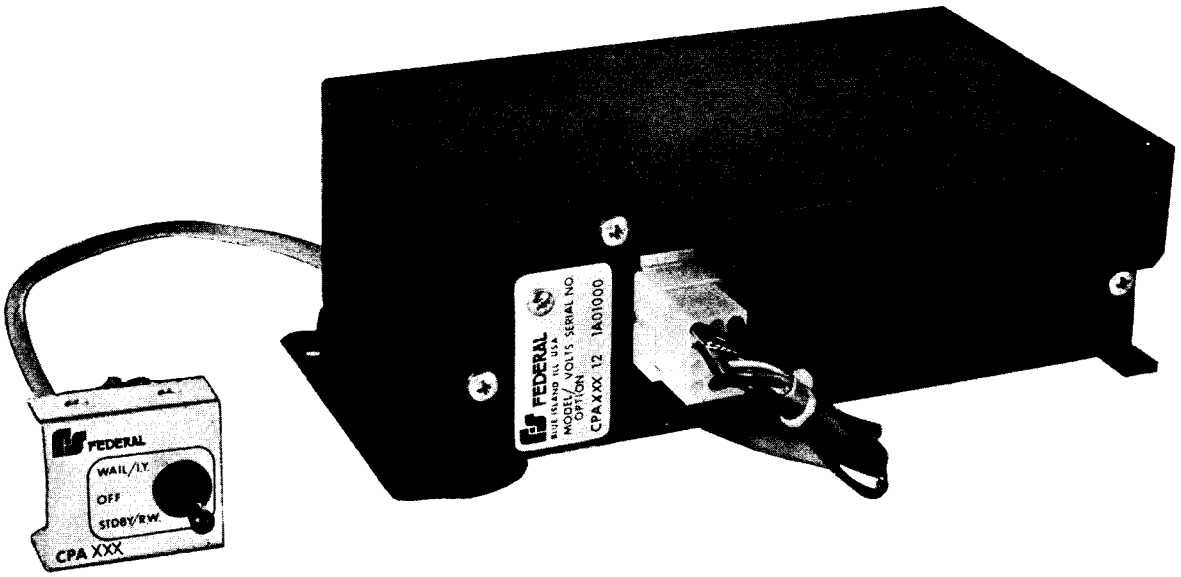
PRICE $2.00

SIGNAL DIVISION
Federal Signal Corporation

MODELS CPA58 and CPA100

ELECTRONIC SIRENS



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 one year 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

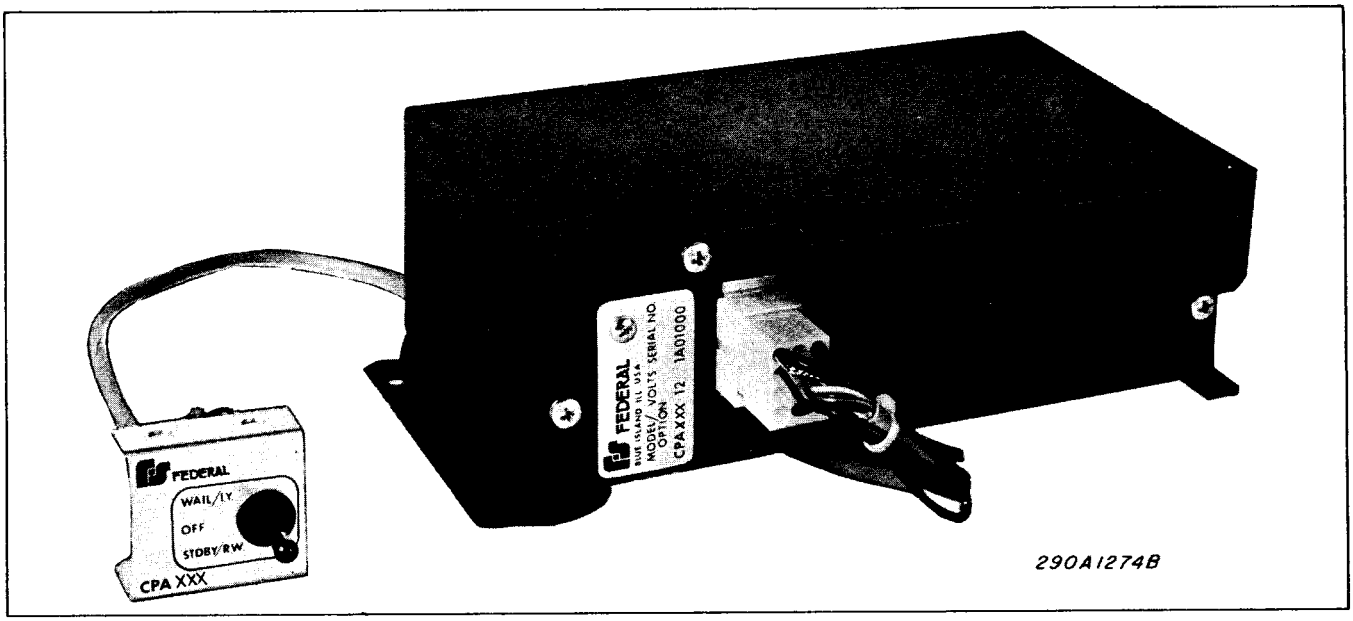

Figure 1-1. Federal Model CPA100 or CPA58 Electronic Siren.

The Federal Models CPA100 (figure 1-1) and CPA58 are precision built, compact, solid state electronic sirens of advanced design. The sirens operate from a nominal 12Vdc, negative ground, electrical system. The packaging and control configurations of both models are identical. In addition, both models are functionally identical except that the CPA100 operates with one 100 watt speaker, such as the Federal Model TS100, and the CPA58 operates with one 58 watt speaker, such as the Federal TS24. Your Federal dealer has a complete line of speakers for use with the Models CPA100 and CPA58.

The siren can be installed in any convenient location, such as the vehicle firewall or under the front seat. The siren can also be installed in the vehicle trunk with the addition of the optional Model EXT 20 Extender Cable. The Model EXT 20 is 20 feet (6.1.m.) in length. Separate installation instructions are provided with the extender cable. The siren is controlled by a bracket-mounted toggle switch that is mounted in a location convenient to the operator.

The siren is capable of producing two distinct siren signals; Wail and Yelp. The unit also has provisions for public address (PA) operation. An optional Federal Model MNCT Microphone is required if it is desired to make use of the PA capability.

The power/control cable plugs into the siren and allows the unit to be removed from the vehicle for servicing without disturbing the wiring to the speaker, power, or control switch(es). The siren and vehicle electrical system are protected by a 15 ampere in-line fuse in the power lead.

The CPA100 is available in two versions; Model CPA100*012H and Model CPA100*012N. The CPA58 is also available as CPA58*012H and CPA58*012N. H Models are equipped with the TAP II Instant Yelp feature. Instant Yelp provides "push on - push off" operation when an auxiliary switch, such as the horn ring switch, is operated while the Siren switch is in the WAIL/I.Y. position. The siren output signal alternates between Wail and Yelp as the horn ring or auxiliary switch is operated. When the Siren switch is in the STDBY/R.W. (remote wail) position, operating the horn ring or auxiliary switch causes the siren to produce the Wail signal until the horn ring or auxiliary switch is operated again.

The Models CPA100*012N and CPA58* 012N (N Models) are identical to the H models except that the N models do not have the Instant Yelp or Remote Wail feature.

If desired, the optional Burglar Alarm can be included in the siren. The Burglar Alarm is enabled by means of a key lock switch installed in the vehicle fender or other convenient location. A trunk switch is also provided to activate the alarm. Additional user-supplied switches or sensors can also be installed, if desired. The option is factory wired to cause the siren to produce Wail when the alarm is activated.

The Burglar Alarm option has no effect on the operation of the siren when the key lock switch is turned off.

SECTION II
SPECIFICATIONS

2-1. GENERAL.

Input Voltage	10Vdc to 16Vdc (16Vdc operation limited to 15 min.
Polarity	Negative ground only
Standby Current (Siren Control Switch set to OFF)	OmA.
Operating Temperature Range	-30°C to +75°C
Dimensions (HWD-overall)	2-7/8" x 8-5/8" x 4-7/8" (73mm x 220mm x 124mm)
Weight (approx.)	4 lb. (1.8 kg)

2-2. SIREN.

Operating Current (14.0Vdc-WAIL)	
1 100 Watt Speaker	10 amperes (max.)
1 58 Watt Speaker (CPA58)	6 amperes (max.)
Frequency Range	550 to 1500Hz
Cycle Rate (approx.)	WAIL - 10 cycles/min. YELP - 180 cycles/min.
Voltage Output (approx.)	
1 100 Watt Speaker (CPA100)	64V p-p
1 58 Watt Speaker (CPA58)	45V p-p

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. All small parts and accessories are packed in a plastic bag.

3-2. SIREN PHYSICAL INSTALLATION.

Locate the plastic bag containing the accessory kit. The accessory kit consists of the power/control cable, the toggle switch, the 1/4" microphone jack, the switch mounting bracket, legend plate and mounting hardware. To install the siren, proceed as follows:

A. Peel off the protective paper backing from the legend plate. Carefully align the hole in the legend plate with the right hand hole in the legend plate (as viewed from the front), and apply the legend plate to the bracket, as indicated in figure 3-1. Press the legend plate firmly against the bracket to ensure that the plate adheres firmly to the bracket.

CAUTION

When drilling holes in ANY part of a vehicle, ensure that both sides of the mounting surface are clear of parts that could be damaged, such as brake lines, fuel lines, electrical wiring or other vital parts.

B. Using the short #8 sheet metal screws supplied in the accessory kit, mount the bracket/legend plate assembly under the vehicle dashboard or other location that is easily accessible to the siren operator.

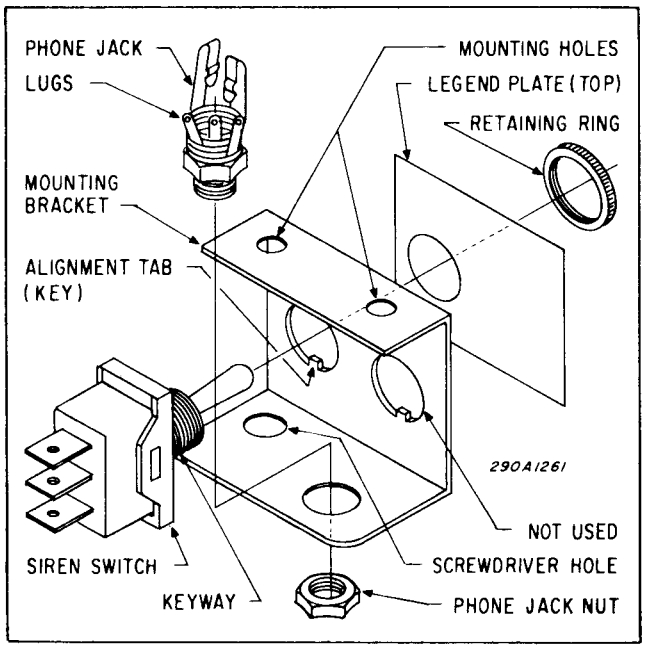

Figure 3-1. Toggle Switch and Phone Jack Installation.

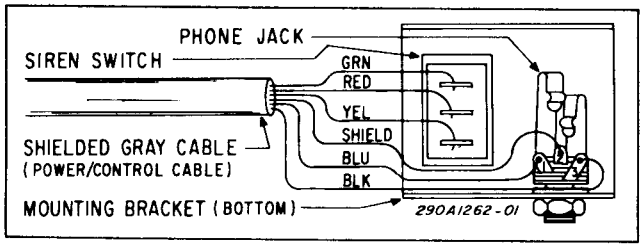

Figure 3-2. N Model Electrical Connections.

C. See figure 3-1. Align the keyway on the switch with the alignment tab in the mounting bracket hole and install the switch in the hole in the mounting bracket. Place the retaining nut on the switch and tighten the nut to hold the switch on the mounting bracket.

D. Install the phone jack in the large hole in the bottom bend of the mounting bracket, as shown in figure 3-1. Position the phone jack so that the three lugs are toward the rear of the bracket, as shown in figure 3-2.

NOTE

The power/control cable is six feet in length. Therefore, be sure that the location selected for mounting the siren is not more than six feet from the switch mounting bracket.

E. Select the siren mounting location, and using the holes in the mounting flanges of the siren housing as a template, scribe four screw location marks at the mounting location.

F. Drill four 1/8" diameter holes at the position marks.

G. Secure the siren to the mounting surface using the long #8 sheet metal screws supplied in the accessory kit.

NOTE

Perform the following steps only if the siren is equipped with the Burglar Alarm Option.

H. Drill a 3/4" hole at the key lock switch mounting location, and install the switch.

I. Select the trunk switch mounting location. The trunk switch must be mounted so that the alarm is not activated when the trunk lid is closed, and the switch is actuated to sound the alarm when the trunk is opened.

Drill a 1/4" hole at the trunk switch mounting location. Thread the trunk switch into the hole.

J. If desired, install other user-supplied sensors or switches at the desired locations.

3-3. SPEAKER PHYSICAL INSTALLATION.

It is recommended that siren speaker be installed under the hood of the vehicle. Install the speaker following the manufacturer's instructions. If the Federal Model TS100 or TS24 is used, a Federal Model TSKC Concealed Mounting Kit is required to install the speaker under the hood.

3-4. ELECTRICAL CONNECTIONS.

A. Power/Control Cable

1. Plug the plastic connector on the power/control cable into the receptacle on the siren.

2. Connect the red AWG16 wire having the in line fuseholder to the vehicle's positive battery terminal If necessary, splice additional AWG 16, or larger, wire on the red wire.

3. Connect the black AWG 16 wire directly to the vehicle frame as close as possible to the siren.

4. Connect the brown two conductor ("zip") cord in the power/control cable to the siren speaker. If necessary, splice additional AWG 18 wire on the two conductor cord.

B. Control Switch(es)

1. N Models

See figure 3-2. The power/control cable assembly contains a five conductor shielded gray cable. Each of the wires in the gray cable is terminated by a factory-installed solderless terminal. Slide these terminals on the lugs on the rear of the SIREN switch, as indicated in figure 3-2.

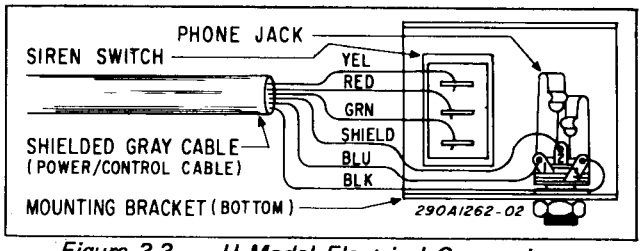

Figure 3-3. H Model Electrical Connections.

2. H Models

See figure 3-3. The power/control cable assembly contains a five conductor shielded gray cable. Each of the wires in this cable is terminated by a factory-installed solderless terminal. Slide these terminals on the lugs on the rear of the YELP-OFF-WAIL switch, as indicated in figure 3-3.

C. Microphone Jack.

See figure 3-2.Connect the blue wire in the shielded gray cable to lug 1 on the microphone jack. Connect the shield to lug 2 and the black wire to lug 3.

D. Horn Ring (H Models only).

The power/control cable for the Model CPA100*012H has two additional AWG 20 wires; a blue and an orange. These two wires are NOT part of the shielded gray cable. To connect these wires to the vehicle horn ring switch, proceed as follows:

1. Cut the wire between the vehicle horn ring switch and the horn or horn relay.

2. Splice the blue AWG 20 wire to the horn ring side of the cut wire. Insulate the splice.

3. Splice the orange AWG 20 wire to the horn side of the cut wire. Insulate the splice.

E. Auxiliary Switch (H Models only).

Connect one side of the user-supplied auxiliary switch to the vehicle chassis (ground). Connect the other side of the switch to the blue AWG 20 wire in the power/control cable.

F. Optional Burglar Alarm.

1. Connect the white wire in the power/control to one of the terminals on the key lock switch. If neces-

sary, splice additional AWG 18, or larger wire to the white wire in the power/control cable to reach the key lock switch. Route the wire so that it is not accessible from the outside of the vehicle. If the switch is mounted on one of the front fenders, it may be desirable to route the wire through the engine compartment to the switch.

2. Connect the remaining terminal of the key lock switch to the vehicle chassis, as close as practical to the switch.

3. Connect the white/black wire in the power/control cable to the terminal on the trunk switch. If necessary, splice additional AWG18, or larger, wire to the white/black wire in the cable. Route the wire so that it is inaccessible from outside of the vehicle. If the siren is installed in the vehicle passenger compartment; it may be desirable to route the wire under the floor mats. If the siren is installed in a police vehicle, it is essential that all wiring be inaccessible and hidden from view in the interior of the vehicle. This is especially true if the wire passes from the front of the passenger compartment, under the back seat,and to the trunk.

4. Connect all other sensors and switches in parallel with the trunk switch. These devices must apply a switch closure to ground to activate the burglar alarm.

3-4. PA LOUDNESS ADJUSTMENT.

After the siren is completely installed, depress the microphone push-to-talk switch and speak into the microphone in a normal speaking voice. Using a small screwdriver, adjust R42 for the desired PA loudness level. See figure 6-2 for the location of R42. It may be desirable to station another person outside of the vehicle, approximately 10 feet from the front of the speaker, to assist the operator while making the adjustment.

SECTION IV
OPERATION

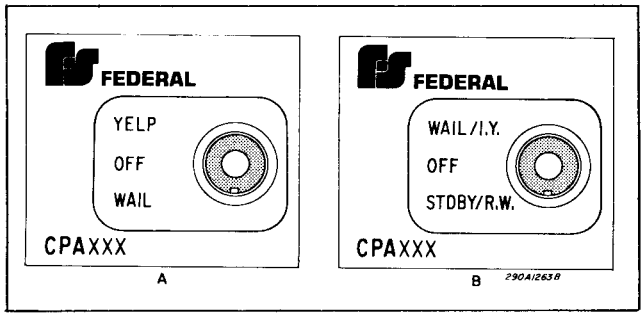

Figure 4-1. Siren Control Functions.

WARNING

The siren is intended to help the vehicle operator make a rapid and safe trip to the scene of a fire or emergency. However the siren CANNOT guarantee right of way. Therefore,NEVER assume that you have the right of way when the siren is sounding.Drive defensively!

CAUTION

Do NOT OPERATE the siren when other persons are in the immediate vicinity of the loudspeaker. This vehicle siren can cause severe hearing discomfort because of the high intensity of the sound that it produces.

4-1. GENERAL.

The controls used in the operation of N Models and H Models are shown in figures 4-1A and 4-1B, respectively. As shown in the figures, the operating control of each model is a single toggle switch. The function of the switch positions on each siren model will be described separately.

4-2. SWITCH FUNCTIONS.

A. N Models

1. WAIL causes the siren to produce a "wailing" sound whose frequency varies between 600Hz and 1500Hz at a rate of 10 to 15 cycles per minute. The public address overrides the Wail signal when the microphone push-to-talk (PTT) switch is depressed.

2. OFF. The siren produces no sound. However, public address is operational when the microphone PTT switch is depressed.

3. YELP produces a signal similar to WAIL, but at a much faster rate. The siren signal frequency varies between 600Hz and 1500Hz at a rate of approximately 180 cycles per minute. Pressing the PTT switch causes public address to override the signal.

B. H Models

1. WAIL/I.Y. (Instant Yelp) causes the siren to produce the Wail signal as described in paragraph 4-2.A, with the addition of TAP II Instant Yelp. TAP II Instant Yelp is activated by operating the vehicle horn ring or other auxiliary switch. This causes the siren signal to change from Wail to Yelp. The Wail signal resumes when the horn ring (or auxiliary switch) is operated again, or the toggle switch position is changed. Deparessing the microphone push-to-talk (PTT) switch causes the public address (PA) function to override either signal.

2. OFF. The siren produces no sound. However, public address is operational when the microphone PTT switch is depressed.

3. STANDBY/R.W. (Remote Wail). The siren produces no signal until the horn ring (or auxiliary) switch is operated. Operating the switch causes the siren to produce the Wail signal until the switch is operated again or the siren toggle switch position is changed. The public address function is always operational. In addition, the PA function overrides the siren signal when the microphone PTT switch is depressed.

4-3. BURGLAR ALARM OPTION.

The Burglar Alarm option requires approximately 10mA of current in standby (alarm not sounding). This low current level does not discharge the vehicle battery significantly over a relatively short period of time. However, it is recommended that the vehicle engine be started every three to four days to recharge the battery if the alarm is enabled for an extended period of time.

Enable the burglar alarm by setting the siren switch to OFF or STDBY/R.W., and turn the key lock switch clockwise. Disable the alarm by turning the key lock switch counterclockwise.

SECTION V
THEORY OF OPERATION

5-1. GENERAL.

The circuit theory of the Models CPA100*012N,CPA58*012N, CPA100*012H, and CPA58*012H is nearly identical. Therefore, all circuit descriptions are applicable to all models unless otherwise specified. Refer to the Main Board schematic diagram figure 6-3, and the Auxiliary schematic (H Models only), figure 6-5, while reading the paragraphs in this section.

5-2. POWER CONTROL CIRCUITRY.

The power control circuitry on the Main Circuit Board applies regulated 8.2VDC to the Tone Control Oscillator and Tone Generator when a Wail or Yelp signal is activated. The Power Control circuit also applies unregulated operating voltage to the Audio Amplifier stages from the vehicle battery when a siren signal is initiated or when the microphone push-to-talk (PTT) switch is operated.

On N Models, when the toggle switch on the mounting bracket is set to the WAIL position, 12VDC is applied through the power/control cable to J1-9 and P1-9. This voltage is then filtered by C17, and applied to the anode of CR14, forward biasing CR14. CR14 couples the battery voltage through R59 to the base of Q9, causing Q9 to conduct through CR5 and R14. The conduction of Q9 allows Q8 to conduct through DS1, R47, and zener diode CR6. CR6 in conjunction with DS1 and Q8, regulates the supply voltage to the Tone Control Oscillator and Tone Generator circuits at 8.2 volts DC. This regulated voltage is required to prevent undesired variations in the signal frequency that could otherwise occur.

The circuit consisting of Q3, and associated components ensures that the timing capacitors in the Tone Control Oscillator are fully discharged when the siren signal is changed from YELP to WAIL or, vice versa. The mechanical structure of the SIREN switch is such that when switch is set from one signal position to the other it must pass through the center-OFF position.During the interval that the switch is in the OFF position, 12VDC is not applied to the Power Control Circuit. As a result, Q9 and Q8 are cut off. However, the residual positive charge on C12 is applied through the supply lines, R14, and R15 to the base of Q3. This allows Q3 to conduct through CR3 and CR4. This applies ground to C2 and C4,discharging them and ensuring that these capacitors are initialized in preparation for the generation of the selected signal. After the SIREN switch is set to the desired signal position, 12VDC is reapplied to the base of Q9,allowing Q9 to resume conduction.This cuts off Q3 and allows C2 and C4 to control the Tone Control Oscillator output waveform as will be described in paragraph 5-3.B.

The operation of the Power Control circuit is nearly identical when the SIREN switch is set to YELP. Battery voltage (12V) is applied through J1-6 and P1-6, filtered by C16, and to the anode of CR13. CR13 then couples the positive voltage through R59, causing the remainder of the Power Control circuitry to operate as already described.

The operation of the Power Control Circuitry in H Models is similar. The differences between the operation of H Models and N Models is described in paragraphs 5-6.B. and 5-6.C.

5-3. TONE CONTROL OSCILLATOR.

A. General.

The Tone Control Oscillator (TCO) produces the control voltage waveforms necessary for the generation of the Wail, and Yelp siren signals.The shape of the control waveforms for both signals is similar. However, the frequency of the Yelp control waveform is higher than that of the Wail waveform. The control voltage waveform controls the output frequency of the VCO voltage controlled oscillator in the Tone Generator.

B. WAIL.

When the SIREN switch is set to WAIL,the Wail tone control voltage is initiated by IC1. IC1 is a timing circuit acting as a free running (astable) multivibrator whose output frequency is determined by the charge and discharge rates of C2. C2 charges through CR1 and R3 until it reaches the threshold voltage of IC1; approximately 5.5 volts. When the voltage at IC1-6 reaches approximately 5.5 volts, IC1 changes states, causing the voltage at IC1-7 to almost instantly drop to zero volts. This reverse biases CR1 and interrupts the charge path of C2. As a result, C2 discharges through R5 to approximately 2.7 volts. When the charge on C2 reaches 2.7 volts,IC1-2 causes IC1 to return to its original state and the cycle repeats.

C2 charges to 5.5 volts much more rapidly than it discharges to 2.7 volts. This is because the RC time constant of the charge path is much shorter than that of the discharge path.This controls the frequency of the output signal at IC1-3.

The output waveform from IC1 at IC1-3 is an asymmetrical square wave. However, the circuits that process the signal require a symmetrical waveform for proper operation. In addition, the frequency of the signal at IC1-3 is too high for proper circuit operation.IC2A converts the signal to a symmetrical square wave and divides the frequency by two before applying it to Q4.

The collector of Q2 is connected to IC2A-4. Q2 ensures that IC2A is initialized when switching from one signal to the other. The stage is activated by the Power Control circuit as described in paragraph 5-2.

Q4 acts as an electronic switch that is activated by the series of symmetrical alternating highs and lows from IC2A-1.Q4 conducts when the signal is low and is cut off when the signal is high. Q4 controls the operation of the integrator circuit consisting of R26,C5, and R25. The conduction of Q4 through R26 and R25 causes C5 to charge exponentially. During the interval that Q4 is cut off, C5 discharges exponentially through R25. The charge and discharge rate of C5 is determined by the values of the components in the circuit. The integrated waveform produced by this circuit is coupled through R23 to IC3A-2 in the Tone Generator.

The output signal from IC2A-1 is also applied to the base of Q5. However, when the Wail signal is selected, 12Vdc from P1-9 is applied through R20 to the base of Q7. As a result, Q7 conducts heavily, bypassing C6 and R18 to ground. Therefore, Q5,C6 and associated components have no effect on the Wail control waveform.

C. YELP

Circuit operation when the Yelp signal is being generated is similar to that of the Wail signal. However, the cycle rate of the Yelp signal is faster than that of Wail.This faster cycling rate is accomplished by using electrical switching to shorten the RC time constant of the Tone Control Oscillator and change integrator circuits.

When the Yelp signal is selected, 12Vdc from the vehicle battery is present at P1-6. This voltage is coupled through CR12 and R1 to the base of Q1, causing Q1 to conduct (Q1 does NOT conduct when the Wail signal is being generated). The conduction of Q1 through R4,CR1,and R3 effectively bypasses (shorts out) R5.This does not significantly affect the RC charge time of C2, because C2 charges to 5.5V through CR1 and R3 as it does in WAIL. However, the discharge time of C2 is much shorter because the discharge path is through Q1 and R4. The combined DC resistance of these two components is much less than that of R5 (C2 discharges through R5 in WAIL). As a result, the upper and lower threshold levels of IC1 occur at a faster rate than in WAIL. Therefore, the frequency of the square wave output at IC1-3 is higher. Consequently, the frequency of the signal at IC2A-1 is also higher than in Wail.

The 12vdc at P1-6 is also applied through R22 to the base of Q6,causing Q6 to conduct. This bypasses C5 and R25 to ground, preventing these components from having any effect on the signal. 12vdc is not applied to Q7 when Yelp is selected. Therefore, Q7 is cut off and allows Q5 to activate the integrator consisting of C6 and R18.

Two distinct integrator circuits are used because circuit characteristics require that both Wail and Yelp control waveforms have similar shapes even though their frequencies are different. The smaller circuit values in the Yelp integrator compensate for the higher frequency of the Yelp control waveform.

5-4. TONE GENERATOR.

The Tone Generator consists of the scaling amplifier IC3A, and its associated control circuit, IC3B, the voltage controlled oscillator (VCO), and a divider circuit, IC2B.

The Scaling Amplifier shifts the signal dc level and inverts the control waveform from the integrator circuit in use, to the level necessary to control the VCO. The scaling has no significant affect on the shape of the waveform. The gain of IC3A is controlled by IC3B. The scaled control voltage waveform at IC3A-1 is applied to the VCO control point, IC4-5.

The output signal from the voltage controlled oscillator, IC4, is a series of pulses whose frequency is determined by R36, R37, C14 and the voltage at the VCO control point. As the control voltage at IC4-5 increases, the frequency of the output decreases. Conversely, as the control voltage decreases, the output frequency increases. The output signal from IC4 is applied to the divide-by-two circuit at IC2B-13.

The divide-by-two circuit, IC2B, is a toggle flip flop that divides the IC4 pulse frequency by two. The symmetrical output from this circuit is present at IC2B-15.

5-5. AUDIO AMPLIFIER.

The frequency modulated signal from the Tone Generator is applied to the audio preamplifier stage in the Audio Amplifier at IC5-6. The audio preamplifier amplifies the signal voltage to the level necessary to drive the power amplifier stages. After IC5 amplifies the signal, it is coupled from IC5-8 through C10 to the primary of T1. T1 applies a paraphase input to the push-pull amplifier stages. The network consisting of R52, R53, CR17, R54, R55, and RT1 is a biasing circuit that improves amplifier linearity. The power amplifier consists of Q10, Q11, Q12 and Q13. These stages amplify the signal power to the level required to drive the speaker. This amplified signal is coupled through T2 to P1-3 and P1-2 to the power cable and the speaker.

5-6. AUXILIARY CIRCUIT BOARD. (H Models Only).

A. General.

The Auxiliary Circuit Board provides H Models with TAP II Instant Yelp capability. The circuitry on the Auxiliary Circuit Board consists of the ± Auxiliary Input and the Instant Yelp/Remote Wail Control circuits.

B. Power Up.

Application of power to the siren allows regulated 8.2 volts, from the Main Circuit Board to be present at H109. This voltage is applied to the emitter of Q105, through R118 to the base of Q105, and through R112 to C103. As a result, Q105 conducts and C103 begins charging through R122 and R118. Approximately 0.1 ms. after power is applied the charge of C103 cuts off C105. Consequently, the conduction of Q105 applies a 0.1 ms positive pulse to IC102B-12 and through CR108 to IC102A-4. This pulse resets both IC102A-2 and IC102B-14 high.

C. STDBY/R.W.(Standby/Remote Wail).

1. Initialization

When the bracket-mounted toggle switch is set to STDBY/R.W., 12Vdc from P1-6 is present at H101. This voltage is coupled through R121 and CR109 to IC102A-4, ensuring that IC102A is disabled. 12VDC is also applied through CR113 to K101 and H106. As a result, K101 energizes. Simultaneously, the voltage at H106 is applied to H10 on the Main Circuit Board. This activates the Power Control circuit, as already described. The initialization of IC102 causes the voltage at IC102B-14 and IC102A-2 to go high. The high at IC102B-14 is present at H119 and applied through H19 to IC2A-7, on the Main Circuit Board. This high disables IC2A so that any signal that may be present cannot be applied to the integrator.

The high at IC102B-14 is also coupled through R112 to the base of Q104, causing Q104 to conduct. Q104

conducts through R114 and H125 to H25 R26, and Q4 on the Main Circuit Board, disabling the Wail integrator.

2. Signal Activation.

The configuration of vehicle horn circuits is usually unpredictable. In some vehicles, the horn ring switch applies 12 volts to the horn. However, in other vehicles the horn is activated when the horn switch grounds the return side of the horn circuit. Consequently, the ± Auxiliary Input circuit was designed to operate from either type of horn circuit. This is accomplished by CR101 or CR103. If the vehicle uses a grounded horn circuit, the ± Auxiliary Input is activated through CR101. A positive horn circuit uses CR103 to activate the ± Auxiliary Input.

When the vehicle horn ring is depressed, the circuit at H110 is completed. As a result, either 12 volts or ground (depending on the horn circuit configuration) is applied through the contacts of K101 to the ± Auxiliary Input circuit. If a grounded horn circuit is used, the ground is applied through CR101 to the emitter of Q101, forward biasing the base-emitter junction and allowing Q101 to conduct. Similarly, if a positive horn is used, 12VDC is coupled through CR103 to the base of Q101, causing Q101 to conduct. The conduction of Q101 causes the collector to go low. This low is coupled across CR102 to IC101-6 and IC101-7. IC101 is a monostable (one shot) multivibrator whose output pulse width is determined by C101 and R107. As a result, the low at IC101-2 causes IC101 to produce a positive pulse at IC101-3. IC101-3 applies the pulse to IC102A-3 and IC102B-13.This pulse has no effect on IC102A because of the high at IC102A-4. However, the pulse on IC102B-13 causes IC102B to change states so that IC102B-14 goes low, causing H119 to go low. This low is applied to H19 and IC2A-7. This enables IC2A and it begins to operate as already described. The low at IC102B-14 causes Q4 to cut off, and enable the Wail integrator on the Main Circuit Board. Consequently, the siren produces a Wail signal.

D. WAIL/I.Y. (Instant Yelp).

1. Initialization

The mechanical configuration of the bracket-mounted toggle switch makes it necessary for the switch to pass through the center-OFF position when the siren function is changed from STDBY/R.W.to WAIL/I.Y.,or vice versa. As the switch passes through center-OFF, battery voltage at H106 is interrupted, cutting off Q106. As a result the collector voltage of Q106 increases, causing Q107 to conduct and discharge C103. After the toggle switch is set to WAIL/I.Y., 12 volts is restored to H106, and Q108 resumes conduction, cutting off Q107. This allows C103 to charge and initialize IC102 as already described.

The WAIL/I.Y. switch position applies 12V to H105, and through CR111 to K101, causing K101 to energize. Simultaneously, 12 volts is also applied through R116 and CR105 to IC102B-9. This ensures that IC102B-14 is low. This low allows the TCO to generate a Wail Signal.

When the toggle switch position was changed, IC102A-2 was initialized high by Q105,cutting off Q103 and Q102. This disables the Yelp circuitry in the TCO.When the horn ring (or auxiliary switch) is operated, the ± Auxiliary Input circuit applies a pulse to IC102A-3 causing IC102A-2 to go low, allowing Q103 and Q102 to conduct.The conduction of Q103 causes Q1 and Q6, on the Main Circuit Board, to conduct. Consequently, the TCO generates a Yelp control waveform while the Wail integrator is disabled. Simultaneously, the conduction of Q102 causes Q7 to cut off and enable the Yelp integrator so that Yelp signal is produced.

When the horn switch is operated again, the output of the ± Auxiliary Input circuit causes IC102 to return to its initialized state, and the Wail signal resumes.

5-7. BURGLAR ALARM OPTION.

A. Key Lock Switch and Power Control.

The key lock switch enables or disables the Burglar Alarm by grounding or ungrounding the base of Q204. When the switch is open as shown in figure 6-7. the base of Q204 is ungrounded, allowing approximately 9.1V to be applied to the base of Q204. When the key lock switch is closed, ground potential is applied to the base of Q204, disabling Q204. This circuit

configuration has the advantage that if the wire from the key lock switch is cut or broken, the regulated power source is enabled regardless of the key lock switch position.

B. Alarm Signal Control.

Assume that the regulated power source, Q204 is enabled because the key lock switch is open. As a result, Q204 conducts, causing regulated 8.5V dc to be present at the emitter of Q204. The level of the regulated voltage at the emitter of Q204 is controlled by the conduction of CR208 through R211. The regulated voltage at the emitter of Q204 is filtered by C204 and C205 and applied to the burglar alarm control circuits.

A burglar alarm signal is initiated when the trunk lid is opened, closing the alarm (trunk) switch. As a result, ground potential is applied to H201. This negative transition is differentiated by C201 and applied as a negative trigger to IC201-2.

IC201 is a monostable multivibrator whose output pulse controls the production and duration of the Wail or Yelp burglar alarm signal. The duration (width) of the output pulse from IC201 is approximately one minute, as determined by C203, R204, and R203.

The negative trigger at IC201-2 causes IC201 to change states so that the voltage at IC201-5 goes high. This high is coupled through R205 to Q202 and Q205 to conduct. The conduction of Q202 causes a low to be coupled through CR207 to H210, through R209 to H211, through CR207 to H212 and through R210 to H213. The low at the collector of Q202 is also applied through R207 to the base of Q201, causing Q201 to conduct and apply a high to the anodes of CR201, CR202 and CR204. CR201 couples the high to H205 and H216; CR202 couples the high to H206; and CR204 couples the high to H208. At the end of the one minute cycle, IC201-3 returns to its static low voltage level, terminating the control signal outputs from the circuit board.

The characteristics of IC201 are such that once the timing cycle of IC201 has been initiated, IC201 cannot be retriggered until the timing cycle is complete. In addition, the ground at H201 must be removed and reapplied before another IC201 timing cycle can be initiated. This is because C201 requires a negative going voltage change to apply a trigger to IC201-2.

C. Signal Activation.

The Alarm Signal Control circuit ensures that the siren signal selected as the burglar alarm is activated when the siren is left in the STDBY/R.W. Position.

1. Wail Alarm with Tap II.

When the burglar alarm is in standby (not activated) Q202 is cut off, reverse biasing CR208 and CR207. As a result, the collector voltage of Q202 has no effect on the voltage at H210, H211, H212, or H213. However, the reverse biasing of CR206 allows the emitter of Q105, on the Auxiliary Circuit Board, to apply a positive voltage through CR112, H120, H210, H211 and H20 to the base of Q3, on the Main Circuit Board. This causes Q3 to conduct and prevent C2 from Charging. Consequently, the TCO cannot produce a tone control waveform.

Activation of the burglar alarm causes Q202 to apply a low to H212 and H213. This low output is applied through CR201 to IC2A-7, on the Main Circuit Board, allowing IC2A to function as a divide-by-two circuit, as already described. Simultaneously, the conduction of Q202 forward biases CR206. This applies a low to Q3, cutting off Q3. As a result, C2 can begin to alternately charge and discharge, causing IC1 to produce the Wail control waveform.

CR205 allows Q104 in the TAP II circuits to conduct and bypass C5 when the alarm is in standby disabling the Wail integrator. Activating the burglar alarm reverse biases CR205, allowing C5 to integrate the Wail control waveform.

CR202 and CR203 comprise a wired OR gate. This gate ensures that regulated power is applied to the siren circuits when the burglar alarm is activated regardless of the siren switch position. CR203 couples switched battery from H106 and H207 through H206, H10, CR14, and R59 to the base of Q9 in the power control circuitry. Q9 conducts, allowing regulated operating voltage to be present. Switched battery is also applied to Q7, causing Q7 to conduct, disabling the Yelp integrator. If the siren switch is left in the OFF position, switched battery is not present at H207. As a result, Q7 is cut off, and regulated operating voltage is not present in the siren circuitry. However, activating the burglar alarm causes the collector of Q201 to go high, forward biasing CR202 This high is then applied to Q7 and Q9 so that regulated operating voltage is present, and the Yelp integrator is disabled.

2. Wail Alarm without TAP II.

When the siren is activated, the voltage from P1-9 through H216 and H205 to H10 causes Q9 to conduct and apply operating voltage to the siren while the siren switch is set to WAIL. This allows the siren to produce a Wail signal as already described.

If the alarm is activated when the siren switch is set to any position, IC201 causes Q201 to conduct. The conduction of Q201 causes Q9 to conduct, as already described.

SECTION VI

SERVICE AND MAINTENANCE

Most of the electronic component parts used in the CPA100 and CPA58 are standard items that are available at almost any radio or electronics supply outlet.

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 telephone 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
Signal Division
Federal Signal Corporation
136th and Western Avenue
Blue Island, Illinois 60406

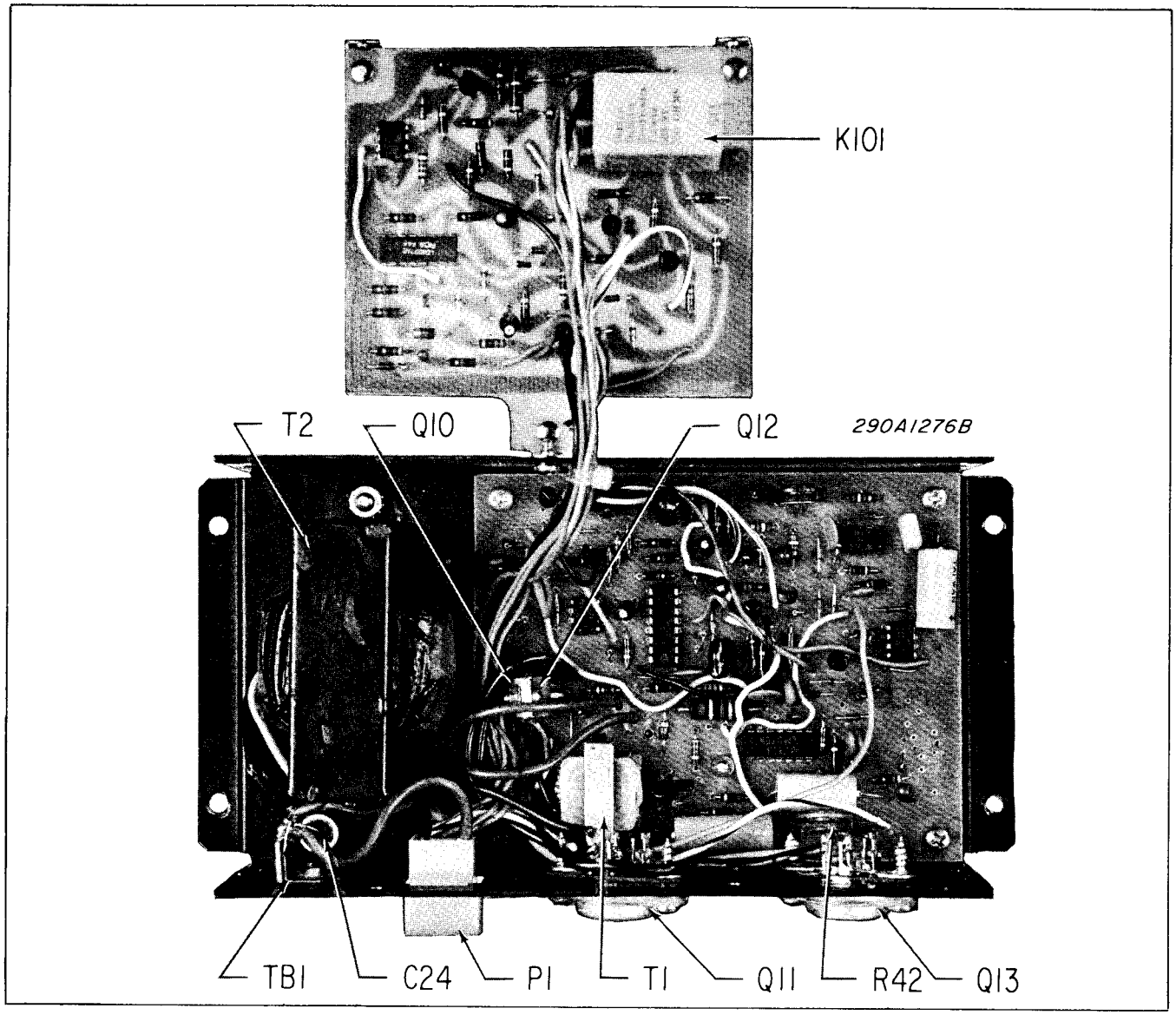

Figure 6-1. H Model Interior View with Auxiliary Circuit Board Removed.

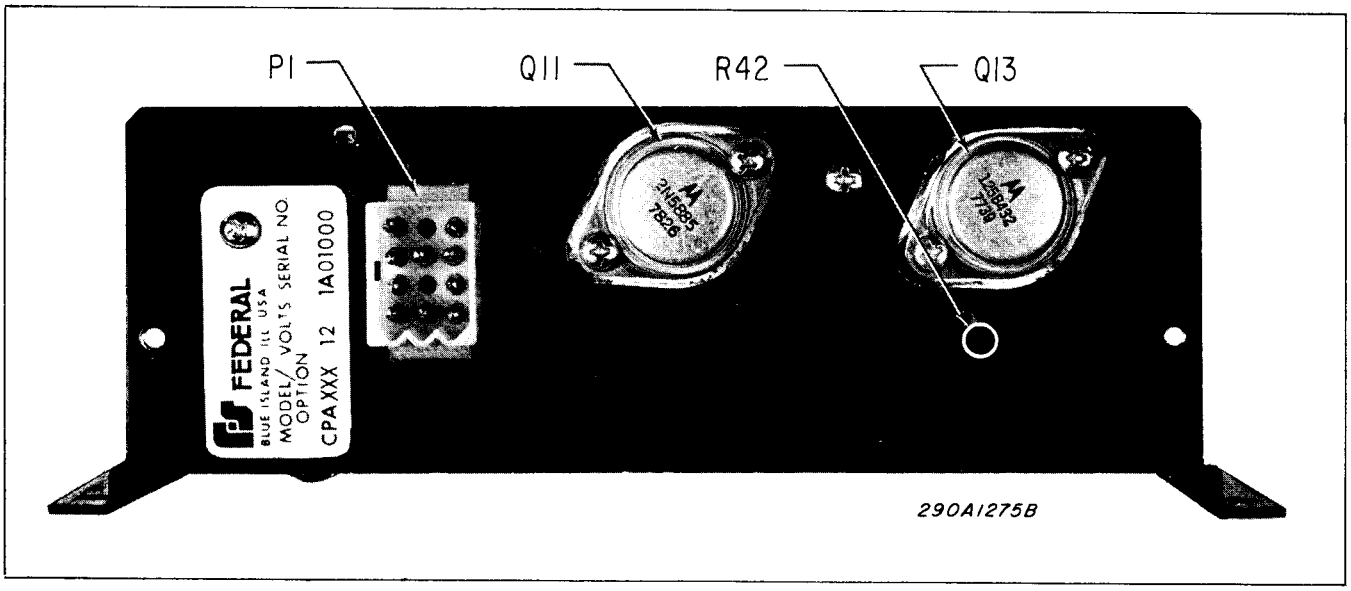

Figure 6-2. Siren Side View with Cover Removed.

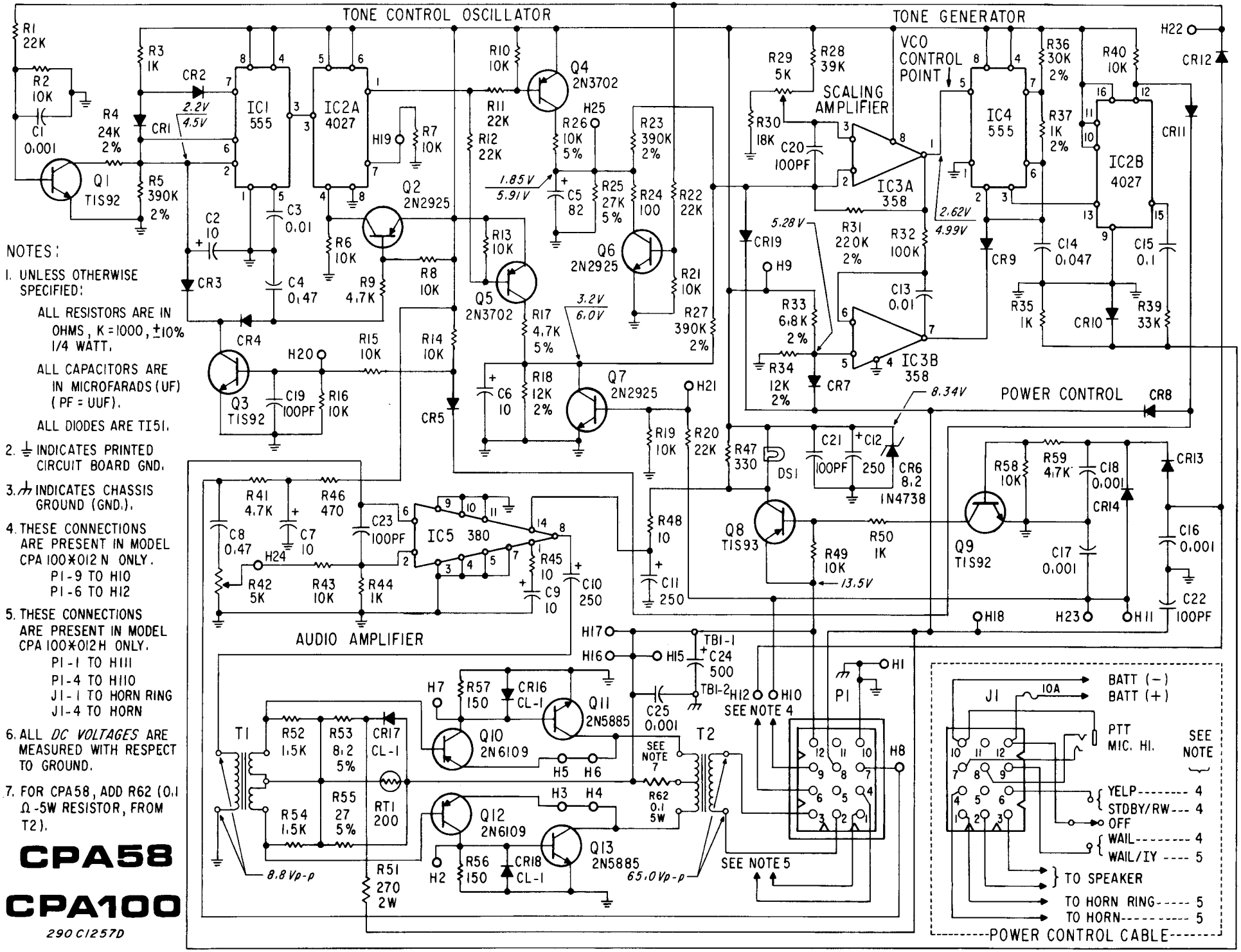

Figure 6-3. Main Circuit Board Schematic Diagram.

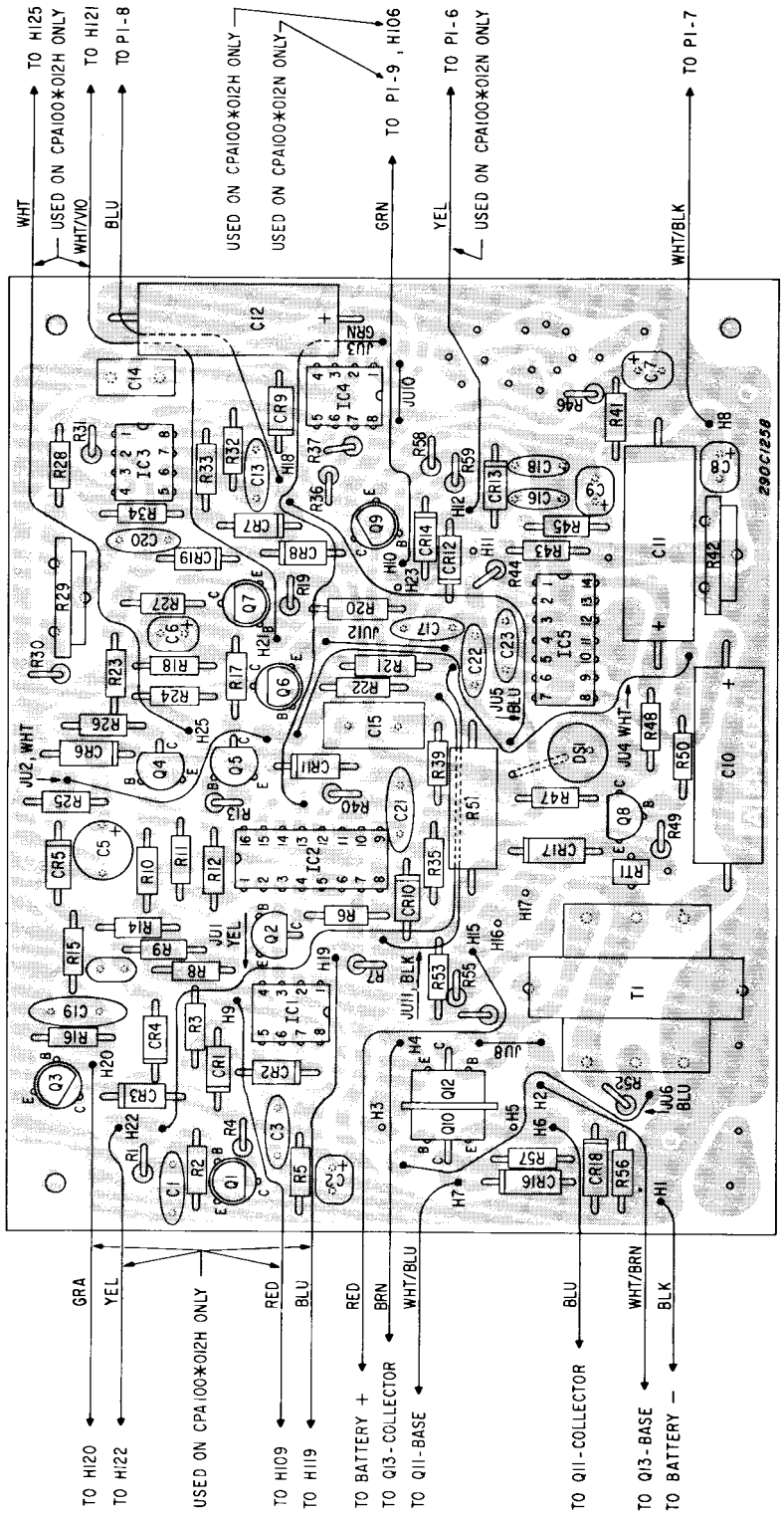

Figure 6-4. Main Circuit Board Parts Location Diagram.

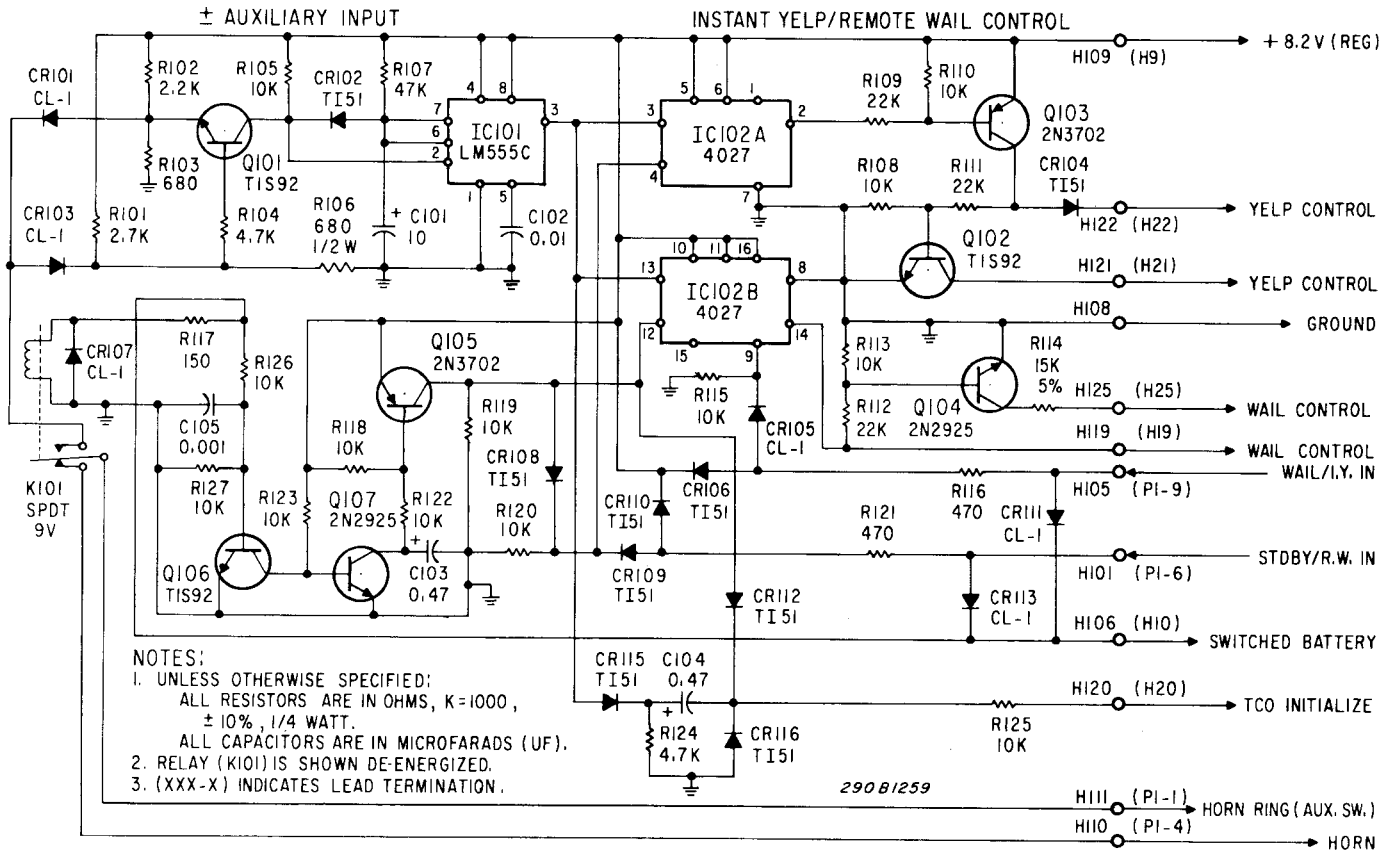

Figure 6-5 Auxiliary Circuit Board Schematic Diagram (H Models only).

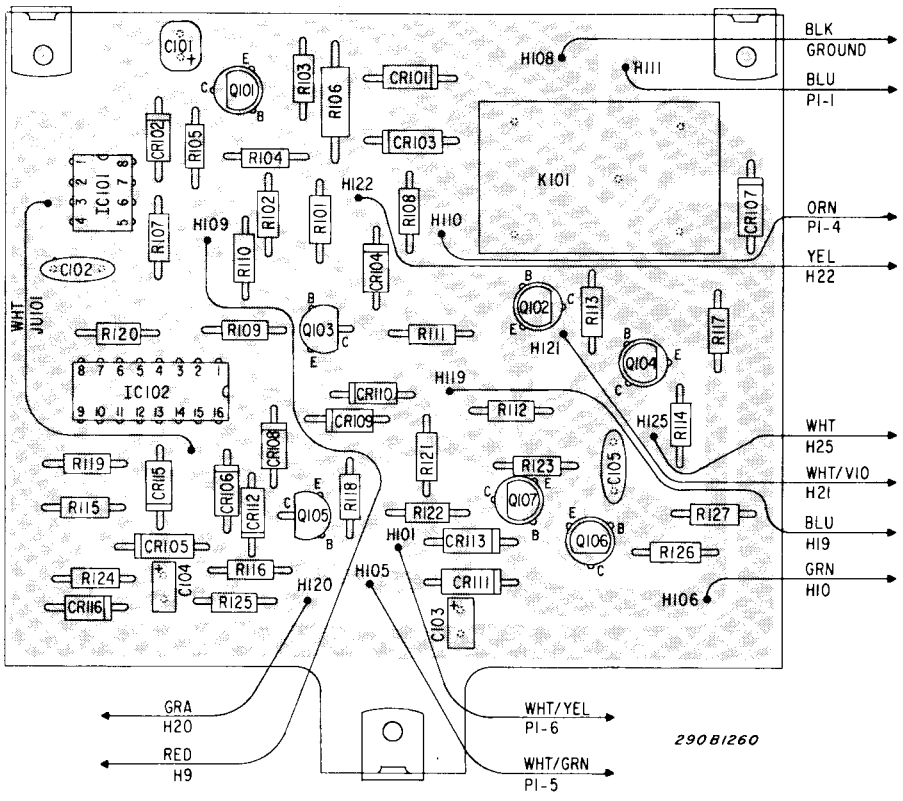

Figure 6-6. Auxiliary Circuit Board Parts Location Diagram.

AUXILIARY CIRCUIT BOARD

Schematic Symbol	Description	Part No.
	RESISTORS (See Note)	
R101	2.7K Ohm	100A206
R102	2.2K Ohm	100A221
R103	680 Ohm	100A231
R104,124	4.7K Ohm	100A224
R105,108,110, 113,115,118, 119,120,122, 123,125.126, 127	10K Ohm	100A207
R106	680 Ohm, 1/2 watt	100A313
R107	47K Ohm	100A228
R109,111,112	22K Ohm	100A208
R114	15K Ohm, 5%	100A239
R116,121	470 Ohm	100A255
R117	150 Ohm	100A238

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

CAPACITORS

C101	10UF, 20V, tantalum	107A634
C102	.01 UF,25V, disc	107A226
C103,104	.47UF, 35 tantalum	106A645
C105	.001, 500V, disc	107A263

SEMICONDUCTORS

IC101	Integrated Circuit, LM555	128A043A-(
IC102	Integrated Circuit, RCACD4027BE	128A044
Q101,102,106	Transistor, silicon, NPN,T1S92	125B132
Q103,105	Transistor, silicon, PNP,2N3702	125A113
Q104,107	Transistor, silicon NPN, 2N2925	125A119
CR101,103, 107,111,113	Diode, ED 3002S(CL-1)	115B301
CR102,104,105, 106,108,109, 110, 112,115, 116	Diode, TI51	115B101

MISCELLANEOUS

K101	Relay, SPDT, 9VDC	131A104
	Circuit Board (with parts installed)	200D731
	Riveted Assembly, Printed Circuit Board (without parts)	8536C313

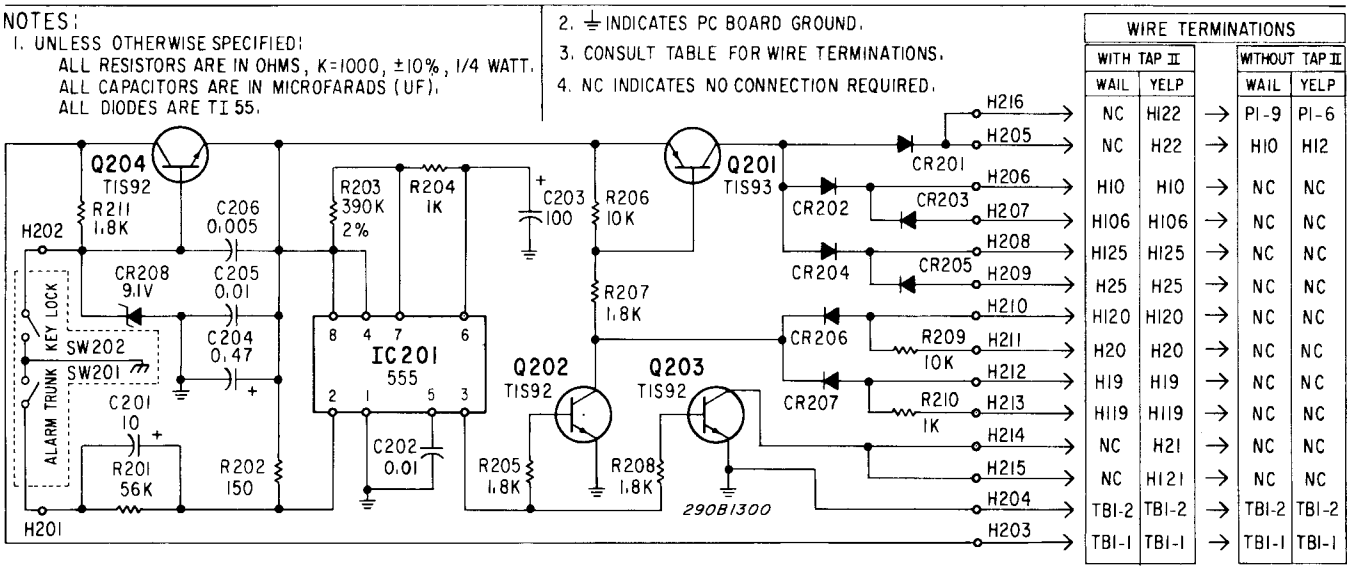

Figure 6-7. Burglar Alarm Circuit Board Schematic Diagram.

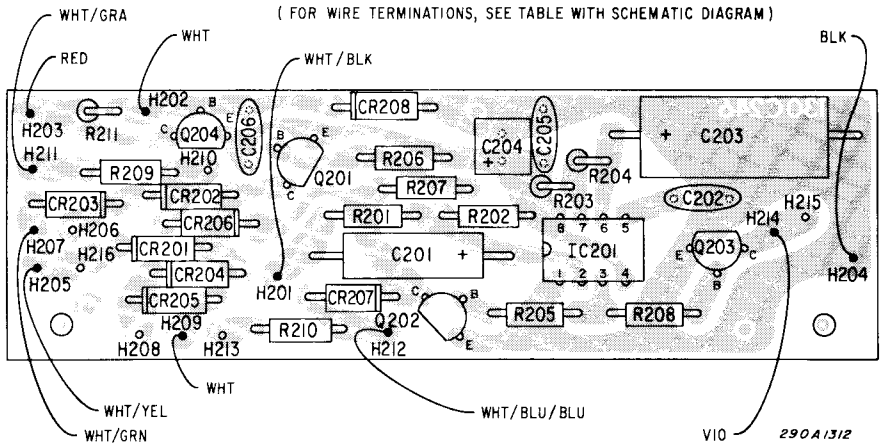

Figure 6-8. Burglar Alarm Board Parts Location Diagram.

PARTS LIST
BURGLAR ALARM CIRCUIT BOARD

Schematic Symbol	Description	Part No.
	RESISTORS (See Note)	
R201	56K Ohm	100A229
R202	150 Ohm	100A238
R203	390 Ohm, 2%	100A760
R204,210	1K Ohm	100A233
R205,207, 208,211	1.8K Ohm	100A205
R206,209	10K Ohm	100A207
Note:	Unless otherwise specified, all resistors are carbon composition, 10%, 1/4 watt	
	CAPACITORS	
C201	10UF, 15V, electrolytic	108A102
C202,205	.01UF, 25, disc	107A226
C203	100UF, 15V, tantalum	107A627
C204	.47UF, 35V, tantalum	107A647
C206	.005UF, 100V, disc	107A211

Schematic Symbol	Description	Part No.
	SEMICONDUCTORS	
IC201	Integrated Circuit, LM555	128A043-02
Q201	Transistor, PNP, TIS93	125B133
Q202,203 204	Transistor, NPN, TIS92	125B132
CR201,202, 203,204, 205,206, 207	Diode, TI55	115B101
CR208	Diode, zener, 9.1Vdc	115A210
	MISCELLANEOUS	
	Circuit Board (with parts installed)	200C740
	Circuit Board (without parts)	130C246

PARTS LIST
MAIN CIRCUIT BOARD

Schematic Symbol	Description	Part No.
	RESISTORS (See Note)	
R1,11,12,20,22	22K Ohm	100A208
R2,6,7,8,10,13, 14,15,16,19,21, 40,43,49,58	10K Ohm	100A207
R3,35,44,50	1K Ohm	100A202
R4	24K Ohm, 2%	100A764
R5,23,27	390K Ohm, 2%	100A760
R9,41,59	4.7K Ohm	100A224
R17	4.7K Ohm 5%	100A298
R18,34	12K Ohm, 2%	100A716
R24	100 Ohm	100A236
R25	27K Ohm, 5%	100A244
R26	10K Ohm, 5%	100A257
R28	39K Ohm	100A214
R29,42	Potentiometer,PC,5K ohm	105B204-01
R30	18K Ohm	100A204
R31	220K ohm, 2%	100A719
R32	100K Ohm	100A222
R33	6.8K Ohm, 2%	100A762
R36	30K Ohm, 2%	100A717
R37	1K Ohm, 2%	100A712
R39	33K Ohm	100A211
R45,48	10 Ohm	100A251
R46	470 Ohm	100A255
R47	330 Ohm	100A201
R51	270 Ohm 2 W,WW	103A128
R52,54	1.5K Ohm	100A220
R53	8.2 Ohm, 5%	100A724
R55	27 Ohm, 5%	100A290
R56,57	150 Ohm	100A238
R62(CPA58 only)	0.1 Ohm, 5W,WW	103A202
RT1	Thermistor, 200 Ohm	104A111
	Note: Unless otherwise specified, all resistors are carbon composition,10%,¼ watt.	
	CAPACITORS	
C1,16,17,18,25	.001 UF,500V,disc	107A263
C2,6,7,9	10UF,10V,tantalum	107A634
C3,13	.01UF,25V,disc	107A226
C4,8	.47UF,35V,tantalum	107A645
C5	82UF,15V tantalum	107A650
C10,11,12	250UF, electrolytic	108107
C14	.047UF,50V, mylar	107A418
C15	0.± UF,100V, mylar	107A406
C19,20,21,22, 23	100 pf, 100V disc	107A235
C25	500UF,15V,electrolytic	108A122
	SEMICONDUCTORS	
IC1,4	Integrated Circuit, LM555	128A043A-02
IC2	Integrated Circuit,RCA CD4066 AE	128A044
IC3	Integrated Circuit, LM358	128A045
IC8	Integrated Circuit, LM380	128A046
Q1,3,9	Transistor,silicon, NPN,TIS92	125B132
Q2,4,5	Transistor, silicon, PNP, 2N3702	125B113
Q6,7	Transistor, silicon, NPN,2N2925	125A119
Q8	Transistor, silicon, PNP,T1S93	125B133
Q10,12	Transistor, silicon, PNP,2N6109	125B431
Q11,13	Transistor,silicon, NPN,1N5885	125B432
CR1,2,3,4,5, 7,8,9,10,11, 12,13,14,19	Diode, TI51	115B101
CR6	Diode, zener, 8.2V, 1N4738	115A232
CR16,17,18	Diode, ED3002S(CL-1)	115B301
	MISCELLANEOUS	
T1(CPA58)	Transformer,driver	120B124
T1(CPA100)	Transformer, driver	120B145
T2	Transformer assembly, output (includes Molex pins)	120C151A-01
P1	Connector, 12 pin	139A152
	Circuit Board (with parts installed)	200D730
	Circuit Board (without parts)	130D243
	Accessory Kit (CPA100*012N only)	8536A307
	Accessory Kit (CPA200*012H only)	8536A308