

PRICE \$2.00



SIGNAL DIVISION
Federal Signal Corporation

MODEL PA 200

ELECTRONIC SIREN



INSTALLATION AND SERVICE INSTRUCTIONS

LIMITED WARRANTY

The Signal Division, Federal Signal Corporation (Federal), warrants each new product to be free from defects in material and workmanship, under normal use and service, for a period of two years on parts replacement and one year on labor from the date of delivery to the first user-purchaser.

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

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

This warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product, or labor charges for removal and re-installation of the product. Lamps, flash tubes, or batteries are not covered under warranty.

This warranty does not extend to any unit which has been subjected to abuse, misuse, improper installation or which has been inadequately maintained, nor to units which have problems relating to service or modification at any facility other than the Federal factory or authorized warranty service centers.

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



FEDERAL SIGNAL CORPORATION

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SECTION I

GENERAL DESCRIPTION



Figure 1. Model PA 200 Electronic Siren.

The Federal Model PA 200 (figure 1) is a precision built, compact, solid-state electronic siren of advanced design.

The PA 200 comes equipped for use with a 12 VDC power source (negative grounded system only). It is of the latest design with carefully chosen output power taps that allow the use of either 100 watt or 58 watt siren speakers. Your FEDERAL dealer has a full line of speakers that can be used with the PA 200.

The unit provides three distinct siren sounds (Wail, Yelp, Hi-Lo) plus provisions for public address, manual siren operation and the amplification of radio messages. A manual SIREN switch is provided for controlling the siren.

The unit can also be operated manually by use of an auxiliary switch, such as a horn ring or foot switch. The unit can still be operated manually after the auxiliary switch is installed, by depressing the SIREN button. Also available is an "instant yelp" option, which causes the siren to emit a yelp signal whenever the auxiliary switch is depressed.

The microphone plug-in convenience of the PA 200 allows the user to utilize the vehicle's two-way radio microphone, or an independent microphone.

The PA200 may be used with its own microphone or with a two-way radio microphone that operates in common with the siren and the two-way radio. A switch at the rear of the unit converts the unit from common microphone operation to PA override operation. With the switch in PA override, the vehicle radio and siren have separate microphones and the public address function will be obtained in any control or function switch position except RADIO by depressing the microphone pushbutton switch. In PA override, the PA function will override all siren functions except radio re-broadcast.

In the common microphone position, the vehicle's two-way radio and siren share a common microphone. An adapter cable connects the siren directly to the two-way radio. The common microphone will be electrically connected to the two-way radio in all function switch positions except PA. When in the PA position the microphone will be connected to the siren amplifier for broadcast of messages on the vehicle's siren speaker system.

Other special features of the PA 200 include:

- New feedback circuitry producing better audio quality for public address and radio rebroadcast.
- Newly designed solid-state amplifier which provides improved performance and durability under a wide range of environmental conditions.
- Plug-in printed circuit board for ease of service.

SECTION II

SPECIFICATIONS

2-1. GENERAL.

Input Voltage	10VDC to 16VDC (16V operation limit to 15 min.)
Polarity	Negative ground only
Standby Current	170 MA approx. (not incl. panel light)
Operating Temperature Range	-30°C to +65°C
Auxiliary Switch Leakage Resistance (manual siren or Instant Yelp ^{T.M.} option)	10K ohms, minimum

2-2. SIREN.

Operating Current (14.0 VDC - Wail):	
1 Low Power Speaker	5 amperes, max.
2 Low Power Speakers or/ 1 High Power Speaker	10 amperes, max.
2 High Power Speakers	15 amperes, max.
Frequency Range	500 to 1500 Hz
Cycle Rate	Wail - 10 cycles/min. Yelp - 180 cycles/min. Hi-Lo - 50 cycles/min.
Voltage Output (approx.)	
1 Low Power Speaker	45V P-P
2 Low Power Speakers	40V P-P
1 High Power Speaker	64V P-P
2 High Power Speakers	60V P-P

2-3. AUDIO.

NOTE

Input voltage 14.0 VDC. Radio potentiometer and Volume Control at maximum.

Frequency Range	300 to 10,000 Hz
Harmonic Audio Distortion (300-3,000Hz).	10% max., all power levels from $\frac{1}{2}$ to 70 watts (frequency response <u>+3dB</u>)
Input Impedance	Radio - 500 ohms Carbon Mic. - 3,000 ohms Magnetic Mic. - 10K ohms
Input voltage required to obtain 20 VRMS across 2 speaker load (high power tag)	Radio - 0.55 VRMS Carbon Mic. - 0.165 VRMS Magnetic Mic. - 0.025 VRMS

SECTION III

INSTALLATION

3-1. UNPACKING.

After unpacking the Model PA 200, examine it for damage that may have occurred in transit. If the equipment has been damaged, file a claim immediately with the carrier stating the extent of the damage. Carefully check all envelopes, shipping labels and tags before removing or destroying them. The radio interconnecting cable, if ordered, is packed in a separate carton.

3-2. MOUNTING BRACKET.

The PA200 is shipped with a swinging bracket which enables it to be mounted in a variety of positions. Positioning the bracket above the unit allows mounting to the underside of the dash. Positioning the bracket below the unit will permit mounting on any horizontal surface or, by the use of Federal's TU-70 Tunnel Mount on the vehicle's transmission hump.

The unit should be mounted in a position that is both comfortable and convenient to the operator. Keep visibility and accessibility of controls in mind. To install the unit under the dash, determine the mounting location and proceed as follows (see figure 2):

CAUTION

The unit must be installed in an adequately ventilated area. Never install near heater ducts.

A. Use one of the mounting brackets as a template and scribe two drill positioning marks at the selected mounting location under the dash.

B. Drill two $\frac{1}{4}$ -inch diameter holes at the position marks.

C. Secure the mounting bracket to the dash with (2 each) $\frac{1}{4}$ -20 x $\frac{3}{4}$ hex. head screws, $\frac{1}{4}$ split lockwashers and $\frac{1}{4}$ -20 hex. nuts as shown in figure 2.

D. Secure the PA-200 unit to the mounting bracket with black $\frac{1}{4}$ -20 x $\frac{7}{16}$ hex head screws and $\frac{1}{4}$ split lockwashers.

E. Tilt the unit to the desired position. Tighten the black $\frac{1}{4}$ -20 x $\frac{7}{16}$ hex head screws.

NOTE: When installing the PA-200 on the transmission hump, a Federal Model TU-70

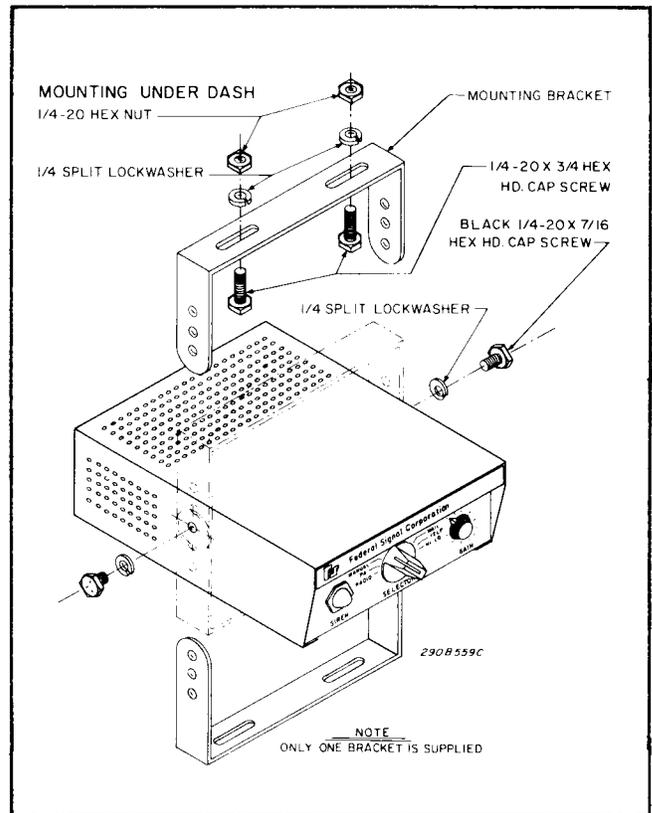


Figure 2. Installation of PA 200 Under Dash.

Tunnel Mount is recommended. The TU-70 Tunnel Mount is drilled and tapped for the PA 200 mounting bracket. Follow the installation instructions packed with each unit.

3-3. POWER CABLE INSTALLATION.

The power cable included in the carton is equipped with an eight prong plug (J3) that mates with the connector (P3) on the rear of the electronic siren (see figure 3). The various wires on the connector must be connected as described below.

A. Speaker.

The unit is designed to operate with one 11 ohm impedance speaker, or two 11 ohm impedance speakers connected in parallel.

Speakers are not included as part of the electronic siren. FEDERAL speakers are weatherproof and may be installed in any convenient location; on the roof, fender, behind the grille, etc. Any special mount-

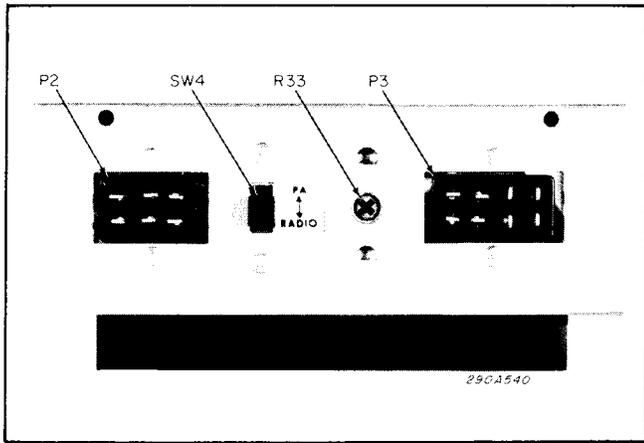


Figure 3. Rear View of PA-200.

ing instructions applicable to the type of speaker you have selected will be found in the speaker carton.

Advanced circuitry in the Model PA-200 allows the use of either 58 watt or 100 watt speakers. If one or two 58 watt speakers are used, such as Federal Signal Corporation's CP-25 or TS-24, connect the speaker leads (18 gauge wire) to the green and brown leads of J3 (pins 5 and 6) as shown in figure 4. When 100 watt speakers are used, such as Federal's CP-100 or TS-100, the speaker leads should be connected to the yellow and brown leads of J3 (pins 7 and 6) as shown in figure 5.

When two speakers are used, it is necessary to connect the speakers in parallel and in-phase for optimum performance. This can be accomplished by connecting the two speaker leads marked "1" to the same power cable lead, and the two speaker leads marked "2" to the other power cable lead (see figure 4 or 5).

CAUTION

When using 58 watt speakers, never connect speaker wires to the yellow power cable lead (J3, pin 7). Damage to the speaker may result.

B. Connection to Power Source.

NOTE

The PA-200 should be used only in a vehicle which has a negative ground electrical system.

Connect the red power cable lead (P3, pin 1) directly to the vehicle's power distribution box (Federal's Model PDC-70 is recommended) or directly to the battery. To protect the wire when connected to the battery terminal, use an in-line fuseholder

and 20-ampere fuse (not supplied). The fuseholder should be installed as close to the battery as practical. If necessary, additional #14 gauge or heavier wire can be spliced to the red lead. See figure 4 or 5.

The black wire should be grounded directly to the vehicle frame near the siren.

C. Auxiliary Connections.

The PA-200 has the capability to be operated from an auxiliary switch (foot switch, horn switch, etc.). To take advantage of this feature, connect the auxiliary switch to the gray power cable lead (J3, pin 4). The PA-200 will now automatically respond to both positive and negative auxiliary circuits without regard to polarity and without adjustment.

When using a horn switch to control the siren, a SPDT switch should be installed between the gray power cable lead (J3, pin 4) and the horn switch. This will allow the horn ring to be switched between the vehicle's horns and the electronic siren's AUX. input.

3-4. RADIO INTERCONNECTIONS.

NOTE

Refer to Section IV for a description on the operation of the PA override and common microphone features. The PA-200 can be easily set for operation in one of these modes. If required, the mode of operation can be changed at a future date.

A. PA Override Connections.

NOTE

If the radio broadcast function is not desired, or if the vehicle is not equipped with a two-way radio; proceed as follows, except disregard information on FN212 and FN203 adapter cables.

In order to take advantage of the PA override feature, separate microphones are required for the two-way radio and the siren's public address function. If PA override operation is desired, with re-broadcast of radio messages, proceed as follows:

1. Set the PA-RADIO switch, located on the rear panel (see figure 3), to PA. This sets the PA-200 to the PA override mode of operation.

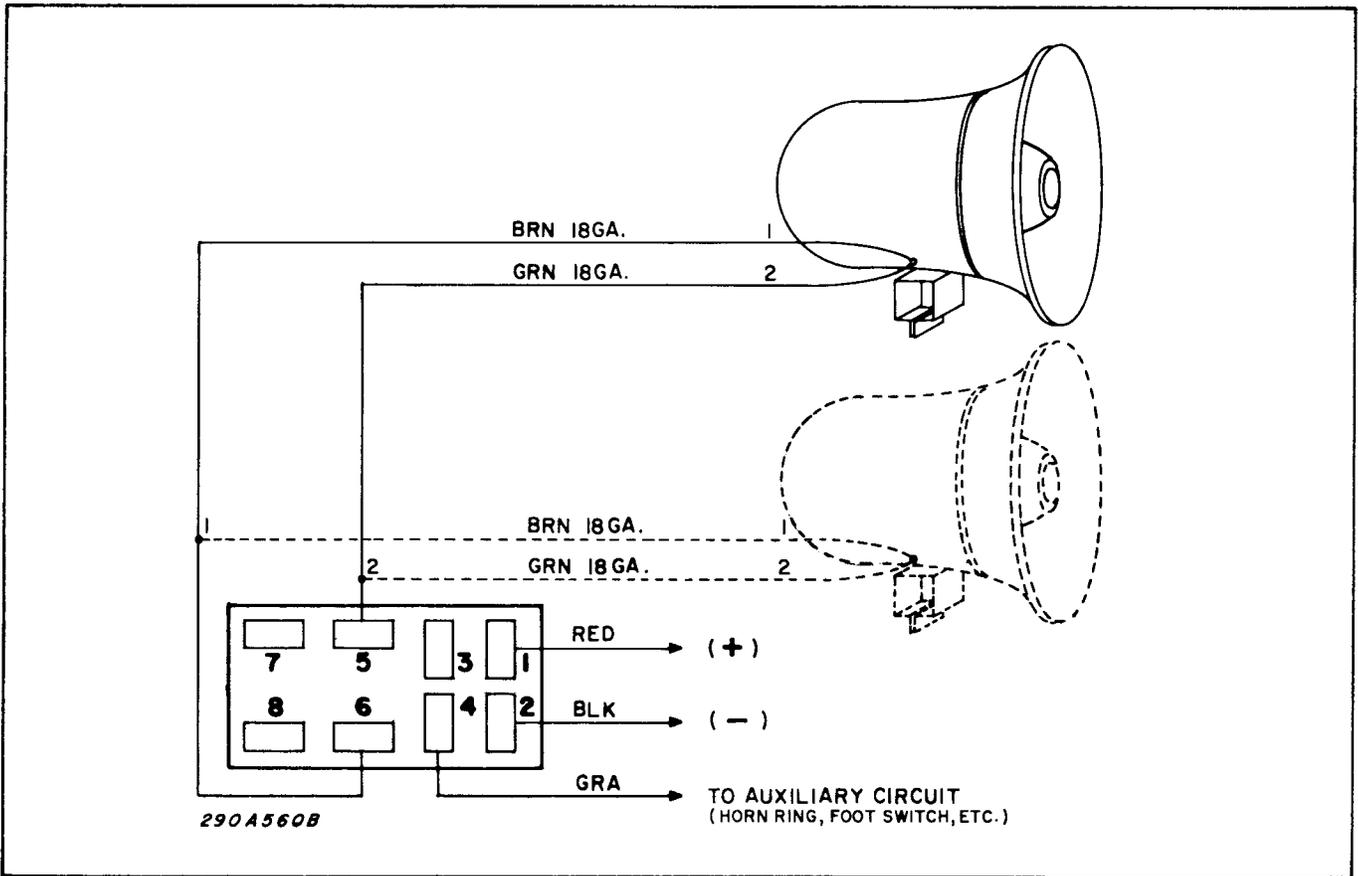


Figure 4. Connection of 58 Watt Speakers to PA-200.

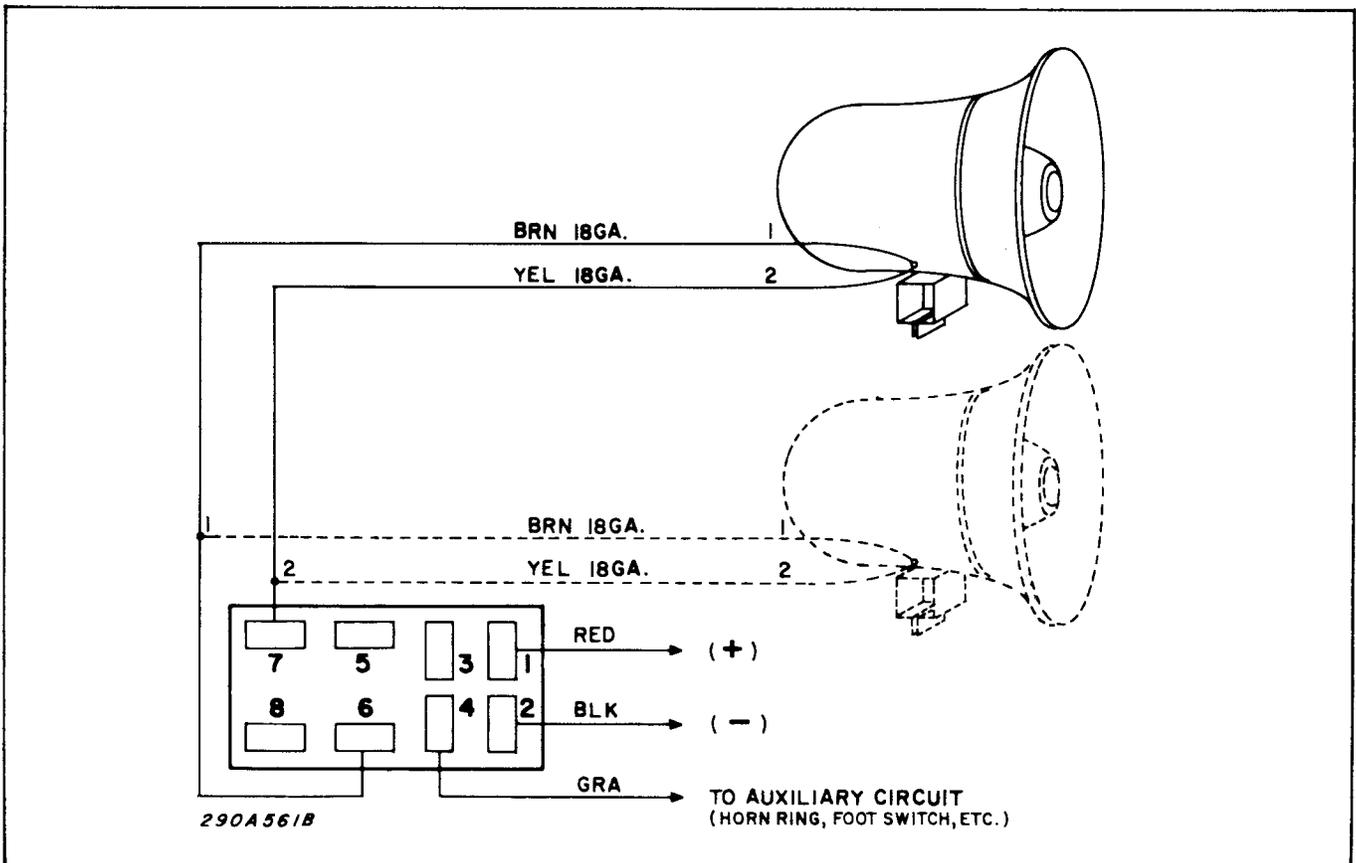


Figure 5. Connection of 100 Watt Speakers to PA-200.

2. Obtain Federal radio cable Model FN212 or Model FN203. Plug the cable into the 6-pin connector (P2 in figure 3) located at the rear of the unit.

3. Connect the black and red wire of the FN212 cable (or green and red wires if using FN203) across the two-way radio's speaker voice coil terminals.

4. Plug the Federal microphone (Model MNC or MR) into the microphone jack at the bottom of the Siren Module. The PA-200 is now set for PA override operation.

B. Common Microphone Connections.

If common microphone operation is desired (common microphone for public address and vehicle's two-way radio) with re-broadcast of radio messages, proceed as follows:

1. Set the PA-RADIO switch, located on the rear panel (see figure 3), to RADIO. This sets the PA-200 internal circuitry to the common microphone mode of operation.

2. Obtain the appropriate Federal radio adapter cable which corresponds to the type of two-way radio installed in your vehicle (refer to Bulletin 320). Follow the installation instructions supplied with the cable.

3. Plug the two-way radio microphone into the microphone jack at the bottom of the unit. The PA-200 is now set for common microphone operation.

C. Carbon or Magnetic Microphone Switch Setting.

The unit will operate with a magnetic, controlled magnetic (noise cancelling), carbon or transistorized magnetic microphone. A slide switch (SW3), located on the right side of the plug-in printed circuit board (see figure 6) inside the unit, must be set according to the type of microphone used. The switch setting (C or M) can be easily changed by placing the index finger under the PC board just in front of the driver transformer located on the front right-hand side of the chassis.

When a controlled magnetic microphone is used, set the switch to the position marked "M". (Move the switch toward the front of the panel.) If a carbon or transistorized microphone is used, set the switch to the position marked "C". (Move the switch toward the rear panel of the chassis.) The "C" and "M" markings are clearly etched into the printed circuit board.

D. Relative PA Loudness Adjustment.

After the PA-200 is completely installed in the vehicle, set the SELECTOR switch to PA. Depress the microphone push-to-talk switch, speak in a normal voice, and adjust the GAIN control for a desirable listening level outside the vehicle. Turn-on the vehicle's two-way radio and adjust the volume to a comfortable listening level inside the vehicle. Then, set the SELECTOR switch to RADIO. Stand outside the vehicle and note the radio re-broadcast loudness. If too loud or soft; adjust R33, located on the rear panel (see figure 3), for the desired level. If the volume outside the vehicle was too loud, adjust the control counterclockwise. If too soft, vary the control clockwise until the desired level is obtained.

Once the adjustment is completed, the radio re-broadcast and public address loudness may be varied by using the front panel GAIN control.

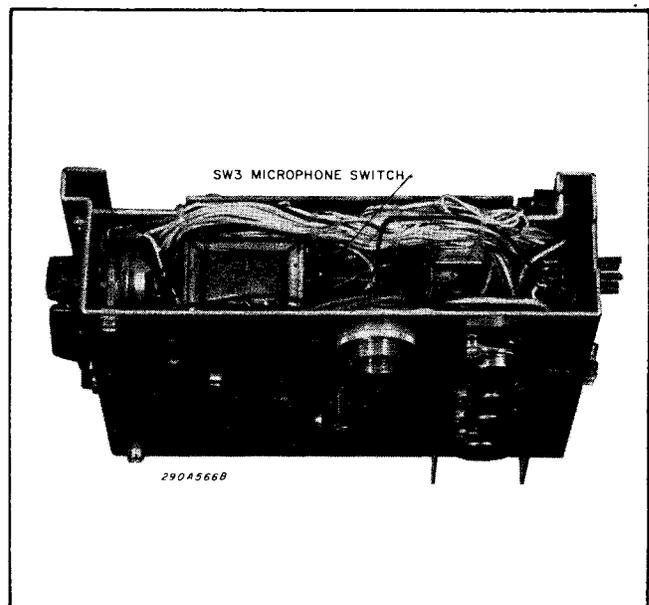


Figure 6. Microphone Switch Location.

SECTION IV OPERATION

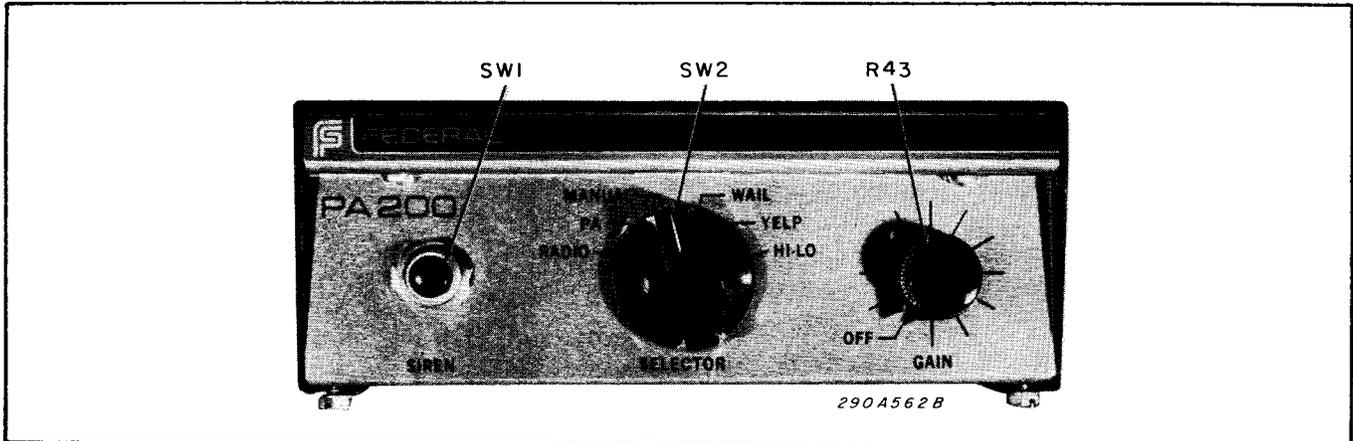


Figure 7. PA-200 Front View.

4-1. GENERAL.

All controls utilized during normal operation of the PA-200 are located on the front panel (see figure 7).

The microphone plug-in convenience of the PA-200 allows the user to utilize the vehicle's two-way radio microphone, or an independent microphone.

The PA-200 may be used with its own separate microphone or with a two-way radio microphone that operates in common with the PA-200 and the two-way radio. A switch located at the rear of the unit is provided to convert the unit from common microphone operation to PA override operation.

With the switch in the PA override position, the vehicle radio and siren have separate microphones and the public address function will be obtained in any control or function switch position except RADIO by depressing the microphone push button switch. In the PA override position, the public address function will override all other siren functions, except radio re-broadcast.

In the common microphone position, the vehicle's two-way radio and siren share a common microphone. An adapter cable connects the siren directly to the two-way radio. The common microphone will be electrically connected to the two-way radio in all function switch positions except PA. When in the PA position the microphone will be connected to the siren amplifier for broadcast of messages on the vehicle's siren speaker system.

4-2. GAIN CONTROL.

The GAIN control is used to control the volume when the electronic siren is used for public address or radio amplification. Clockwise rotation of the knob increases voice volume in the public address or radio amplification mode. The GAIN control does not control the volume of the siren.

Radial lines around the knob can be used for setting the volume to a predetermined level. The maximum clockwise setting of the control will be determined, in most cases, by the point at which feedback or "squeal" occurs. This will depend upon the microphone gain, open windows, speaker placement, proximity of reflecting surfaces (buildings or other vehicles), etc. Adjust the GAIN control to a position just below the point at which feedback occurs or as desired.

4-3. SELECTOR SWITCH.

The SELECTOR switch is a six position rotary switch used to select the mode of operation. The following are positions on the SELECTOR switch:

A. RADIO.

In this position, incoming radio messages are amplified by the Siren Module. Volume can be controlled by the GAIN control. The radio volume may be adjusted to match the PA volume by means

of the resistor control (R33) located on the rear panel of the Siren Module (see figure 3). (Refer to Section 3-4.D).

B. PA.

In this position the PA 200 may be used as a public address system. Volume is controlled by the GAIN control. If a common microphone is used for both the electronic siren and two-way radio, this is the only position in which the microphone is disconnected from the two-way radio's transmitter.

C. MANUAL.

In this position it is possible to operate the siren by depressing the front panel SIREN button. The siren can also be activated by means of an auxiliary switch, such as a foot switch or horn ring button. Operation will be similar to that of a conventional electro-mechanical siren unless the optional Instant Yelp feature is provided.

D. WAIL.

In this switch position, the siren produces a continuous "wailing" sound, up and down frequency.

E. YELP.

In this position a continuous rapid "warbled" tone is generated.

F. HI-LO.

In this position a two-tone sound will be heard. This distinctive tone may be reserved for any special indication or situation.

4-4. SIREN BUTTON.

The SIREN button located on the left-hand side of the front panel, is used to activate the siren when the SELECTOR switch is in the MANUAL position.

4-5. INSTANT YELP (OPTION Y).

If the serial number on the bottom rear of the PA 200 begins with "Y" (Example: Y1A5003), the unit is equipped with the Instant Yelp feature. When equipped, the unit will emit a "Yelp" signal whenever the AUX. control switch (horn ring) is depressed regardless of the setting of the SELECTOR switch. NOTE: The manual siren button will continue to operate the manual siren signal.

4-6. INSTANT YELP (OPTION T).

If the serial number on the bottom rear of the PA 200 begins with "T" (Example: T1A5007), the unit is equipped with the Instant Yelp feature with "tap on" - "tap off" switching. When equipped, depressing the horn ring will turn on the Yelp signal, which will continue to sound until the horn ring is again depressed. Units equipped with OPTION "T" contain a small printed circuit board mounted near the front of siren chassis.

SECTION V

CIRCUIT DESCRIPTION

5-1. GENERAL.

Refer to the schematic diagram while reading the following paragraphs.

5-2. WAIL - YELP TIMING OSCILLATOR.

In the WAIL or YELP position, Q3 and Q4 function as a timing oscillator. The output of the timing oscillator determines the frequency of the sweep oscillator (Q7 and Q8). Initially, assume the SELECTOR switch set to WAIL and Q3 conducting. C1 will charge through R7 and the emitter-collector junction of Q1. When C1 is sufficiently charged, Q3 cuts-off, thus turning-on Q4. C1 discharges through R14 and R9. The charge and discharge of C1 determines the repetition rate (10 cycles/minute) in the WAIL mode. The RC network of R16, R13 and C4 takes the sawtooth waveform of the Q4 emitter and produces the desired triangular rising and falling waveform of the WAIL control voltage.

In the YELP mode, C2 has a similar function as C1. The repetition rate in the YELP mode is approximately 220 cycles/minute. The RC network of R13, R15 and C3 develops the desired waveform of the YELP signal.

The output of the YELP or WAIL RC networks is applied to the sweep oscillator and determines the frequency of operation.

5-3. MANUAL SIGNAL.

With the SELECTOR switch set to MANUAL, Q3 and Q4 no longer function as a timing oscillator. When the front panel SIREN push button (SW1) is depressed, Q4 conducts and allows C4 to charge. While C4 is charging, the sweep oscillator frequency increases. After releasing SW1, Q4 turns-off and C4 discharges through R16 causing the sweep oscillator frequency to decrease.

In the standard unit (yelp option not included), a positive or negative voltage can be applied to P3, pin 4 and to the circuitry of Q1 and Q2. Q1 and Q2 activate Q3 and Q4 to produce the manual siren signal. Normally Q1 is conducting and Q2 non-conducting. A negative voltage will be applied to the base of Q1 via P3, pin 4 and CR1 which will turn Q1 off and Q2 on. When Q2 conducts, Q3 turns off as its base goes to ground and Q4 conducts producing the manual signal. Similarly, a positive voltage applied to the base of Q2 via P3, pin 4 and CR3 and CR5 will turn it on with the previously described results occurring. CR1, CR3 and CR5 serve to isolate the Q1 and Q2 inputs preventing false triggering.

If the Instant Yelp^{T.M.} Option is included in your unit, a positive or negative voltage applied to P3, pin 4 will activate Instant Yelp relay K1. In this case, the collector of Q2 will be connected to K1. When activated, K1's contacts will by-pass the SELECTOR switch and instantly produce the yelp signal.

5-4. HI-LO OSCILLATOR.

The Hi-Lo timing oscillator functions only when the SELECTOR switch is set to the HI-LO position. With this switch set to HI-LO, C5 charges through the base emitter junction of Q5. When the C5 charge voltage reaches the trip point of Q6, it immediately discharges through the anode-cathode function of Q6. The charge and discharge of C5 causes a rising and falling voltage with a repetition rate of approximately 45 cycles/minute, which turns Q5 on and off. When CR10 is not conducting the low tone is generated, and when CR10 conducts (R19 in parallel with R17) the high frequency tone is generated. The square wave at the junction of R17 and R18 is applied to the sweep oscillator.

5-5. SWEEP OSCILLATOR.

The rising and falling voltages from either of the timing oscillators is applied to the junction of R28 and R29. The voltage at this point determines the bias voltage at Q7 and Q8, which function as an astable multivibrator. CR12 and

CR13 are used to set the DC bias of the transistors. The output of the sweep oscillator is a series of square waves, frequency determined by the bias voltage. This frequency, 500 to 1500 Hz, increases when the bias voltage increases and decreases when the bias voltage decreases. The output of the sweep oscillator is taken from the collector of Q8 and applied to the base of Q10, which functions as an emitter-follower impedance transformation stage. This signal in turn is applied to Q11, the preamplifier stage. NOTE: Q16 does not take part in normal siren operation.

5-6. MICROPHONE PRE-AMP.

The microphone pre-amplifier is used only when SW3 is set to the "M" position (magnetic microphone) and the siren is being used in the PA mode of operation. The signal from a magnetic microphone is applied through SW3 to the base of Q9. The low level signal is amplified by Q9 and flows through SW3, SW2E and the GAIN control (R43) to the base of pre-amplifier Q11.

5-7. PRE-AMPLIFIER AND DRIVER STAGES.

All siren and audio signals are applied to the input of the pre-amplifier stage (Q11) via capacitor C13. Q11 amplifies the signals and applies them to T2. The push-pull output of T2 is applied to Q12 and Q13, which serve as a Class AB push-pull amplifier. The collector load output of Q12 and Q13 is applied to T3 and again supplied as a push-pull signal to the output stage, Q14 and Q15. R48, R49, R56, RT1 and CR14 form a highly stable, temperature compensated bias network for Q12 and Q13.

5-8. OUTPUT AMPLIFIER.

Transistors Q14 and Q15 form a Class B emitter follower push-pull amplifier. The drive signal is coupled to the bases of Q14 and Q15 by driver transformer T3. The output is formed and coupled to the speaker by T4. R50, C15, R55 and C18 sample the output waveform and feed a portion of it back to Q12 and Q13 for better signal (audio) quality. Likewise R59, R60, C16 and C17 stabilize the output stage.

SECTION VI

SERVICE AND MAINTENANCE

6-1. GENERAL.

Most of the component electronic parts used in the PA 200 are standard items that can be obtained from any radio or electronics supply shop.

The following diagrams should be an aid to the repairman in isolating a malfunction and locating components:

<u>Fig.</u>	<u>Diagram</u>
8	Chassis Removal
9	PC Board Removal
9A	SELECTOR Switch Rear View
10	Bottom View
11	Internal View
12	Component Location
13	Schematic

The factory can and will service your equipment or assist you with technical problems, should any arise, that cannot be handled satisfactorily and promptly locally.

Communications and shipments should be addressed to:

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

If any unit is returned for adjustment or repair, it can be accepted only if we are notified by letter or phone in advance of its arrival. Such notice should clearly indicate the service requested and give all pertinent information regarding nature of malfunction and, if possible, its cause.

6-2. SIREN.

A. General.

Any competent radio repairmen or electronic technician should have little difficulty in tracing and correcting a malfunction, should any occur. When servic-

ing the PA 200, the troubleshooting chart (Table 1) can be useful in isolating a malfunction. For emergency replacement of any of the small components, care must be used when soldering. Heat easily impairs transistors, capacitors and circuit boards. It is therefore advisable to use longnose pliers or a similar heat sink on the lead being soldered.

When replacing output transistors (Q14, Q15), insure that a matched pair is used. Use a heat sink compound on both sides of the Q12 and Q13 mica insulators. Insure that the mica is installed properly. Improper installation of mica could cause a short circuit.

NOTE

Most cases of defective output transistors are caused by a defective speaker (short circuited voice coil). Make certain that the speaker is not defective prior to installing the repaired PA 200.

B. Removal for Servicing.

When removing the chassis for servicing, loosen the two hexagon head screws on the underside of the unit, near the front edge. Disconnect all plug-in connectors. Slide the entire chassis out of the case as shown in figure 8.

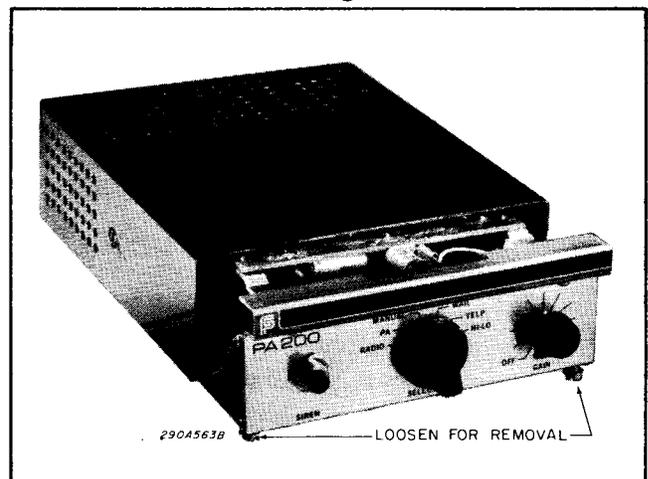


Figure 8. Chassis Removal.

C. Removal of Circuit Board.

The PC Board is secured to the chassis by two Phillips-head screws (figure 9). Removing these screws allows the board to be pulled out of its edge connector.

D. Symmetry Adjustment.

The symmetry of the output waveform is factory adjusted and does not normally require readjustment unless Q7 or Q8 or Q12, Q13, Q14, Q15 are replaced. To perform the symmetry adjustment, proceed as follows:

1. Remove the speaker leads connected to P3. Connect a 5.5-ohm load across pins 7 and 6.
2. Connect an oscilloscope across pins 7 and 6.
3. Set the SELECTOR switch to WAIL or HI-LO. Adjust R25 (see figure 9) for a perfect square wave on the oscilloscope.

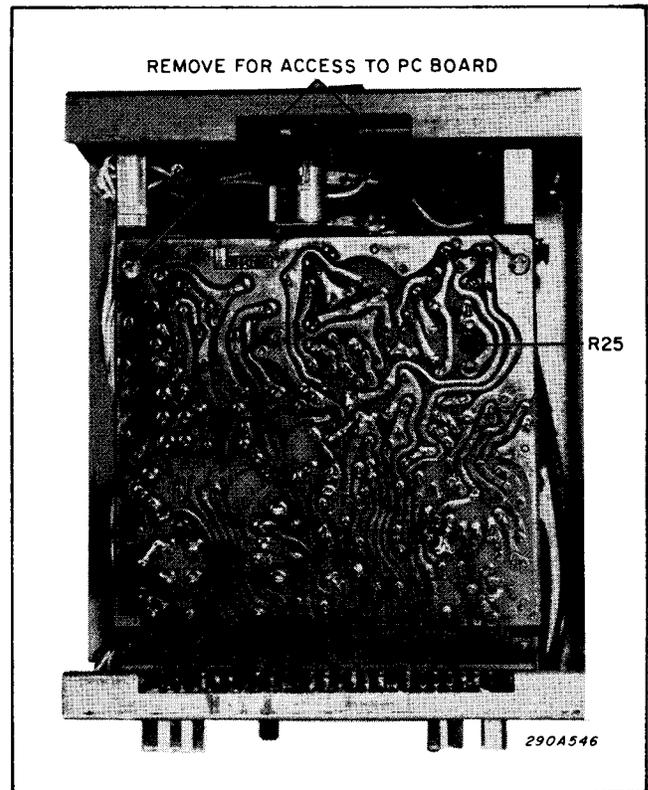


Figure 9. PC Board Removal.

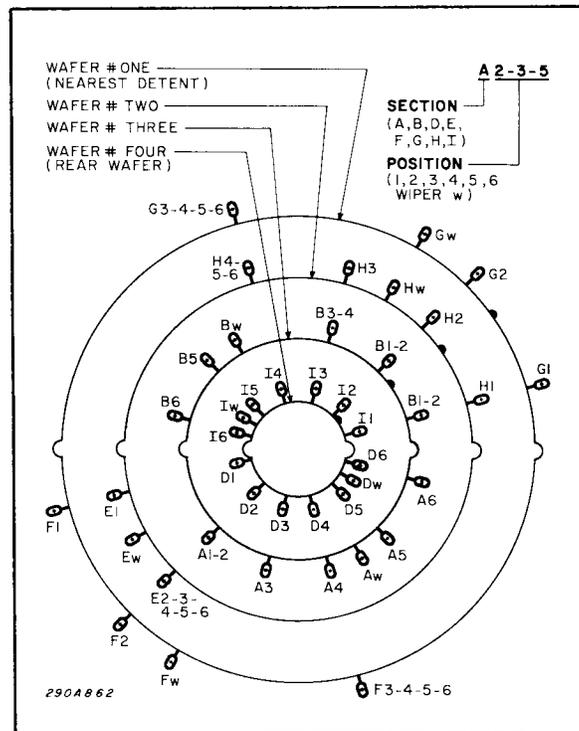


Figure 9A. SELECTOR Switch Rear View.

Table 1. Troubleshooting Chart.

<u>TROUBLE</u>	<u>PROBABLE CAUSE</u>
Fuse blows.	<p>One or more output transistors (Q14, Q15) defective resulting from any one of the following causes:</p> <ol style="list-style-type: none"> 1) Defective speaker. Check for short-circuited voice coil before replacing transistor(s). 2) Excessive battery charging voltage (over 14.6 VDC). 3) Improper output transistor used for replacement. Use Federal replacement or Delco DTG 600 only. 4) Unit exposed to excessive ambient temperatures. <u>Never install electronic siren in the path of heater ducts or in an unventilated console.</u> 5) Improper driver stage transistors, resulting in inadequate drive to output stage. Use Federal transistors or RCA 40316, min. h_{FE} 100 at 100 MA. 6) Symmetry adjustment changed or not adjusted properly. Refer to paragraph 6-3.D.
No siren in any position. Radio and PA function normally.	Open capacitor C12. Check Q16.
No siren. Unit "chirps" in YELP position.	Open capacitor C7 or C8.
Intermittent output.	Loose connection or defective interconnecting cable.
Low or no output in all positions.	Defective transistor Q14, Q15 or interconnecting cable.
Little or no volume in RADIO position. PA is OK.	Improper adjustment of R33.
Little or no output when magnetic microphone is used.	Microphone pre-amp switch in "C" position. Open capacitor C9. Defective microphone. Open capacitor C11 or C13.
No output from carbon or transistorized microphone.	Microphone pre-amp switch in "M" position. Open capacitor C11 or C13. Defective microphone.
No radio or PA. Siren tones OK.	Defective GAIN control R43
Steady tone in all siren positions except manual.	Defective resistor R8 or R9.

Table 1. Troubleshooting Chart (continued).

<u>TROUBLE</u>	<u>PROBABLE CAUSE</u>
WAIL tone falls only. Manual tone only when SIREN button is held (does not coast down, but stops immediately when SIREN button is released).	Open capacitor C4.
WAIL tone rises to steady tone and holds. All other tones OK.	Open capacitor C1.
YELP tone falls only. All other tones OK.	Open capacitor C3.
Steady tone in YELP position. All other tones OK.	Open capacitor C2.
In MANUAL position, siren emits a steady or intermittent tone even though auxiliary switch (horn ring or foot) is not operated. (Standard unit only.)	Defective transistor Q1 through Q4. Defective diode CR3. Electrical leakage at auxiliary switch or horn ring due to dirt or moisture. Switch resistance should not be less than 10K ohms.
Instant yelp (option) operates when horn ring or auxiliary switch is not activated and SELECTOR switch is not in YELP position.	Defective transistor Q1 or Q2. Defective diode CR3. Electrical leakage at auxiliary switch or horn ring due to dirt or moisture. Switch resistance should not be less than 10K ohms.
Excessive noise in PA position only.	Short-circuit in microphone. There should be an open-circuit between pin 2 and shell of microphone plug.
Buzz in loudspeaker when engine is "running".	Open capacitor C20. Amplifier housing not grounded to B-.
Short siren blast in MANUAL position. Sometimes heard when vehicle is being started or shut off.	Defective capacitor C6 and/or defective diode CR11.

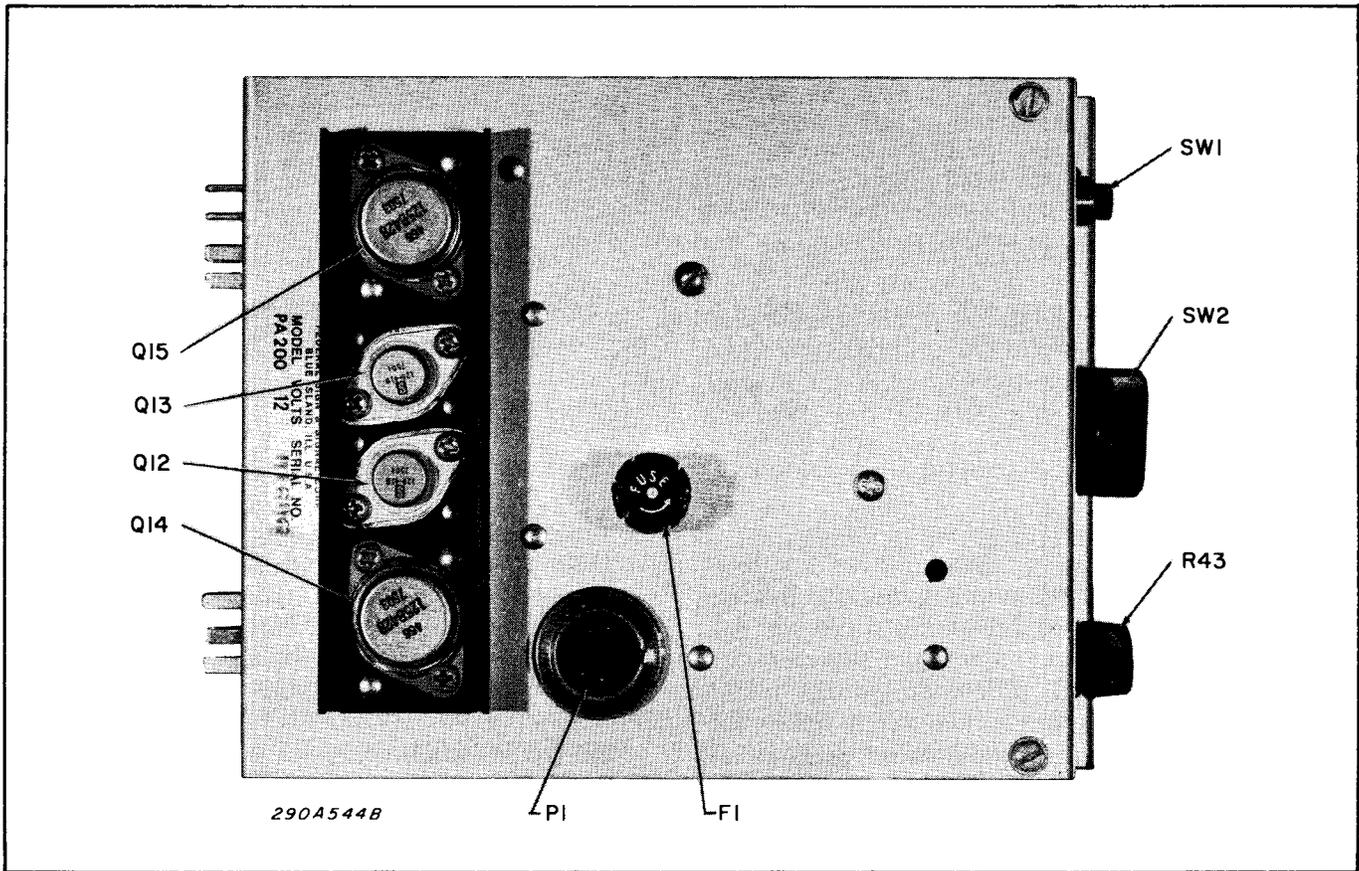


Figure 10. Bottom View of Electronic Siren.

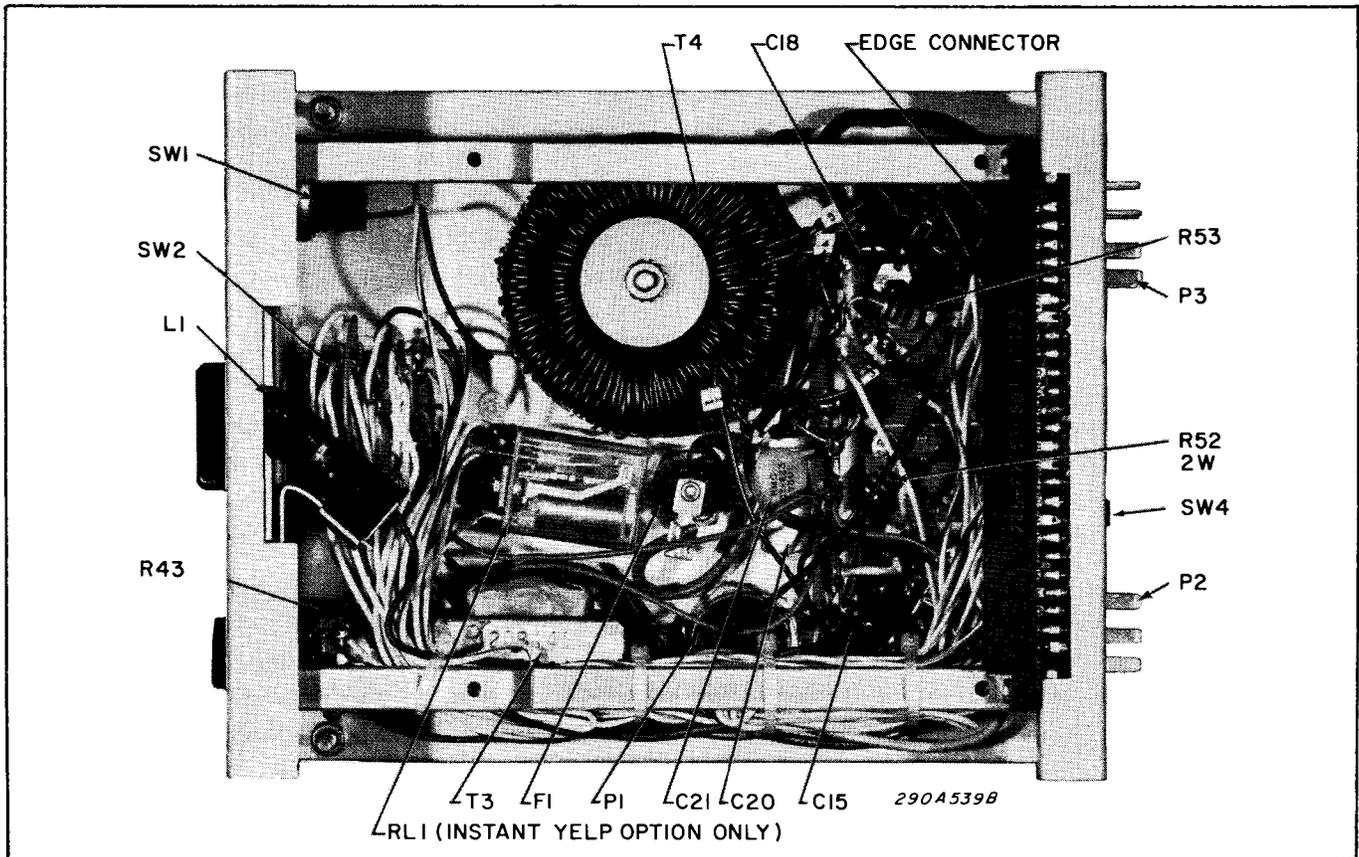
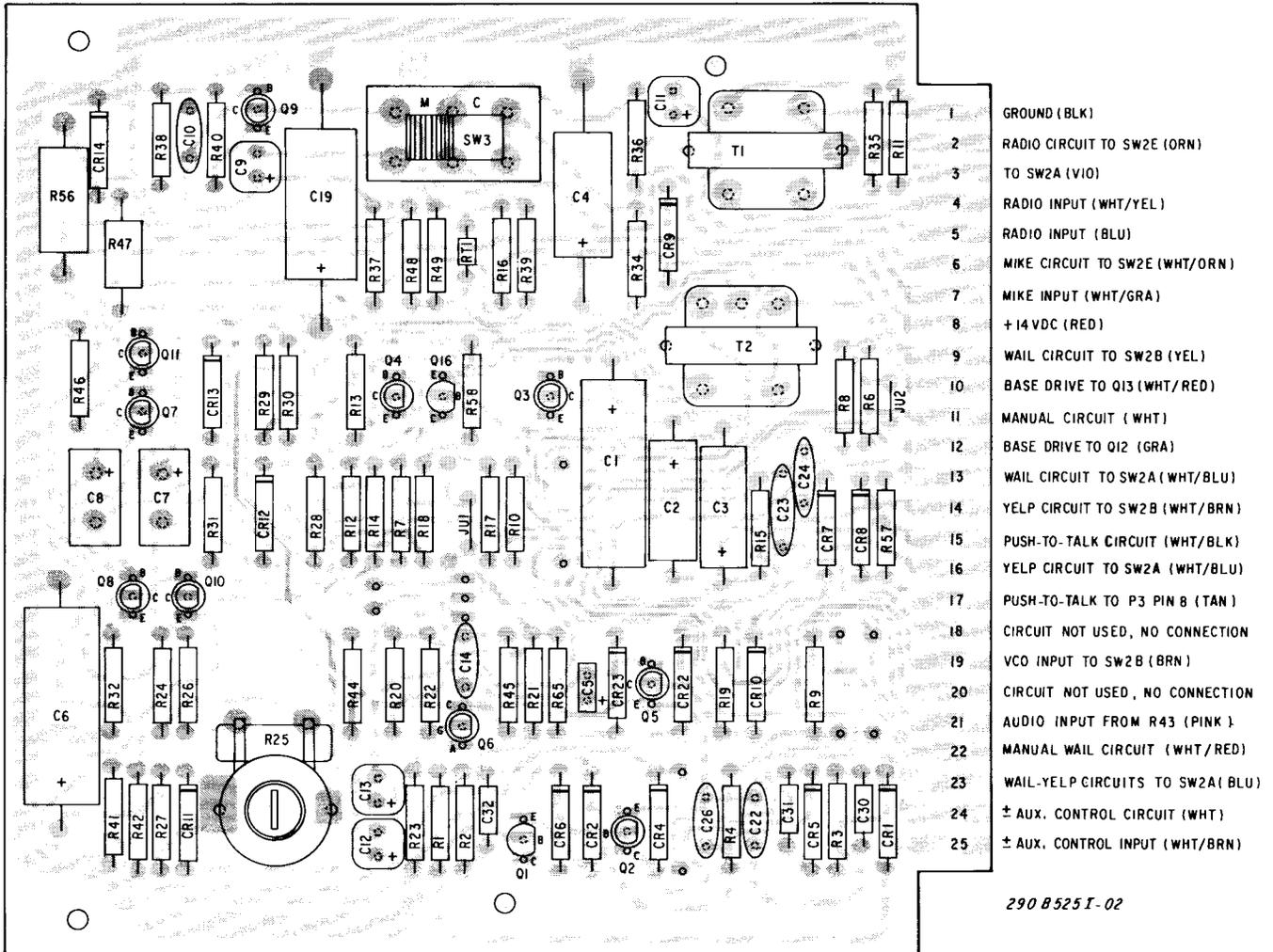


Figure 11. Internal View of Siren Module.



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Figure 12. Component Location Diagram.

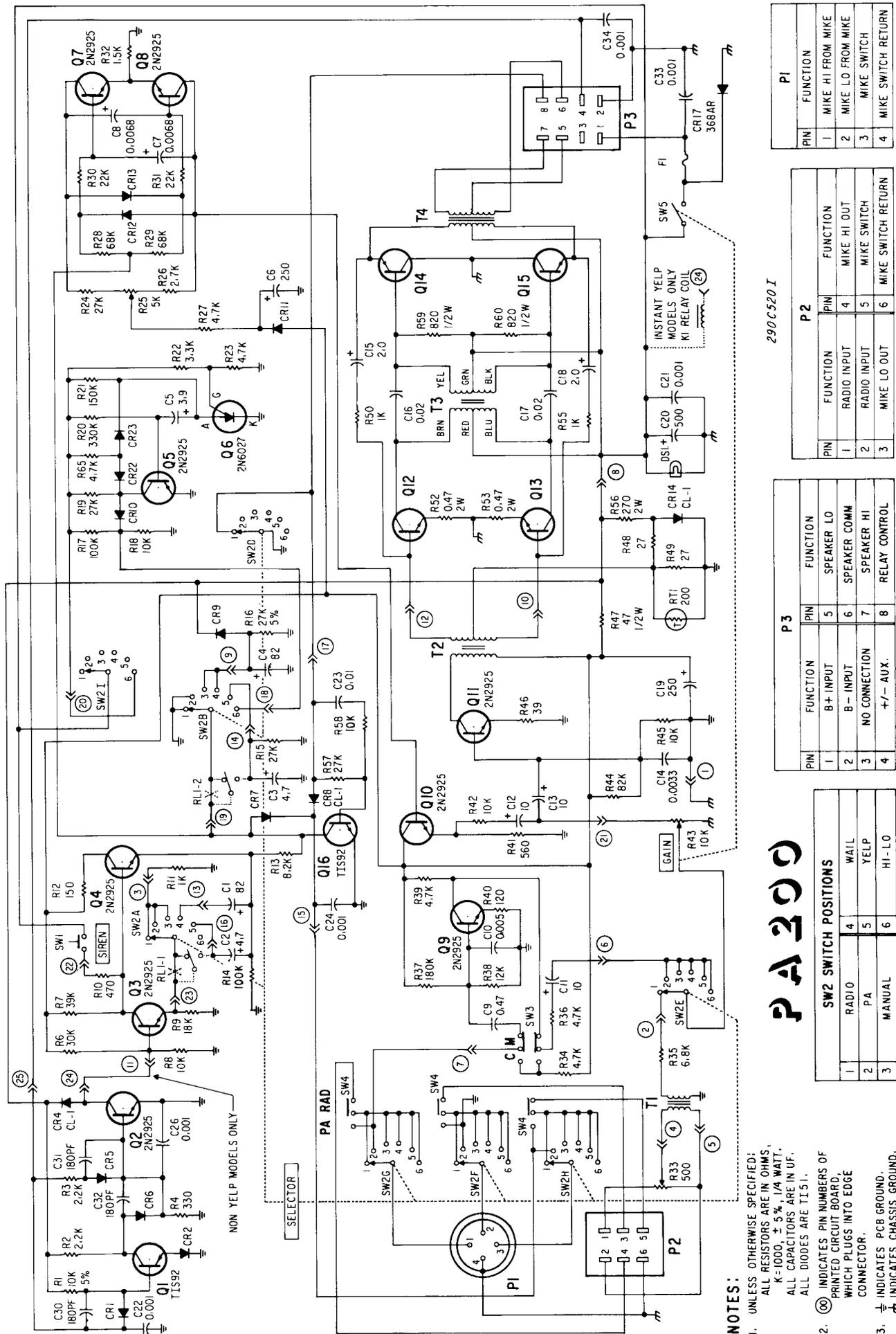


Figure 13. PA 200 Schematic Diagram.

PARTS LIST

Schematic Symbol	Description	Part No.	Schematic Symbol	Description	Part No.
*RESISTORS			*RESISTORS (Cont.)		
R1, 8, 18, 42 45, 58	10K Ohm	100A257	R52, 53 R56	0.47 Ohm, 2 Watt 270 Ohm, 2 Watt, Wirewound	103A130 103A128
R2, 3	2200 Ohm	100A225	*Unless otherwise specified; all RESISTORS are carbon type, \pm 5%, 1/4 Watt.		
R4	330 Ohm	100A201			
R6	30K Ohm	100A293			
R7	39K Ohm	100A260			
R9	18K Ohm	100A258			
R10	470 Ohm	100A248			
R11, 50, 55	1000 Ohm	100A233			
R12	150 Ohm	100A238			
R13	8200 Ohm	100A223			
R14, 17	100K Ohm	100A262			
R15, 16, 19, 57	27K Ohm	100A244	CAPACITORS		
R20	330K Ohm	100A212	C1, 4	82UF, 10V, Tantalum	107A624
R21	150K Ohm	100A226	C2, 3	4.7UF, 15V, Tantalum	107A678
R22	3300 Ohm	100A242	C11, 12, 13	10UF, 10V, Tantalum	107A634
R23, 27, 34, 36, 39, 65	4700 Ohm	100A298	C5	3.9UF, 15V, Tantalum	107A642
R24, 26	2700 Ohm	100A256	C6, 19	250UF, 15V, Electro- lytic	108A107
R25	5000 Ohm, Potentio- meter	105B204	C7, 8	0.0068UF, 50V, Mylar	107A413
R28, 29	68K Ohm	100A261	C9	0.47UF, 35V, Tanta- lum	107A645
R30, 31	22K Ohm	100A259	C10	0.005UF, 100V, Disc	107A211
R32	1500 Ohm	100A220	C14	0.0033UF, 100V, Disc	107A271
R33	500 Ohm, Potentio- meter	105A212	C15, 18	2.0UF, 25V, Electro- lytic	108A131
R35	6800 Ohm	100A210	C16, 17	0.02UF, 25V, Disc	107A261
R37	180K Ohm	100A243	C20	500UF, 15V, Electro- lytic	108A122
R38	12K Ohm	100A297	C21, 22, 24	0.001UF, 100V, Disc	107A263
R40	120 Ohm	100A232	26, 33, 34		
R41	560 Ohm	100A274	C23	0.01UF, 100V, Disc	107A223
R43	10K Ohm, Potentio- meter, GAIN	106A116	C30, 31, 32	180pF, 160V, Poly	107A710
R44	82K Ohm	100A230	DIODES		
R46	39 Ohm	100A286	CR1, 2, 5, 6, TI55		115B101
R47	47 Ohm, 1/2 Watt	100A304	7, 9, 10, 11, 12, 13, 22, 23		
R48	2.7 Ohm	100A294	CR4, 8, 14	ED3002S	115B301
R49	27 Ohm	100A290	CR17	368AR	115A311
R59, 60	820 Ohm, 1/2 Watt	100A403			

PARTS LIST (continued)

<u>Schematic Symbol</u>	<u>Description</u>	<u>Part No.</u>	<u>Schematic Symbol</u>	<u>Description</u>	<u>Part No.</u>
TRANSISTORS			SWITCHES (Cont.)		
Q1, 2, 16	TIS92, NPN	125B132	SW3	Slide, DPDT	122B119
Q3, 4, 5, 7 8, 9, 10, 11	2N2925, NPN	125A119	SW4	Slide, TPDT	122A153
Q6	GE-D13T1	125C310	MISCELLANEOUS		
Q12, 13	RCA 40316, NPN	125B410	RT1	Thermistor, 200 Ohm	104A111
Q14, 15	Delco, DTG600, PNP	125B428	P1	Connector, Microphone	139B134
TRANSFORMERS			P2	6-Pin Jones Plug	140A113
T1	Audio	120B123	P3	8-Pin Jones Plug	140A114
T2	Pre-Amplifier	120B142	K1	Relay	131A118
T3	Driver	120B141	F1	Fuse, 20-Ampere, 3AG	148A127
T4	Output	120B140	DS1	Lamp, 14-volt	8107A085
SWITCHES				PC Board	130D216B
SW1	Push button, SIREN	122A228		Connector, Edge, 25-Contact	139A156
SW2	Rotary, SELECTOR	122B163		Holder, Fuse	143A106
				Knob, GAIN Control	141A102
				Knob, SELECTOR	141A111
				Bracket, Relay	8474A144
				Heat Sink	8536B023
				Bracket, Lamp	8536A025
				Socket, Lamp	138A115
				Circuit Board (with parts installed)	8536D011-01