE 10W40 oil.

The blower motor bearings are sealed and prelubricated. Therefore this motor requires no additional lubrication.

2. Rotator and Chopper Assemblies

(a) Turn off the power to the siren. Remove the oil level plug from the rotator gear reducer housing (see figure 5-5). If oil does not drip from the oil level hole, remove the oil breather plug and add SAE 10W40 motor oil through the oil breather hole until oil begins to drip from the oil level hole. Replace both plugs.

Cover the Rotator Spur and Pinion Gears with a light film of grease such as Texaco Regal AFB2 to prevent oxidation.

(b) Grease is dispensed to the chopper tube bearings by two grease cups. As shown in figure 5-6, one of the grease cups is located on the rotator spur gear in the rotator housing. The other grease cup is located just below the chopper housing.

To apply grease to the chopper tube bearings, rotate each grease cup approximately two turns clockwise. When the grease cups cannot be rotated any further, refill them with a high quality grease such as Texaco Regal AFB2.

Both the rotator motor and chopper motor have sealed and prelubricated bearings. Therefore, neither of these motors require any additional lubrication.

B. Annual Inspection and Maintenance.

In order to minimize the possibility of siren failure, inspection and maintenance at regular intervals is desirable. Therefore the following schedule is suggested as a guideline. However, it may be necessary to vary the schedule if the siren is used frequently or if it is used in an extreme climate.

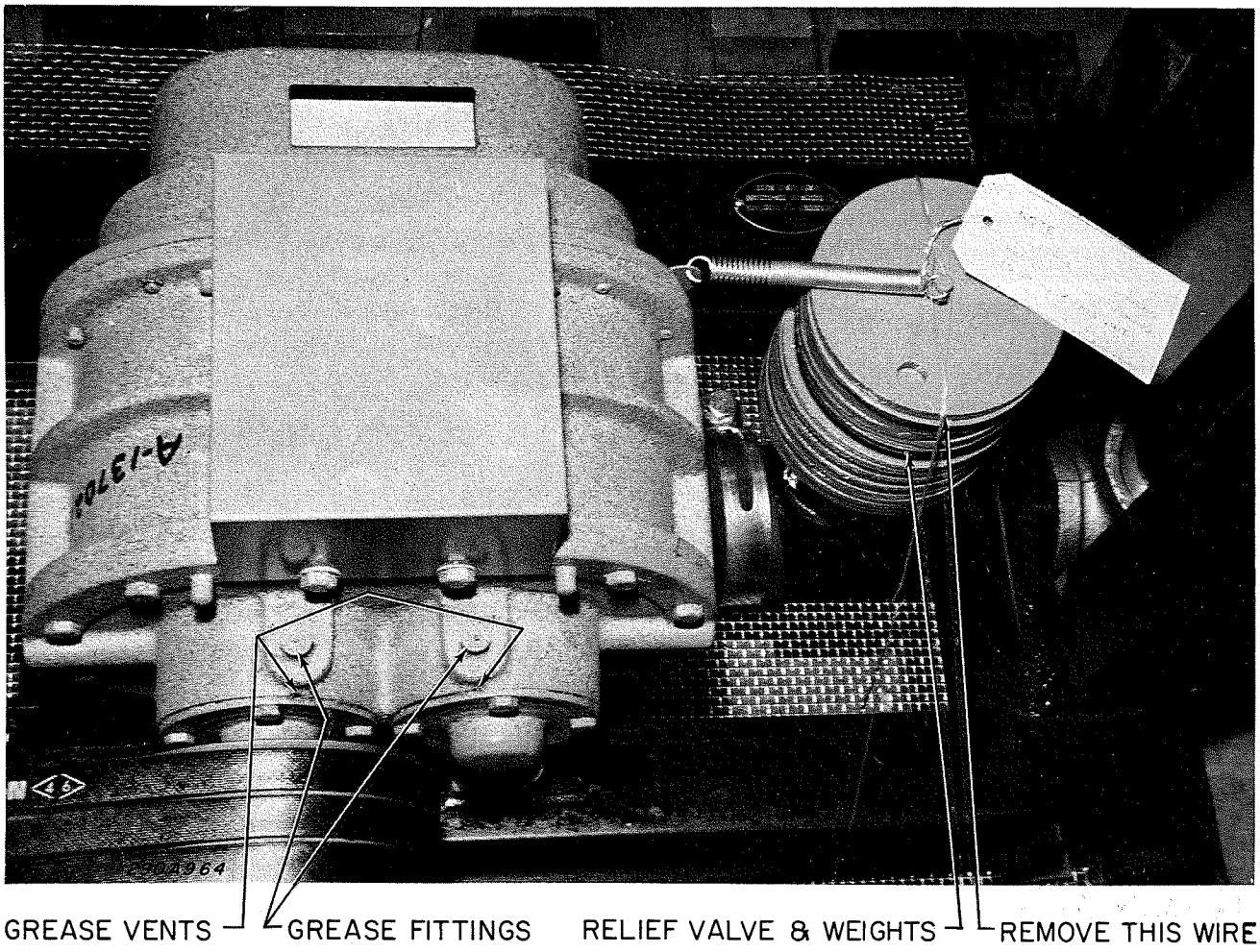


Figure 5-4. Blower Assembly Lubrication.

1. Remove the weights from the blower relief valve. Clean all machined surfaces and cover them with a film of SAE 10W40 motor oil. See figure 5-4 to locate the blower relief valve.

2. Examine the blower drive belts for excessive wear. Depress each of the belts individually with one finger. The belts should not depress more than about 1/2 inch (13mm). Replace all belts if any belt is excessively worn or frayed. Tighten the belts if they depress more than 1/2 inch. Refer to paragraph 5-4B.1 for the belt tightening procedure.

3. Examine the rotator drive belt for excessive wear. Depress the belt with one finger. The belt should not depress more than approximately 1/2" (13mm). Replace the belt if it excessively worn or adjust if it depresses more than 1/2 inch. Paragraph 5-2A contains belt replacement instructions.

4. Change the oil and grease in the blower. Refer to paragraph 5-3A.1.

5. Change the oil in the rotator gear reducer. Refer to paragraph 5-3A.2.

6. Clean the rotator spur and pinion gears. Apply a light film of fresh grease, such as Texaco Regal AFB2, to the gears.

7. Lubricate the chopper tube bearings by rotating the grease cups approximately two turns. Refer to paragraph 5-3A.2.(b) for details.

It is also recommended that all painted surfaces be inspected and repainted as necessary.

It is recommended that the Thunderbolt 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.

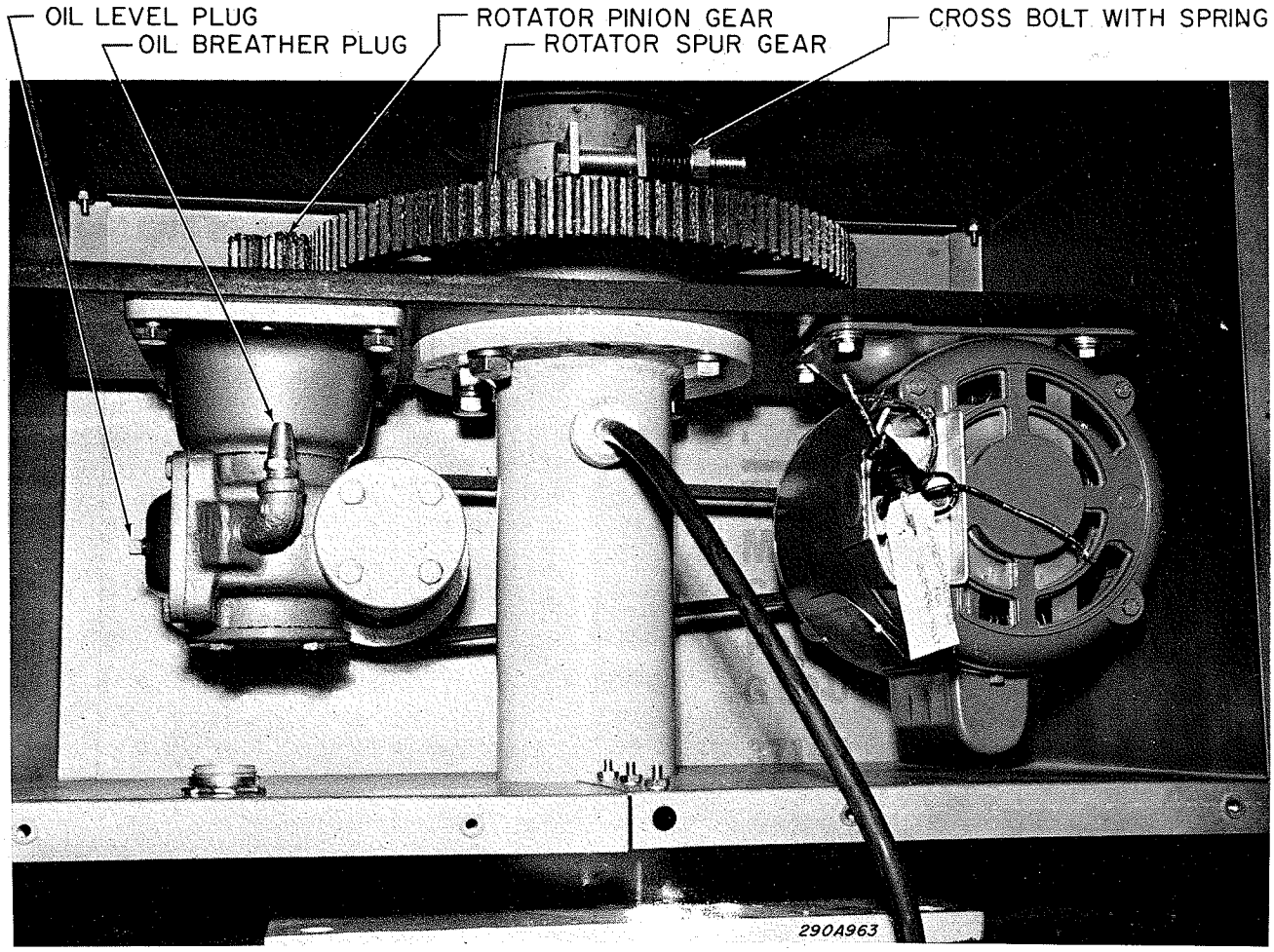


Figure 5-5. Rotator Lubrication.

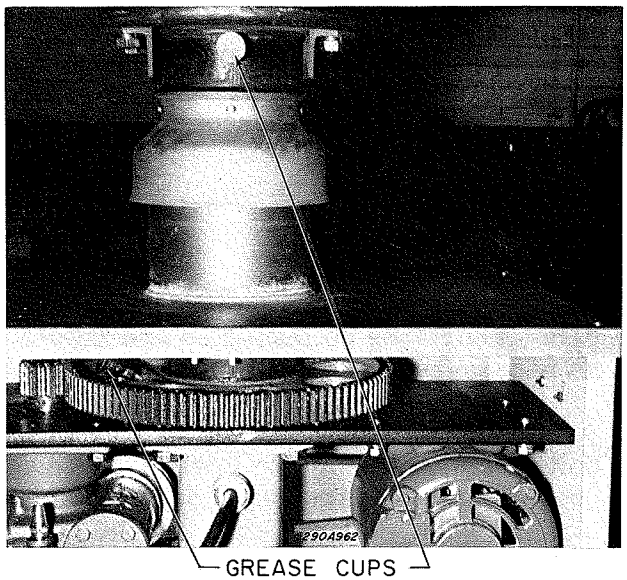


Figure 5-6. Chopper Tube Grease Cup Location.

5-4. CORRECTIVE MAINTENANCE.

A. Troubleshooting.

The Troubleshooting Chart (Chart 5-1) is provided to assist repair personnel when troubleshooting a siren malfunction. The following diagrams may also be helpful to repair personnel when control devices require repair.

Fig.	Diagram
5-15	Model RCM1A Control Cabinet Wiring Diagram
5-16	Model RCM1B Control Cabinet Wiring Diagram
5-17	Model RCM3 Auxiliary Control Panel Wiring Diagram
5-18	Model AR Timer Wiring Diagram
5-19	Model AF Timer Wiring Diagram
5-20	Thunderbolt Siren Parts Index
5-21	Model RCM1 Control Panel Parts Index
5-22	Model RCM3 Auxiliary Control Panel Parts Index
5-23	Model AF and AR Timer Parts Index

Chart 5-1. Troubleshooting Chart.

TROUBLE	POSSIBLE CAUSE	REMEDY
Horn Does not rotate	ROTATOR switch in Control Cabinet in center-OFF position.	Set ROTATOR switch to TEST. Observe horn rotation. If horn rotates set switch to AUTO-MATIC.
	Rotator motor starter overload relay tripped.	Reset relay (Refer to paragraph 5-4.D).
	Open circuit between Control Cabinet and motor.	Check wiring for continuity
	Rotator motor starter control winding defective.	Check coil and replace if neces-sary.
	Rotator motor defective.	Check motor and repair or re-place, if necessary.
	Reducer gear mechanism jammed.	Turn pulleys by hand. Locate source of binding if pulleys turn hard.
Horn rotates erratically	Chopper tube bearings binding.	Lubricate bearings (Refer to paragraph 5-3A.2(b).
	Grease on drive bands.	Remove bands, clean and read-just.
	Insufficient drive band tension.	Tighten drive band cross bolt. Refer to paragraph 5-4.E.
Blower does not operate	Blower motor starter overload relay tripped.	Reset blower overload relay (see paragraph 5-4.D).
	Open circuit between Control Cabinet and motor.	Check wiring for continuity.
	Blower motor defective.	Check motor and repair or re-place if necessary.
	Blower motor starter control winding defective.	Check coil and replace, if nec-essary.
	Blower jammed.	Turn blower pulley by hand. Blower should turn easily. Look for cause of jamming if not free.
Blower motor over-loaded	Voltage at siren is low.	Install shorter length or heavier gauge wires to siren. Source of power may not be adequate.
	Lubricants in blower gear housing too heavy for cold weather.	Drain and refil with proper lubricants (refer to paragraph 5-3A.1.)

Chart 5-1 (Cont'd)

TROUBLE	POSSIBLE CAUSE	REMEDY
Chopper motor does not operate	Chopper motor starter overload relay tripped	Reset relay (refer to paragraph 5-4.D).
	Open circuit between Control Cabinet and motor	Check wiring for continuity.
	Chopper rotor jammed	Check rotor for free rotation. Remove foreign material.
	Collector ring dirty or collector ring brushes excessively worn	Clean or replace brushes as required (See paragraph 5-4.I).
	Chopper motor defective	Check motor and repair or replace, if necessary.
Chopper motor operates but blower and rotator do not start when a siren signal is initiated	Time delay coil open.	Check coil for continuity. Replace, if necessary. Check circuit for continuity Repair, if necessary.
	Time delay relay inoperative	Check relay for proper operation. Replace, if necessary
	Faulty circuit between time delay relay and motor starters	Check circuits for continuity. Repair, if necessary.
No two-tone modulation of "Fire" signal (Model 1003 only)	Tone modulator relay K301 or tone modulator timer, M301, faulty	Check K301 and M301 for proper operation, repair or replace, as required.
	Open circuit between Auxiliary Control Panel and solenoid - operated slide valves	Check circuit for continuity. Repair, if necessary.
	Solenoid-operated slide valve(s) inoperative	Check valves for possible mechanical jamming.
		Solenoid(s) faulty. Check solenoids and replace, if necessary. Refer to paragraph 5-4.K.
	Rotator Assembly slip ring brushes excessively worn	Replace brushes.
	Solenoid return springs dislodged or broken	Replace springs.

B. Belt Changing and Tightening.

1. Blower Belts

NOTE

The blower motor drives the blower by means of a matched set of three belts. If the belts are not matched, the blower may not operate properly. Therefore, whenever it is necessary to replace a belt, all three belts should be changed.

(a) Turn off power to the siren at the disconnect switch.

(b) Remove the blower housing from the Blower Assembly.

(c) Turn both adjusting bolts clockwise until the blower motor can slide approximately two inches toward the blower (see figure 5-7).

(d) Loosen the four motor mounting bolts (see figure 5-7).

(e) Slide the blower motor toward the blower by pressing firmly on the belts.

(f) Replace all three belts.

(g) Slide the blower motor away from the blower. Use a pry bar, if necessary.

(h) Tighten the motor mounting bolts only until the bolts are snug.

(i) Using a yardstick or similar straight edge, align the blower motor sheave with the blower sheave.

(j) Turn both adjusting bolts counterclockwise until the belts do not depress more than 1/2" when pressure is applied with one finger. Do not overtighten the bolts or the belts may break or wear excessively.

(k) Tighten all mounting bolts.

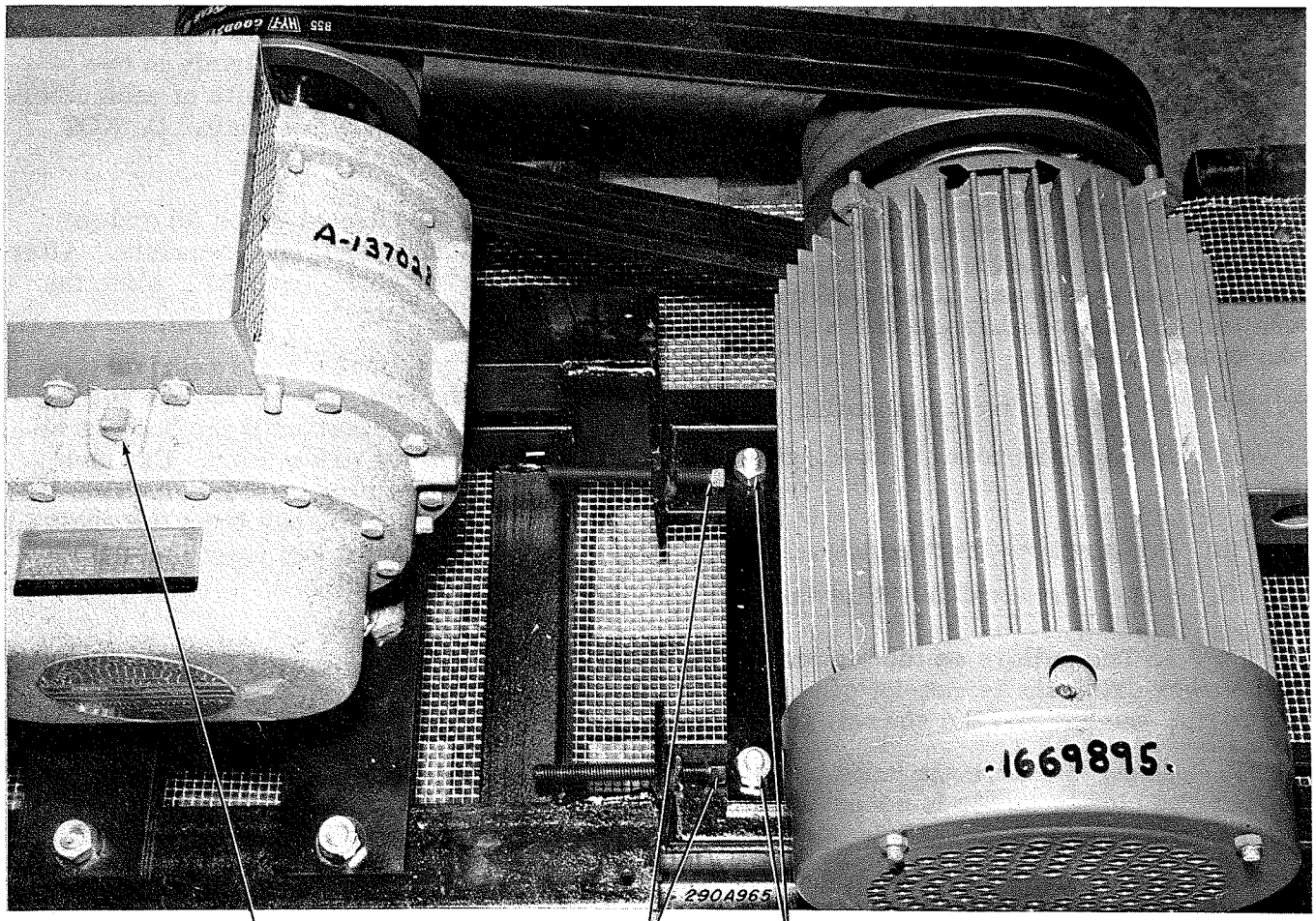


Figure 5-7. Blower Belt Adjustment.

(l) Replace the blower housing on the blower assembly.

2. Rotator Belt

NOTE

To remove the rotator belt follow the instructions in paragraph 5-2A. To replace the belt, follow the instructions in reverse.

To tighten the rotator belt, proceed as follows:

(a) Turn off the power to the siren at the disconnect switch.

(b) Remove both large panels from the rotator housing.

(c) Remove the rotator housing side panel next to the rotator motor.

(d) Loosen the rotator motor mounting bolts.

(e) Slide the motor away from the gear reducer, tightening the belt. Tighten the belt so that the belt depresses approximately 1/2" when pressure is applied to the belt with one finger. In order to develop proper belt tension, it will probably be necessary to use a pry bar to slide the motor away from the gear reducer. If a pry bar is used, use caution to avoid damage to the motor and the rotator parts.

(f) Tighten the motor mounting bolts

(g) Replace the rotator housing side panel.

(h) Replace both large panels.

C. Pulley Removal and Reinstallation.

1. The pulleys on the blower motor and blower drive shafts consist of two major parts; the hub and the sheave.

(a) Remove the belts from the blower and blower motor in accordance with the instructions in paragraph 5-4B.

(b) Remove the three bolts from the clearance (untapped) holes in the sheave. Move the bolts to the tapped holes in the sheave. (See figure 5-8.)

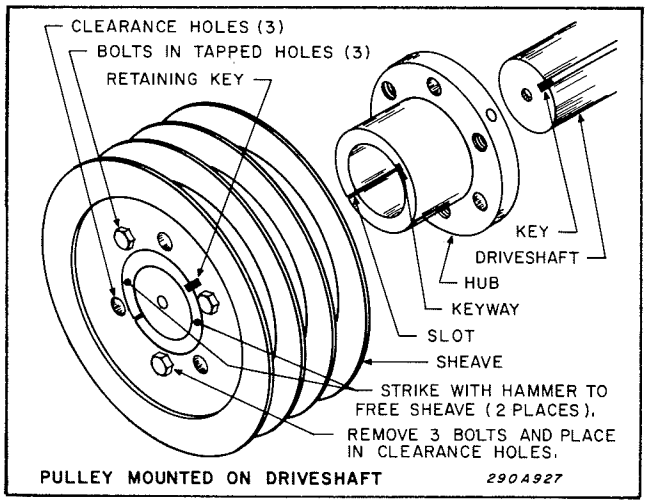


Figure 5-8. Pulley Removal and Reinstallation.

(c) Tighten all three bolts with your fingers until the bolts make contact with the hub.

(d) Use a wrench to tighten all three bolts evenly, approximately one-half turn.

(e) As indicated in figure 5-8 use a hammer and large pin punch or similar tool to strike the hub firmly in two places diametrically opposite of each other. Do NOT strike the drive shaft. Do NOT strike the hub near the slot.

(f) Repeat steps (d) and (e) until the sheave and hub separate. After the sheave and hub separate, slide the sheave off the hub.

(g) Insert a screwdriver into the slot in the hub. Gently tap the screwdriver with a hammer until the hub can be removed from the drive shaft. Use caution to avoid cracking or otherwise damaging the hub. Slide the hub from the shaft and lift the retaining key from the slot in the motor drive shaft.

2. To install the pulley on the replacement blower motor or blower, proceed as follows:

(a) Install the retaining key in the slot on the new drive shaft.

(b) Insert a screwdriver into the slot in the hub. Gently tap the screwdriver with a hammer until the hub will slide on the new drive shaft. Use caution to avoid damaging the hub. Press the hub on the shaft as far as it will go.

(c) Remove the bolts from the threaded holes in the sheave and insert them into the clearance holes. Screw these three bolts into the threaded holes in the hub and tighten them evenly one turn at a time.

(d) Replace the belts on the pulleys in accordance with steps (f) through (l) in paragraph 5-4B.1.

D. Manual Resetting of Overload Relays. (See figure 5-9)

Turn off the power at the disconnect switch, and firmly press the appropriate reset button until it "clicks". If the reset button does not reset on the first attempt, allow the overload relay to cool for at least one minute before attempting to reset the relay again.

NOTE

Some single phase blower motors have a built-in circuit breaker. Therefore, if resetting the overload relay on the blower motor starter, does not allow the blower motor to run, it may be necessary to reset the breaker on the motor. The circuit breaker is located in the motor conduit box.

E. Drive Band Adjustment.

1. When the drive band requires adjustment, tightening is almost always necessary. To determine if a drive band adjustment is required:

(a) Turn off the power to the siren at the disconnect switch.

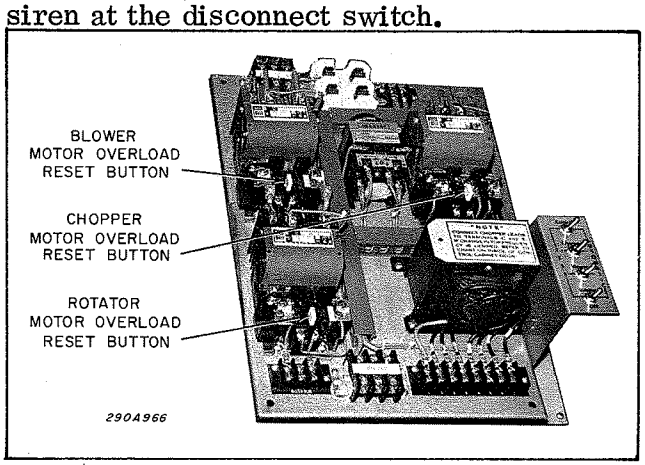


Figure 5-9. Overload Reset Button Location.

(b) Attach a spring scale having a capacity of at least 50 pounds (22kg.) to the Horn Support Bracket, as shown in figure 5-10.

(c) Pull on the scale until the horn begins to rotate. Continue to rotate the horn by pulling on the scale while reading the scale. The scale should indicate between 35 and 40 pounds (16 and 18 kg.) It may require more than 40 pounds of force to start the horn moving. However, after the horn is moving, the scale indication should decrease to some force within the specified range. If the scale does not indicate between 35 and 40 pounds (16 and 18 kg.), the drive band requires adjustment.

2. To adjust the drive band:

(a) Perform steps (a), (b), and (c) in paragraph 5-4E.1 (above) to determine if a drive band adjustment is necessary.

(b) Ensure that power to the siren is turned off.

(c) Remove the large panel opposite the conduit fitting on the rotator housing.

(d) If necessary, manually rotate the gear reducer pulley until the cross bolt having the spring, is accessible (see figure 5-5).

(e) Tighten the cross bolt having the spring one or two turns. DO NOT tighten or loosen the cross bolt without the spring. Attach the scale to the horn support bracket and pull on the scale to rotate the horn. If the scale does not indicate between 35 and 40 pounds (16 and 18 kg), repeat this step until the scale indicates the proper force.

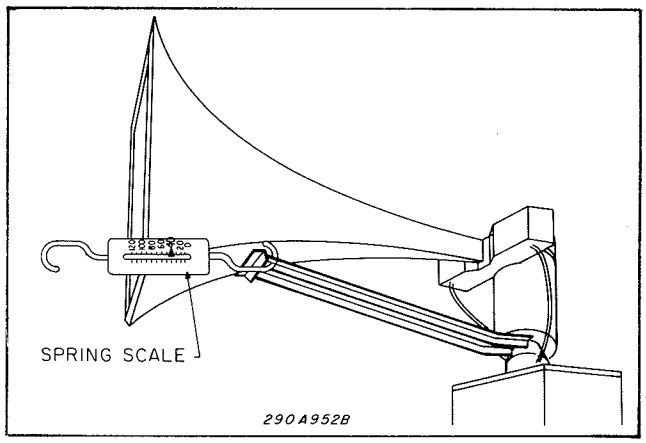


Figure 5-10. Attachment of Spring Scale to Horn.

CAUTION

If the spring cross bolt is tightened so that more than 40 pounds of pull is necessary to maintain manual horn rotation, high winds may cause damage to the rotator drive mechanism.

(f) Replace the large panel on the rotator housing.

F. Chopper Disassembly (Refer to Figure 5-20 for parts location.)

1. Turn off the power to the siren at the disconnect switch.

2. Remove the four bolts that hold the horn to the chopper stator or Solenoid Assembly (Model 1003 only). However, allow the horn to remain supported by the horn support bracket.

Model 1003 only:

See Figure 5-14. Scrape the filler material from the mounting holes in Solenoid Assembly and remove the mounting bolts.

NOTE: After remounting the Solenoid Assembly on the chopper stator, refill the mounting holes with a high quality "knife grade" putty.

3. Remove the four screws from the rim of the chopper stator. Do not remove the taper pins at this time.

4. Lift the entire chopper mechanism from the chopper housing. DO NOT separate the chopper stator from the motor housing at this time.

5. Remove the two motor brushes from the brush holders.

6. Knock out the taper pins from the motor housing side.

7. Separate the chopper stator from the motor housing. It may be necessary to use two screwdrivers to pry the stator and housing apart. Lift the chopper stator from the motor housing. The chopper rotor and armature are attached to the stator.

G. Chopper Armature Replacement.

1. Disassemble the chopper, following the instructions in paragraph 5-4F.

2. Remove the four bolts holding the chopper rotor and armature to the stator. Lift out the rotor and armature.

3. Remove the lock nut and lockwasher from the armature.

4. Use a bearing puller to pull both roller bearings from the armature shaft.

5. Use a hydraulic press to separate the armature from the chopper rotor.

6. When installing a new armature it may be necessary to change the electrical connections of the field. Therefore, refer to the instructions included with the replacement armature for the correct field connections.

7. Install the replacement armature following steps 1 through 5 in reverse.

H. Chopper Field Replacement (See figure 5-20 for parts location).

1. Disassemble the chopper following the instructions in paragraph 5-4F.

2. Remove the field retaining ring from the motor housing.

3. Disconnect the four wires connecting the field to the brush holders. Do NOT discard the brass rings on the collector ring brush holders. Unsolder the field wires from the rings and set the rings aside.

4. Arrange two spacers consisting of 4" x 4" (102mm x 102mm) lumber or similar material, approximately 5" (127mm) apart on a solid work surface as shown in figure 5-11.

5. Sharply rap the motor housing against the spacers several times until the field drops out of the motor housing. The motor housing is an aluminum die casting. As a result, it can be broken or damaged. Therefore, use caution to ensure that the motor housing strikes the spacers squarely as indicated in figure 5-11.

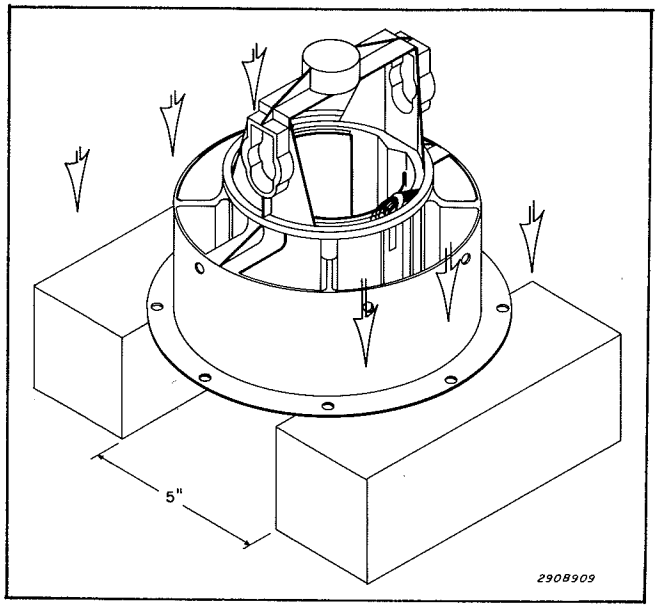


Figure 5-11. Chopper Field Removal.

NOTE

It is not necessary to follow the procedure described in steps 6 through 9 if a hydraulic press is available to press the replacement field into the motor housing.

6. Fabricate two 8" (203mm.) guide pins from 3/16" (5mm.) metal rod. Taper these pins as indicated in figure 5-12.

7. Insert the tapered end of the pins into the threaded holes in the field holder ring as indicated in figure 5-12.

8. Set the new field on the motor housing with the guide pins passing through the two mounting holes in the body of the field as shown in figure 5-12. Be sure that the four wires are in the position shown in figure 5-12.

9. Set a length of 3/8" (9.5mm.) steel bar stock approximately 5" (127mm) long, or similar object, on the field as illustrated in figure 5-12. Drive the field into the motor housing by firmly and squarely tapping the bar with a hammer. See figure 5-12. Use caution to avoid damaging the field. Also use caution to avoid cutting or otherwise damaging the wires that are connected to the field.

10. Connect the two wires having rings to the motor brush holders, one wire to each brush holder.

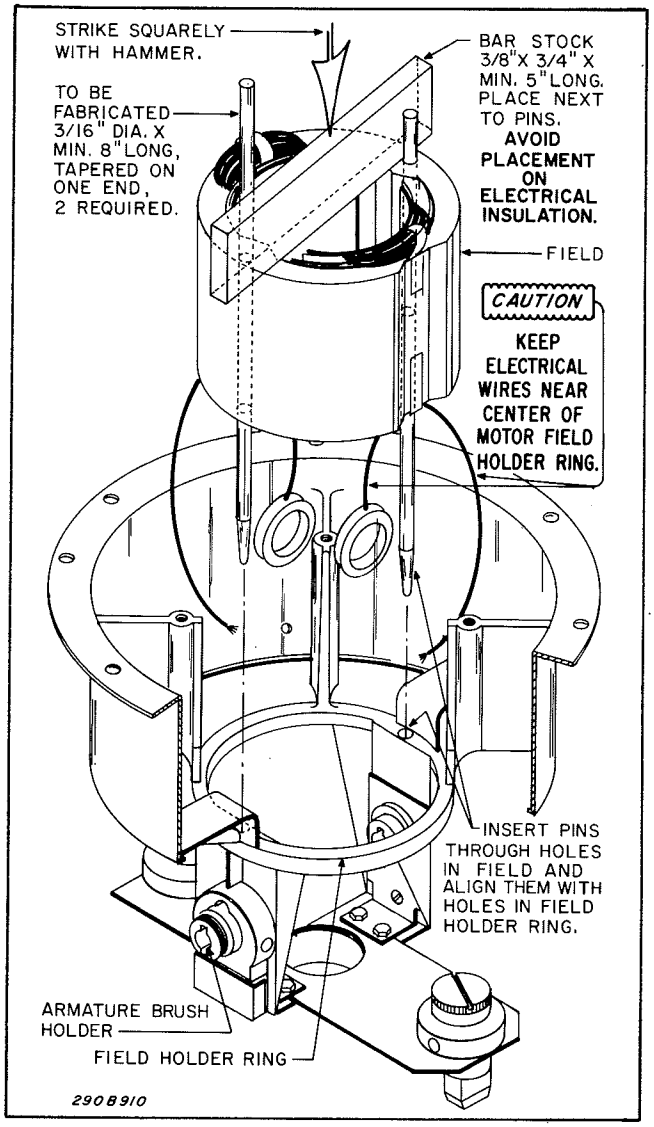


Figure 5-12. Chopper Field Replacement.

11. Solder the two wires without rings to the rings that were removed from the collector ring brush holders in step 3 and replace the rings on the collector ring brush holders.

12. Reinstall the field retaining ring.

13. Insure that the O-Ring gasket is installed between the chopper stator and motor housing and reassemble the chopper.

I. Collector Ring Brush Replacement.

1. Use a file or sandpaper to flatten the concave surface and bevel the edges of the replacement brushes as shown in figure 5-13A.

2. Remove the worn collector ring brush from the brush holder in the brush holder bar.

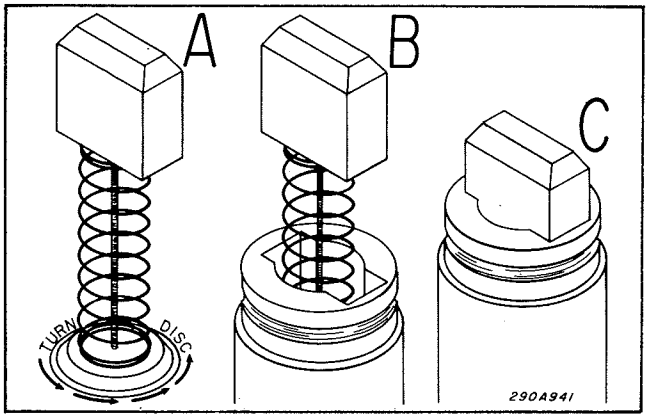


Figure 5-13. Slip Ring Brush Replacement.

3. Insert the replacement brush into the brush holder. If the brush protrudes through the brush holder so that the installation resembles figure 5-13B, the wire length needs to be shortened.

CAUTION

The wire connected to the brush may break if it is twisted excessively. Therefore, do not turn the metal disc to shorten the wire more than absolutely necessary to obtain the proper length.

4. To shorten the wire length remove the brush from the brush holder and turn the metal disc, on the end of the spring, 2 or 3 turns counterclockwise as shown in figure 5-13A. Repeat steps 3 and 4 until the installation looks like figure 5-13C.

J. Armature Brush Replacement.

1. See figure 5-12. Remove the insulated cap from the Armature Brush Holder and slide out the worn armature brush. Do not loosen or remove the brush holder.

2. Install the replacement brush and replace the cap. Ensure that the brush is properly seated before tightening the cap. Make sure that the cap seats properly. Do NOT tighten the cap excessively, or it may break.

K. Solenoid Replacement (Model 1003 only - see figure 5-14)

1. Turn off the power to the siren at the disconnect switch.

2. Remove the cover and gasket from the solenoid housing.

3. Remove the two return springs.

4. Slide out the return spring rod.

5. Disconnect the wiring from the solenoid.

6. Remove the four solenoid retaining nuts from the outside of the solenoid housing and remove the solenoid from the housing.

7. Separate the solenoid mounting bracket from the solenoid.

8. Disconnect the solenoid link and slide valve from the solenoid.

9. To install the replacement solenoid, perform the above procedure in reverse.

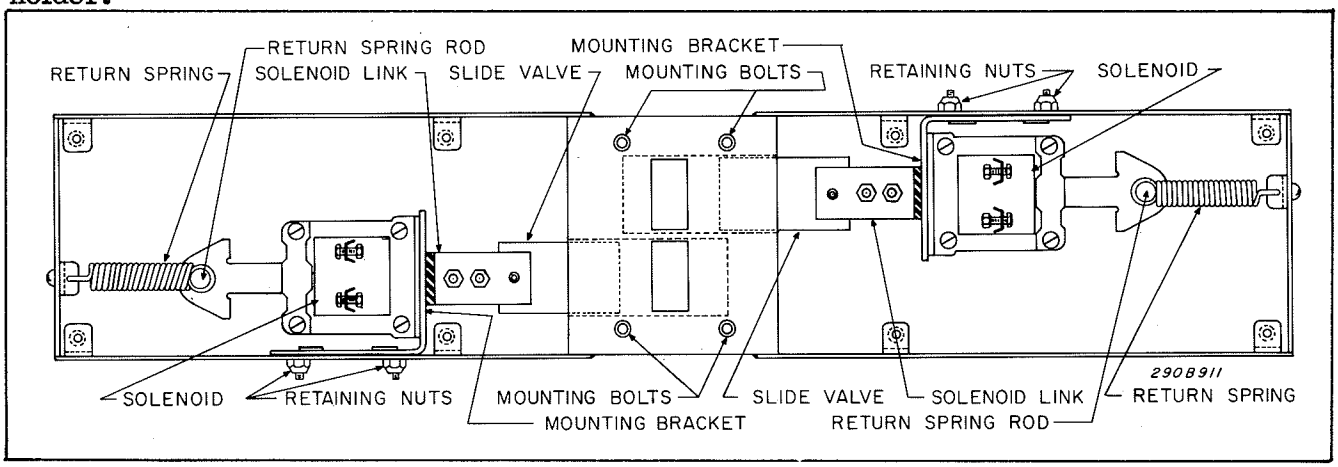


Figure 5-14. Slide Valve Assembly Interior View.

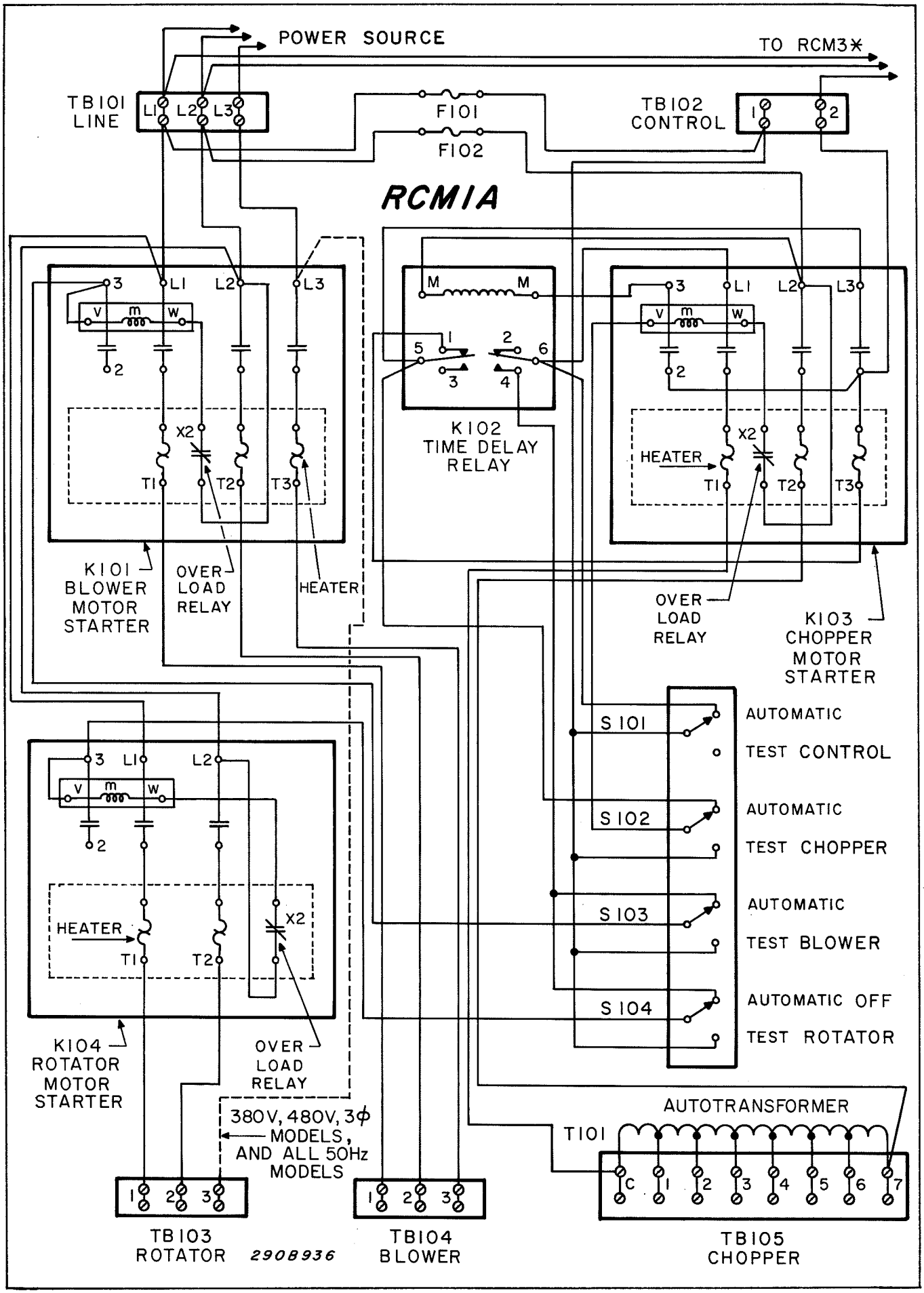


Figure 5-15. Model RCM1A Control Cabinet Wiring Diagram.

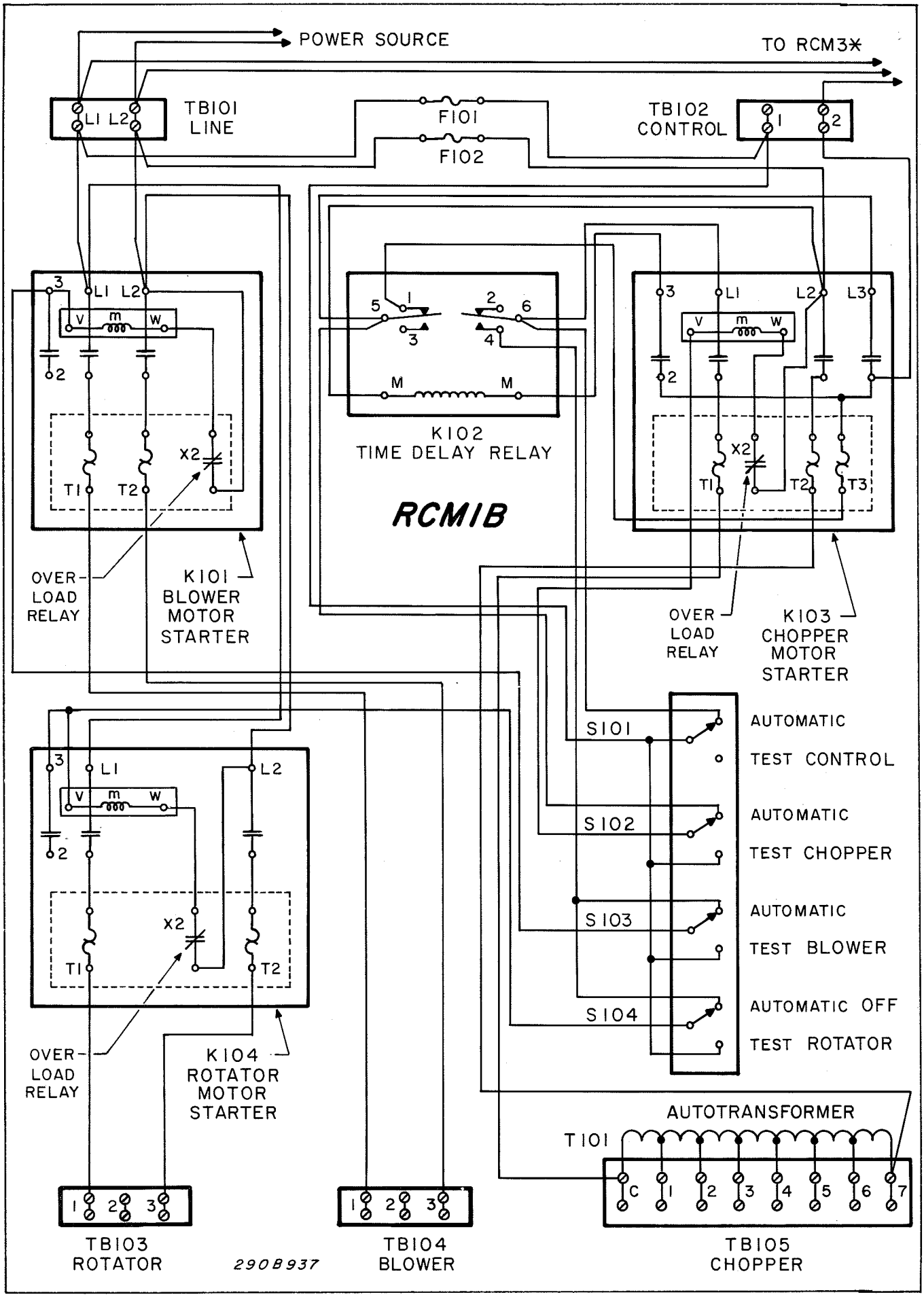


Figure 5-16. Model RCM1B Control Cabinet Wiring Diagram.

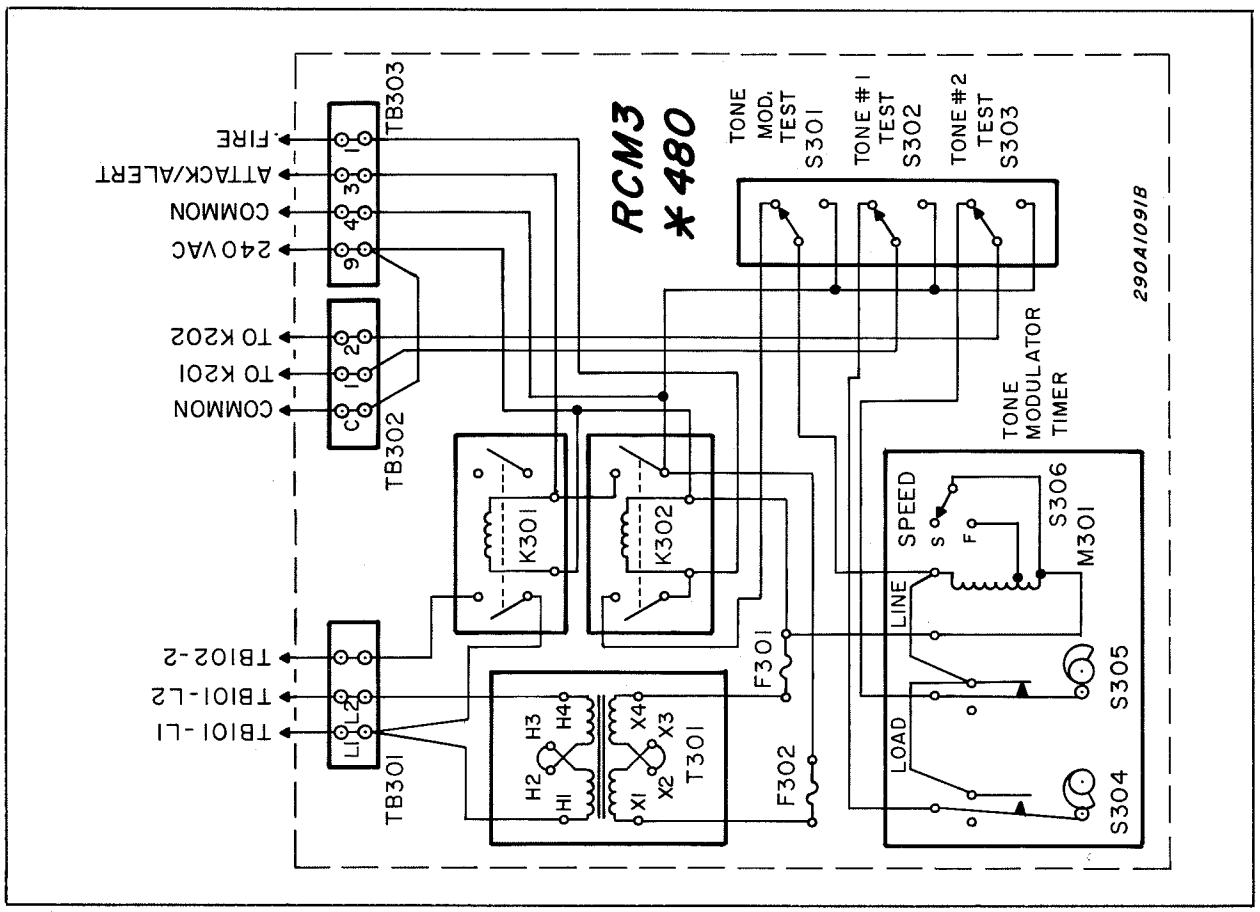


*Figure 5-17B. Model RCM3*480 Auxiliary Control Panel Wiring Diagram.*

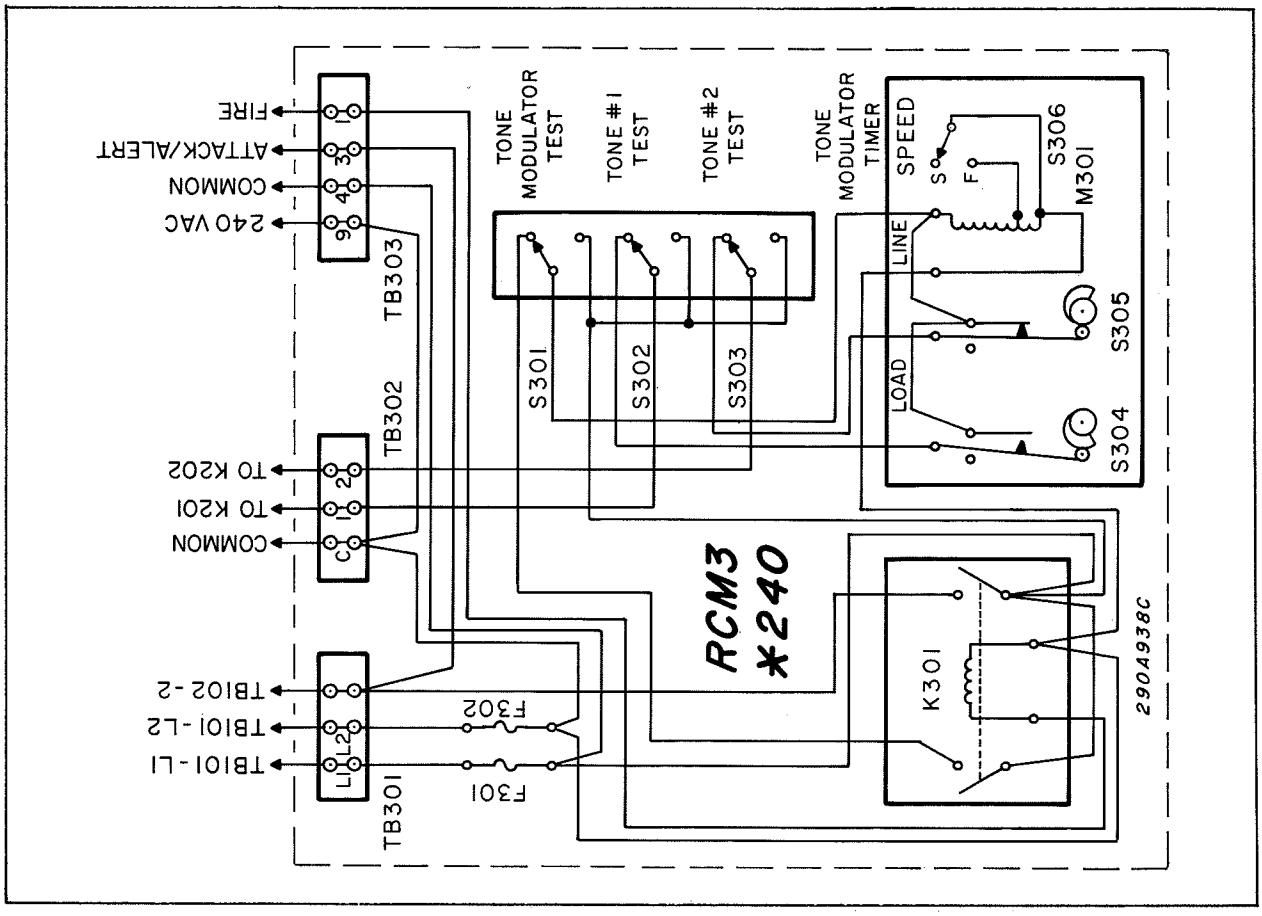


*Figure 5-17A. Model RCM3*240 Auxiliary Control Panel Wiring Diagram.*

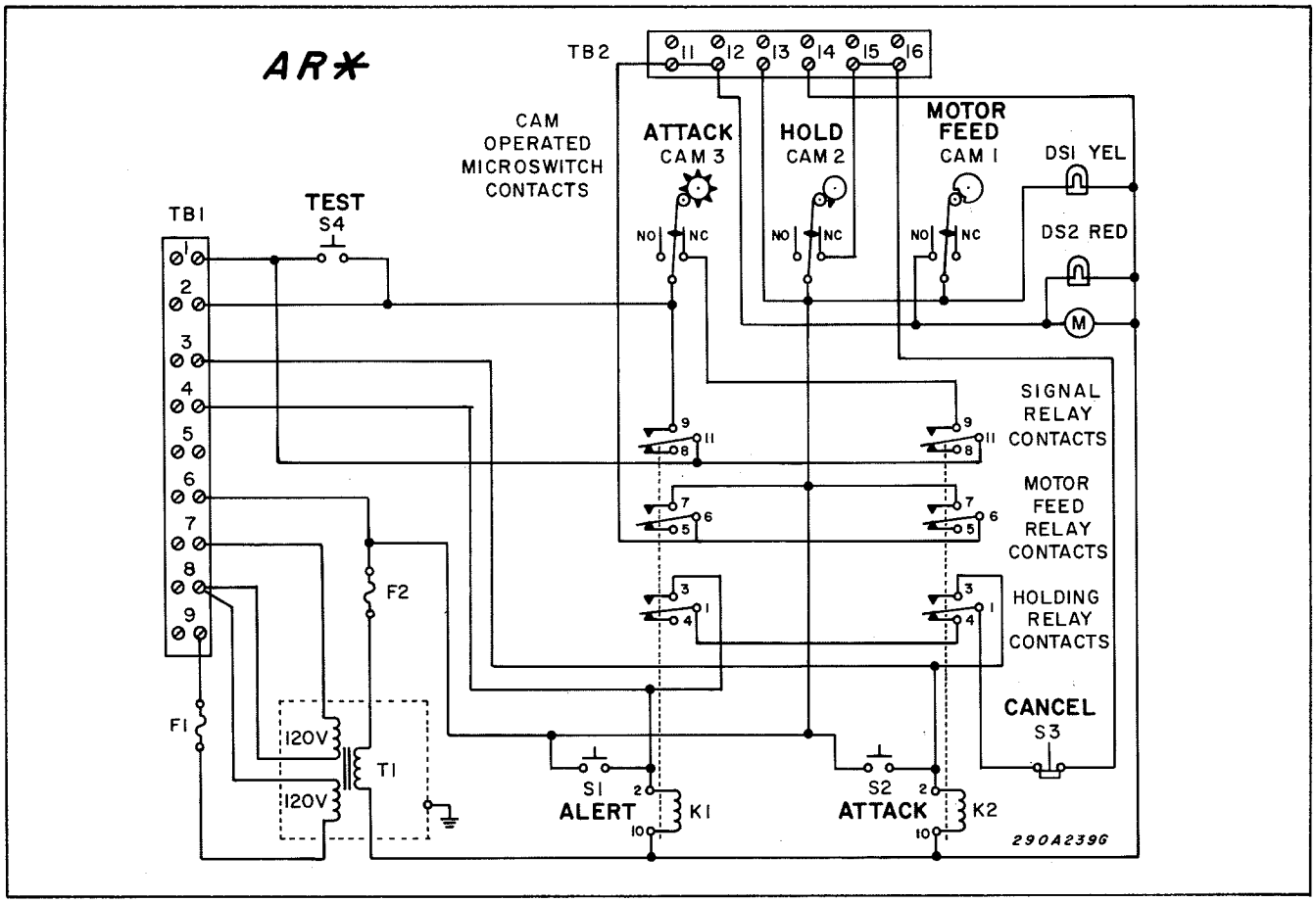


Figure 5-18. Model AR Timer Wiring Diagram.

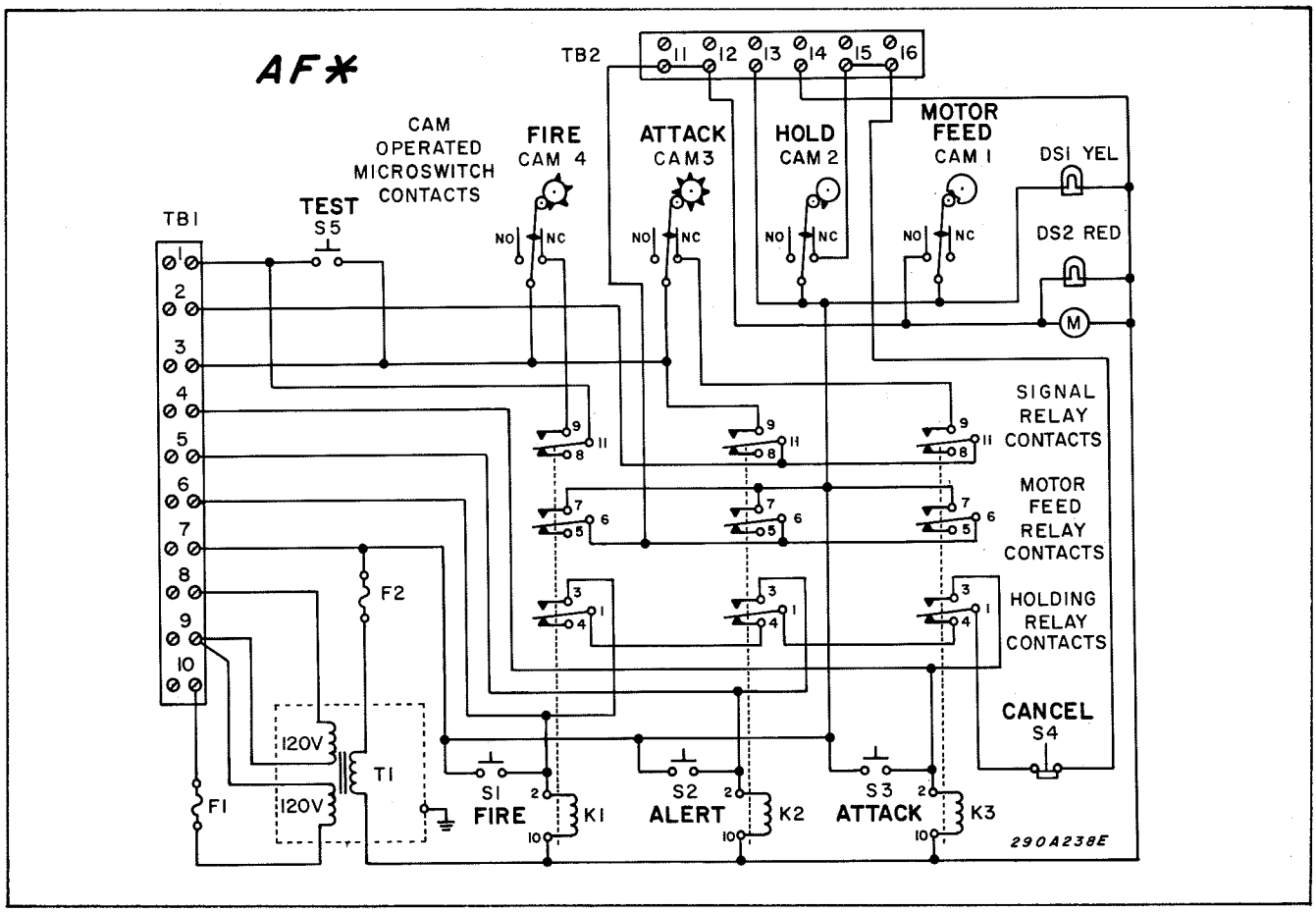


Figure 5-19. Model AF Timer Wiring Diagram.

SIGNAL DIVISION
Federal Signal Corporation

PARTS INDEX
MODELS 1000, & 1003
Series "A"
THUNDERBOLT

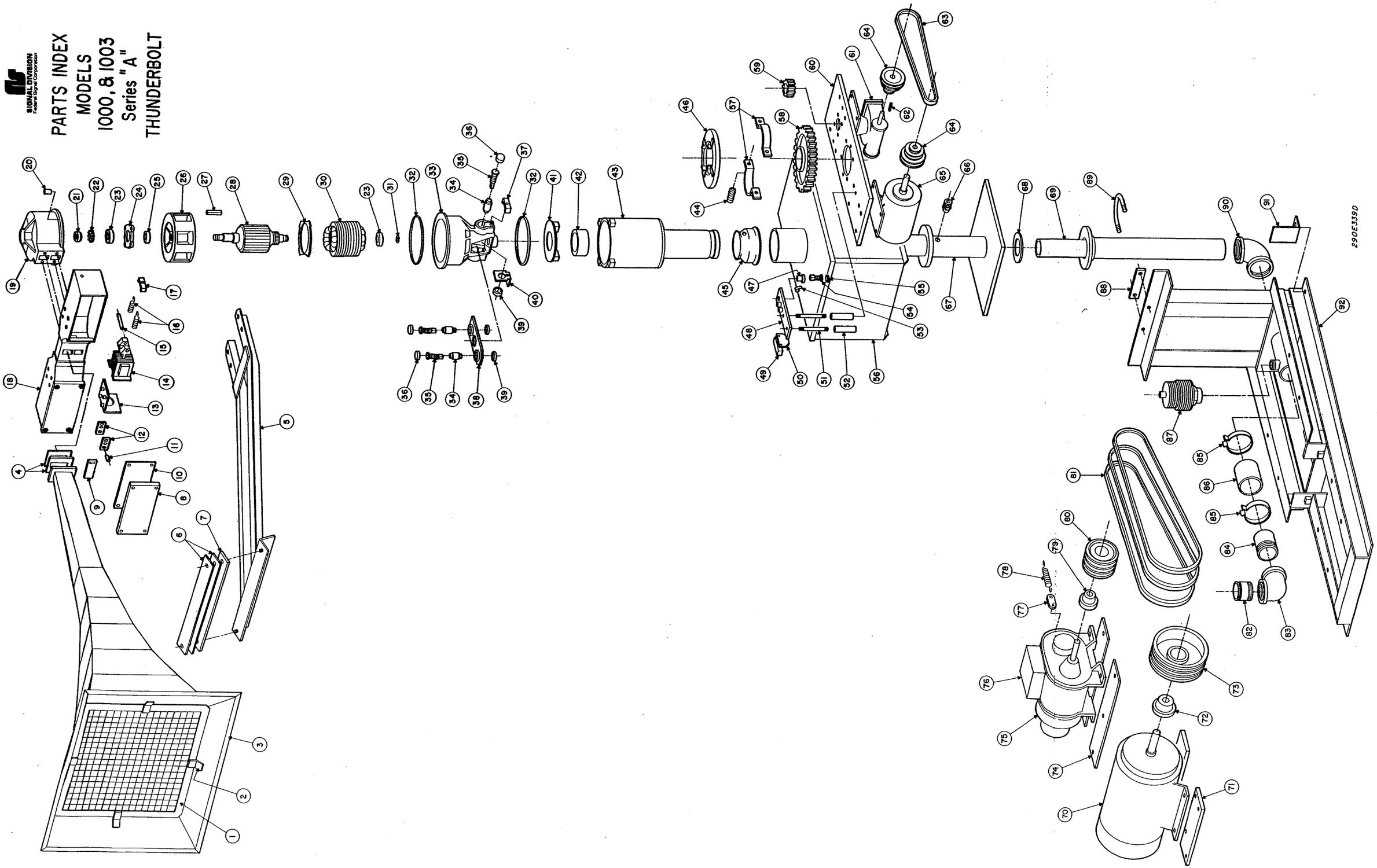


Figure 5-20. Thunderbolt Siren Parts Index.

Index No.	Description	Part No.	Qty.
1	Screen	8400A083	1
2	Bracket	8400A111	4
3	Horn Assy.	8400D022	1
4	Gasket	8400A054	2
5	Horn Support Assy.	8400B026	1
6*	Plate, Filler	8400B078-01	2
7*	Plate, Filler	8400B078-02	1
8*	Cover	8300A019	2
9*	Slide, Valve	8300A024	2
10*	Gasket	8300B018	2
11*	Pin, Roll	7091A011	2
12*	Link, Solenoid	8300A027	4
13*	Solenoid Mounting Bracket Assy.	8300A052	2
14*	Solenoid	8300A054	2
15*	Shaft	8300A053	2
16*	Spring	8300A049	4
17*	Bracket	8300A050	2
18*	Solenoid Housing Assy.	8300D003	1
19	Stator	8400D001	1
20	Pin, Taper	8400A229	5
21	Nut, Lock	LO1-15	1
22	Washer, Lock	LO1-16	1
23	Bearing, Ball	8239A045	2
24	Ring, Locking	LO1-07	1
25	Spacer, Rotor	LO1-08	1
26	Rotor (single tone)	LO1-21	1AR
	Rotor (dual tone)	8400D165	
27	Key	8247A057	1
28	Armature	8247B039G	1
29	Ring, Field Locking	LO1-20	1
30	Field	8247B040G	1
31	Ring, Spring Locking	LO1-11	1
32	Gasket,"O" Ring	8400A230	2
33	Housing, Motor	8400D115	1
34	Holder, Brush	8247A021	4
35	Brush and Spring	8247A020	4
36	Cap, Brush	8247A022	4
37	Clamp	8400A109	2
38	Brush Bracket Assy.	8400A019	1
39	Ring, Clamp	8283A117	4
40	Bracket, Reinforcing	8400A108	2
41	Collector, Ring Assy.	8400B056	1

*Indicates used on Model 1003 only.

Index No.	Description	Part No.	Qty.
42	Bearing, Sleeve	8400A017	1
43	Chopper Housing Assy. (Model 1000)	8400D020	1AR
	Chopper Housing Assy. (Model 1003)	8300D007	
44	Spring	8283A886	1
45	Seal, Rotator (Model 1000)	8400B041	1AR
	Seal, Rotator (Model 1003)	8300C011	
46*	Slip Ring Assy.	8300C012	1
47*	Holder, Brush	8442A025	3
48*	Bar, Brush Holder	8300B020	1
49*	Block, Terminal	8442A033	1
50*	Strip, Marker	8300A039	1
51*	Stud	8300A035	2
52*	Spacer	8300A031	2
53*	Terminal, Brush Holder	8442A027	3
54*	Brush	8442A028	3
55*	Cap, Brush Holder	8442A026	3
56	Housing, Rotator (Model 1000)	8400D044-01	1AR
	Housing, Rotator (Model 1003)	8300D005	
57	Drive Band Assy.	8400B055	2
58	Gear, Spur	8400C008	1
59	Pinion	8400A018	1
60	Plate, Motor Base	8400B031	1
61	Reducer, Gear	8400A068	1
62	Key (Gear Reducer)	8400A363A	1
63	Belt, V	8400A252	1
64	Pulley , V	8400A077-01	2
65	Motor, single phase	8283A852	1AR
	Motor, 3- phase	8283A853	
66	Connector	8400A234	1
67	Chopper Tube Assembly	8400D021	1
68	Gasket	8400A233	1
69	Standpipe Assembly	8400B076-01	1
70	Motor, single phase 7-1/2 H.P. (Models 1000B, BT, and 1003B)	8287B184	1AR
	Motor, 3-phase 10 H.P. (Models 1000A, AT, and 1003A	8400B286	
71	Adapter Plate	8400B287	2
72	Hub, 1-3/8 Bore (both A & B Models)	8400A256	1AR
	Hub, 1-1/8 Bore (old Model B ONLY)	8400A340	
73	Sheave (all present models)	8400B190	1AR
	Sheave (old B Models ONLY)	8400B219	
74	Plate , Adapter	8400C155	2
75	Blower	8400A194	1
76	Strainer , Blower Intake	8400C265	1
77	Clip, Spring	8300A038	1
78	Spring	8445A034	1

Index No.	Description	Part No.	Qty.
79	Hub, 7/8 Bore (all present models)	8400A213	1 AR
	Hub, 7/8 Bore (old B Modles ONLY)	8400A348A	
80	Sheave (all present models)	8400B191	1AR
	Sheave (old B Models ONLY)	8400B190	
81	Belt, V	8400A189	1 set
82	Nipple, 2-1/2" Pipe	8400A192	1
83	Elbow, Pipe Reducing	8400A193	1
84	Nipple, 3" Pipe	8400A047	1
85	Clamp, Hose	8400A195	2
86	Hose	8400A048	1
87	Valve, Relief	8400A217B	1
88	Shim	8400A073	AR
89	Bolt, U (includes nuts)	7003A005	1
90	Elbow, 3" Pipe	8400B057	1
91	Angle, Sheet Metal	8400B258	2
92	Blower Base Assembly	8400D036	1
Not Shown	Blower Assembly (3 phase)	8400D196	1 AR
	Blower Assembly (1 phase)	8400D196-01	
	Blower Housing	8400D040	1
	Grease Cup For Rotator	8400A231	2
	Projector Screen Assembly (includes items 1 and 2)	8400A239	1
	Chopper Assembly (includes items 19 - 40)		1 AR
	Model 1000, single tone	8400D071	
	Model 1000, dual tone	8400D071-01	
	Model 1003	8400D071-01	
	Rotator , Model 1000 (includes items 41-45, and 56-68)	8400D070-01	1AR
	Rotator, Model 1003	8300D002-01	
	Code Mechanism Assembly Model 1003 (includes items 8-18)	8300D001	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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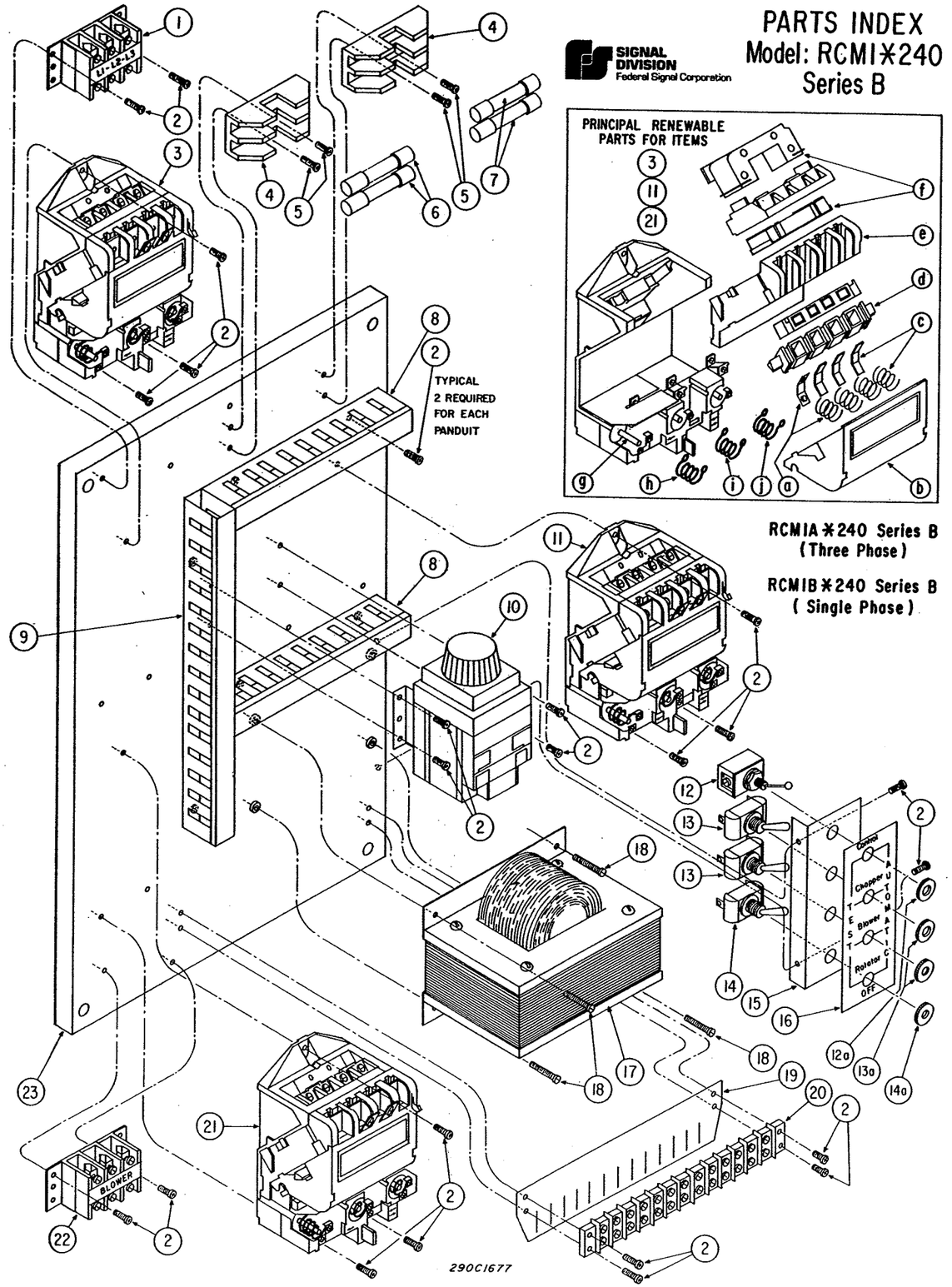

SIGNAL DIVISION
Federal Signal Corporation

PARTS INDEX
Model: RCM1*240 Series B

RCM1A*240 Series B
(Three Phase)

RCM1B*240 Series B
(Single Phase)

*Figure 5-21A. Model RCM1*240 Volt Control Cabinet Parts Index.*

RCM1A*240 Series B (three phase)
RCM1B*240 Series B (single phase)

PPL 0173
PARTS LIST

MOTOR CONTROL ASSEMBLY

JANUARY 1982

Item No.	Description	Part No.	Qty.
1	Terminal Block (stamped L1 - L2 - L3)	8283A885	1
2	10-32 x 5/8 Scr. , Thd. Frm. , Phl. Pan Hd. used to secure items 1, 3, 8, 9, 10, 11, 15, 20, 21, and 22	7011A102-10	29
3	Motor Starter, Blower, 240V	8217C188	1
3a	Contact & Spring, Interlock Pole	8217C180-12	1 AR
3b	Contact Board Cover	8217C180-14	1 AR
3c	Contact & Spring, Power Pole	8217C182-11	3 AR
3d	Cross Arm (less contacts)	8217C182-13	1 AR
3e	Contact Board	8217C180-15	1 AR
3f	Coil 60Hz, 208-220/440V	8217C180-17	1 AR
3g	Overload Relay, 3 Pole	8217C188-18	1 AR
3h	Heater, Overload Relay	8217C188-21	3 AR
3i	Heater, Overload Relay	8217C188-22	3 AR
3j	Heater, Overload Relay	8217C188-23	3 AR
4	Fuse Block, 2 Pole	8400A519	2
5	8-32 x 1/2 Scr. , Thd. Frm. , Phl. Hd. used to secure item 4	7011A062-08	4
6	Fuse, 5 Amp	8400A518-02	2
7	Fuse, 15 Amp	8400A518	2
8	Panduit, w/Cover, 0.75 x 1.5 x 7.5 Lg.	8400A511-01	2
9	Panduit, w/Cover, 0.75 x 1.5 x 12 Lg.	8400A511-03	1
10	Time Delay Relay	8287A098	1
11	Motor Starter, Chopper, 240V	8217C187	1
11a	Contact & Spring, Interlock Pole	8217C180-12	1 AR
11b	Contact Board Cover	8217C180-14	1 AR
11c	Contact & Spring, Power Pole	8217C183-11	3 AR
11d	Cross Arm (less contacts)	8217C180-13	1 AR
11e	Contact Board	8217C180-15	1 AR
11f	Coil, 60Hz, 208-220/440V	8217C180-17	1 AR
11g	Overload Relay, 3 Pole	8217C187-18	1 AR
11h	Heater, Overload Relay, 240V	8217C187-19	1 AR
12	Switch, Control, 3 SPDT, 7320K3	8283A883	1
13	Switch, Blower & Chopper, SPDT 7505-K4	8283A872	2
14	Switch, Rotator, SPDT 7503-13	8233A871	1
15	Bracket, Control Switch	8400B030	1
16	Nameplate, Control Switch	8400A052	1
17	Transformer, Auto 969-001-527	8400A248	1
18	1/4-20 x 1/2 Mach. Scr. , Slt. Rd. Hd.	7000A072-08	4
19	Marking Strip, Terminal, RCM 1	8400A510	1
20	Terminal Block 13-142	8283A1002	1
21	Motor Starter, Rotator	8217C186	1
21a	Contact & Spring , Interlock Pole	8217C180-12	1 AR
21b	Contact Board Cover	8217C180-14	1 AR
21c	Contact & Spring, Power Pole	8217C186-11	3 AR
21d	Cross Arm (less contacts)	8217C180-13	1 AR
21e	Contact Board	8217C186-15	1 AR
21f	Coil, 60Hz, 208-220/440V	8217C180-17	1 AR
21g	Overload Relay, 1 Pole	8217C186-18	1 AR
21h	Heater, O verload Relay	8217C186-19	1 AR
22	Terminal Block (stamped BLOWER)	8283A885	1 AR
23	Panel Assembly	8400D512	1
Not Shown			
	Cabinet	8400D275	1 AR
	Cover, Front	8400D276	1 AR

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

Refer to PARTS PRICE LIST (Part Number 1001) for prices of parts.

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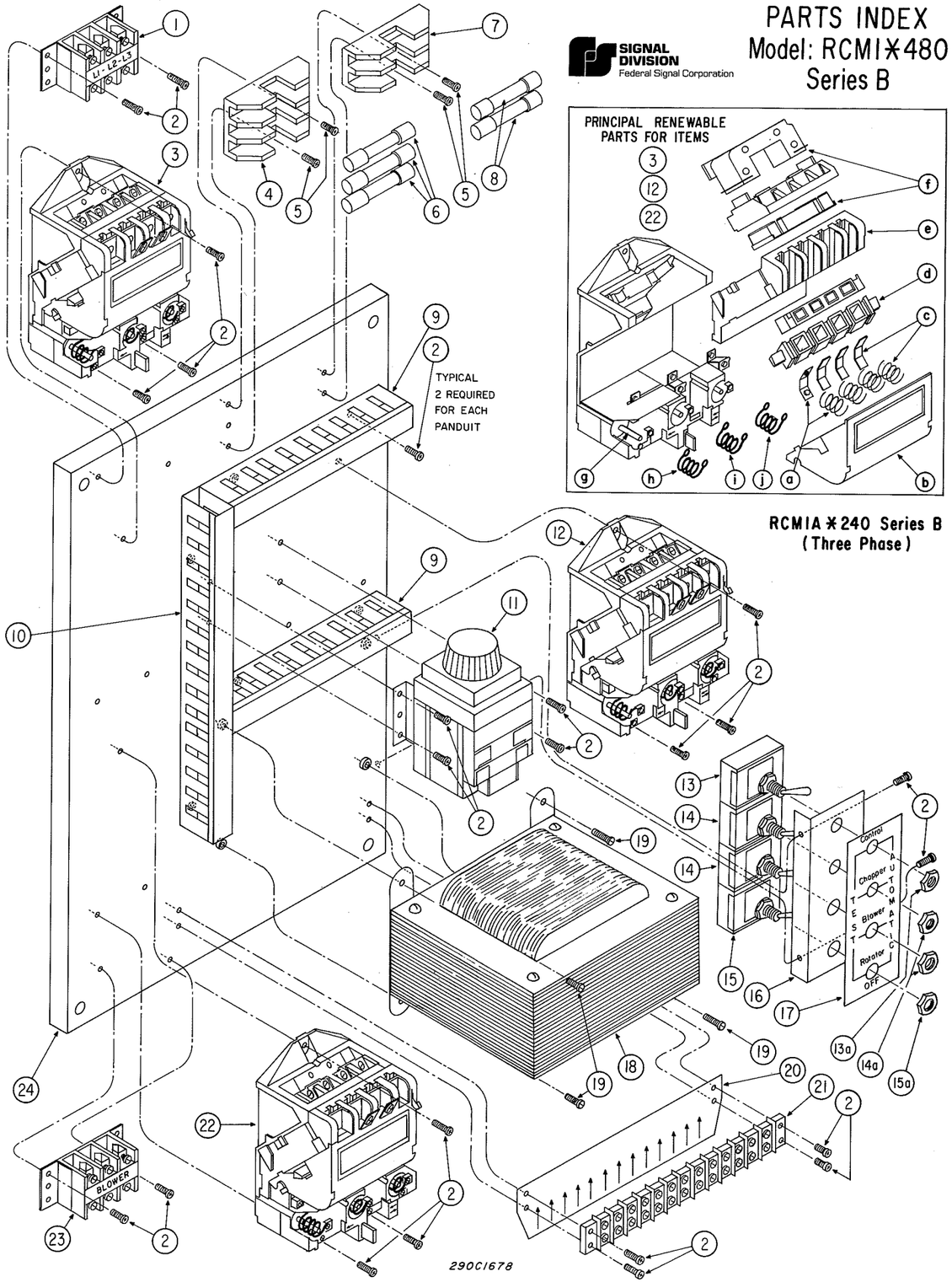

SIGNAL DIVISION
Federal Signal Corporation

PARTS INDEX
Model: RCM1*480 Series B

RCM1A*240 Series B
(Three Phase)

*Figure 5-21B. Model RCM1*480 volt Control Cabinet Parts Index.*

RCM1A*480 Series B (three phase)

PPL 0174
PARTS LIST

MOTOR CONTROL ASSEMBLY

JANUARY 1982

Item No.	Description	Part No.	Qty.
1	Terminal Block (stamped (L1 - L2 - L3)	8283A885	1
2	10-32 x 5/8 Scr. , Thd. Frm. , Phl. Pan Hd. used to secure items 1, 3, 9, 10, 11, 12, 16, 21, 22, and 23	7011A102-10	29
3	Motor Starter, Blower, 480V	8217C188-01	1
3a	Contact & Spring, Interlock Pole	8217C180-12	1 AR
3b	Contact Board Cover	8217C180-14	1 AR
3c	Contact & Spring, Power Pole	8217C182-11	3 AR
3d	Cross Arm (less contacts)	8217C180-13	1 AR
3e	Contact Board	8217C180-15	1 AR
3f	Coil, 60 Hz, 208-220/440V	8217C180-17	1 AR
3g	Overload Relay, 3 Pole	8217C188-18	1 AR
3h	Heater, Overload Relay	8217C188-21	3 AR
3i	Heater, Overload Relay	8217C188-22	3 AR
3j	Heater, Overload Relay	8217C188-23	3 AR
4	Fuse Block, 3 Pole	8400A520	1
5	8-32 x 1/2 Scr. , Thd. Frm. , Phl. Pan Hd. used to secure items 4 and 7	7011A062-08	4
6	Fuse, 1.25 Amp	8400A518-03	3
7	Fuse Block, 2 Pole	8400A519	1
8	Fuse, 10 Amp	8400A518-01	2
9	Panduit, w/Cover, 0.75 x 1.5 x 7.5 Lg.	8400A511-01	2
10	Panduit, w/Cover, 0.75 x 1.5 x 12 Lg.	8400D511-03	1
11	Time Delay Relay	8217A098-01	1
12	Motor Starter, Chopper, 480V	8217C187-01	1
12a	Contact & Spring , Interlock Pole	8217C180-12	1 AR
12b	Contact Board Cover	8217C180-14	1 AR
12c	Contact & Spring, Power Pole	8217C183-11	3 AR
12d	Cross Arm (less contacts)	8217C180-13	1 AR
12e	Contact Board	8217C180-15	1 AR
12f	Coil, 60 Hz, 208-220/440V	8217C180-17	1 AR
12g	Overload Relay, 3 Pole	8217C187-18	1 AR
12h	Heater, Overload Relay, 480V	8217C187-20	1 AR
13	Switch, Control, 3 PST, 7610K2	8283A874	1
14	Switch, Blower & Chopper, 3 PDT, 7614K2	8283A876	2
15	Switch, Rotator, 3 PDT, 7612K2	8283A875	1
16	Bracket, Control Switch	8400B103	1
17	Nameplate, Control Switch	8400A104	1
18	Transformer, Auto H-4062	8400A092	1
19	1/4 -20 x 1/2 Mach. Scr. , Slt. Rd. Hd.	7000A072-08	4
20	Marking Strip, Terminal, RCM 1	8400A510	1
21	Terminal Block, 13-142	8283A1002	1
22	Motor Starter, Rotator, 480V	8217C192	1
22a	Contact & Spring, Interlock Pole	8217C180-12	1 AR
22b	Contact Board Cover	8217C180-14	1 AR
22c	Conatct & Spring, Power Pole	8217C186-11	3 AR
22d	Cross Arm (less contacts)	8217C180-13	1 AR
22e	Contact Board	8217C192-15	1 AR
22f	Coil, 60 Hz, 208-220/440V	8217C180-17	1 AR
22g	Overload Relay, 1 Pole	8217C186-18	1 AR
22h	Heater, Overload Relay, H9	8217C192-19	3 AR
22i	Heater, Overload Relay, H14	8217C192-20	3 AR
23	Terminal Block (stamped BLOWER)	8283A885	1
24	Panel Assembly	8400D512-01	1
Not Shown			
	Cabinet	8400D275	1 AR
	Cover , Front	8400D276	1 AR

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

Refer to PARTS PRICE LIST (Part Number 1001) for prices of parts.

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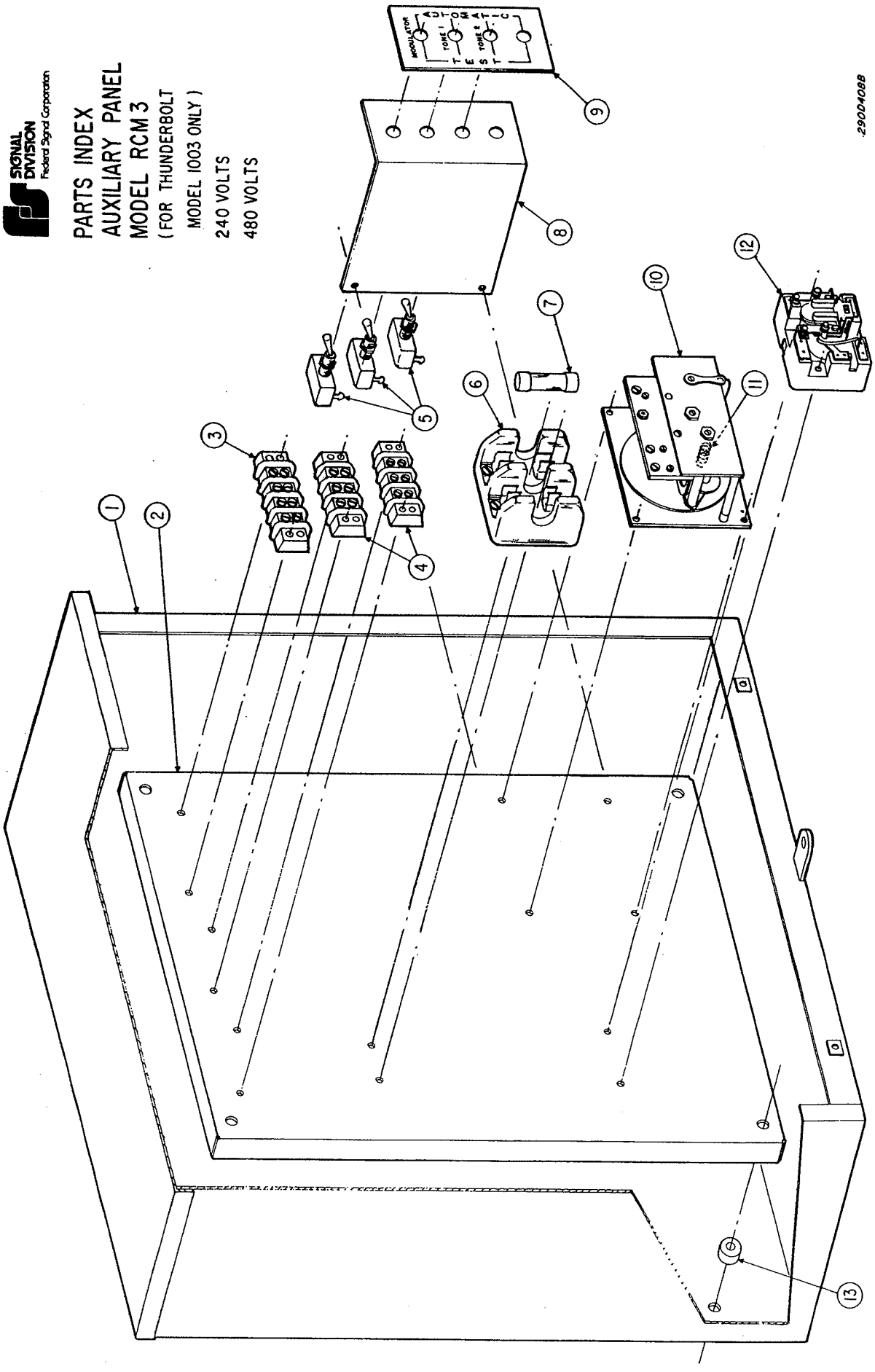

Figure 5-22. Model RCM3 Auxiliary Control Panel Parts Index.

Index No.	Description	Part No.	Qty.
1	Control Cabinet Assembly	8400D275	1
2	Panel, Control	8300D058	1
3	Block, Terminal	8400A244	1
4	Block, Terminal	8283A902	2
5	Switch, Toggle SPDT	8283A872	3
6	Base, Fuse Cutout	8445A074	1
7	Fuse ECN-10	8445A085	2
8	Bracket, Switch	8400B030	1
9	Nameplate	8400A180	1
10	Flasher	8217A054	1
11	Coil, 240V (for item 10)	8217A066	1
12	Relay, 240V, DPST	8283A880	1
	Relay, 480V, DPST	8283A880	2
13	Spacer	8400A050	4
Not Shown	Transformer (480V ONLY)	8287A078	1
	Cover, Front	8400D276	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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PARTS INDEX
MODELS AF & AR
SERIES AI

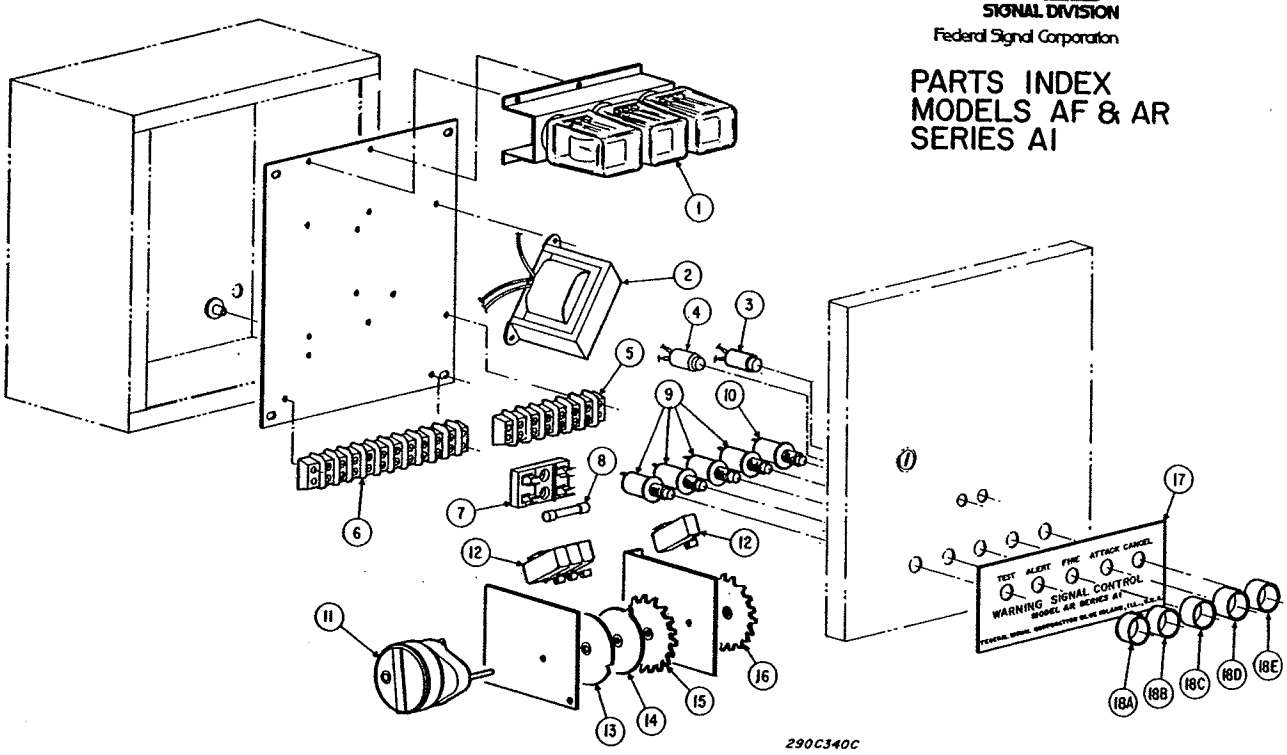

Figure 5-23. Models AF and AR Timers Parts Index.

PPL 0060
PARTS LIST

MODELS MODELS AR and AF TIMERS

JUNE 1979

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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