PRICE $2.00

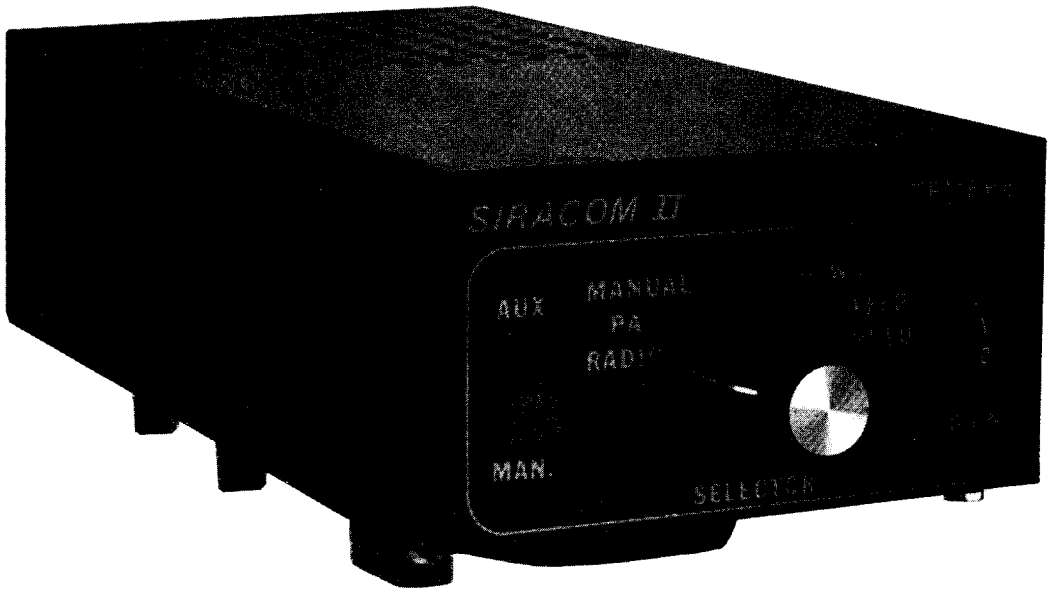
SIGNAL DIVISION
Federal Signal Corporation

MODEL PA2010

Series B

SIRACOM III T.M.

ELECTRONIC SIREN



INSTALLATION AND SERVICE INSTRUCTIONS

Warranty

The Federal Signal Corporation warrants each of its new electronic sirens to be free from defective material and workmanship for a period of two years from date of purchase. Federal Signal Corporation will remedy any defect which under normal installation and operation discloses such defect; provided the unit is delivered, transportation prepaid by owner, to our factory for examination and such examination reveals that in our judgment a defect in material and/or workmanship exists. In all cases, Federal Signal Corporation will be sole judge of what constitutes defective material and workmanship.

Defects of workmanship and material under this warranty will be corrected at no cost to you for labor and material.

This warranty does not extend to any electronic siren which has been subjected to abuse, misuse; improper installation or violation of any instructions supplied by us, nor extended to units which have been serviced or modified at any facility other than our factory.

This warranty takes precedence over all other warranties expressed or implied and no representative or other person is authorized to assume for Federal Signal Corporation any other liability in connection with the sale of our electronic sirens.

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FEDERAL SIGNAL CORPORATION

SECTION I
GENERAL DESCRIPTION

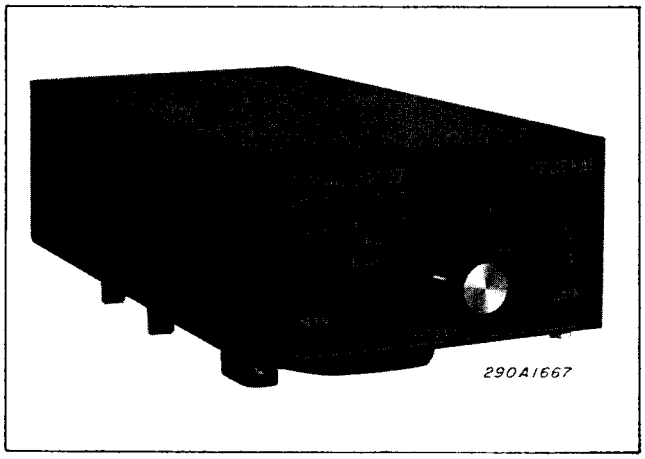


Figure 1-1. Model PA2010B Electronic Siren.

The Federal Model PA2010B SIRACOM II (figure 1-1) is a precisely built compact Electronic Siren of advanced design which can easily be removed from the vehicle.

The Siren produces three distinct siren sounds: WAIL, YELP and HI-LO. In addition, it has provisions for public address (PA) and radio rebroadcast. A light emitting diode (LED) indicator illuminates when the SELECTOR is set to RADIO (radio rebroadcast). A rocker switch is also included for control of the Peak and Hold signal and an optional user-installed Auxiliary Sound Board (AUX position).

The siren can also be operated by an auxiliary switch such as the vehicle horn switch or a foot switch. The unit can still be operated manually by depressing the MAN (manual) switch if an auxiliary switch is installed.

Most of the electronic circuitry in the Siren is mounted on printed circuit boards, providing a high level of performance and reliability over a wide range of environmental conditions. The amplifier incorporates feedback that maintains high audio quality for the PA and radio rebroadcast functions. The circuitry is protected by a 20 ampere fuse.

If it is desired to make use of the provisions for PA and radio rebroadcast a Federal Model MNCT Microphone or the vehicle's two-way radio microphone and the appropriate adapter module are required. The Model MNCT Microphone is a transistorized, noise cancelling microphone that has the characteristics necessary to drive the audio amplifier in the siren. The Model MNCT Microphone and a line of adapter modules to fit most popular makes of two-way radio microphones are available as options from Federal. The adapter modules include the wiring required to interconnect the siren with the microphone and two-way radio.

The Siren operates from a nominal 12 volt DC, negative ground electrical system. The speaker terminals, in conjunction with a slide switch on the rear of the siren, allow the use of 58 watt or 100 watt speakers or a single 200 watt speaker.

In common microphone operation, an optional adapter module (available from Federal) connects the siren directly to the two-way radio. The common microphone is electrically connected to the two-way radio in all of the SELECTOR switch positions except PA. When the SELECTOR switch is set to PA, the microphone is connected to the siren amplifier so that messages can be announced over the siren speaker system.

The TAP II Instant Yelp feature provides push-on, push-off operation when the SELECTOR switch is set to MANUAL, WAIL, YELP or HI-LO position.

Two panel lights are illuminated whenever the vehicle ignition switch is on.

SECTION II
SPECIFICATIONS

2-1 GENERAL

Input Voltage	10VDC to 16VDC (16VDC operation - 15 min.)
Polarity	Negative ground only
Standby Current (MANUAL position)	400mA. (not including panel lamps)
Operating Temperature Range	-30°C to +65°C
Dimensions (HWD - excluding heat sink, knob and rear trim)	2-3/8 x 4-1/8 x 6-3/4 inches (6cm x 10.2cm x 17.2cm)
Weight (approx.)	4 lb. (1.8 kg)

2-2 SIREN

Operating Current (14.0VDC - WAIL)	
1 Low Power Speaker	5 amperes
2 Low Power Speakers or 1 High Power Speaker	10 amperes
2 High Power Speakers	15 amperes
Frequency Range	550 to 1500Hz
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

14.0VDC supply voltage. Radio potentiometer and GAIN control at maximum.

Frequency Range	300 to 10,000Hz
Harmonic Distortion	10% max. at power levels from .5 to 70 watts (frequency response ±3dB).
Input Impedance	Radio - 3.6K ohms Carbon Mic. - 3.6K ohms
Signal input voltage required to obtain 20 Vrms across a 5.5 ohm load	Radio - 1.0Vrms Carbon Mic. - 1.0Vrms

2-4 ACCESSORIES (optional)

Model FN1001	Federal Model MNC or MR Microphone Adapter Module
Model FN1002	Federal Model VPII Microphone Adapter Module
Model FN1003	Motorola Microphone Adapter Module
Model FN1004	Motorola Micor Microphone Adapter Module
Model FN1005	RCA Microphone Adapter Module
Model FN1006	RCA 500 Microphone Adapter Module
Model FN1007	GE Microphone Adapter Module
Model FN1008	GE Master II Microphone Adapter Module
Model FN1009	GE TPL Microphone Adapter Module
Model FN1010	Federal Duty Patrol Microphone Adapter Module
Model FN1011	Aerotron MPAC 6,7, or 8 Adapter Module
Model FN1012	RF Communications Model RF-498 Adapter Module
Model FN1013	Motorola "Converta-Com" Microphone Adapter Module
Model FN1014	Motorola Maxar 80 using TMN6134B Microphone
Model FN1015	RCA VEETAC,TAC200 and TAC400 using MI-59400 Microphone

SECTION III
INSTALLATION

3-1 UNPACKING

After unpacking the siren, 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. If an adapter module was ordered, it is packed in a separate carton.

3-2 GENERAL

Route all wiring to the mounting location of siren, allowing 8 to 12 inches of extra wire at the siren location. Install the vehicle speakers and route the speaker leads (18AWG wire) to the siren location. Run leads to the vehicle's horn ring circuit. Install the wiring between the ignition switch and the siren installation site.

3-3 BRACKET MOUNTING

The siren is shipped with a swinging mounting bracket that makes it possible to mount the unit in a variety of positions. Positioning the bracket above the unit allows mounting on the underside of the dash. Positioning the bracket below the unit permits mounting on any horizontal surface or,in conjunction with Federal's TU70 Tunnel Mount, on the vehicle's transmission hump. Mount the siren in a location that is convenient and comfortable to the operator and where it will not interfere with the safe operation of the vehicle. Keep visibility and accessibility of controls in mind when choosing a mounting location. To install the bracket under the dash,determine the mounting location and proceed as follows (see figure 3-1).

A. Use the mounting bracket as a template and scribe two drill positioning marks at the selected mounting location under the dash. The unit must be installed in an adequately ventilated area. Never install the siren near heater ducts.

B. Drill two 1/4-inch diameter holes at the position marks.

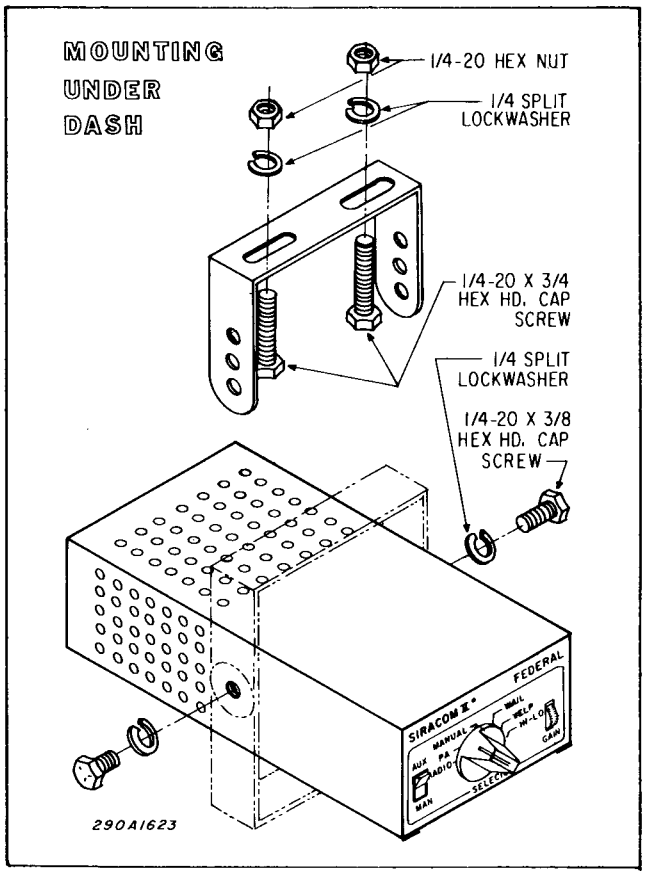


Figure 3-1 Installation of Siren under the dash

C. Secure the mounting bracket to the dash using two each of the following: 1/4 - 20 x 3/4 hex head screws, 1/4" split lockwashers and 1/4 - 20 nuts, as shown in figure 3-1.

D. Set the siren on the floor of the vehicle as close as possible to its final mounting location. Do NOT secure the siren to the mounting bracket at this time.

When installing the siren on the transmission hump, a Federal Model TU70 Tunnel Mount is recommended. The TU70 is drilled and tapped to accept the siren mounting bracket. Follow the installation instructions packed with each unit.

3-4 POWER CONNECTIONS

NOTE

The siren can be installed only in vehicles that have a negative ground electrical system.

A. The power cable included in the carton is equipped with an 8-prong plug (J301) that mates with connector P301 on the rear of the electronic siren (see figure 3-2). The various wires on the connector must be connected as described in the following paragraphs.

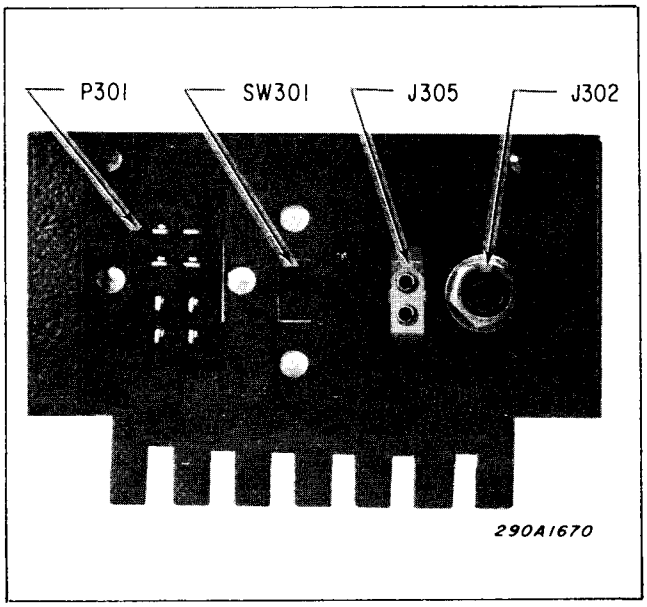


Figure 3-2 PA2010B Rear View

A. Connect the red power lead (J301, pin 1) directly to the vehicle's power distribution box 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 AWG14 or heavier wire can be spliced to the red lead.

B. Use AWG14, or heavier, wire to connect the other side of the fuseholder to the vehicle battery.

C. Connect the black wire directly to the vehicle frame as close as possible to the electronic siren.

3-5 SPEAKER CONNECTIONS

Either 58 watt or 100 watt speakers may be used with the PA2010B. The siren is also capable of driving a single 200 watt speaker such as the Federal TS200. If one or two 58 watt speakers such as Federal's CP25 or TS24 are being installed, set the speaker HI/LOW switch, SW301, to LOW.

See figure 3-2 for the location of SW301. Connect the speaker leads to the brown zip cord leads (J301, pins 5 and 6) as shown in figure 3-3.

CAUTION

When using 58 watt speakers, ALWAYS be sure that the speaker switch is set to LOW. If the speaker switch is set to HI, the 58 watt speakers will probably be damaged or destroyed.

When 100 watt speakers such as Federal's CP100 or TS100 are being installed, set SW301 to HI before connecting the speakers to the siren. Use 18 AWG wire as indicated in figure 3-3.

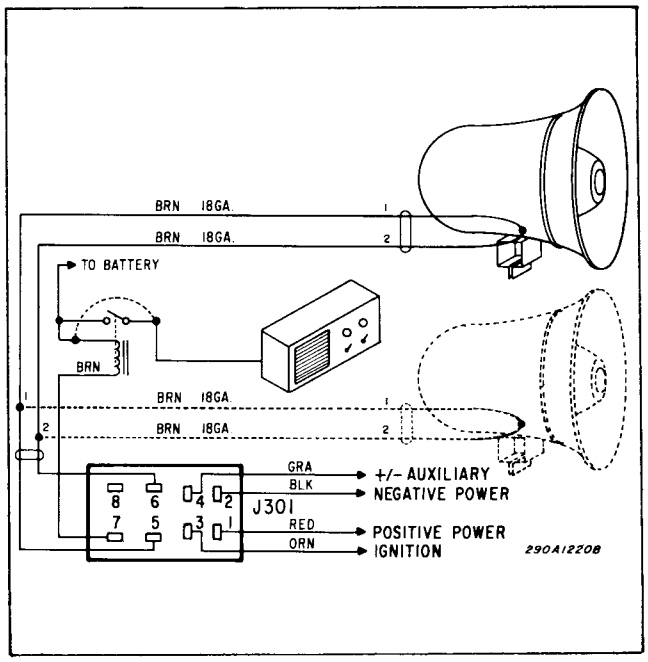


Figure 3-3 58 watt and 100 watt Speaker Connections

When two speakers are used, it is necessary to connect the speakers in parallel and in phase for optimum performance. Connect the 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 3-3).

The siren is capable of driving only one TS200 speaker. Therefore, do NOT connect any other speaker to the siren. Follow the instructions packed with the TS200 and set the speaker switch to HI before connecting the speaker to the siren with 18AWG wire (see figure 3-4).

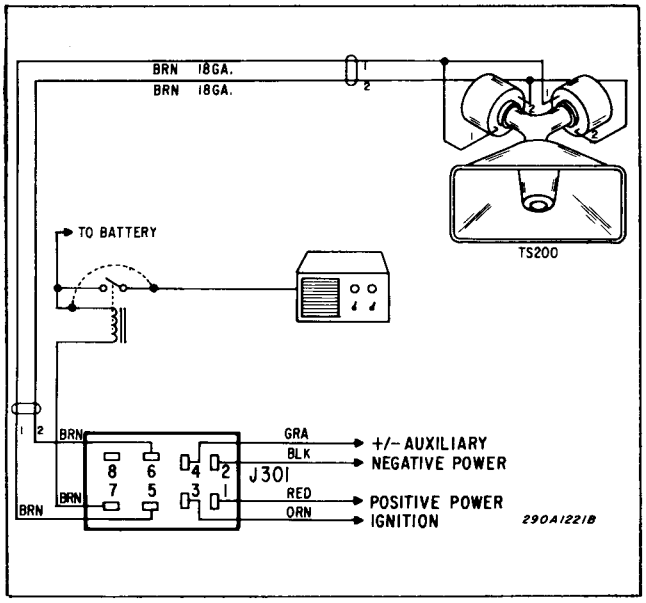


Figure 3-4 TS200 Speaker Connections

3-6 RADIO INTERCONNECTIONS

NOTE

Refer to Section IV for a description of the operation of the PA override and common microphone features. The PA2010B can easily be set for operation in either of these modes. If required, the mode of operation can be changed at a future date.

A. PA override Connections.

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

1. Locate the two-conductor "zip" cord; two-position connector assembly, in the accessory kit. Connect the wires across the two-way radio speaker voice coil terminals.

2. Plug the two-position connector into the rear of the siren.

3. Plug the Model MNCT Microphone into the rear of the Siren, which is now set for PA override operation.

B. Common Microphone Connections

1. Obtain the Adapter Module that is appropriate for the make of two-way radio in the vehicle. Install the Adapter Module in accordance with the instructions supplied with the module.

2. Cut JU2, on the front of the Main Circuit Board. (See figure 3-5).

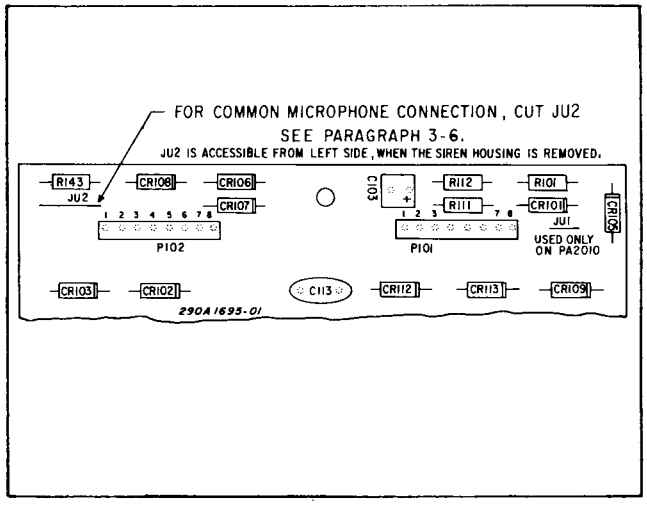


Figure 3-5 Location of Jumper JU-2

3-7 IGNITION CIRCUIT

Connect the IGN terminal to the vehicle ignition or accessory circuit using 22AWG wire. This terminal supplies power to the panel lights as well as activating the radio control circuit.

3-8 AUXILIARY CONNECTIONS

The PA2010B 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 between the gray power cable lead (J301, pin 4) and vehicle chassis ground (see figures 3-3 or 3-4). The PA2010B siren will 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 (J301, 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.

3-9 RADIO CONTROL CIRCUIT

NOTE

Before performing the procedure in this paragraph, ensure that the instructions in paragraph 3-7 have been performed.

Proper connection of the radio control circuitry allows power to be supplied to the two-way radio whenever the vehicle's ignition is on or when the SELECTOR switch is set to RADIO (radio rebroadcast). To perform this connection, proceed as follows:

A. Obtain a 12VDC Relay.

B. Connect the relay to the brown wire as shown in figures 3-3 or 3-4.

NOTE

FCC Rules and Regulations require the use of a key-lock switch to control the power to a mobile transmitter. Therefore, wire the relay to control the power to the receiver only. Wiring to accomplish this type of control varies with the type of two-way radio. Refer to the radio manufacturer's service manual.

3-10 OPTIONAL AUXILIARY SOUND BOARD

If an optional Auxiliary Sound Board will not be installed in the siren, disregard the procedure in this paragraph. However, if it is desired to install an optional Auxiliary Sound Board, proceed as follows:

1. In order to install the optional Auxiliary Sound Board, it is necessary to remove the top cover from the chassis. To remove the top cover, loosen the two hex head captive screws on the bottom of the unit and slide the cover off.

2. Remove the three Phillips head screws that hold the Main Circuit Board in the Siren. Disconnect P104 from J104.

Lift off the Main Circuit Board, rotating it to the left, as viewed from the front of the Siren. Use caution to avoid damaging wires that connect the circuit board to chassis-mounted components.

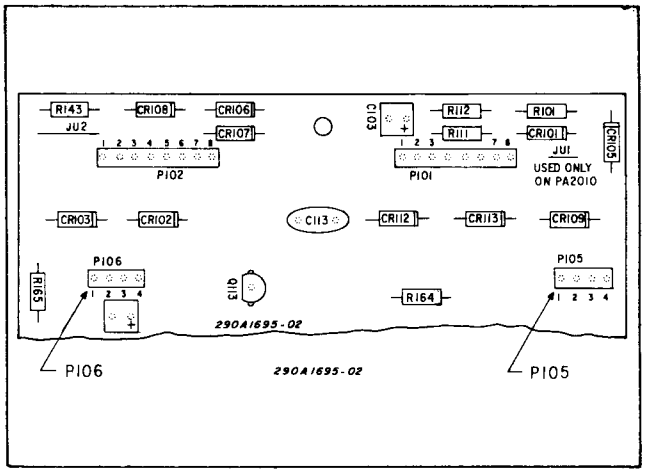


Figure 3-6 Location of P105 and P106

3. Install the optional Auxiliary Sound Board on P105 and P106, as shown in figure 3-6. Make sure the component side of the optional Auxiliary Board is toward the rear of the Main Circuit Board.

4. Insert the 6-32 screw, supplied with the optional Auxiliary Sound Board, into the sound board L bracket from the foil side of the Main Circuit Board. Tighten the screw.

5. Reassemble the siren, reversing the procedure in steps 1 and 2.

3-11 RELATIVE PA LOUDNESS ADJUSTMENT

When the electrical wiring to the siren is completed, set the SELECTOR switch to PA. Depress the microphone push-to-talk switch, speak in a normal voice, and adjust the front panel GAIN control to determine the desired sound level outside the vehicle. Turn on the two-way radio and adjust the volume for a comfortable listening level inside the vehicle. Set the SELECTOR switch to RADIO. Stand outside the vehicle and note radio rebroadcast loudness. If too loud, or too soft, adjust R142. (see figure 6-1). Access to R142 is through a hole in the top of the unit.

Clockwise rotation of R142 increases the sound level. Counterclockwise rotation decreases the sound level.

When this adjustment is completed, the loudness of the radio rebroadcast and public address may be controlled with the front panel GAIN control. Secure the siren to the mounting bracket with 1/4 - 20 x 3/4" hex head screws and 1/4" split lockwashers. Tilt the PA2100B to the desired position and tighten the 1/4 - 20 x 3/4" screws.

SECTION IV
OPERATION

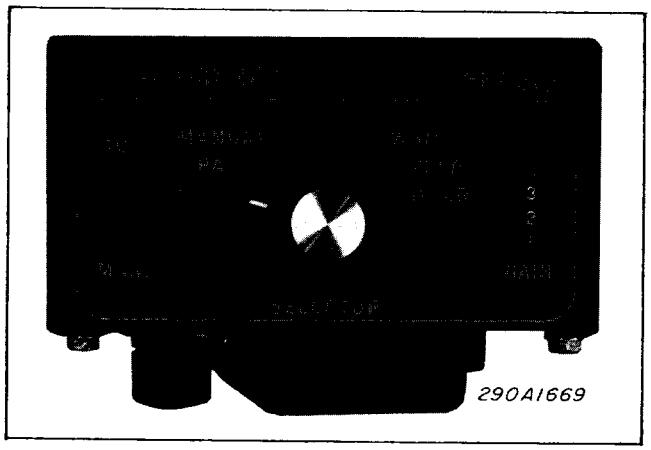


Figure 4-1 PA2010B Front View

4-1 GENERAL

As shown in figure 4-1, all PA2010B operating controls are located on the front panel of the Siren.

A line of optional adapter modules allows the user the option of using either the siren's own microphone (PA override) or the two-way radio microphone (common microphone).

The optional Model MNCT Microphone is required when PA override operation is used. When the siren is connected for PA override operation, the two-way radio and siren each have their own separate microphones. In addition, the public address is available in any SELECTOR switch position, except the RADIO position, when the microphone push-to-talk switch is depressed.

When it is desired to have common microphone operation, the radio microphone is used for both the siren and the two-way radio in the vehicle. A Federal adapter module that is designed to accommodate the two-way radio microphone connects the siren directly to the radio.

The common microphone is electrically connected to the two-way radio in all SELECTOR switch positions except PA. When the SELECTOR switch is set to PA, the two-way radio microphone is connected to the siren amplifier so that announcement can be made over the siren speaker system.

4-2 GAIN CONTROL

The GAIN control controls the loudness of the sound output from the speaker(s) siren when the siren is being used as a public address or radio rebroadcast amplifier. Downward rotation of the GAIN control increases the sound level from the speaker. The GAIN control does not control the volume of the siren.

The GAIN control also acts as the on-off switch. When it is rotated all the way up, it shuts off all functions except manual and auxiliary, even though the panel lamps will remain lit. They become lit when the ignition is turned on.

4-3 SELECTOR SWITCH

The SELECTOR switch is a six position rotary switch that selects the siren function. The following describes the six positions of the SELECTOR switch.

A. RADIO

When the SELECTOR switch is in this position, incoming radio messages are amplified by the siren amplifier and rebroadcast over the siren speaker system. Volume is controlled by the GAIN control. A LED (light-emitting diode) indicates the SELECTOR switch is set to RADIO. Power is always supplied to the two-way radio when the SELECTOR switch is set to RADIO, even if the ignition switch is off.

B. PA.

When the SELECTOR is set to the PA position, the siren amplifier may be used as a public address amplifier. When the siren and two-way radio share the same mircophone, PA is the only SELECTOR switch position that connects the microphone to the siren amplifier.

C. MANUAL

This position of the SELECTOR switch allows operation of the siren with the front panel AUX./MAN. rocker switch. The siren can also be activated by use of an auxiliary switch, such as a foot switch or horn ring switch.

D. WAIL

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

E. YELP

This position of the SELECTOR switch causes the siren to produce a rapid "warbled" tone.

F. HI-LO

In this switch position the siren produces a distinctive two-tone signal.

4-4 ROCKER SWITCH

If the SELECTOR switch is set to MAN (manual), WAIL or YELP positions, moving the rocker switch on the front panel downward produces the Peak and Hold signal. In the HI-LO position, it will cause the siren to YELP. When the rocker switch is moved upward, it activates the Auxiliary Sound, providing that the sound board is installed. If the Auxiliary Sound Board is NOT installed, upward rotation of the rocker switch will kill all sound output. The Auxiliary Sound overruns all other siren signals.

4-5 TAP II INSTANT YELP

If the Siren is set to the WAIL or HI-LO SELECTOR switch positions, the vehicle's horn ring or an auxiliary switch such as a foot switch, will operate the TAP II Instant Yelp siren signal. To operate in this mode, momentarily push the auxiliary switch or horn ring to change the siren to Yelp operation. A second momentary "tap" will change the operation of the siren back to either the "Wail" position or the "HI-LO" position, whichever is appropriate.

If the SELECTOR switch is set to MAN (Manual) position, operation of the horn ring will cause TAP II WAIL. If set to the YELP position, operation of the Horn Ring will cause TAP II HI-LO.

SECTION V
CIRCUIT DESCRIPTION

5-1 GENERAL

Refer to the Siren Functional Block Diagram, figure 5-1, and the Siren Schematic Diagram, figure 6-3, while reading the circuit description that follows.

5-2 POWER SUPPLIES AND CIRCUIT INITIALIZATION

A. Power Supplies.

Rotating the thumbwheel pot upward closes switch SW203 and a low is applied through R119 to the base of Q107, allowing Q107 to conduct.

The conduction of Q107 applies unregulated 12VDC from the vehicle battery to the 5V Supply, Q108, and the 8V Supply CR110. The 5V Supply uses zener diode CR111 to regulate the voltage at the emitter of Q108 to 5V. C106 and C107 filter the regulated 5V output.

CR110 is an 8.2V zener diode that, along with R120, produces a regulated nominal 8 volts. C104 and C105 filter noise and other transients.

B. Initialization.

The siren circuitry uses two nearly identical circuits to prevent false and annoying signals from being produced when power first is applied. Q103 and associated components initialize the bistable TAP II flip flop IC-2. Similarly, Q113 and associated components initialize the circuitry in IC4, which is responsible for the production of siren signals.

When power first is applied, Q103 begins to conduct. As a result, the voltage at the collector of Q103 goes high. This high is then applied to IC2-4 to ensure that IC2-1 is low. Simultaneously, C103 begins to charge through R111.

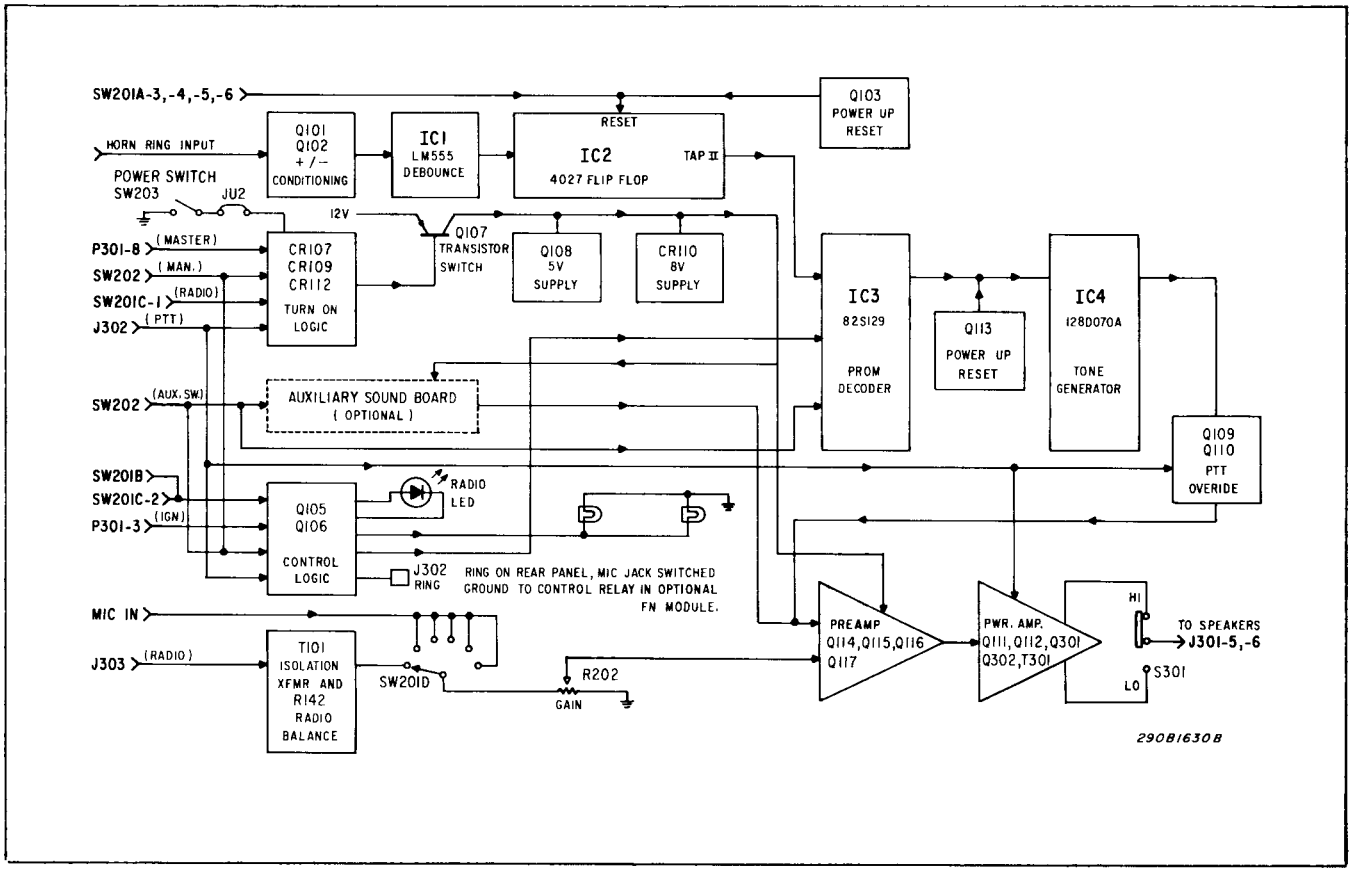


Figure 5-1 Functional Block Diagram

Approximately 5 ms. after power is applied, the voltage on C103 cuts off Q103, allowing the collector of Q103 and IC2-4 to return low, resulting in high reset voltage at IC2-4 for about 5 ms. Operation of Q113 and associated components is similar to that of Q103, except that the initializing voltage is present at IC4-24 approximately 50 ms.

5-3 SIREN SIGNAL CONTROL

A. WAIL

When SW201 (the SELECTOR switch) is set to the WAIL position, SW201B applies a low to P101-2. This low is applied through the 10K ohm pull up network, R123, which consists of several 10K resistances connected to the regulated 5V supply on one end and to the signal control lines on the other end. This arrangement ensures that all IC3 inputs are held high ("pulled up") with no control applied. The low from P101-2 is then applied to IC3-4.

B. YELP

The Yelp signal is initiated by a low at P101-3. This low is coupled through R123 to IC3-7.

C. HI-LO

Setting SW201 to the HI-LO position applies a low from SW201B-6 through CR202 to SW201B-5 and P101-3. The low is coupled through CR203 to SW201B-4 and P101-2 simultaneously. These two lows are then applied to IC3-7 and IC3-4.

D. TAP II

The Tap II circuitry can be activated by either a positive or negative horn ring circuit. Operation of the horn ring causes a high or low, depending upon horn ring circuit polarity to be applied from P301-4 through J303-1 and P103-1 to CR102 and CR103. If a high is present, CR102 couples the voltage to the Q101 emitter, turning it on. If the horn ring circuit applies a low, then CR103 is forward biased, coupling the low through R105 to the base of Q101, allowing Q101 to conduct.

When Q101 conducts, a high is applied to the base of Q102, causing Q102 to conduct and apply a low through CR104 to IC106 and IC107. This causes IC1-3 to go low. IC1-3 remains low for about 0.5 seconds after horn is released. This low is applied to IC2-3, causing IC2-1 to go high, turning on Q104, which pulls IC3-5 to ground.

A second operation of the horn ring applies a second triggering voltage to CR102 or CR103. CR102 or CR103 is then forward biased, as already explained. The operation of Q101, Q102, and IC1 is as explained above. However, this time, the 0.5 sec. low at IC1-3 causes the output of the TAP II bistable flip flop IC2 to go low. Consequently, Q104 cuts off and a high is applied to IC3-5, deactivating the TAP II signal.

5-4 DECODER

Decoder, IC3, is a programmable read-only memory (PROM) that contains the decoding necessary for the production of the various siren signals. The appropriate data for a given siren signal is addressed when a low is applied to the appropriate pin of IC3, as described in paragraph 5-3.

The output of IC3 consists of different combinations of highs and lows at IC3-12, IC3-11, IC3-10 and IC3-9. These logic levels cause IC4 to produce the various siren signals. The logic level combinations and the siren signals that they control are shown in Table 5-1.

	IC3(IC4) PIN NO.			
SIGNAL	12(22)	11(17)	10(3)	9(24)
OFF	1	1	1	1
PEAK	0	1	0	1
WAIL	1	0	0	0
YELP	1	0	0	1
HI-LO	0	1	1	0
COAST*	1	1	0	1
*Coast is part of Wail or Peak and Hold.				

Table 5-1. The Logic Level Combinations and the Siren Signals They Control

5-5 SIGNAL PRODUCTION

IC4 contains most of the circuitry necessary for the production of all siren signals. The signal being produced at any given time is determined by the logic levels applied by IC3 to IC4-22, IC4-17, IC4-3 and IC4-24 (see Table 5-1).

Some of the signal production circuitry is external to IC4. R128 and C108 are connected to IC4-16. These two components control the frequency of the rate oscillator in IC4 to approximately 360Hz. The rate oscillator controls the cycle rate of the Wail, Yelp and Hi-Lo signals.

R129 and R131 control the frequency of the tones in the Hi-Lo signal. R132, R133, R134, R140, and R141 control the waveshape of the Wail and Yelp signals. C112 is an integrating capacitor that determines the signal envelope.

R137 sets the gain of an amplifier that is internal to IC4. The gain controls the frequency range of the output signal.

5-6 PREAMPLIFIER AND OUTPUT STAGES

The preamplifier section; Q114, Q115, Q116 and Q117 amplifies all audio signals to the level necessary to drive the output stages. After the preamp amplifies the signal, it is coupled from the emitters of Q114 and Q115 through C118 to the primary of T102. T102 applies a paraphase input to the push-pull amplifier stages. The network consisting of R157, R158, CR114 and RT1 is a biasing circuit that improves amplifier linearity. The power amplifier consists of Q111, Q112, Q301 and Q302. These stages amplify the signal power to the level required to drive the speaker(s). This amplified signal is coupled through T301, then through SW301, the OUTPUT POWER SELECTOR SWITCH, then to P301.

SECTION VI
SERVICE & MAINTENANCE

6-1 GENERAL

Except for the custom chip and the programmed PROM, most of the electronic components in the PA2010B are standard parts that are available at most electronic supply outlets.

The factory can and will service your equipment or provide technical assistance with problems that cannot be handled satisfactorily and promptly locally.

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

Address all communications and shipments to:

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

The following diagrams are provided to assist repair personnel when service to the equipment is required.

Fig.	Diagram
6-1	Siren Printed Circuit Board Removal
6-2	Siren Front Circuit Board Parts Location Diagram
6-3	Siren Schematic Diagram
6-4	Siren Main Circuit Board Parts Location Diagram
6-5	Siren Internal View
6-6	PA2010B Bottom View

6-2 SIREN

A. General

Any competent electronic technician should have little difficulty in tracing and correcting a malfunction. When trouble-shooting the PA2010B, Table 601 may be useful for isolating a malfunction.

Use care when soldering. Heat easily damages integrated circuits, transistors, capacitors and circuit boards. Therefore, it is advisable to use longnose pliers or similar heat sink on the component lead being soldered.

When replacing the Driver Amplifier transistors, Q111 and Q112, or the Output Amplifier transistors, Q301 and Q302, insure that a matched pair is used. In addition, always replace the SIL-PAD insulators. Ensure that they are properly installed. Improper installation of the insulator could cause a short circuit.

Always adjust the symmetry of the output waveform when Q111 and Q112 or Q301 and Q302 are replaced. To perform this adjustment, disconnect the speaker(s) and connect a 5.5 ohm 200 watt dummy load across the speaker terminals. Connect an oscilloscope across the dummy load and activate the Yelp signal. Adjust R156 for the best possible square wave. See figure 6-4 for the location of R156.

B. Removal for Servicing.

To remove Siren, loosen two hex head screws on the bottom of the unit, and slide the Siren out (see figure 6-6).

C. Circuit Board Removal.

1. To remove the Main Circuit Board remove the three screws that hold the board in the Siren (see figure 6-1). Disconnect the two connectors at the rear of the board and lift the board out of the chassis.

2. To remove the Front Circuit Board, remove the Main Circuit Board as described in subparagraph 6-2. C.1. Loosen the control knob set screw and slide the knob from its control shaft. Remove the spanner nut that holds the SELECTOR control to the front panel of the siren. Remove the two screws from the bottom of the Siren that screw into the front PC Board L-brackets. Lift out the Front PC Board.

Table 6-1 lists voltages and waveforms that appear on the integrated circuits and transistors in the PA2010B when the SELECTOR switch is set to its various positions. Abbreviations are used to describe the SELECTOR position. These abbreviations and their meanings are as follows:

R = RADIO W = WAIL

P = PA Y = YELP

M = MANUAL H = HI-LO

The Tables below show characteristics of IC-1, which debounces the Horn Ring signal; IC-2, the bistable TAP II flip flop and IC-3, the PROM. On suceeding pages are the characteristics of IC-3 continued; a chart of hexidecimal addresses and outputs; the characteristics of IC-4, which contains most of the circuitry necessary for the production of all siren signals; plus the square wave characteristics of Q111, Q112, Q301 and Q302.

Table 6-1

At the end of these pages are square wave drawings. When a waveform is present at a point, the waveform is listed by a capital letter or its peak-to-peak voltage. For example, the waveforem at IC1-3 corresponds to the drawing labeled B at the end of these pages, which shows that when an oscilloscope is connected to IC1-3, this waveform having an amplitude of 5V should be observed.

IC1

PIN	SELECTOR POSITION	VOLTAGE OR WAVEFORM	NOTES
1	All	OV	
2	All	A	Only as long as Horn Ring is operating.
3		B	
4,8	All	5VDC	
5	All	3VDC	
6,7		C	

IC2

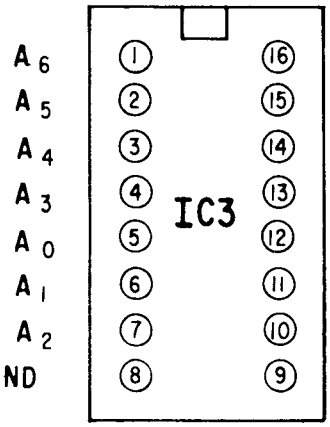
PIN	SELECTOR POSITION	VOLTAGE OR WAVEFORM	NOTES
1	All	5V or 0V on alternate operation of Horn Ring	RESET when ROTARY switch is changed.
3	All	B	While Horn Ring is held down.
4	All	D,E	
5,6,16	All	5VDC	Switched 5V
7,8,9, 10,11, 12,13	All	0VDC	Ground

IC3

PIN	SELECTOR POSITION	VOLTAGE OR WAVEFORM	NOTES
1	All	D	As long as AUX is operated.
2	All	D	As long as PEAK is operated.
3	M	OV	5V in other SELECTOR positions.
4	W	OV	5V in other SELECTOR positions.
5	All	OV or 5V	Alternates as Horn Ring is depressed.
6	All	OV or 5VDC	HIGH as long as Horn Ring is depressed.
7	Y	OV	5V in other SELECTOR positions.
8,13,14	All	OV	
9		See Hex table on next page	
10			
11			
12			
15	All	5V	
16	All	5V	

IC3 ADDRESSES AND OUTPUTS IN HEXADECIMAL

AD	OUT	AD	OUT	AD	OUT	AD	OUT	AD	OUT	AD	OUT	AD	OUT	AD	OUT	AD	OUT	AD	OUT
00	B	1B	F	36	F	51	9	6C	3	87	B	A2	B	BC	F	D7	A	F2	9
01	B	1C	F	37	F	52	9	6D	B	88	B	A3	B	BD	F	D8	A	F3	6
02	B	1D	F	38	F	53	9	6E	3	89	B	A4	B	BE	F	D9	A	F4	9
03	B	1E	F	39	F	54	A	6F	B	8A	B	A5	B	BF	F	DA	A	F5	3
04	B	1F	F	3A	F	55	A	70	9	8B	B	A6	B	C0	B	DB	A	F6	9
05	B	20	B	3B	F	56	A	71	6	8C	F	A7	B	C1	B	DC	A	F7	3
06	B	21	B	3C	F	57	A	72	9	8D	F	A8	B	C2	B	DD	A	F8	6
07	B	22	B	3D	F	58	A	73	6	8E	F	A9	B	C3	B	DE	A	F9	9
08	B	23	B	3E	F	59	A	74	9	8F	F	AA	B	C4	B	DF	A	FA	6
09	B	24	B	3F	F	5A	A	75	3	90	F	AB	B	C5	B	E0	B	FB	9
0A	B	25	B	40	B	5B	A	76	9	91	F	AC	F	C6	B	E1	B	FC	F
0B	B	26	B	41	B	5C	A	77	3	92	F	AD	F	C7	B	E2	B	FD	F
0C	F	27	B	42	B	5D	A	78	6	93	F	AE	F	C8	B	E3	B	FE	F
0D	F	28	B	43	B	5E	A	79	9	94	F	AF	F	C9	B	E4	B	FF	F
0E	F	29	B	44	B	5F	A	7A	6	95	F	B0	F	CA	B	E5	B		
0F	F	2A	B	45	B	60	B	7B	9	96	F	B1	F	CB	B	E6	B		
10	F	2B	B	46	B	61	B	7C	A	97	F	B2	F	CC	A	E7	B		
11	F	2C	F	47	B	62	B	7D	A	98	F	B3	F	CD	A	E8	B		
12	F	2D	F	48	B	63	B	7E	A	99	F	B4	F	CE	A	E9	B		
13	F	2E	F	49	B	64	B	7F	A	9A	F	B5	F	CF	A	EA	B		
14	F	2F	F	4A	B	65	B	80	B	9B	F	B6	F	D0	9	EB	B		
15	F	30	F	4B	B	66	B	81	B	9C	F	B7	F	D1	9	EC	3		
16	F	31	F	4C	A	67	B	82	B	9D	F	B8	F	D2	9	ED	B		
17	F	32	F	4D	A	68	B	83	B	9E	F	B9	F	D3	9	EE	3		
18	F	33	F	4E	A	69	B	84	B	9F	F	B0	F	D4	A	EF	B		
19	F	34	F	4F	A	6A	B	85	B	A0	B	BA	F	D5	A	F0	9		
1A	F	35	F	50	9	6B	B	86	B	A1	B	BB	F	D6	A	F1	6		



A_7 = BURGLAR ALARM
A_6 = AIR HORN INPUT
A_5 = PEAK AND HOLD INPUT
A_4 = MANUAL INPUT
A_3 = 1 INPUT
A_2 = 2 INPUT
A_1 = +/−/AUXILIARY INPUT
A_0 = TAP II INPUT

290B1698

DESCRIPTION OF OPERATION

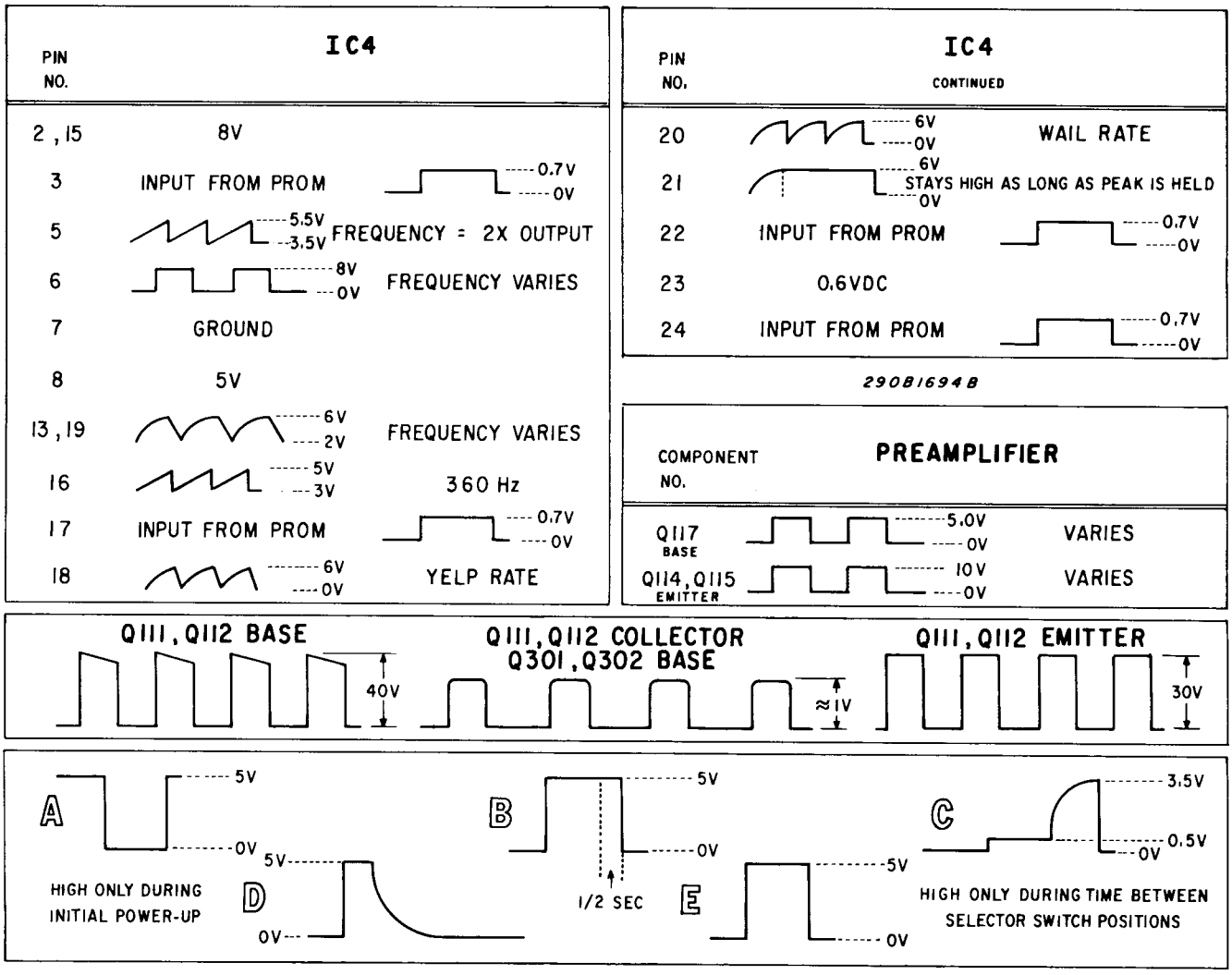
HIGHS are 3.7V or Above to 5V
LOWS are .7V or Below

All Inputs are active lows

1. Air Horn Active - Output is always off (Hexadecimal Code - F).
2. Accidental triggering or malfunction of burglar alarm will not interfere with normal operation.
3. PEAK and HOLD button always causes Peak in MAN (manual), WAIL or YELP. In HI-LO it causes Yelp.
4. HORN RING activation causes Tap II to engage WAIL if in manual mode, YELP in all other modes.

OUTPUT CODING

B = 1011	COAST
F = 1111	OFF
A = 1010	PEAK
9 = 1001	YELP
3 = 0011	WAIL
6 = 0110	HI-LO



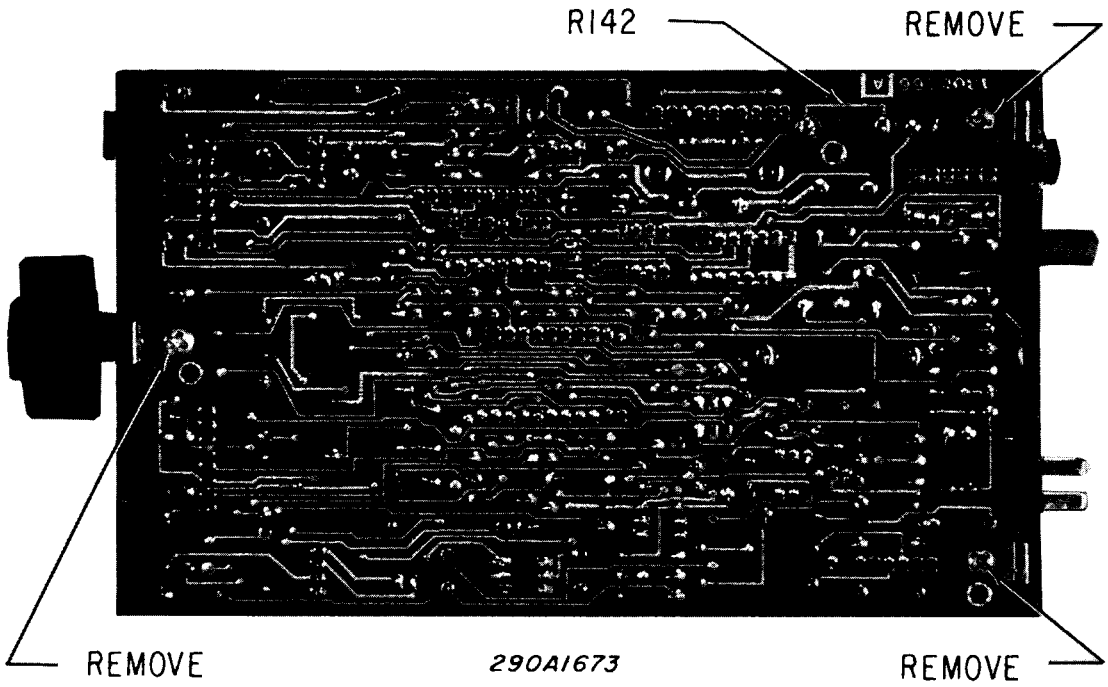


Figure 6-1 Siren Amplifier Printed Circuit Board Removal

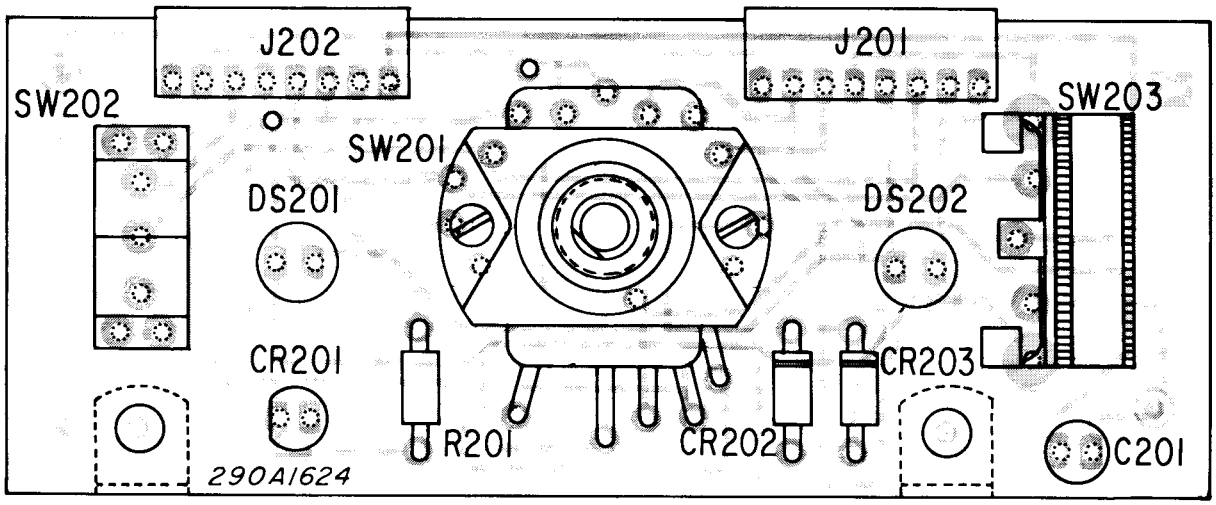
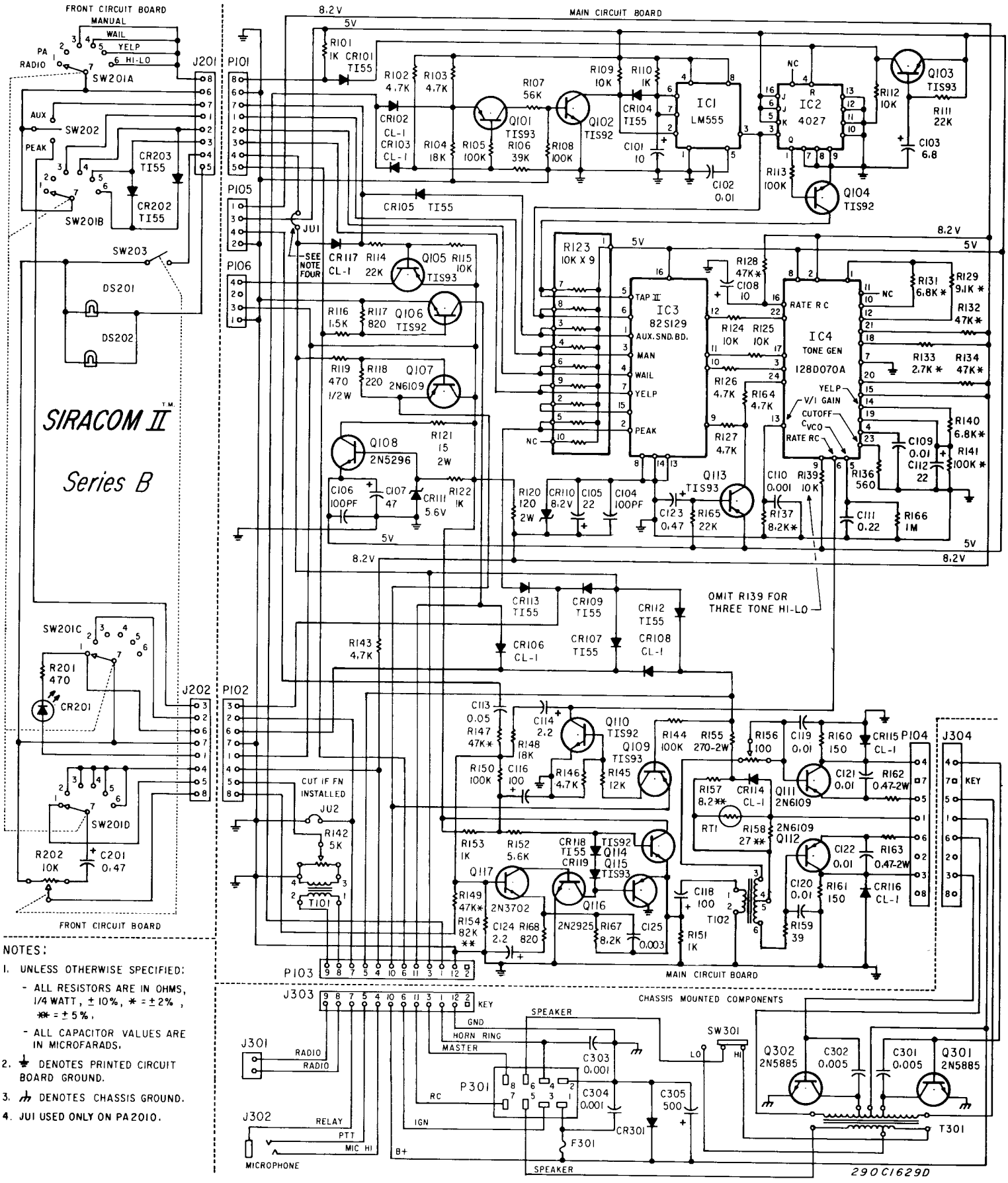


Figure 6-2 Siren Front Circuit Board Parts Location Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - ALL RESISTORS ARE IN OHMS, 1/4 WATT, ± 10%, * = ± 2%, ** = ± 5%.
   - ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ⏚ DENOTES PRINTED CIRCUIT BOARD GROUND.
3. ⏚ DENOTES CHASSIS GROUND.
4. JU1 USED ONLY ON PA2010.

Figure 6-3 Model PA2010B Schematic Diagram

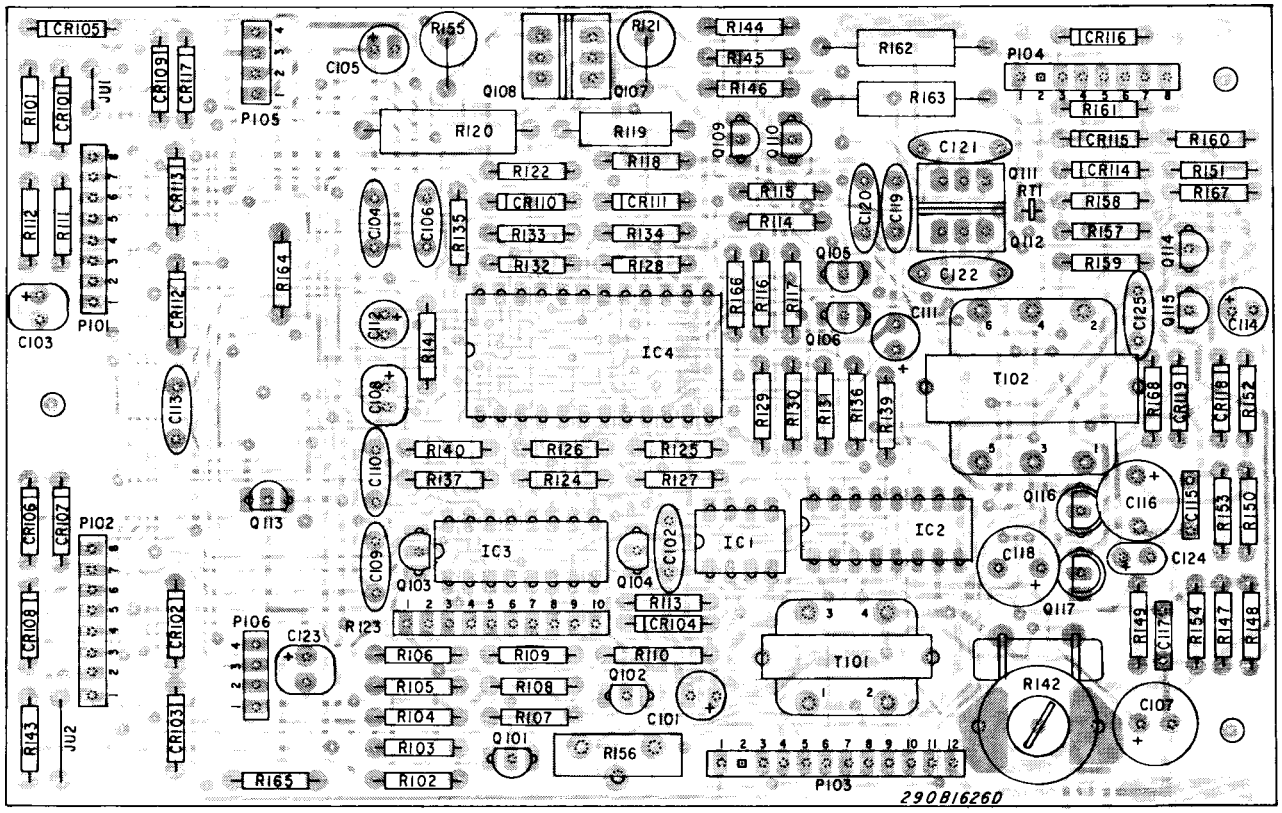


Figure 6-4 Siren Main Circuit Board Parts Location Diagram

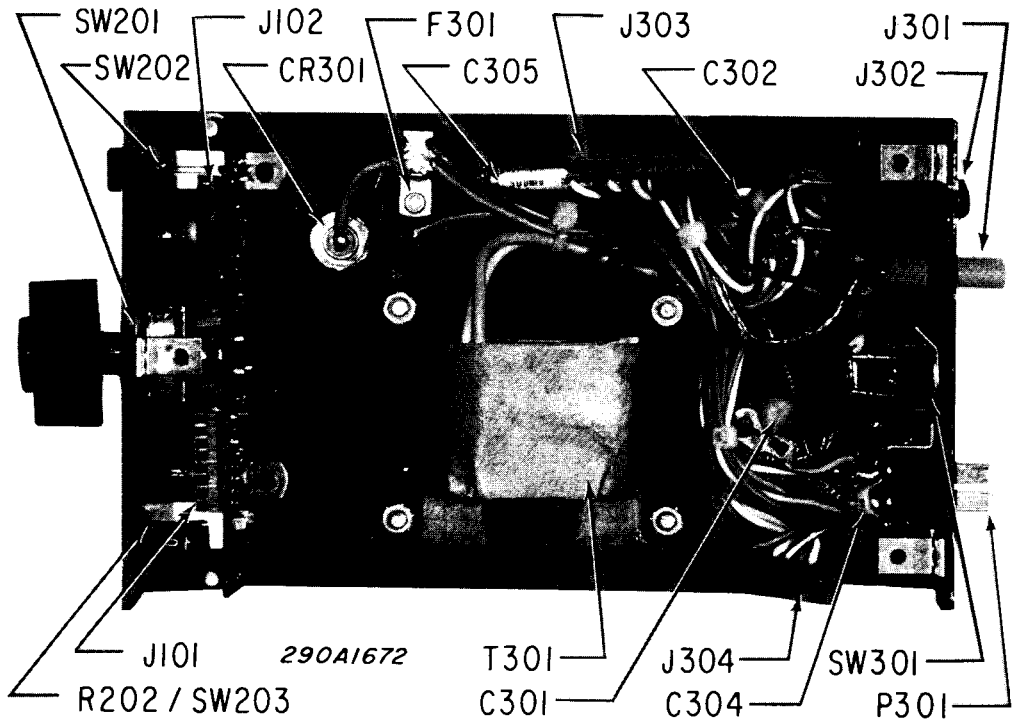


Figure 6-5 Siren Internal View

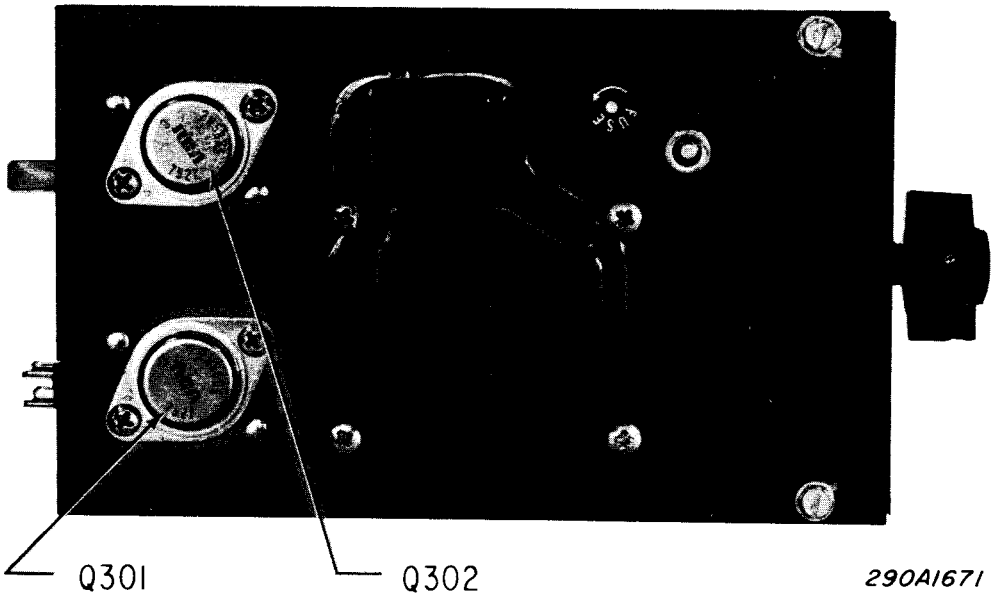


Figure 6-6 PA2010B Bottom View

MAIN CIRCUIT BOARD PARTS LIST

Schematic Symbol	Description	Part No.
	RESISTORS (See Note)	
R101,110,122,151, 153	1K Ohm	100A233
R102,103,126,127, 143,146,164	4.7K Ohm	100A224
R104,148	18K Ohm	100A204
R105,108,113,144, 150	100K Ohm	100A222
R106	39K Ohm	100A214
R107	56K Ohm	100A229
R109,112,115,124, 125, 139	10K Ohm	100A207
R111,114,165	22K Ohm	100A208
R116	1.5K Ohm	100A220
R117,168	820 Ohm	100A267
R118	220 Ohm	100A219
R119	470 Ohm, 1/2 W.	100A311
R120	120 Ohm, 2W., WW	103A105
R121	15 Ohm, 2W.	103A116
R123	Resistor Network 9x10K Ohm	100A801
R128,132,134,147, 149	47K Ohm, 2%	100A778
R129	9.1K Ohm, 2%	100A781
R131,140	6.8K Ohm, 2%	100A762
R133	2.7K Ohm, 2%	100A773
R136	560 Ohm	100A274
R137	8.2K Ohm, 2%	100A715
R141	100K Ohm, 2%	100A780
R142	Potentiometer, 5K Ohm	105B204
R145	12K Ohm	100A269
R152	5.6K Ohm	100A253
R154	82K Ohm, 5%	100A750
R155	270 Ohm, 2W., WW	103A128
R156	Potentiometer, 100 Ohm	105A244
R157	8.2 Ohm, 5%	100A724
R158	27 Ohm, 5%	100A290
R159	39 Ohm	100A286
R160,161	150 Ohm	100A238
R162,163	0.47 Ohm, 2W.,WW	103A130
R166	1 Megohm	100A215
R167	8.2K Ohm	100A368
RT1	Thermistor, 200 Ohm	104A111

Note: Unless otherwise specified, all resistors are carbon composition, 10% 1/4 watt.

	CAPACITORS	
C101	10UF,16V, electrolytic	108A143
C102,109,119,120	0.01UF, 25V, disc	107A226
C103	6.8UF,35V,tantalum	107A604
C104,106	100pf, 100V, disc	107A235
C105	22UF, 16V, electrolytic	108A144
C107	47UF, 16V, electrolytic	108A145
C108	10UF, 10V, tantalum	107A634
C110	0.001UF, 500V, disc	107A263
C111	0.22UF, 35V, tantalum	107A1101
C112	22UF, tantalum	107A667-02
C113	0.05UF, 35V, disc	107A227
C114,124	2.2UF, 25V, electrolytic	108A142
C116,118	100UF, 16V, electrolytic	108A146
C121,122	0.01UF, 100V, disc	107A223
C123	0.47UF, 35V, tantalum	107A645
C125	0.0033UF, 100V, disc	107A271
	SEMICONDUCTORS	
IC1	Integrated Circuit, LM555	128A043A-02
IC2	Integrated Circuit, 4027AE	128A044
IC3	Integrated Circuit, 82S129	128A055-01
IC4	Integrated Circuit, tone generator	128D070
Q101,103,105,109, 113,115	Transistor, PNP, TIS93	125B133
Q102,104,106,110, 114	Transistor, NPN, TIS92	125B132
Q107,111,112	Transistor, PNP, 2N6109	125B431
Q108	Transistor, NPN,2N5296	125B415
Q116	Transistor, NPN	125A119
Q117	Transistor, PNP, 2N3702	125A113
CR101,104,105, 107,109,112,113, 118,119	Diode, TI55	115B101
CR102,103,106, 108,114,115,116, 117	Diode, CL1 (ED3002S)	115B301
CR110	Diode, Zener,8.2V,IN4738	115A232
CR111	Diode, Zener, 5.6V, IN5232B	115A254
	MISCELLANEOUS	
T101	Transformer, Audio	120B123
T102	Transformer, Driver	120B145
	Circuit Board (without parts)	130D266D
	Circuit Board (complete with parts installed)	200D789B
P101,102,104	Connector, Wafer	140A170
P103	Connector, Wafer	140A195
P105,106	Connector, Interlocking	140A186
	Insulator, Thermal	235A124A
	SCR, Mach. Rd.Hd.SLT STL	7000A055-05
	Nut, Hex Ext. Keys STL	7058A001
JU-1,JU-2	Wire, Buss 22	R301A022-00

CHASSIS MOUNTED COMPONENTS PARTS LIST

Schematic Symbol	Description	Part No.
C301,302	Capacitor,0.005 UF,100V,disc	107A211
C303,304	Capacitor,0.001 UF,100V,disc	107A207
C305	Capacitor,500 UF,15V,electrolytic	108A122
Q301,302	Transistor, NPN, 2N5885	125B432A
CR301	Diode, 368AR	115A311
T301	Transformer Output	120C158A
J301	Connector, 2 contact	140A197
J302	Jack, Microphone	142A118A
J303	Connector, 12 contact, AMP MTA	233A139
J304	Connector, 8 contact, AMP MTA	233A138
P301	Connector, 8 contact, cinch Jones	140A114
SW301	Switch, Slide, DPDT	122A144
	Fuseholder, 342002	143A106
	Polarizing Keys - 2 required	231A141A
	Transformer Cover	8536C605
	Foam Pad - 2 piece	230A133
F301	Fuse, 20 ampere, 3AG	148A127

FRONT CIRCUIT BOARD PARTS LIST

Schematic Symbol	Description	Part No.
R201	Resistor, 470 Ohm,FC,10%, 1/4W	100A255
C201	Capacitor, 0.47 UF. 35V, tantalum	107A645
CR201	Light Emitting Diode, red	147A113A-01
CR202,203	Diode, T155	115B101
SW201	Rotary Switch, 4 pole, 6 pos.	122B198
SW202	Rocker Switch, SPST, center-off	122B191
SW203/ R202	Switch/Thumbwheel potentiometer	104B116A
DS201,202	Lamp, subminiature	149A117
	Front Circuit Board (without parts)	130C265
	Front Circuit Board (with parts installed)	200C788
	Right Angle Connector	139A161

255A186C
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