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Pace P5950 Service / Owner's Manual

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MODEL P5950
PACE-CALL (ENCODER/DECODER)

MANUAL
for
INSTALLATION AND SERVICE

PATHCOM INC.
PACE TWO-WAY RADIO PRODUCTS
24049 S. Frampton Ave., Harbor City, California 90710

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GENERAL INFORMATION

INSPECTION OF EQUIPMENT

Your PACE-CALL Encoder/Decoder has been fully tested and aligned before shipment. The equipment should be unpacked and examined immediately upon receipt for any damage that may have occurred in transit.

SERVICE

Your PACE-CALL Encoder/Decoder is warranted against defects in workmanship for a period of 90 days from date of purchase. The warranty card must be filled out and returned to PATHCOM, INC. within 10 days of purchase for the warranty to be in effect. If your unit is out of warranty or if you select to have any repairs done in the field (not covered by factory warranty), contact your PATHCOM, INC. dealer who will recommend a qualified repair facility to do the work.

SPECIFICATIONS

Frequency Range	750 - 1615 Hz (Factory set at 1095 Hz)
Modes	STANDBY - NORMAL - CALL
Input Voltage	13.8 VDC from Transceiver
Circuitry	100% Solid State
Current Drain (maximum)	STANDBY: 70 mA NORMAL: 110 mA CALL: 100 mA
Dimensions	4" H, 5.75" W, 3.25" D
Weight	22 Ounces
Modulation	0 - 100% Adjustable
Tone Delay	0 - 15 Seconds Adjustable
Sensitivity5 uV @ 40% Modulation

OPERATION

DESCRIPTION

The PACE-CALL Model P5950 is an all solid state Encoder/Decoder. The PACE-CALL eliminates the need for constant channel monitoring. Mobile or base units remain in a squelch condition until they are signaled by an Encoder on the same frequency; at this time, a tone will be heard on the radio speaker and a red "CALL" light will come on. The tone is set for two seconds duration and can be switched to soft or loud level by moving the tone switch to the desired position. The red "CALL" light will remain on once triggered. If the unit has been left unattended, this will alert the operator upon his return that an attempt to contact him was made.

The P5950 operates by transmitting and detecting one single audio tone. When the mode switch on the front panel is moved toward the "INITIATE CALL" position, the transmitter will be activated and the single tone from the PACE-CALL will modulate the transmitter.

When the receiver picks up the signal, it is applied to the PACE-CALL Decoding circuitry (in "STANDBY" position only). If the tone is the correct frequency, the PACE-CALL will open the audio so that the tone will be heard on the speaker and at the same time the "CALL" light will illuminate.

The tone frequency is controlled by a tunable inductor and a fixed capacitor. Frequency of operation is selected by changing the capacitor C4 and tuning the inductor L1 (see Table 2). Frequency of operation is factory set at 1095 Hz.

CONNECTIONS TO TRANSCEIVER

The P5950 PACE-CALL is self contained and is ready to operate. It is wired to plug into any PACE CB transceiver equipped with an accessory socket on the back panel. The power is derived from the transceiver so that no other connection is required.

OPERATION

Connect the PACE-CALL to the transceiver and set the mode switch to "NORMAL OPERATION" position. Ascertain that the radio operates in a normal manner. Move the mode switch to "STANDBY" position. The radio should be silenced as the squelch circuitry in the PACE-CALL will take over and mute the radio.

Listen on a nearby receiver and move the mode switch to "INITIATE CALL" position. A single tone signal should be heard. The PACE-CALL is ready for use.

NORMAL OPERATION: PACE-CALL is disabled in this position. The transceiver will work in a normal manner and the green "NORMAL OPERATION" light will come on.

CALL STANDBY: The green "NORMAL OPERATION" light will be off. The radio is automatically squelched and will remain in this mode until signaled by the proper frequency. At this time, a tone (two seconds in duration) will be heard thru the radio speaker and the red "CALL STANDBY" light will light up. Note: Before answering a call, the mode switch must be reset to "NORMAL OPERATION" for the radio to operate in a normal manner. At the end of the conversation, switch the radio back to "STANDBY" so that the unit is then ready for the next call.

INITIATE CALL: This switch mode is spring loaded to prevent the unit from being accidentally left on transmitting. To initiate a call, move the switch to "INITIATE CALL" position. The circuitry on the PACE-CALL will automatically modulate the RF carrier on the transceiver to the proper frequency of operation. Hold the switch in this position until the red "CALL" light comes on (this will indicate that the signal has been on the air for enough time to be decoded at the

receiving end). Then go back to "NORMAL OPERATION" mode and operate in a normal manner. There is a delay of 3 to 5 seconds built into the PACE-CALL to prevent the unit from triggering falsely due to signal interference on the air. When initiating a call, always hold the switch on "INITIATE CALL" position until the red light comes on. Note: Before initiating a call, monitor the channel (switch to "NORMAL OPERATION") for 3 or 4 seconds to make sure that the channel is not being used.

TONE HI-LO: Allows the operator to set the level of the decoded tone as required due to noise conditions.

MAINTENANCE

The P5950 PACE-CALL does not require any regular maintenance. An occasional wipe with a rag moistened with alcohol will keep the unit in like-new condition. If extremely dusty conditions are encountered, the unit may be blown out with a low pressure air hose. Should the switch contacts become erratic, a suitable cleaner will recondition them. The PACE-CALL is an uncomplicated unit and can be serviced by competent technicians.

CIRCUIT DESCRIPTION - THEORY OF OPERATION

The PACE-CALL is composed of 11 transistors and 10 diodes plus the associated components. Silicon transistors plus high impedance FET's are used.

ENCODE MODE (CALL)

The detector on the transceiver is grounded thru the switch (SW1-1) preventing audio oscillations on the transceiver.

SW1-2 completes the feedback path between Q1 and Q2. Q1 acts as an oscillator at this time and Q2 is an amplifier. C4 and L1 are a tuned circuit for the desired tone frequency. The gate of Q3 is directly coupled to the tuned circuit, thus sampling a perfect sine wave. Q3 is the modulation level amplifier. The output is taken from the drain and is adjustable from 0 to 100% by adjusting R10 (Modulation Level Adjustment). It is factory set for 90% modulation.

SW1-3 energizes the transmitter section on the radio while at the same time completes the ground return for the base and the collector of Q4, thus turning it on. Q4 will maintain a fixed bias on the audio circuit of the transceiver so that the setting of the volume or the squelch control does not affect the modulation level or the tone level on the receiver. CR4 will block any DC from getting in the collector of Q4. The output of Q2 is also fed to a Schmitt trigger, thus giving the detector CR6 a constant level regardless of the input level. R22 is the delay control and can be adjusted from 1 to 15 seconds of delay. R21, C8 and C9 form a time constant for the encode delay. C8 is engaged in transmitting mode only by means of SW1-3. After C8-C9 have charged to the proper level of 1.2 volts, the voltage will flow thru R24 running current into the base of Q8. Q8 is turned on and its collector is pulled toward ground. This in turn forces the base of Q9 to go toward ground and turns Q9 on and the "CALL" light on.

DECODE MODE (STANDBY)

On "STANDBY" mode the encoding tone is recovered from the transceiver detector circuitry by means of SW1-1. R2 - C2 - R4 offer a high impedance load to the detector together with FET Q1. In the "STANDBY" mode, Q1 is an amplifier and C4 - L1 form a tuned circuit resonating at the required frequency of operation. Q2 amplifies the audio tone more and feeds it to the Schmitt trigger (the output of the Schmitt trigger is constant regardless of the input level). The output of the Schmitt is detected by CR6. R22 and C9 are a time constant adjustable from 1 to 15 seconds (it is factory set for 3 seconds). After C9 has been charged to its proper value, approximately 1.2 volts, this voltage will flow through R24 running current into Q8, thus turning it on. Q8 - Q9 act as a bistable multivibrator. Once Q8 is turned on, it turns on Q9 by completing Q9 base return thru R29. R26 is a feedback path to keep Q8 on after the signal has been removed from the air. Q3 samples part of the tone frequency and feeds it to Q4, the audio bias. SW1-3 takes one side of R13 to ground completing a voltage divider (R10 - R13) which sets the level of the audio tone. CR3 prevents any voltage from flowing into the base of Q4.

In the "STANDBY" mode, R30 is grounded, which turns switch Q10 on and then the squelch control Q11 is turned on by completing a base return thru R31 - Q10. A high voltage will appear on the collector of Q11 which is coupled to the audio circuit on the transceiver. This will cause the audio to be squelched. Once the bistable (Q8 - Q9) is turned on, the collector of Q9 will be high. This will charge C11, putting a DC level at the base of Q10 which momentarily will turn Q10 and Q11 off. The squelch will open and a tone will be heard on the speaker for approximately two seconds (the time it takes C11 to charge). Once C11 is charged, Q10 will turn on and Q11 will also turn on squelching the radio.

SW2 is the tone level control. It allows the operator to switch from soft to loud tone level. On "LO" position, voltage is run into the source of Q3 causing the bias to change and hence its gain. The "CALL" light will remain latched on until the mode switch is set to "NORMAL OPERATION." This takes the base of Q8 to ground by means of SW1-3, which turns off Q8 and its collector goes to supply, thereby causing the base of Q9 to lose its ground. As a result, Q9 is turned off and the "CALL" light goes off.

NORMAL MODE

The PACE-CALL is disabled on "NORMAL" mode. The base of Q5 is grounded thru R24 and SW1-3, turning Q5 on and turning DS2, the "NORMAL" light on. SW1-2 puts a DC level into the base of Q10 keeping it off, which keeps Q11 off and preventing the transceiver from being externally squelched.

TUNING INSTRUCTIONS

GENERAL INFORMATION

The following sections contain all the necessary information to perform a detailed troubleshooting analysis and complete alignment of the PACE-CALL. The procedures

given in this manual assume a general knowledge and familiarization with transistors. Every effort has been made to keep the required instruments necessary to align and service as simple as possible.

CHASSIS REMOVAL

1. Remove mounting bracket.
2. Remove the four screws in the corners of the front panel.
3. Slide unit out of the case.

EQUIPMENT NEEDED

1. PACE mobile or base station with accessory jack.
2. Signal generator with external modulation input.
3. Oscilloscope (50 MHz).
4. Audio generator.

CALL MODE

1. Equipment hookup as per Figure 1.
2. Set mode switch on "NORMAL OPERATION" position (green light should come on and unit must function in a normal manner).
3. Set mode switch to "INITIATE CALL" position. Adjust modulation level (R10) until the carrier is modulated 90%, then return to "NORMAL OPERATION" position.
4. Set R22 to the middle of its range and switch back to "INITIATE CALL" position. Observe how long it takes for the red "CALL" light to come on. Adjust R22 as required to get a 5 seconds delay.

STANDBY MODE

1. Equipment hookup as per Figure 2.
2. Set mode switch to "STANDBY" position. Audio will be cut off as unit becomes squelched.
3. Set tone switch to "HI" position.
4. Externally modulate the signal generator 40% with a 1095 Hz tone (standard factory set) or with any other desired frequency.
5. Set RF out to .5 uV.

6. Connect scope probe to drain of Q2 and adjust inductor L1 until approximately 2 V PP or better are obtained at this point.
7. Observe how long it will take for the red "CALL" light to come on (approximately 3 to 4 seconds). Adjust if necessary with R22. The tone shall be heard on the speaker for approximately 3 seconds and gradually will decrease on level as the radio goes mute again. The red light must remain on after the tone disappears.
8. As the tone is present, switch back and forth to "LO" and "HI" and ensure that tone changes level from "HI" to "LO". Return unit to "NORMAL OPERATION" position: Green light should come on and red light should go off. End of test.

CHANGING FREQUENCY

Refer to Table 2 for proper value of C4 versus frequency. Retune per method outlined above, steps 1 thru 6.

TABLE 2

PACE CALL FREQUENCIES

Frequency in Hz	Value of C4 (uF)
750	.047
825	.047
895	.032
985	.027
Std. 1095	.022
1210	.022
1280	.01
1420	.01
1545	.01
1615	.01

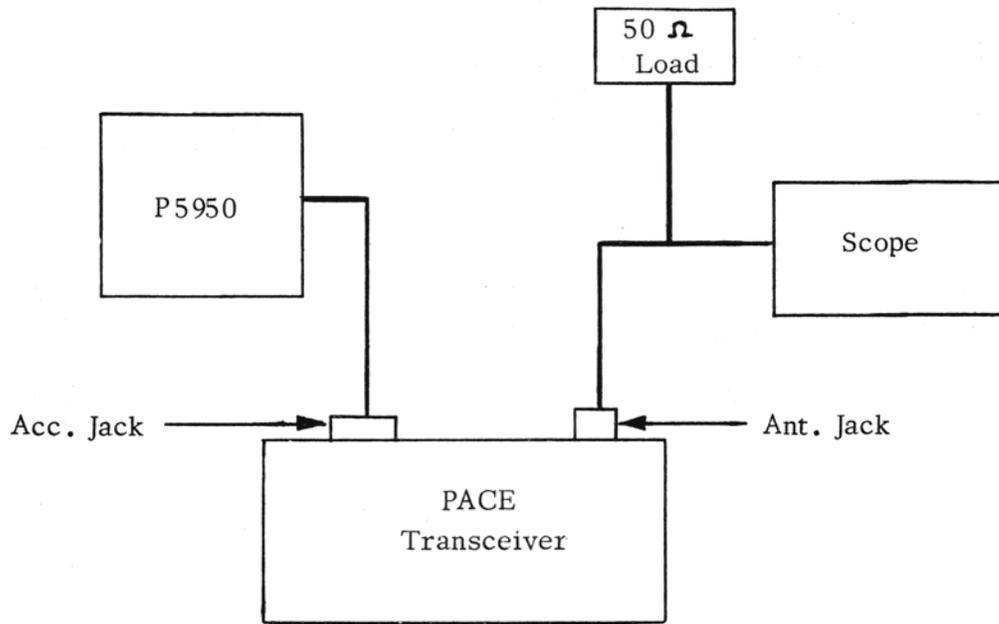


FIGURE 1
EQUIPMENT HOOKUP (CALL)

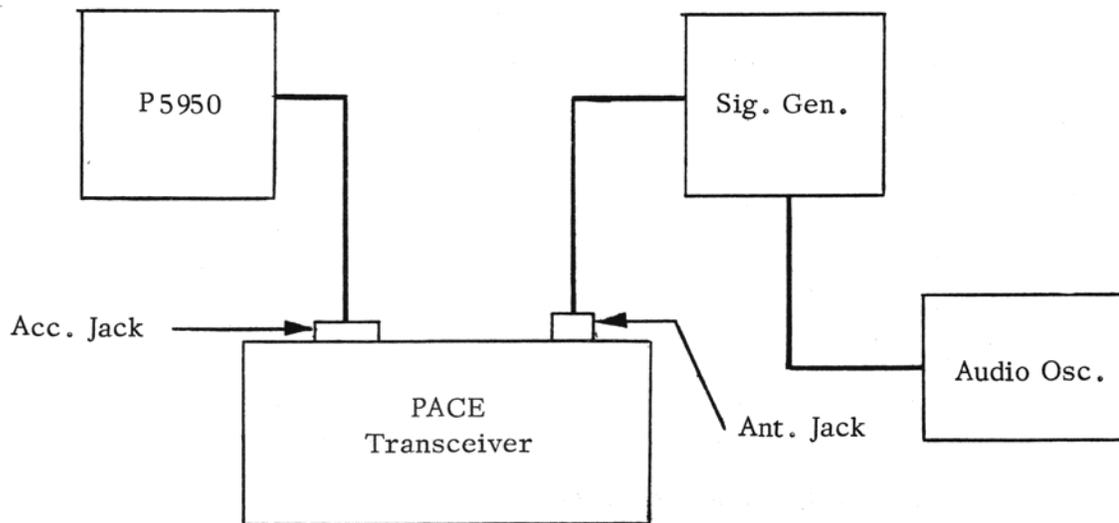


FIGURE 2
EQUIPMENT HOOKUP (STANDBY)

TABLE 1
P5950 VOLTAGE READINGS (INPUT 13.0 V)

Point	NORMAL	No Signal STANDBY	Signal STANDBY	CALL
DQ1	2.7	2.7	2.7	4.6
SQ1	1.0	1.0	1.0	0.7
DQ2	7.0	7.0	7.0	6.2
SQ2	0.3	0.3	0.3	0.4
DQ3	8.0	8.0	8.0	7.5
SQ3	0.6	0.6	0.7	0.7
EQ4	11.0	3.0	3.0	2.0
BQ4	13.0	2.0	2.0	1.2
CQ4	13.0	0.7	0.7	0.5
BQ5	12.0	12.0		12.5
CQ5	13.0	0.0		0.0
EQ6	0.4	0.4	0.5	0.5
BQ6	1.0	1.0	1.0	0.9
CQ6	0.5	0.5	2.0	3.0
BQ7	0.4	0.4	0.6	0.7
CQ7	10.0	10.0	6.8	6.0
EQ8	0.0	0.0	1.2	1.2
BQ8	0.0	0.0	2.0	2.0
CQ8	13.0	13.0	1.3	1.3
BQ9	13.0	13.0	12.0	12.2
CQ9	0.0	0.0	13.0	12.7
EQ10	13.0	1.4	Variable	13.0
BQ10	13.0	0.7	Variable	10.0
EQ11	13.0	13.0	Variable	13.0
BQ11	13.0	12.0	Variable	13.0
CQ11	6.0	13.0	Variable	5.0

Note: All Voltage Readings \pm 20%

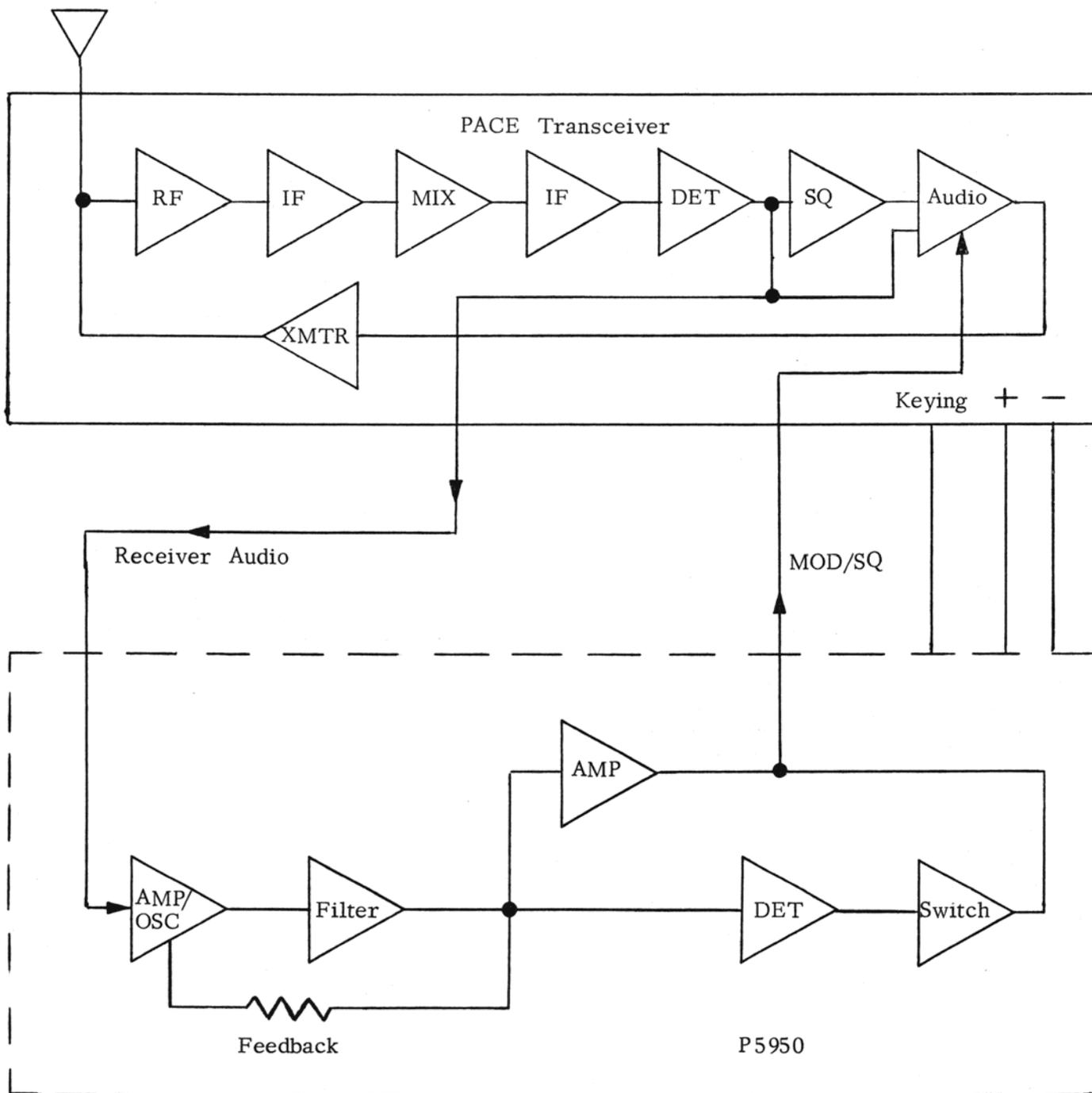
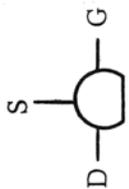
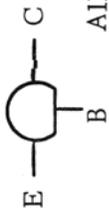


FIGURE 3

P5950 BLOCK DIAGRAM



Q1, 2, 3



All Others

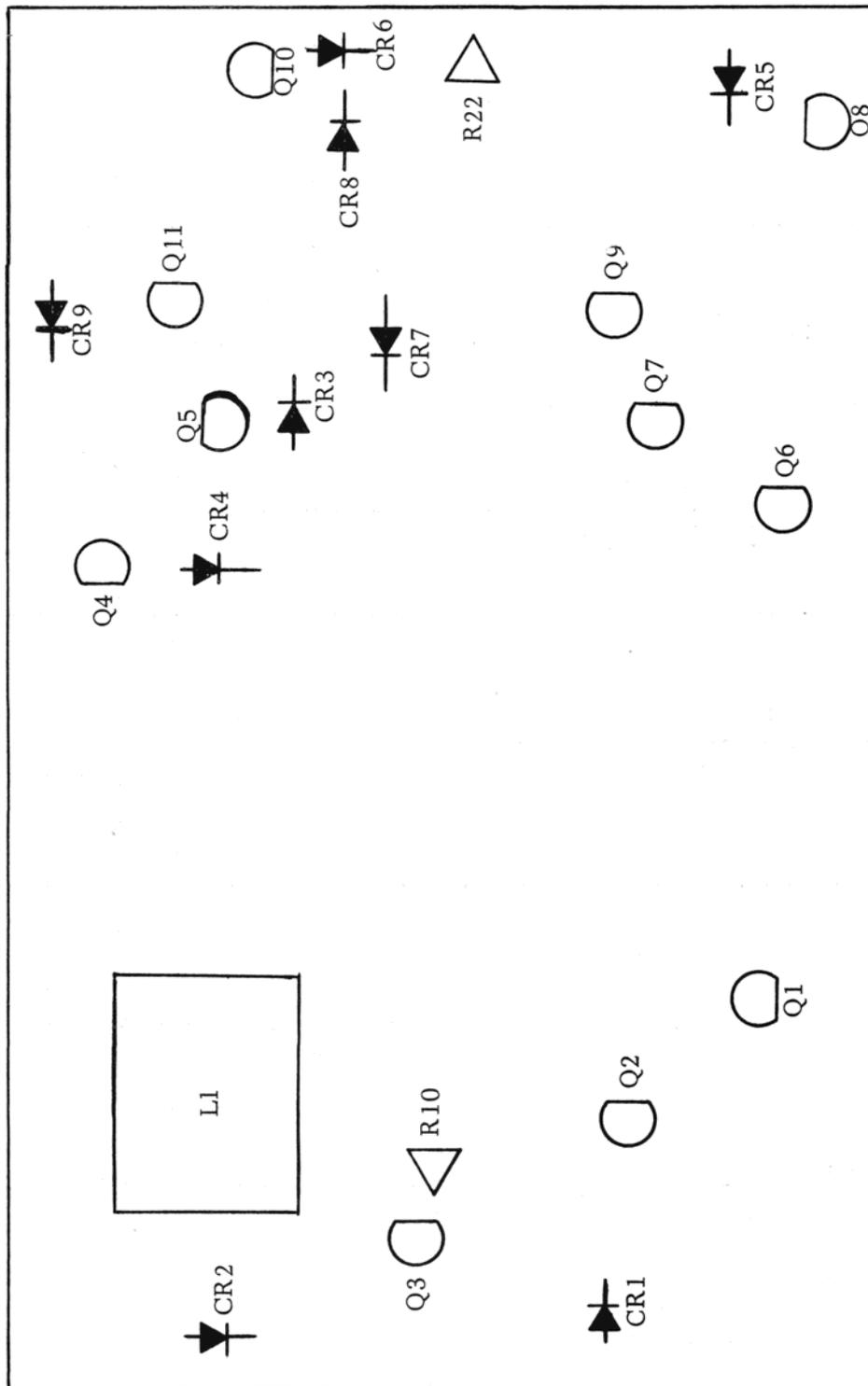


FIGURE 4

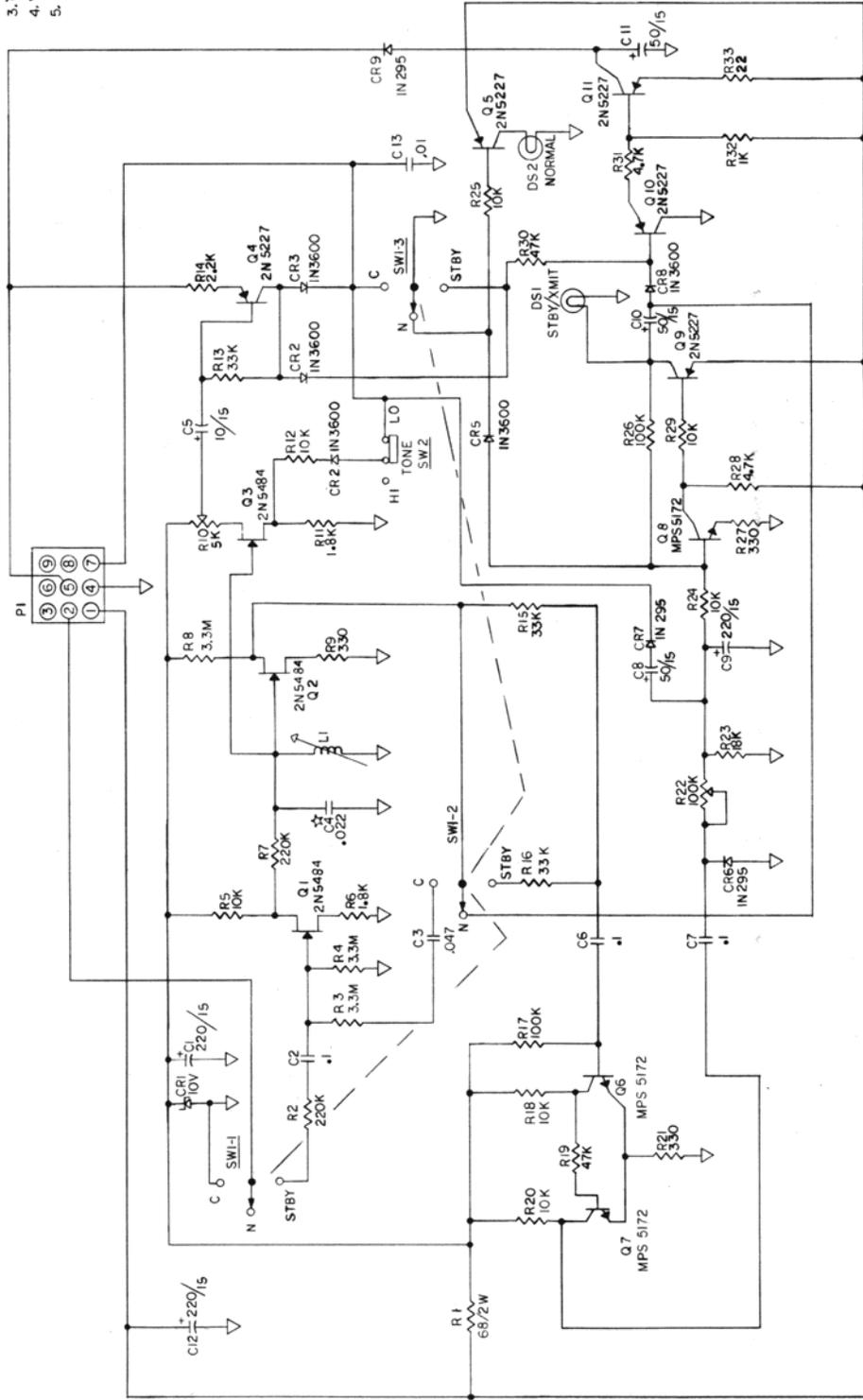
PARTS LOCATOR

PARTS LIST

Reference Design	Description	Part Number
SEMICONDUCTORS		
CR1	Diode, Zener, 10 volts	13-0002
CR2, 3, 5, 6, 8	Diode, Silicon IN 3600	13-0003
CR4, 6, 7, 9	Diode, Germanium IN 295	13-0004
Q4, 5, 9, 10, 11	Transistor, Silicon (2N5227) PNP	13-0084
Q6, 7, 8	Transistor, Silicon (MPS5172) NPN	13-0092
Q1, 2, 3	Transistor, Field Effect (2N5484)	13-0114
RESISTORS		
R33	Resistor, Carbon, 1/4 watt, 22 ohms	14-0009-48
R9-21, 27	Resistor, Carbon, 1/4 watt, 330 ohms	14-0009-76
R32	Resistor, Carbon, 1/4 watt, 1K ohms	14-0009-88
R6, 11	Resistor, Carbon, 1/4 watt, 1.8K ohms	14-0009-94
R14	Resistor, Carbon, 1/4 watt, 2.2K ohms	14-0009-96
R8	Resistor, Carbon, 1/4 watt, 3.3K ohms	14-0009-100
R28, 31	Resistor, Carbon, 1/4 watt, 4.7K ohms	14-0009-104
R5, 12, 18, 20, 24, 25, 29	Resistor, Carbon, 1/4 watt, 10K ohms	14-0009-112
R23	Resistor, Carbon, 1/4 watt, 18K ohms	14-0009-118
R13, 15, 16	Resistor, Carbon, 1/4 watt, 33K ohms	14-0009-124
R19, 30	Resistor, Carbon, 1/4 watt, 47K ohms	14-0009-128
R17, 26	Resistor, Carbon, 1/4 watt, 100K ohms	14-0009-136
R2, 7	Resistor, Carbon, 1/4 watt, 220K ohms	14-0009-144
R3, 4	Resistor, Carbon, 1/4 watt, 3.3M ohms	14-0009-172
R1	Resistor, Carbon, 2 watts, 68 ohms	14-0020
R10	Resistor, Variable 5K ohms	14-0026-1
R22	Resistor, Variable 100K ohms	14-0026-2
CAPACITORS		
C3	Capacitor, Mylar .047 uFD	19-0043
C2, 6, 7	Capacitor, Mylar .1 uFD	19-0044
C4	Capacitor, Mylar .022 uFD, selected for freq.	19-0068
C13	Capacitor, Ceramic .01 uFD	19-0082
C5	Capacitor, Electrolyte 10/15	19-0127
C8, 10, 11	Capacitor, Electrolyte 50/15	19-0129
C1, 9, 12	Capacitor, Electrolyte 220/15	19-0138
MISCELLANEOUS		
DS1, 2	Lamp, Call/Xmit and Normal	13-0019
L1	Inductor, tunable, 774-946 mH	17-0078
SW2	Switch, slide	15-0058
SW1	Switch, rotary	15-0080
	Case	24-0058
	Knob	24-0072
	Lense, red	24-0065-1
	Lense, green	24-0065-4
	Glides	24-0091
	Bracket	25-0023
	Front Panel	25-0223
	Plug	27-0077
	Screw, Mounting Bracket	28-0158-3

NOTES

1. ALL RESISTORS IN OHMS
2. ALL CAPACITORS IN MICROFARADS
3. *SELECTED FOR FREQUENCY
4. ▽ SYSTEM GROUND.
5. LAST REF. DES. USED:
R 33, C 13, Q 11 & CR 9



REV	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			

PATHCOM, INC.
HARBOR CITY, CALIF.

SCHEMATIC P 5950

DATE: 1/25/64
DRAWN: JG
CHECKED: JG
APPROVED: JG

11-0047