WAØUZI

# C111 Instruction Manual

AEROTRON, INC.
P.O. Box 6527, Raleigh, N.C. 27628, (919) 876-4620 Telex 579301

4201-1249-002

TABLE OF CONTENTS


**Operating Instructions** ..... 1

**Circuit Description** ..... 4
- Tone Qualification ..... 5
- Timer ..... 5
- Priority Scan ..... 6
- Mike hanger ..... 7
- PTT and Tone Phase Reversal ..... 7

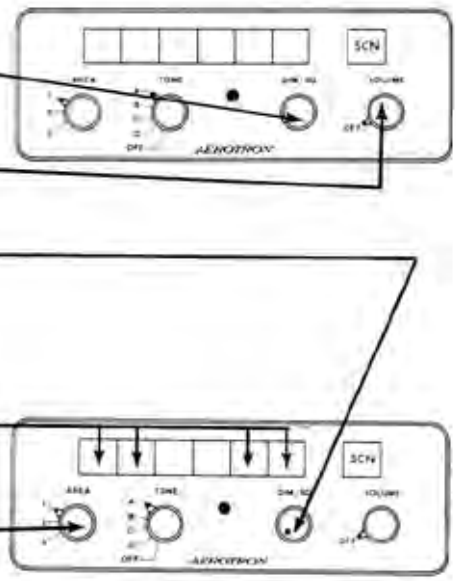
**PC Board with Block Diagram and Parts List**
- Block Diagram ..... 9
- Wiring Harness Schematic ..... 10
- Chassis Assembly Drawing ..... 11
- Scan Module Parts Location ..... 12
- Switch Module ..... 16
- 1180 UNICALL ..... 18
- 8 Tone Burst Encoder ..... 22
- Oscillator Carrier Installation ..... 24
- 10 Channel Oscillator Carrier ..... 26
- 1090 Squelch Board ..... 30
- 1090 Fast Squelch Board ..... 32
- I.C. Diagram, 10W II ..... 35

**Master C-111 Scan Head Parts List** ..... 36

# OPERATING INSTRUCTIONS

## I. A. GENERAL

1. Push in knob and rotate fully clockwise.
2. Rotate clockwise out of detent (OFF) position and set at desired listening level.
3. Remove mike from hanger, pull knob out and set at desired squelch level. Push knob in and set front panel illumination at desired level. Replace mike in hanger.
4. Depress desired channel selector button.
5. If channel 1 or 2 is selected, set at appropriate area position.



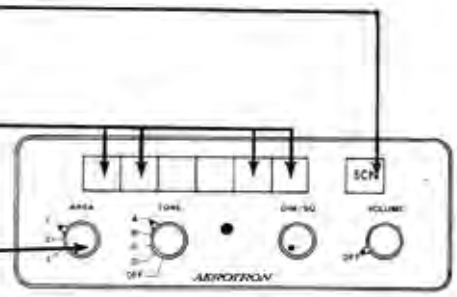

## B. SCAN

1. Perform steps 1, 2, and 3 in A above.

   NOTE

   Mike must be in hanger to allow scan circuit to operate.

2. Depress to turn on scan circuit. Observe that button is illuminated.
3. To establish priority channel, depress desired channel selector.
4. If channel 1 or 2 is selected, set at appropriate area position.
5. When signal is present, push-button for that channel will be illuminated and audio will be applied to speaker.

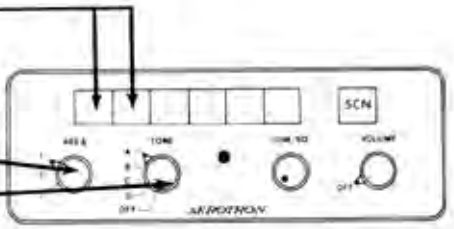


## C. UNICALL

1. Perform steps 1, 2, and 3 in A.

NOTE
Mike must be in hanger to allow UNICALL circuit to operate.

2. Depress either channel 1 or 2 push-button.
3. Set at appropriate area position.
4. Set at appropriate tone position.

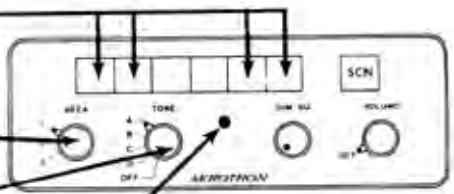



5. When properly coded call is received, audio signal will be applied to the speaker.

## D. TO TRANSMIT:

1. Select appropriate channel.
2. If channel 1 or 2 is selected at appropriate area position.
3. If UNICALL is desired, on channel 1 or 2 channels set at appropriate tone position.
4. Remove mike from hanger, listen to determine that channel is not in use, depress PTT bar and speak directly into mike. Release PTT bar at end of transmission. Received audio signals will be applied to the speaker.

NOTE
Observe that red T/R lamp illuminates when PTT button is depressed.



II. (1) Area 1,2,3: Selects one of three internal frequency elements (in Mpac) for each of channels 1 & 2.
(example): Area switch on position two - channels scanned inside radio will be 2, 5, 9, 10.

(2) Tone A,B,C,D off: Selects one of up to 4 encode and 4 decode tone frequencies inside Mpac or disables these functions in "off."

(3) Tx Lamp: Indicates transmit condition.

(4) Dim/Sq.: Knob in, rotate counter clockwise to dim lights (except Tx Lamp). Pull knob out, turn knob clockwise to open squelch, or adjust squelch.

(5) Vol./off: Turn clockwise for power on. Continue turning clockwise to increase volume.

(6) Scan: Depress for scan. Out for manual.

(7) Pushbutton channel switches: in manual mode (scan button out) transmit and receive on channel switch depressed. In scan mode (scan depressed; microphone hung up) scan all channels (receive).
(Push buttons 1 & 2 select channels on area knob.)

(8) Microphone connector: Optionally mounted on left end panel or left rear panel.

III. Notes:

(a) Pushbutton channel select switches are lighted when depressed in manual mode. Scan switch lights when depressed except when signal is being received. Then button of selected channel lights.
Also, when microphone is lifted from hanger, scan lamp goes out and pushbutton channel manually selected will light.

(b) Battery cable out rear panel (with in-line fuse holder) may be used to connect to ignition switch (remove fuse inside Mpac) to remove supervisory power from Mpac with ignition off.

OFF/VOLUME, DIM/SQ.

To turn on, turn OFF/VOLUME clockwise until click is heard. Pull DIM/SQ. control toward operator and turn clockwise until noise is heard. Adjust volume clockwise until noise is at comfortable level. Adjust DIM/SQ control counter-clockwise until noise is no longer heard. Mpac is ready to receive and transmit.

Push DIM/SQ in to adjust brilliance of all lamps except TX lamp. The microphone should be in its hanger at all times except during use (transmitting). Lifting the microphone from its hanger switches the Mpac to the Manual Mode even with the Scan button depressed. The pushbutton channel will be selected. For scan operation, the mike must be in its hanger.

During transmit, the microphone should be held approximately one inch from the lips while speaking at a normal voice level. The transmit lamp will light during the transmit mode.

SCAN/MANUAL

A. Scan Mode

Depress Scan/Manual switch. (Mike must be in its hanger.) Scan switch will light except when channel is received, at which time busy channel switch will light. The switch selected channel is the "Priority Channel."

In scan mode, any non-priority channel selected, will be monitored normally, but with a faint muted interruption approximately every 280 milliseconds (3 times per second).

B. Manual Mode

Release Scan/Manual switch. As switch button is depressed, button will snap out (toward operator) into the manual mode. The Scan button will no longer be lit and C111 will be in the manual operating mode. The only channel monitored and available for transmit is the switch selected (button depressed) channel which will be lit at all times.

AREA SWITCH

The area switch provides for manual selection of any of three different frequencies for each of the first two channel slots. The first and second channel select switches on the left side of the front panel are internally wired to select the specific frequency indicated by the position of the area switch.

Example 1: Mode switch in manual area switch in position 1 channel inside radio that is selected is channel 1 if first channel select switch is depressed; channel four (4) is second channel select switch depressed.

Example 2: As above except mode switch in "Scan." Channels scanned will be 1, 4, 9, 10.

Tone Switch

The tone switch permits selection of any four tone frequencies for encode (transmit) and decode (receive). The frequencies are independently selectable and can be mixed. Tone requirements can be removed by turning the tone switch to OFF.

Decode time is approximately 50 MSEC. Decode qualification (the time from noise squelch opening to verification of tone presence is determined in the C111 and is set at approximately 260 MSEC to allow for slower encode tones in mixed systems). Reception is not delayed by tone qualification since the presence of the correct tone allows immediate reception even though, with the absence of tone, the full 260 MSEC is allotted before a signal is disqualified.

Encoder tone starts when mike is removed from mike hanger or scan button is released to the manual position.

## CIRCUIT DESCRIPTION

QUAD gates designated A, B, C, D A (pins 1, 2, 3)
B ( 4, 5, 6); C (8, 9, 10); D (11, 12, 13)

Gates 14A and 14B serve as an astable multivibrator (oscillator) or clock. This clock is operational only in the scan mode. Pin J36 provides connection to the SCAN/MANUAL switch which grounds pin J36 during MANUAL operation.

Capacitor C2503 couples clock pulses to 14C, the clock gate, which is controlled by the fast detector inside the MPAC radio and buffered by 17C. When weak signals are received C2508 and R2547 integrate the noisy pulses from the fast detector to provide continuous monitoring of weak signals. Scan pulses from 14C are coupled through C2506 to 15D. The function of gate 15D will be explained later in this text.

Pulses from 15D are coupled to IC2501, a serial counter, which provides the sequence or SCAN ORDER of the channel oscillators within the Mpac. A total of four or six "SLOTS" or channel positions are scanned in the C111. The selection of four or six is made on the scan board (see schematic) note 3. Flexibility is provided by a front panel switch which permits selection of any of three frequencies for each of the first two "slots" scanned. This switch is designated as S2304 the AREA switch.

IC2502 and 2503 are QUAD AND-OR gates which accept scan information from IC2501 or MANUAL/PRIORITY information from the front panel switch (S101). The input which is accepted is determined by the logic level on pins 14 and 9. Scan information is accepted from IC 2501 when pin 9 is high (J36 "high"). Manual and priority information is accepted when pin 14 is "high". The inputs to IC 2502 and IC2503 which accept manual priority channel information are pins 7, 5, 3, and 1 (IC2502) and 7, and 5 (IC2503). These inputs are brought in from S101 (switch board) on pins J2523-6 through J2528.

The outputs from IC2502 and IC2503 are connected to S2304 (AREA SWITCH) and IC's 4 and 5 which serve as a decimal to BCD converter. BCD (binary coded decimal) is the language used to address the oscillator circuits within the Mpac. Its use minimizes the number of wire interconnects between the C111 and the Mpac. IC2506 A, B, C, & D serve as buffers to provide the power required to switch the channel decoder through the long control cable supplied with the Mpac radio system J2505, 06, 07, and J2508 (BCD 8, 4, 2, 1 respectively) connect to pins 29, 25, 16, and 7 on J2301 control connector).

SW2501 is the unicall programming switch. It is comprised of 6 single pole switches in a single package which are used to select decimal scan information on each "slot" for which tone use is desired. To program this switch it is only necessary to have a tone system inside the Mpac radio and to close the switch corresponding to the appropriate channel. Additional flexibility in the tone system is provided by SW2302 (TONE SWITCH) which provides for front panel selection of any one of four tone frequencies ENCODE and DECODE.

The switches labeled 1 and 2 on SW 2501 are connected to the DECIMAL OUTPUTS 10 and 11 of IC2502 but switches 3, 4, 5, &6 are connected to DECIMAL INPUTS to IC2502 and IC 2503. This provides for placing a tone requirement on the first two scanned slots in scan and priority.

With the capability to select any of three channels for each of the first two scanned manually selected slots and with the additional capability to select any of up to four tones for each channel.

TONE QUALIFICATION

The outputs obtained from the switches in SW2501 are used in combination with a timer composed of the CLOCK, IC2512, IC2513, IC2510m abd IC2511 and with priority information to qualify or disqualify a busy channel as to its tone information.

The output of the fast detector is coupled to 17C. Noisy signals are integrated by R1547 and C1508. The output of 17B is used to control the clock and the various other functions within the C111. 17B initiates UNICALL QUALIFICATION and clears the circuit when the channel is no longer busy. 17B initiates Priority scan and resets after a priority channel call. 17B also resets the timer (IC2512 and IC2513.) When 17B4 is high (a logic "1"), a busy channel is being programmed as either a priority channel or a UNICALL channel, 17B4 initiates the qualification process for these two requirements.

TIMER – IC2512 divider (40) IC2513 counter

After $2^5$ (32) pulses the Q6 output of IC2512 goes positive. After eight more pulses the Q4 goes positive again. The adding of these two outputs gives two positive pulses (of eight pulse durations) every 64 input pulses. The first of these eight pulse intervals is used to "and" with the clock to provide a train of pulses to be counted by IC2513. At the time the first pulse of the eight pulse train is counted a time of $2^6 + 2^3 = 32 + 8 = 40$ (40 X 6.5 MS = 260 MS) 260 MS has elapsed since the first pulse from the clock was counted by JC2512.

The first output from 2513 (1 count) is used to determine if unicall has opened at gate 10C. The second count is used to create a forced scan pulse if no tone is present or the proper tone is not present. The three count is not used.

The four count (286 MS) is used to create a priority scan pulse and the first 6.5 MS of the priority scan mute pulse. The five count is used to generate the last 3.25 MS of the MUTE pulse.

The six count is used to reset the counter/divider to zero.

The counter/divider is also reset to zero count by 17B.

For UNICALL qualification the process is as follows:

1. 17B4 HIGH (BUSY CHANNEL SELECTED)
2. THE ANODE OF CR15, CR16, CR17, CR18, CR29, or CR30 HIGH (CHANNEL PROGRAMMED FOR UNICALL SELECTED).
3. 10D11 goes Low ("0")
4. SETS 10A & 10B (10A3 HIGH)
5. AFTER 266.5 MS IC2513-1 goes high

6. 10C COMPARES INPUTS - IF 10C8 is during the time IC2513-1 is high indicating UNICALL present, 10C10 goes low causing 10A and 10B latch to reset.
7. UNICALL QUALIFIES. Scan stays locked on channel.

At step 6 in the above procedure if 10C8 does not go high by 273 MS after 17B4 goes high, then 10C10 stays high and

7. At 273 MS IC2513-3 goes high (11B 5 & 6 are high) so 11B4 goes low and 11A3 goes high.
8. If either input at 11C is low meaning
   A. Channel slot 1 and 2 not selected or
   B. Non-Priority CHANNEL SELECTED then 11C10 will be high.
9. 11D13 and 11D12 will be high causing 11D11 to go low causing pulse to be coupled to 15D and forcing the scan to be advanced to the next slot. If this slot remains busy, qualification will be attempted on each scan cycle. Every 39 millisecond scan cycle will be interrupted for 273 Msec to determine if tone is available (on the right frequency).

At 11C, if pins 8 and 9 are high (meaning that slot (1) or (2) is selected and programmed for tone and that the slot selected is the priority channel (latch 7B and 7A SET), then 11C10 will be low preventing the scan from being advanced by tone disqualification. In addition to that, 9F15 (being high) causes 16D11 to go high so that 15B5 and 6 are both high causing no Unicall defeat signal to be generated. Thus scan circuit is "locked up" until either of four things happens.

1. Remove or change tone requirement
2. Change priority channel selection or
3. Wait till channel no longer active or
4. Go to normal mode with proper or no tone requirement

In normal scan operation with no tone requirement programmed, the cathodes of CR15 through 18 and CR29 and 30 will all be low so that 15B5 is low and UNICALL (if installed) will be defeated. It can be seen that UNICALL can be required or defeated at the scan rate. Also tone enable is derived from the same diode buss through 9E and Q2502 and is performed at the scan rate. The tone enable output (J2540) connects to the tone select/tone off wiper of S2302.

PRIORITY SCAN

The priority scan function is operational only during the time a non-priority channel is received in the scan mode.

Priority scan is accomplished as follows:

1. Non-priority channel selected 17B4 high
2. Clock pulses are counted by IC2512 and IC2513 (see divider section).
3. After Unicall qualification (273 MSEC) the fourth count of the eight pulse train appears at IC2513-11. This pulse appears at 16A1 and 3. The pulse at 16A1 also appears at 8A2 and 3 is used to generate the first portion of the priority scan pulse.
4. During the first portion of the priority scan pulse (6.5 MSEC), the busy channel oscillator is turned off (output at J2502 to SWITCH BOARD and pins 9 of IC2502 and 2503 pulled low by 9D (priority channel selected).
5. At this time (286 MSEC) IC2512-11 (count-5) goes low and pin 4 goes high. This is anded with the output of the clock (CR2504 & 5) so that the positive half cycle of the next clock period is coupled to 16A2. The length of the pulse at 16A3 is equal to 6.5 MSEC plus 3.25 or 9.75 and is used to mute the receiver during the time the priority channel is checked (7C and 6E). Also occuring at 286.5 MSEC as IC2513 goes low; a pulse is coupled to the input of 9C of approximately 500 u-SEC. During this 500 u-SEC interval, 7D compares this pulse with activity on the priority channel. If the output of the fast detector is high (17C 7 high), the latch 7A & 7B is set so that the priority channel is "locked in".
6. When latch 7A & 7B is set (priority channel selected), 7C8 is low disabling the mute circuit so that the priority channel is heard. So the mute gate inside the radio is "off" during the time the priority channel is sampled, but in "on" when the priority channel is locked in.

After Unicall qualification and priority scan is completed (293 MSEC) pin 5 of IC2513 goes high causing a reset pulse to be generated by 16B which resets the counter/divider (2512 & 13)to zero count.

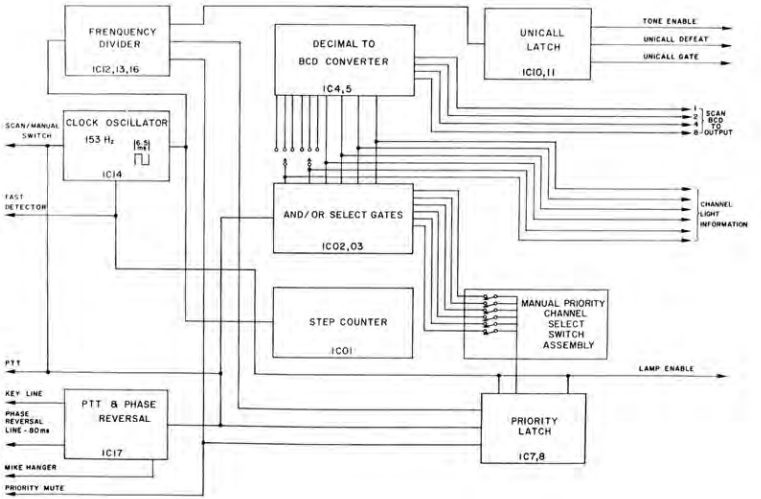
R2533, CR2526, R2534, and C2512 act to provide a power on reset for latch 7A and 7B.

MIKE HANGER

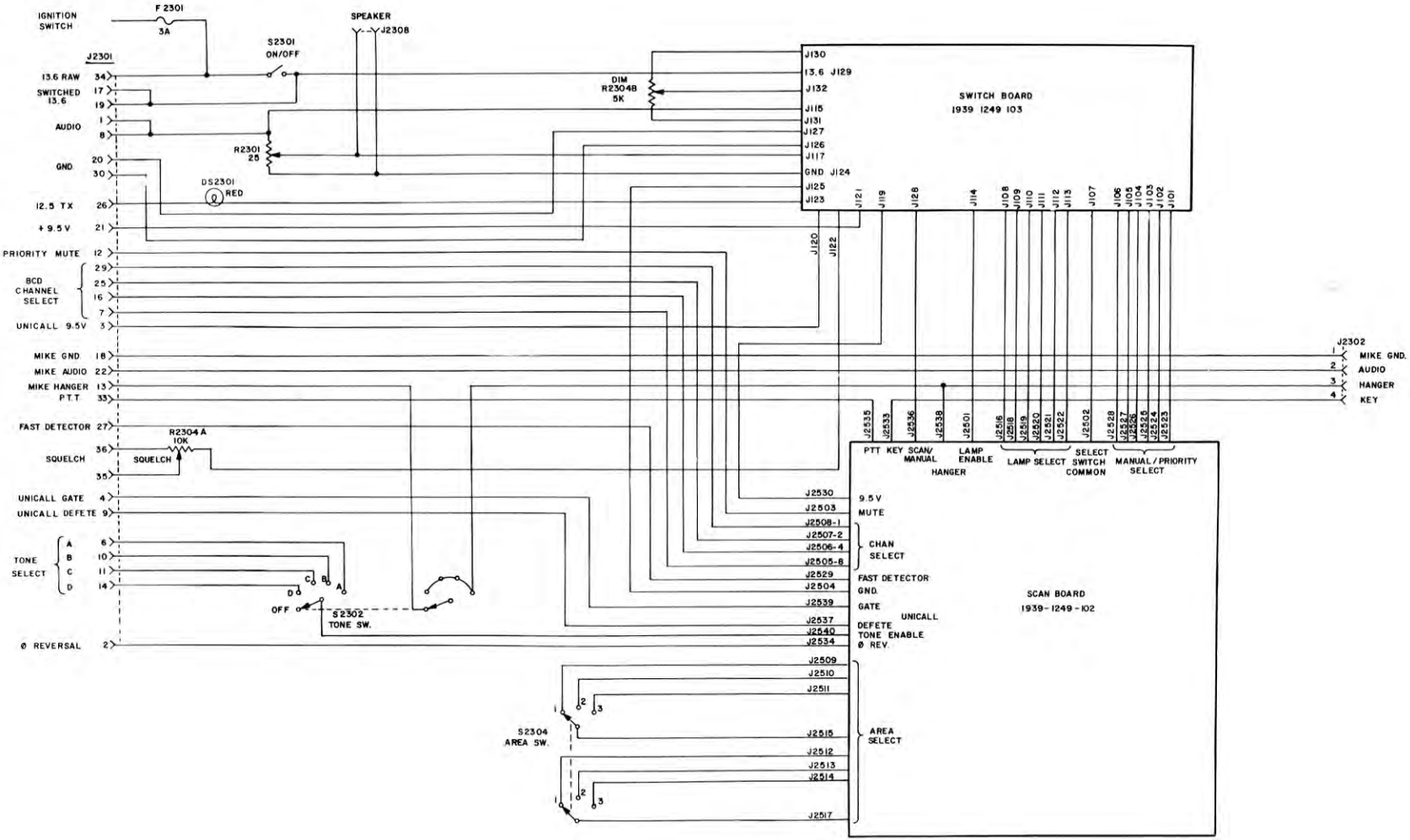
When the mike is lifted form its hanger, J2538 is pulled high producing a "low" at 14D11, a high at 9B4 and a high at 8C10 selecting the priority channel in scan mode. In manual mode, the pushbutton channel is already selected.

PTT & TONE PHASE REVERSAL

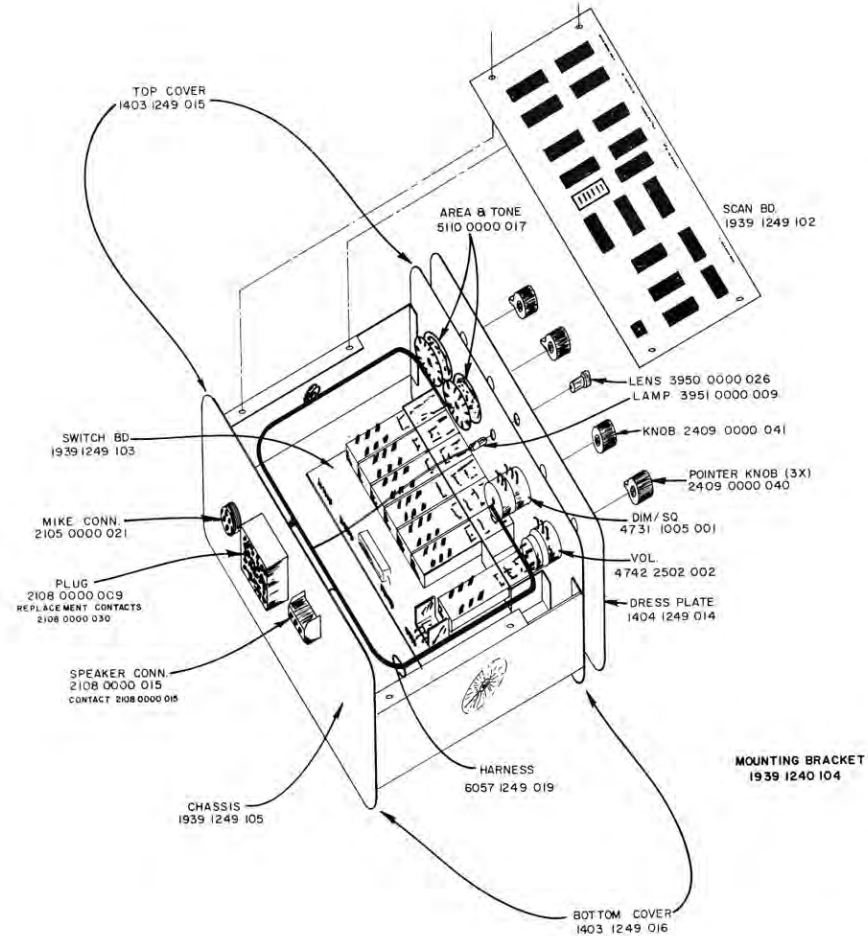
When mike is keyed, J253 goes "low" causing 17D10 to go "high" causing C2505 to charge and Q2503 to pull J2535 low (KEYS TRANSMITTER). When the mike button (key) is released the charge at C2502 holds 17E12 low so that 17A2 goes positive. (TRANSMITTER KEYED BUT NOW TONE PHASE REVERSED). When 2505 discharges, 17E12 goes high causing 17A2 to go low again returning tone to original phase and unkeying transmitter.



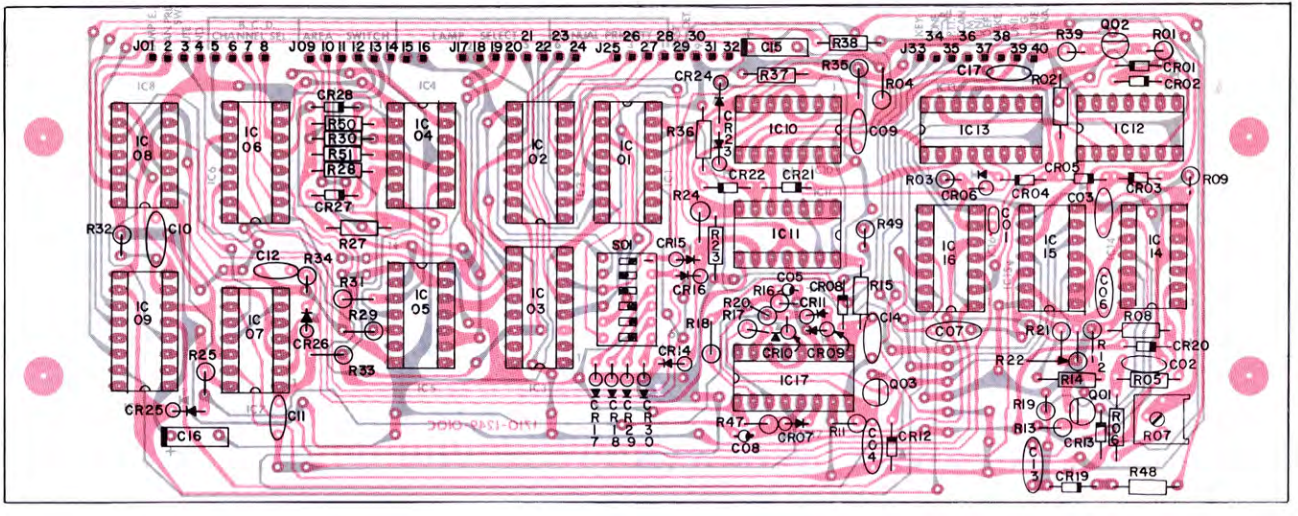

BLOCK DIAGRAM



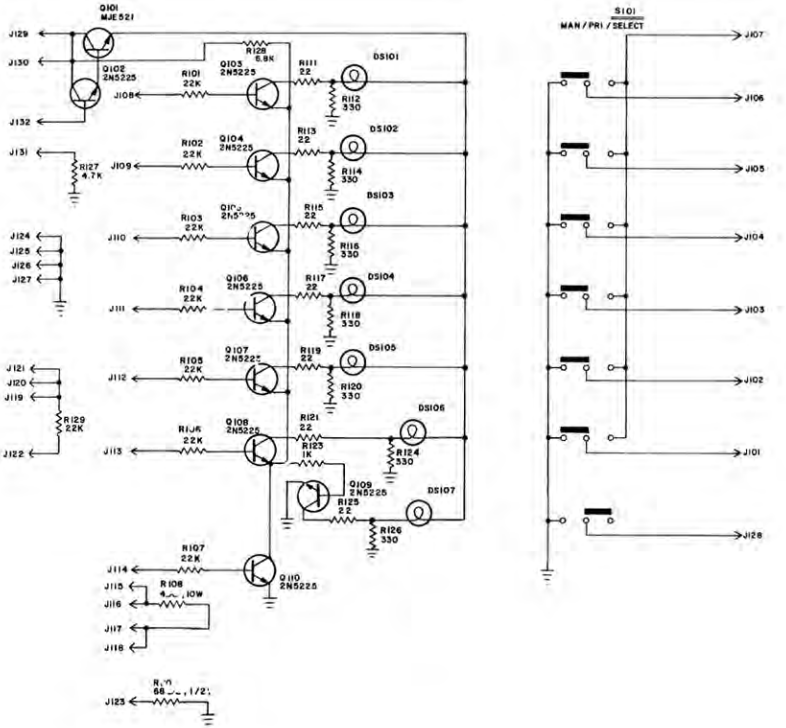

WIRING HARNESS SCHEMATIC




CHASSIS ASSEMBLY




SCAN MODULE PARTS LOCATION




SWITCH BOARD SCHEMATIC

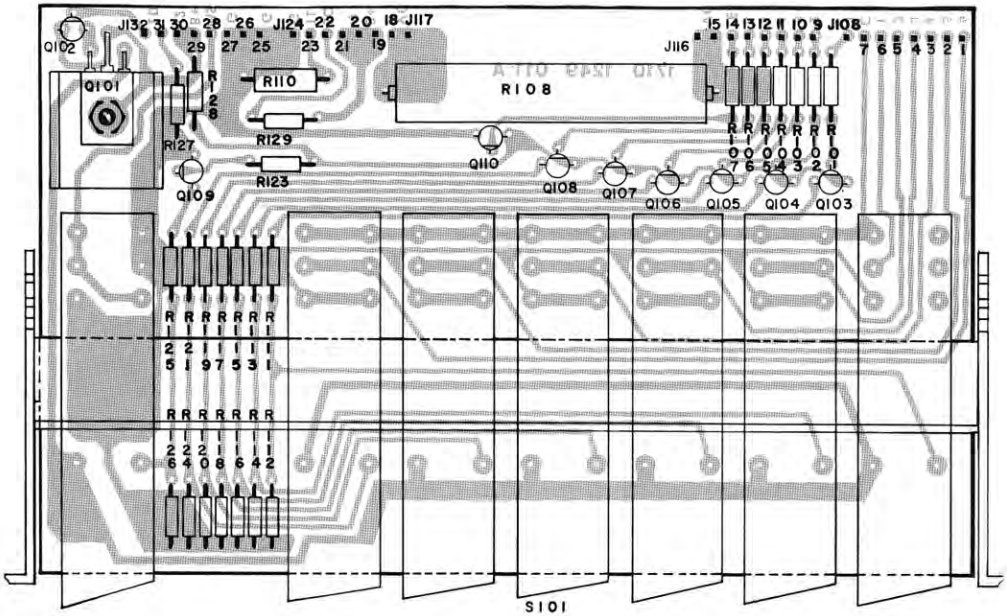
# PARTS LIST

| Item | Description | Part No |
|---|---|---|
| | B SCAN BOARD<br>1939-1249-102<br>(REPLACEABLE PARTS) | |
| C2501 | Capacitor, 1000pf. Stable Submin. | 1526-1004-001 |
| C2502 | Capacitor, Disc. Cer., .01 | 1502-1005-004 |
| C2503 | Capacitor, Disc. Cer., .005 | 1502-1005-004 |
| C2504 | Capacitor, Disc. Cer., .001 | 1506-1004-001 |
| C2505 | Capacitor, .22uf. 15V. Tantalum | 1532-2206-015 |
| C2506 | Capacitor, Disc. Cer., .005 | 1510-5004-001 |
| C2507 | | |
| C2508 | Capacitor, .47uf. 15v. Tantalum | 1532-4706-015 |
| C2509 | Capacitor, .1uf. 12V. | 1505-1006-005 |
| C2510 | Capacitor, Disc. Cer., .005 | 1510-5004-001 |
| C2511 | Capacitor, .1uf. 12V. | 1505-1006-005 |
| C2512 | | |
| C2513 | Capacitor, Disc. Cer., .001 | 1506-1004-001 |
| C2514 | Capacitor, 470pf. | 1502-4703-001 |
| C2515 | Capacitor, 68mfd. Tand. 15V. | 1532-6808-015 |
| C2516 | | |
| C2517 | Capacitor, .005uf. 500V. | 1510-5004-001 |
| Q2501 | Transistor, 2N3638 | 4810-0000-018 |
| Q2502 | | |
| Q2503 | Transistor, 2N2222 | 4811-0000-040 |
| R2501 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2502 | | |
| R2503 | Resistor, 1 meg. 10%, ¼W. | 4704-1007-001 |
| R2504 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2505 | Resistor, 3.3 meg. 10%, ¼W. | 4704-3307-001 |
| R2506 | Resistor, 150K 10%, ¼W. | 4704-1506-001 |
| R2507 | 250K, Trim Pot. | 4735-2506-001 |
| R2508 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2509 | | |
| R2511 | Resistor, 47K 10%, ¼W. | 4704-4705-001 |
| R2512 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2513 | Resistor, 470 ohm, 10%, ¼W. | 4704-4703-001 |
| R2514 | Resistor, 22K 10%, ¼W. | 4704-2205-001 |
| R2515 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2516 | Resistor, 270K 10%, ¼W. | 4704-2706-001 |
| R2517 | Resistor, 10K 10%, ¼W. | 4704-1005-001 |
| R2518 | Resistor, 1K 10%, ¼W. | 4704-1004-001 |
| R2519 | Resistor, 15K 10%, ¼W. | 4704-1505-001 |
| R2520 thru R2525 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2527 thru R2533 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2534 | Resistor, 1 meg. 10%, ¼W. | 4704-1007-001 |
| R2535 thru R2537 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2538 | Resistor, 22K 10%, ¼W. | 4704-2205-001 |
| R2539 | Resistor, 470 ohm, 10%, ¼W. | 4704-4703-001 |
| R2547 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2548 | Resistor, 470 ohm, 10%, ¼W. | 4704-4703-001 |
| R2549 | | |
| R2550 | Resistor, 100K 10%, ¼W. | 4704-1006-001 |
| R2551 | | |
| S2501 | Switch 6PST Miniature | 5106-0000-008 |
| CR2501 CR2530 | Diode, 1N4148 | 4803-0000-004 |
| IC2501 | IC., CD4022 AE | 4851-4022-001 |
| IC2502 | IC., CD4019 AE | 4851-4019-001 |
| IC2503 | | |
| IC2504 | IC., CD4072 BE | 4851-4072-001 |
| IC2505 | | |
| IC2506 | IC., CD4010 AE | 4851-4010-001 |
| IC2507 | IC., CD4011 AE | 4851-4011-001 |
| IC2508 | IC., CD4071 BE | 4851-4071-001 |
| IC2509 | IC., CD4049 AE | 4851-4049-001 |
| IC2510 | IC., CD4011 AE | 4851-4011-001 |
| IC2511 | | |
| IC2512 | IC., CD4024 AE | 4851-4024-001 |
| IC2513 | IC., CD4022 AE | 4851-4022-001 |
| IC2514 | IC., CD4011 AE | 4851-4011-001 |
| IC2515 | | |
| IC2516 | IC., CD4071 BE | 4851-4071-001 |
| IC2517 | IC., CD4049 AE | 4851-4049-001 |
| | 14 Pin IC Sockets | 2136-0000-002 |
| | 16 Pin IC Sockets | 2136-0802-021 |

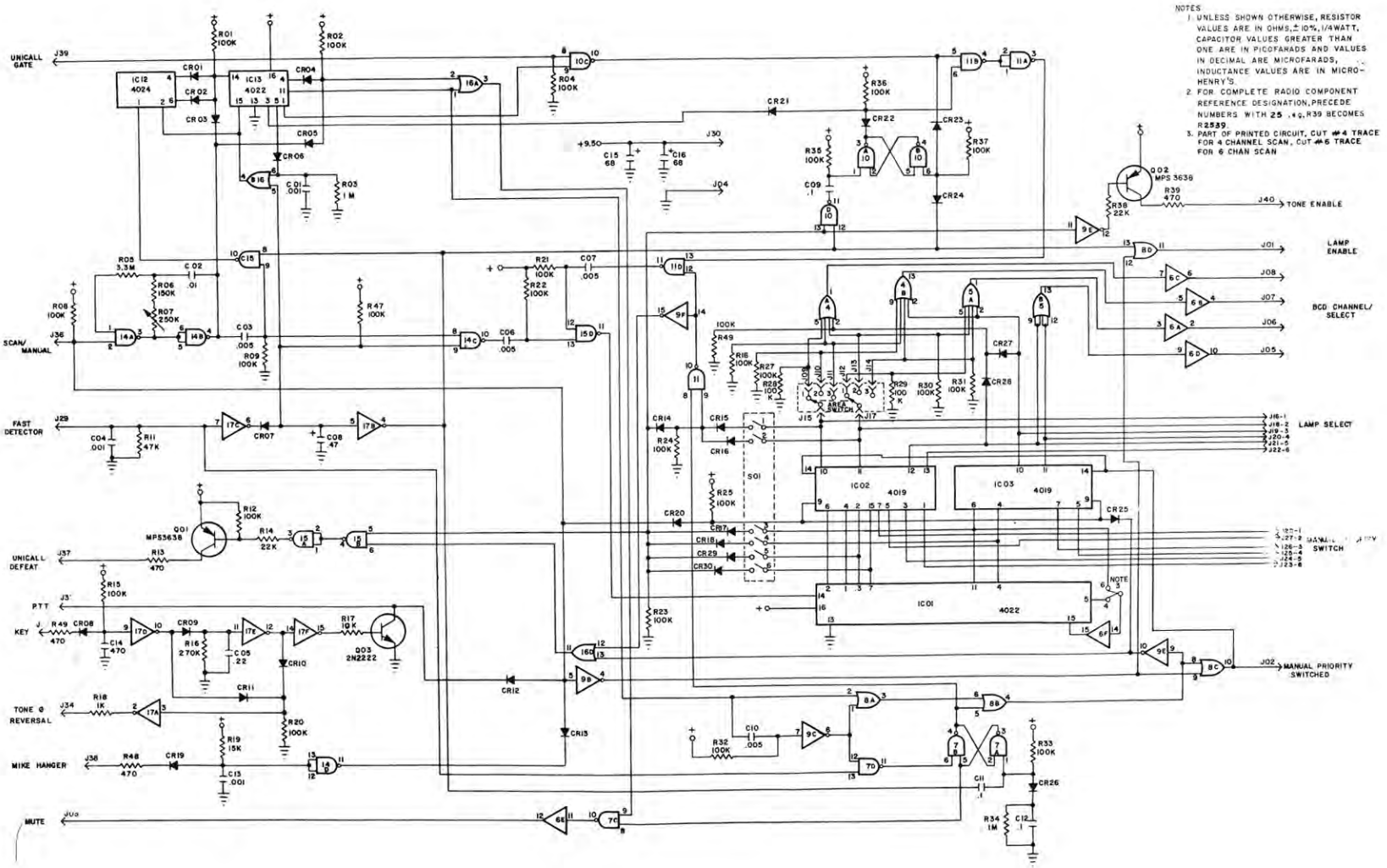
# PARTS LIST

| Item | Description | Part No |
|---|---|---|
| | A SWITCH ASSEMBLY BOARD<br>1939-1249-103<br>(REPLACEABLE PARTS) | |
| Q101 | Transistor, MJE 520 | 4811-0000-021 |
| Q102 | Transistor, 2N5225 | 4811-0000-027 |
| Q110 | | |
| R101 thru R107 | Resistor, 18K 10% | 4704-1805-001 |
| R108 | Resistor, 4 ohm, 10W. | 4716-4001-001 |
| R110 | Resistor, 68 ohm, 10%, ⅛W. | 4701-6802-001 |
| R111 | Resistor, 22 ohm, 10%, ¼W. | 4704-2202-001 |
| R112 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R113 | Resistor, 22 ohm, 10%, ¼W. | 4704-2202-001 |
| R114 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R115 | Resistor, 22 ohm, 10%, ¼W. | 4704-2202-001 |
| R116 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R117 | Resistor, 22 ohm, 10%, ¼W. | 4704-2202-001 |
| R118 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R119 | Resistor, 22 ohm, 10%, ¼W. | 4704-2202-001 |
| R120 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R121 | Resistor, 22 ohm, 10%, ¼W. | 4704-2202-001 |
| R123 | Resistor, 1K 10%, ¼W. | 4704-1004-001 |
| R124 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R125 | Resistor, 22 ohm, 10% ,¼W. | 4704-3303-001 |
| R126 | Resistor, 330 ohm, 10%, ¼W. | 4704-3303-001 |
| R127 | Resistor, 4.7K, 10%, ¼W. | 4704-4704-001 |
| R128 | Resistor, 6.8K, 10%, ¼W. | 4704-6804-001 |
| R129 | Resistor, 22K, 10%, ¼W. | 4704-2205-001 |
| S101 | 7 Button Switch | 5141-0000-010 |
| DS101 thru DS107 | 7 Button Switch | 5141-0000-010 |
| | Heat Sink | 1404-1095-011 |
| | 4-40 Nut | 2831-0408-601 |
| | 4-40 x ½ Screw | 2851-0416-311 |

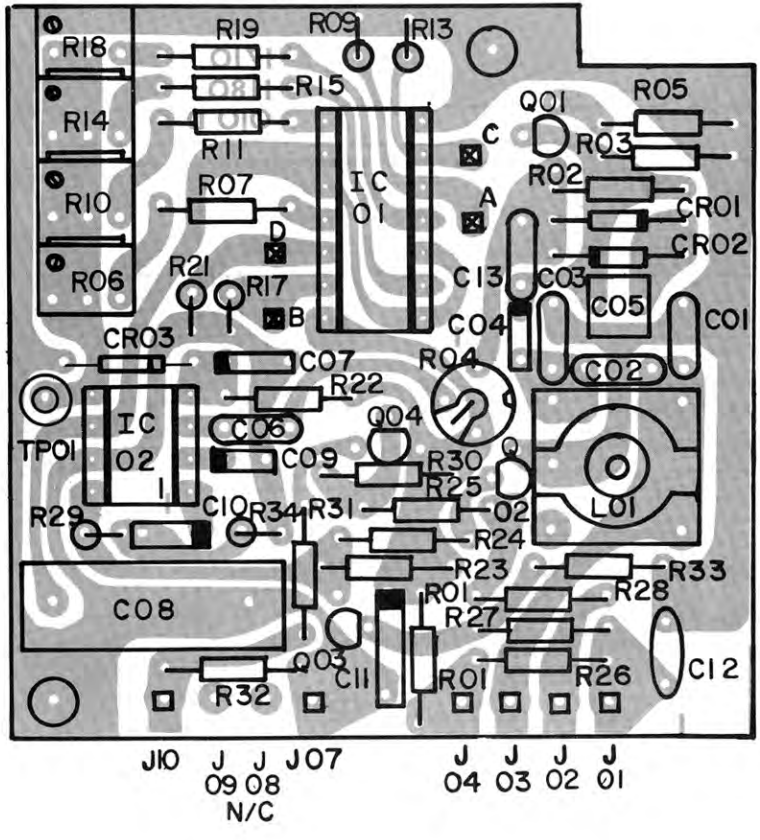
NOTE: B/M 1939 1249 103



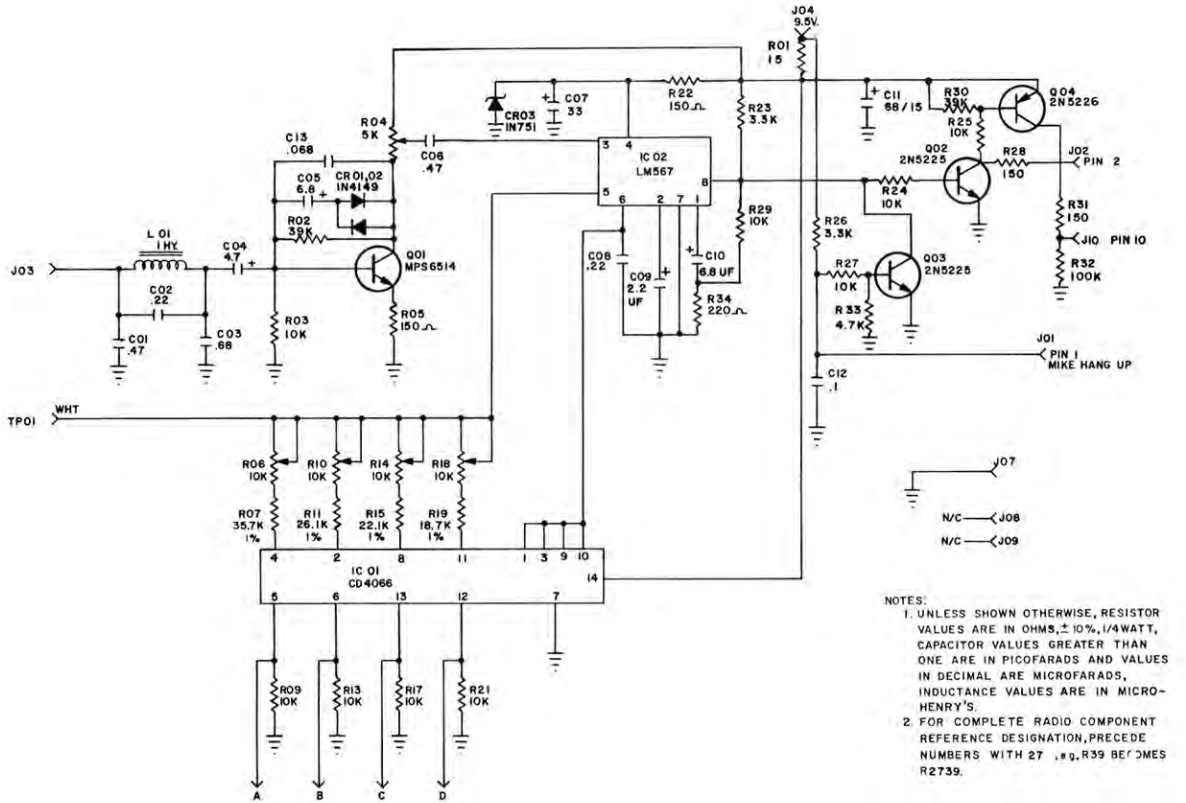

SWITCH MODULE PARTS LOCATION




SCAN BOARD SCHEMATIC




1180 UNICALL MODULE PARTS LOCATION




NOTES:

1. UNLESS SHOWN OTHERWISE, RESISTOR VALUES ARE IN OHMS, ± 10%, 1/4 WATT, CAPACITOR VALUES GREATER THAN ONE ARE IN PICOFARADS AND VALUES IN DECIMAL ARE MICROFARADS, INDUCTANCE VALUES ARE IN MICRO-HENRY'S.
2. FOR COMPLETE RADIO COMPONENT REFERENCE DESIGNATION, PRECEDE NUMBERS WITH 27 , e.g. R39 BECOMES R2739.

1180 UNICALL SCHEMATIC

# PARTS LIST

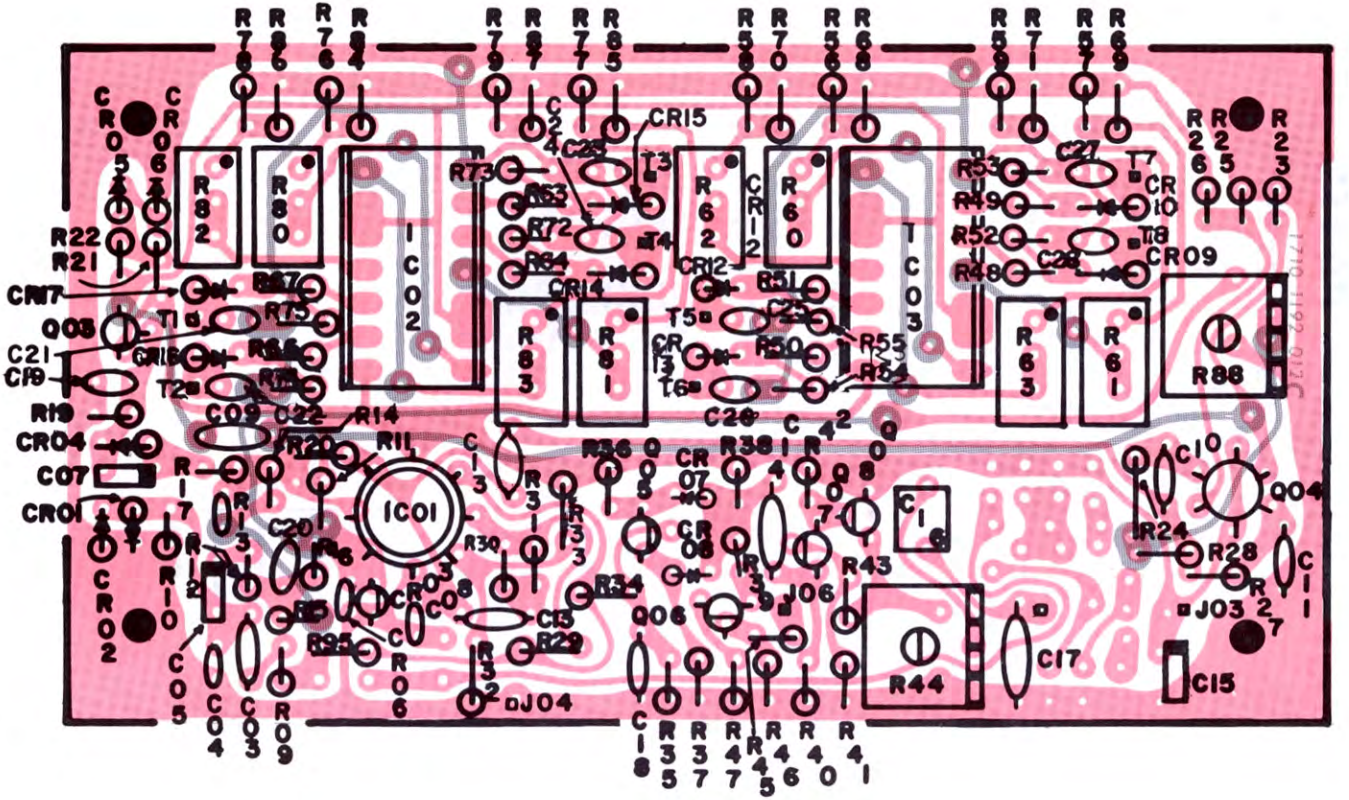
| Item | Description | Part No |
|---|---|---|
| | F 4 CHANNEL TONE DECODER<br>1939-1180-101<br>(REPLACEABLE PARTS) | |
| C01 | Capacitor .47 MFD Stab. | 1526-4706-002 |
| C02 | Capacitor, .22 MFD 50V Stab. | 1526-2206-001 |
| C03 | Capacitor, .68 MFD Stable | 1526-6806-001 |
| C04 | Capacitor, 4.7 MFD, 20V Tant | 1532-4704-001 |
| C05 | Capacitor, 6.8 MFD 15V NP | 1536-6807-015 |
| C06 | Capacitor, .47 MFD | 1526-4706-001 |
| C07 | Capacitor, 33 MFD Tant | 1532-3308-010 |
| C08 | Capacitor, 22 MFD Polycarbonate | 1537-2206-002 |
| C09 | Capacitor, 2.2 MFD 25V Tant | 1532-2207-026 |
| C10 | Capacitor, 6.8 MFD, 35V Tant | 1532-6807-035 |
| C11 | Capacitor, 68 MFD 15V | 1532-6808-015 |
| C12 | Capacitor, .1 Disc. Cer | 1505-1006-005 |
| C13 | Capacitor, .068 MFD 100V Stable | 1526-6805-001 |
| L01 | Choke, 1 HY | 1815-0000-001 |
| Q01 | Transistor, MPS6514 | 4811-0000-012 |
| Q02 | Transistor, 2N5225 | 4811-0000-027 |
| Q03 | | |
| Q04 | Transistor, 2N5226 | 4811-0000-028 |
| R01 | Resistor, 15 ohm, 10%, ¼W. | 4704-1502-001 |
| R02 | Resistor, 39K, 10%, ¼W. | 4704-3905-001 |
| R03 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R04 | 5K Trim Pot | 4735-5004-002 |
| R06 | 10K Pot, (25 Turn) | 4735-1005-003 |
| R07 | Resistor, 35.7K, 1%, ¼W. | 4706-3575-001 |
| R09 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R10 | 10K Pot, (25 Turn) | 4735-1005-003 |
| R11 | Resistor, 26.1K, 1%, ¼W. | 4706-2615-001 |
| R13 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R14 | 10K Pot, (25 Turn) | 4735-1005-003 |
| R15 | Resistor, 22.1K, 1%, ¼W. | 4706-2215-001 |
| R17 | Resistor, 10K, 10%, ¼W. | 4701-1005-001 |
| R18 | 10K Pot, (25 Turn) | 4735-1005-003 |
| R19 | Resistor, 18.7K, 1%, | 4706-1875-001 |
| R21 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R22 | Resistor, 150 ohm, 10%, ¼W. | 4704-1503-001 |
| R23 | Resistor, 3.3K, 10%, ¼W. | 4704-3304-001 |
| R24 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R25 | | |
| R26 | Resistor, 3.3, 10%, ¼W. | 4704-3304-001 |
| R27 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R28 | Resistor, 150 ohm, 10%, ¼W. | 4704-1503-001 |
| R29 | Resistor, 10K, 10%, ¼W. | 4704-1005-001 |
| R30 | Resistor, 39K 10%, ¼W. | 4704-3905-001 |
| R31 | Resistor, 150, 10%, ¼W. | 4704-1503-001 |
| R32 | Resistor, 100K, 10%, ¼W. | 4704-1006-001 |
| R33 | Resistor, 4.7, 10%, ¼W. | 4704-4704-001 |
| R34 | Resistor, 220 ohm, 10%, ¼W. | 4704-2203-001 |
| CR01 | Diode 1N4148 | 4803-0000-004 |
| CR02 | IC LM567 | 4850-0000-014 |
| IC01 | IC CD4066AE | 4850-0000-015 |
| IC02 | IC LM567 | 4850-0000-014 |
| TP01 | Test Point, White | 2150-0000-007 |
| | Diode, 1N751 | 4830-5001-001 |

# PARTS LIST

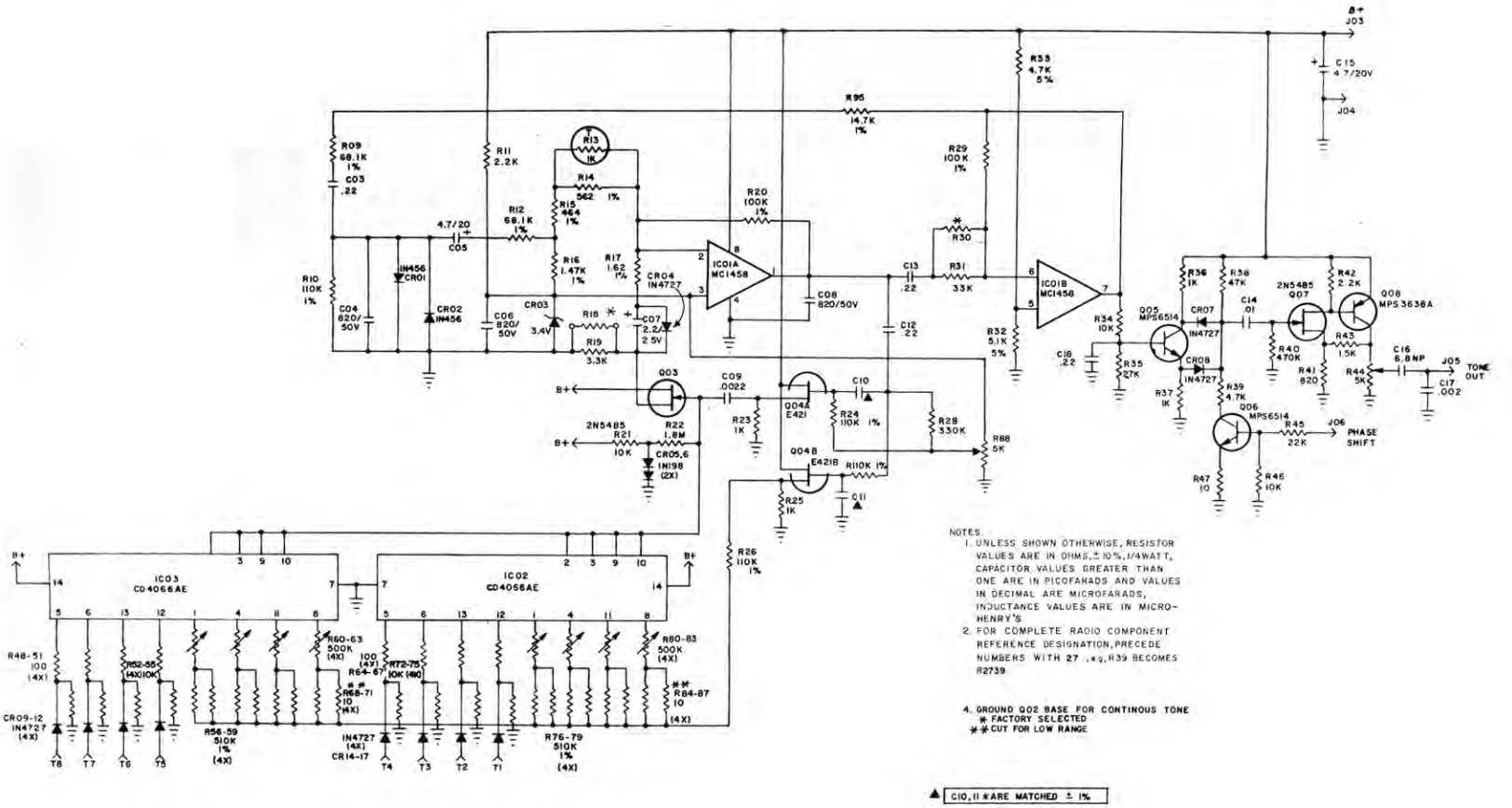
| Item | Description | Part No |
|---|---|---|
| | C 8 TONE ENCODER 1192 A<br>1939-1192-102<br>(REPLACEABLE PARTS) | |
| C03 | Capacitor, .22mf 50V Stable | 1526-2206-001 |
| C04 | Capacitor, 820pf Stable | 1526-8203-001 |
| C05 | Capacitor, 4.7/20 Tant | 1532-4707-001 |
| C06 | Capacitor, 820pf Stable | 1526-8203-001 |
| C07 | Capacitor, 2.2/25 Tant | 1532-2207-026 |
| C08 | Capacitor, 820pf Stable | 1526-8203-001 |
| C09 | Capacitor, .0022 Ultra Stable | 1526-2204-002 |
| C10 | Capacitor, .0022 Matched Pair | 1550-0000-001 |
| C11 | | |
| C12 | Capacitor, .22mf 50V Stable | 1526-2206-001 |
| C13 | | |
| C14 | Capacitor, .01uf 16V | 1502-1005-004 |
| C16 | Capacitor, 6.8 Tant. Non Polar | 1536-6807-015 |
| C17 | Capacitor, .002 Disc. Cer. | 1506-2004-001 |
| C18 | Capacitor, .22mf. 50V Stable | 1526-2206-001 |
| Q03 | Field Effect Trans. 2N5485 | 4812-0000-004 |
| Q04 | Dual Fet. E421 | 4812-0000-007 |
| Q05 | Transistor, MPS 6514 | 4811-0000-012 |
| Q06 | | |
| Q07 | Field Effect Trans. 2N5485 | 4812-0000-004 |
| Q08 | Transistor, MPS 3638A | 4810-0000-018 |
| R09 | Resistor, 68.1K, 1%, 1/8W | 4706-6815-005 |
| R10 | Resistor, 110K, 1%, 1/8W | 4706-1106-003 |
| R11 | Resistor, 2.2K, 10%, ¼W | 4704-2204-001 |
| R12 | Resistor, 68.1K, 1%, 1/8W | 4706-6815-005 |
| R13 | Thermistor, 1K | 4750-1004-001 |
| R14 | Resistor, 562 ohm, 1%,1/8W | 4706-5623-005 |
| R15 | Resistor, 464 ohm, 1%, 1/8W | 4706-4643-005 |
| R16 | Resistor, 1.47K, 1%, 1/8W | 4706-1464-005 |
| R17 | Resistor, 1.62K, 1%, 1/8W | 4706-1624-005 |
| R18 | Factory Selected (Specify Valve) | 4704-XXXX-001 |
| R19 | Resistor, 3.3K, 10%, 1/4W | 4704-3304-001 |
| R20 | Resistor, 100K, 1%, 1/8W | 4706-1006-005 |
| R22 | Resistor, 1.8 MEG, 10%, ¼W | 4704-1807-001 |
| R23 | Resistor, 1K, 10%, ¼W | 4704-1004-001 |
| R24 | Resistor, 1MEG, 25%, 1/8W | 4706-1007-002 |
| R25 | Resistor, 1K, 10%, ¼W | 4704-1004-001 |
| R26 | Resistor, 110K, 1%, 1/8W | 4706-1106-003 |
| R27 | Resistor, 1MEG, 25%, 1/8W | 4706-1007-002 |
| R28 | Resistor, 330K, 10%, ¼W | 4704-3306-001 |
| R29 | Resistor, 100K, 1%, 1/8W | 4706-1006-005 |
| R30 | Factory Selected (Specify Valve) | 4704-XXXX-001 |
| R31 | Resistor, 33K, 10%, ¼W | 4704-3305-001 |
| R32 | Resistor, 5.1K, 5%, ¼W | 4704-5104-001 |
| R33 | Resistor, 4.7K, 5%, ¼W | 4704-4704-002 |
| R34 | Resistor, 10K, 10%, ¼W | 4704-1005-001 |
| R35 | Resistor, 27K, 10%, ¼W | 4704-2705-001 |
| R36 | Resistor, 1K, 10%, ¼W | 4704-1004-001 |
| R37 | | |
| R38 | Resistor, 47K, 10%, ¼W | 4704-4705-001 |
| R39 | Resistor, 4.7, 10%, ¼W | 4704-4704-001 |
| R40 | Resistor, 470, 10%, ¼W | 4704-4706-001 |
| R41 | Resistor, 820 ohm, 10%, ¼W | 4704-8203-001 |
| R42 | Resistor, 2.2K, 10%, ¼W | 4704-2204-001 |
| R43 | Resistor, 1.5K, 10%, ¼W | 4704-1504-001 |
| R44 | Pot, 5K | 4735-5004-003 |
| R45 | Resistor, 22K, 10%, ¼W | 4704-2205-001 |
| R46 | Resistor, 10K, 10%, ¼W | 4704-1005-001 |
| R47 | Resistor, 10 ohm, 10%, ¼W | 4704-1002-001 |
| R48 thru R51 | Resistor, 100 ohm, 10%, ¼W | 4704-1003-001 |
| R52 thru R55 | Resistor, 10K, 10%, ¼W | 4704-1005-001 |
| R56 thru R59 | Resistor, 510K, 1%, 1/8W | 4706-5106-005 |
| R60 thru R63 | 500 Pot | 4735-5006-003 |
| R64 | Resistor, 100 ohm, 10%, ¼W | 4704-1003-001 |
| R65 thru R67 | Resistor, 100 ohm, 10%, ¼W | 4704-1003-001 |
| R68 thru R71 | Resistor, 10 ohm, 10%, ¼W | 4704-1002-001 |

# PARTS LIST

| Item | Description | Part No |
|---|---|---|
| R72 thru R74 | Resistor, 10K, 10%, ¼W | 4704-1005-001 |
| R76 thru R79 | Resistor, 510K, 1%, 1/8W | 4706-5106-005 |
| R80 thru R83 | 500K Pot | 4735-5006-003 |
| R84 thru R87 | Resistor, 10 ohm, 10T, ¼W | 4704-1002-001 |
| R88 | Pot, 5K | 4735-5004-003 |
| R95 | Resistor, 14.7K, 1%, 1/8W | 4706-1475-005 |
| T1 thru T8 | Male Amp Pins | 2150-0000-010 |
| CR01 CR02 | Diode, 1N456 | 4803-0000-025 |
| CR03 | Zener Diode, 3.4V | 4830-1169-013 |
| CR04 | Diode 1N4727 | 4803-0000-004 |
| CR05 CR06 | Diode 1N198 | 4804-0000-004 |
| CR07 CR08 thru CR12 | 1N4727 | 4803-0000-004 |
| CR14 thru CR17 | Diode, 1N4727 | 4803-0000-004 |
| IC01A&B | I.C. 1458 | 4850-0000-011 |
| IC02 | I.C. 4066 | 4850-0000-015 |
| IC03 | I.C. 4066 | 4850-0000-015 |




1192A 8 TONE BURST ENCODER MODULE PARTS LOCATION

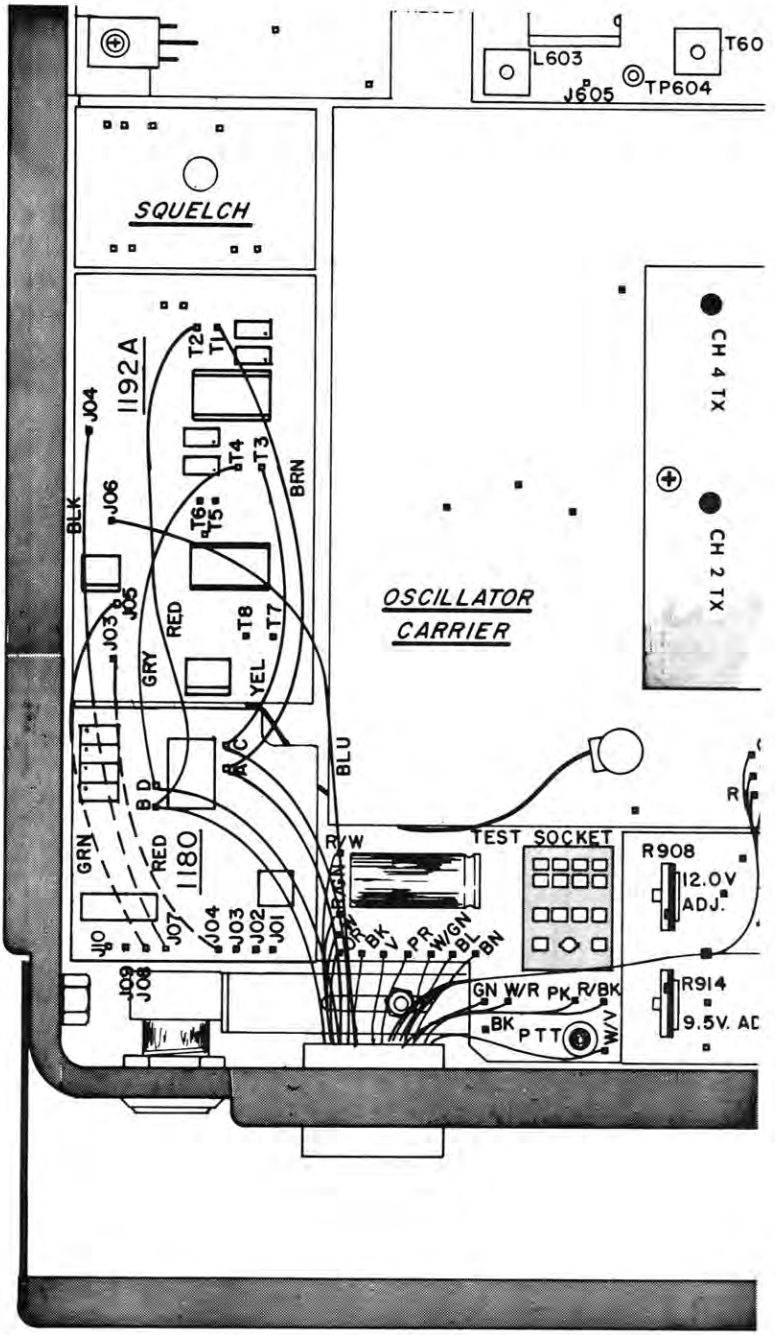



NOTES
1. UNLESS SHOWN OTHERWISE, RESISTOR VALUES ARE IN OHMS, ± 10%, 1/4WATT, CAPACITOR VALUES GREATER THAN ONE ARE IN PICOFARADS AND VALUES IN DECIMAL ARE MICROFARADS, INDUCTANCE VALUES ARE IN MICRO-HENRY'S
2. FOR COMPLETE RADIO COMPONENT REFERENCE DESIGNATION, PRECEDE NUMBERS WITH 27 , e.g. R39 BECOMES R2739

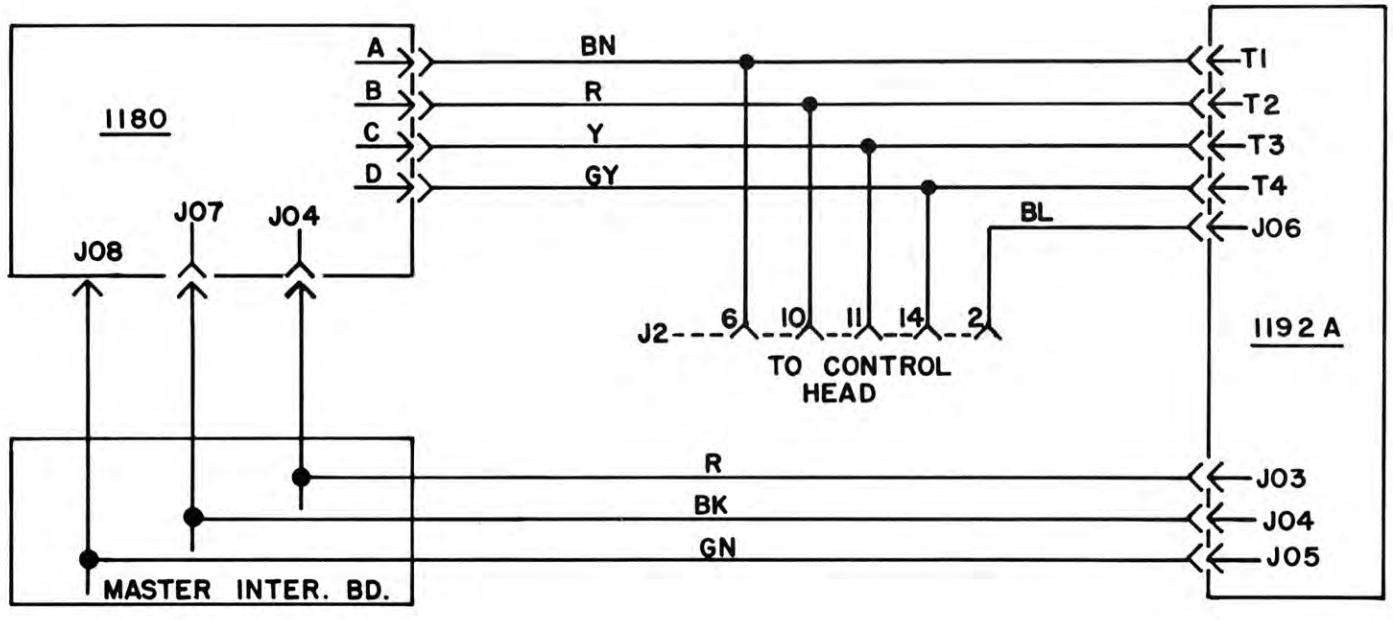
4. GROUND Q02 BASE FOR CONTINOUS TONE
* FACTORY SELECTED
** CUT FOR LOW RANGE

▲ C10, 11 *ARE MATCHED ± 1%

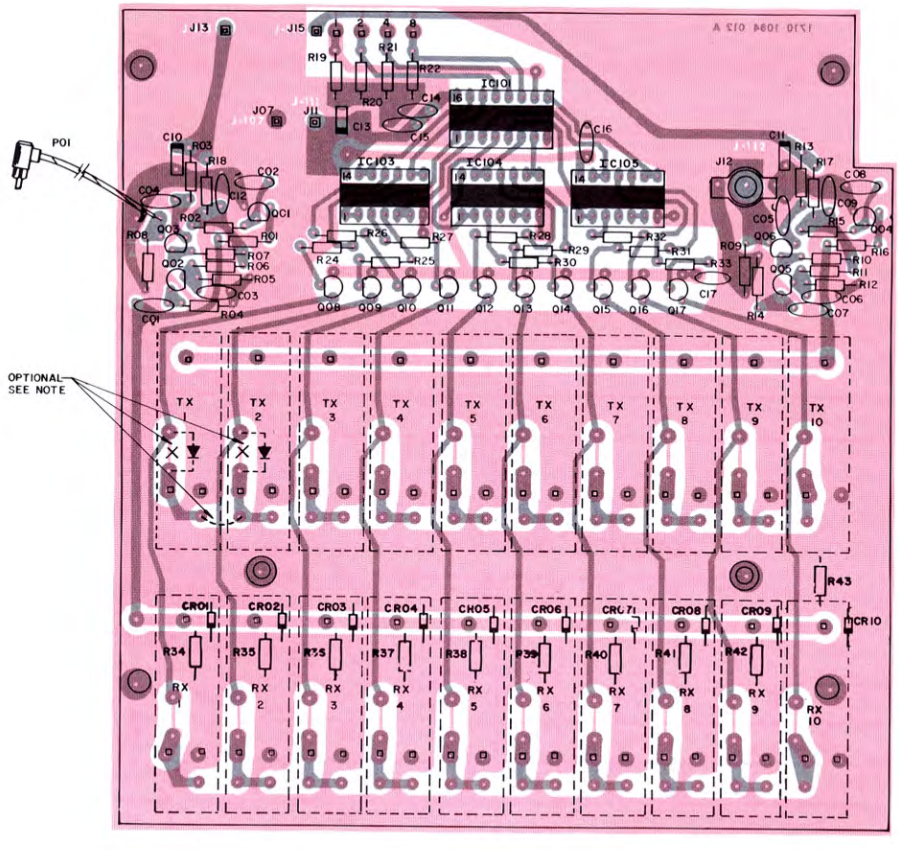
1192A SUBAUDIBLE SCHEMATIC



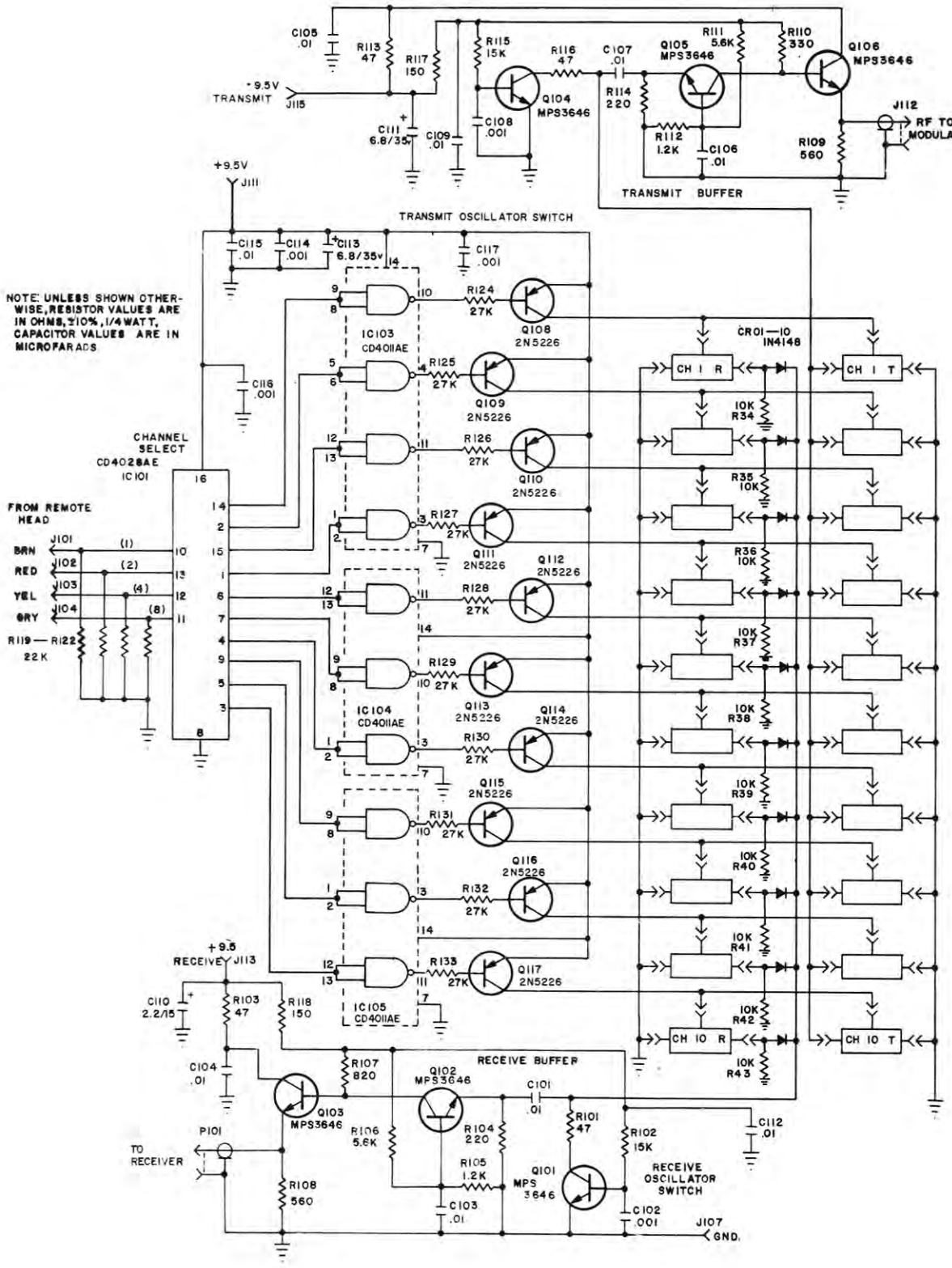

INSTALLATION DIAGRAM




INTERCONNECT SCHEMATIC FOR 1192A AND 1180 BOARDS




10 CHANNEL OSCILLATOR CARRIER MODULE PARTS LOCATION



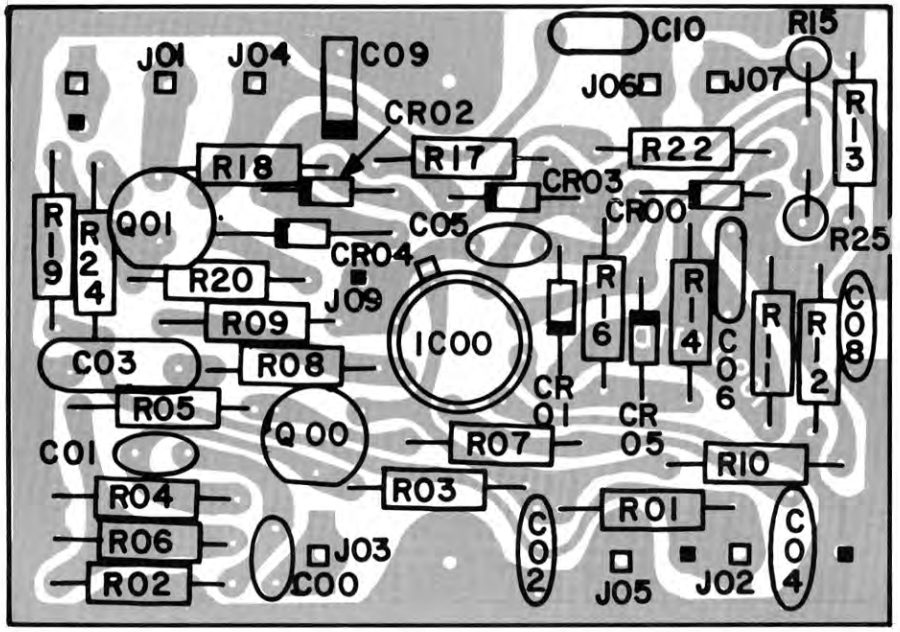

10 CHANNEL OSCILLATOR CARRIER SCHEMATIC

# PARTS LIST

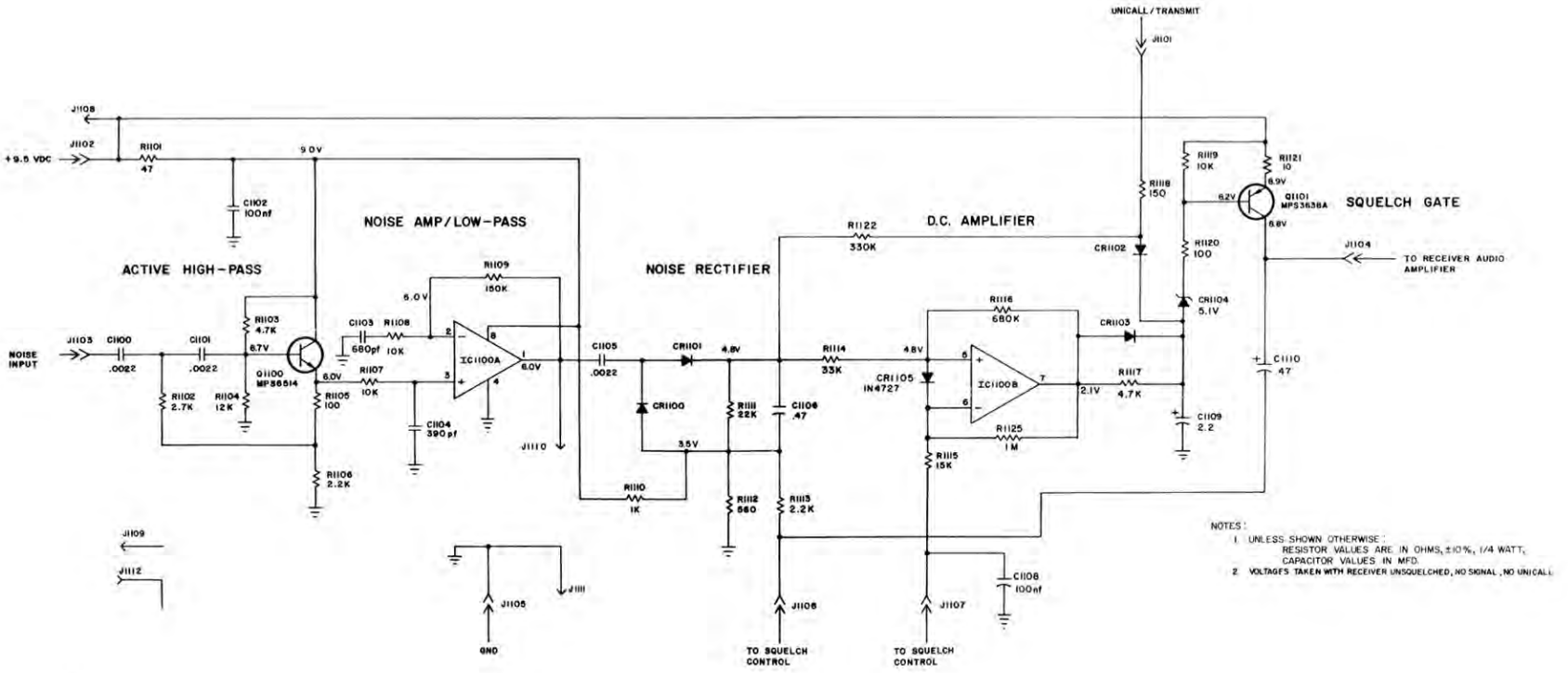
| Item | Description | Part No |
|---|---|---|
| | C OSCILLATOR CARRIER ASSEMBLY 10 CHANNEL<br>To order complete board, use part number<br>1939-1084-102 | |
| C101 | Capacitor, Disc. Cer. .01uf 12V | 1502-1005-004 |
| C102 | Capacitor, Disc. Cer. .001uf | 1506-1004-001 |
| C103 thru C107 | Capacitor, Disc. Cer. .01uf 12V | 1502-1005-004 |
| C108 | Capacitor, Disc. Cer. .001uf | 1506-1004-001 |
| C109 | Capacitor, Disc. Cer. .01uf 12V | 1502-1005-004 |
| C110 | Capacitor, tant. 2.2uf 25V | 1532-2207-026 |
| C111 | Capacitor, tant. 6.8uf 35V | 1532-6807-035 |
| C112 | Capacitor, Disc. Cer. .01uf 12V | 1502-1005-004 |
| C113 | Capacitor, tant. 6.8uf 35V | 1532-6807-035 |
| C114 | Capacitor, Disc. Cer. .001uf | 1506-1004-001 |
| C115 | Capacitor, Disc. Cer. .01uf 12V | 1502-1005-004 |
| C116 | Capacitor, Disc. Cer. .001uf | 1506-1004-001 |
| C117 | | |
| Q101 thru Q106 | Transistor, NPN 2N3646 HFE 60-120 | 4811-0000-041 |
| Q108 thru Q116 | Transistor, PNP, 2N5226 or Equiv. | 4811-0000-028 |
| R101 | Resistor, 47 ohm | 4704-4702-001 |
| R102 | Resistor, 15K | 4704-1505-001 |
| R103 | Resistor, 47 ohm | 4704-4702-001 |
| R104 | Resistor, 220 ohm | 4704-2203-001 |
| R105 | Resistor, 1.2K | 4704-1204-001 |
| R106 | Resistor, 5.6K | 4704-5604-001 |
| R107 | Resistor, 820 ohm | 4704-8203-001 |
| R108 | Resistor, 560 ohm | 4704-5603-001 |
| R109 | | |
| R110 | Resistor, 680 ohm | 4704-6803-001 |
| R111 | Resistor, 5.6K | 4704-5604-001 |
| R112 | Resistor, 1.2K | 4704-1204-001 |
| R113 | Resistor, 47 ohm | 4704-4702-001 |
| R114 | Resistor, 220 ohm | 4704-2203-001 |
| R115 | Resistor, 15K | 4704-1505-001 |
| R116 | Resistor, 47 ohm | 4704-4702-001 |
| R117 | Resistor, 150 ohm | 4704-1503-001 |
| R118 | | |
| R119 thru R122 | Resistor, 22K | 4704-2205-001 |
| R124 thru R133 | Resistor, 27K | 4704-2705-001 |
| R134 thru R143 | Resistor, 10K | 4704-1005-001 |
| CR101 thru CR110 | Diode, 1N4149 | 4803-0000-027 |
| IC101 | CD4028 AE, Decoder, I.C. | 4851-4028-001 |
| IC103 thru IC105 | CD4011 AE, I.C. | 4851-4011-001 |

# PARTS LIST

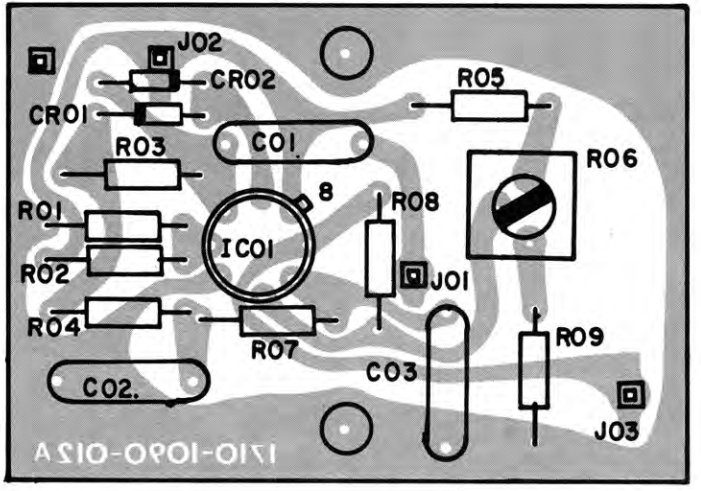
| Item | Description | Part No |
|---|---|---|
| | L SQUELCH BOARD<br>1939-1090-102<br>(REPLACABLE PARTS) | |
| C1100 | Capacitor, Disc. cer. .002uf | 1526-2204-001 |
| C1101 | | |
| C1102 | Capacitor, Disc. cer. 100nf 12V | 1505-1006-005 |
| C1103 | Capacitor, S.M. 680pf | 1513-6803-001 |
| C1104 | Capacitor, Disc. Cer. 390pf | 1502-3903-001 |
| C1105 | Capacitor, Disc. cer. .002uf | 1526-2204-001 |
| C1106 | Capacitor, .47mf .50V Stable | 1526-4706-002 |
| C1108 | Capacitor, Disc. cer. 100nf, 12V | 1505-1006-005 |
| C1109 | Capacitor, tant. 2.2uf 25V | 1532-2207-026 |
| C1110 | Capacitor, .47mf 50V | 1526-4706-001 |
| Q1101 | Transistor, MPS3638A | 4810-0000-018 |
| Q1107 | Transistor, MPS6514 | 4811-0000-012 |
| R1101 | Resistor, 47 ohm | 4704-4702-001 |
| R1102 | Resistor, 2.7K | 4704-2704-001 |
| R1103 | Resistor, 4.7K | 4704-4704-001 |
| R1104 | Resistor, 12K | 4704-1205-001 |
| R1105 | Resistor, 100 ohm | 4704-1003-001 |
| R1106 | Resistor, 2.2K | 4704-2204-001 |
| R1107 | Resistor, 10K | 4704-1005-001 |
| R1108 | | |
| R1109 | Resistor, 150K | 4704-1506-001 |
| R1110 | Resistor, 1K | 4704-1004-001 |
| R1112 | Resistor, 560 ohm | 4704-5603-001 |
| R1113 | Resistor, 2.2K | 4704-2204-001 |
| R1114 | Resistor, 33K | 4704-3305-001 |
| R1115 | Resistor, 15K | 4704-1505-001 |
| R1116 | Resistor, 680K | 4704-6806-001 |
| R1117 | Resistor, 4.7K | 4704-4704-001 |
| R1118 | Resistor, 150 ohm | 4704-1503-001 |
| R1119 | Resistor, 10K | 4704-1005-001 |
| R1120 | Resistor, 100 ohm | 4704-1003-001 |
| R1121 | Resistor, 10 ohm | 4704-1002-001 |
| R1122 | Resistor, 330K | 4704-3306-001 |
| R1125 | Resistor, 1 Meg. | 4704-1007-001 |
| CR1100 thru CR1103 | Diode, 1N4727 or equiv. | 4803-0000-004 |
| CR1104 | Diode, 5.1V Zener | 4830-5001-001 |
| CR1105 | Diode, 1N4727 or equiv. | 4803-0000-004 |
| IC1100 | I.C. MC1458 | 4850-0000-011 |



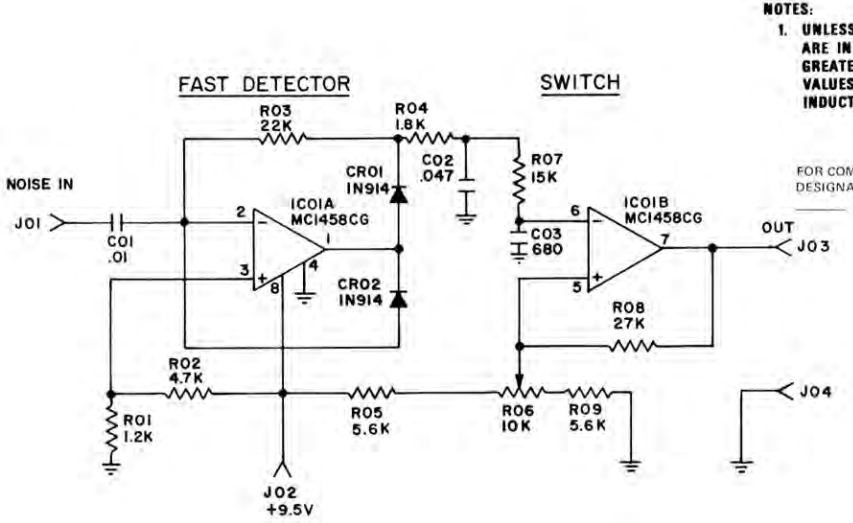

1090 SQUELCH MODULE PARTS LOCATION




1090 SQUELCH SCHEMATIC




1090 FAST NOISE SQUELCH MODULE PARTS LOCATION




**NOTES:**

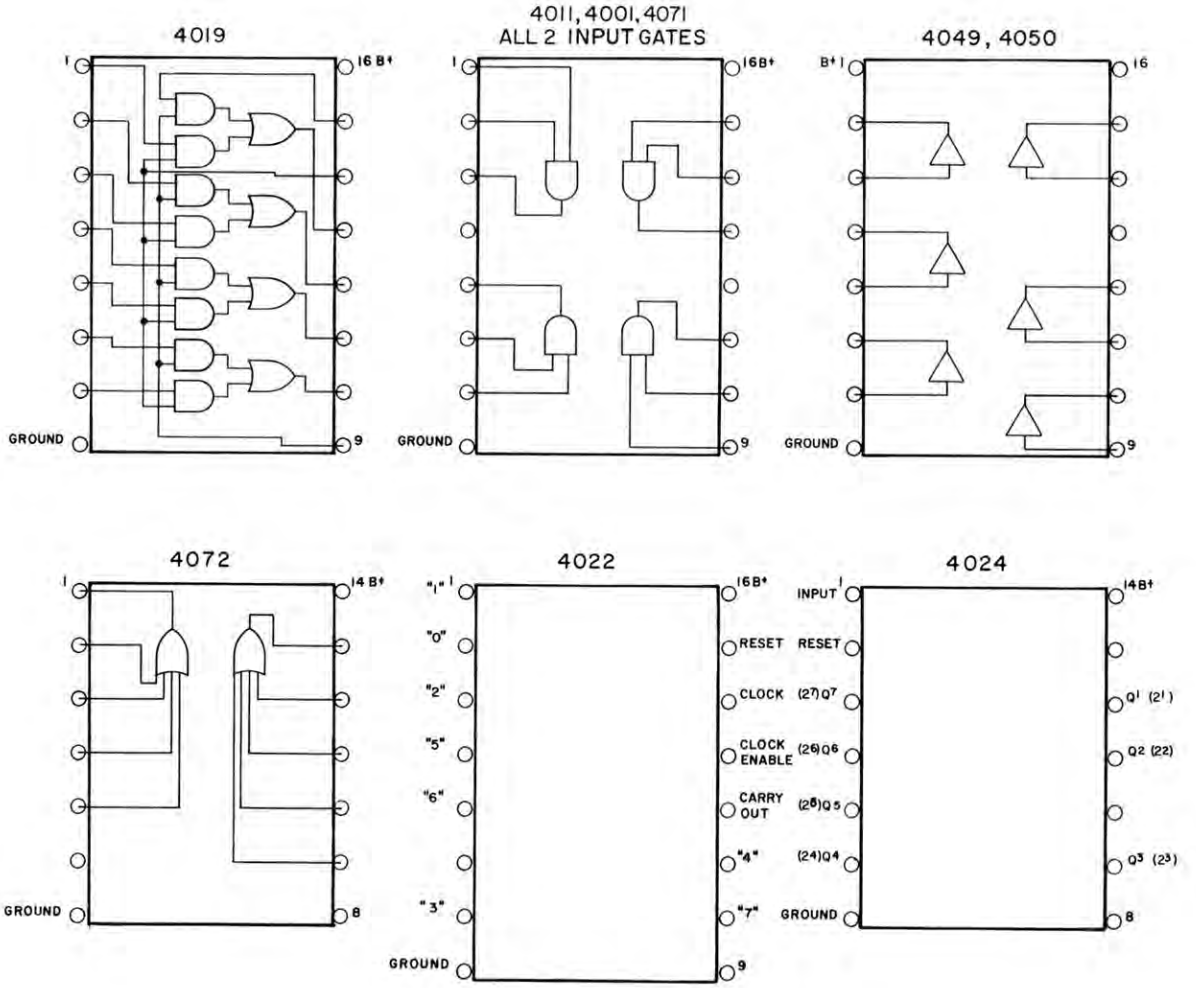
1. **UNLESS SHOWN OTHERWISE, RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 WATT, CAPACITOR VALUES GREATER THAN ONE ARE IN PICOFARADS AND VALUES IN DECIMAL ARE MICROFARADS, INDUCTANCE VALUES ARE IN MICROHENRY'S.**

FOR COMPLETE RADIO COMPONENT REFERENCE DESIGNATION, PRECEDE NUMBERS WITH _____, e.g. R39 BECOMES R1139

1090 FAST NOISE SQUELCH SCHEMATIC

# PARTS LIST

| Item | Description | Part No |
|---|---|---|
| | E FAST DETECTOR<br>1939-1090-101<br>(REPLACEABLE PARTS) | |
| C1101 | Capacitor, Foil, .01uf, ± 10% | 1529-1005-003 |
| C1102 | Capacitor, Foil, .047uf ± 10% | 1529-4705-001 |
| C1103 | Capacitor, 680 S.M. | 1513-6803-001 |
| R1101 | Resistor, 1.2 K | 4704-1204-001 |
| R1102 | Resistor, 4.7K | 4704-4704-001 |
| R1103 | Resistor, 22K | 4704-2205-001 |
| R1104 | Resistor, 1.8K | 4704-1804-001 |
| R1105 | Resistor, 5.6K | 4704-5604-001 |
| R1106 | Potentiometer, 10K, P.C. MT. | 4735-1005-002 |
| R1107 | Resistor, 15K | 4704-1505-001 |
| R1108 | Resistor, 27K | 4704-2705-001 |
| R1109 | Resistor, 5.6K | 4704-5604-001 |
| CR1101<br>CR1102 | Diode, Silicon, 1N4148 | 4803-0000-004 |
| IC1101 | Dual OP. Amp. MC1458CG | 4850-0000-011 |


4019
1
16 B+
GROUND
9
4011, 4001, 4071
ALL 2 INPUT GATES
1
16 B+
GROUND
9
4049, 4050
B+ 1
16
GROUND
9
4072
1
14 B+
GROUND
8
4022
"1" 1
16 B+
"0"
RESET
"2"
CLOCK
"5"
CLOCK ENABLE
"6"
CARRY OUT
"4"
"3"
"7"
GROUND
9
4024
INPUT 1
14 B+
RESET
(27) Q7
Q1 (21)
(26) Q6
Q2 (22)
(25) Q5
(24) Q4
Q3 (23)
GROUND
8

IC DIAGRAM

# PARTS LIST

| Item | Description | Part No |
|---|---|---|
| | A MASTER, C-111 SCAN HEAD<br>1939-1249-101<br>(REPLACEABLE PARTS) | |
| F2301 | Fuse, 3A AGC-3 | 5150-3004-004 |
| S2301 | Volume Control & Switch | 4742-2502-002 |
| S2302 | 2 Pole 6-Position Rotary Switch | 5110-0000-017 |
| S2304 | | |
| R2301 | Volume Control & Switch | 4742-2502-002 |
| R2304A | Squelch/Dimmer Pot. | 4731-1005-001 |
| R2304B | | |
| | Top Cover | 1403-1249-015 |
| | Bottom Cover | 1403-1249-016 |
| | Front Dress Panel | 1404-1249-014 |
| | Mounting bracket | 1939-1240-104 |
| | Scan Board | 1939-1249-102 |
| | Selector Switch Board | 1939-1249-103 |
| | Weldment Ass'y | 1939-1249-105 |
| | 4 x 40 Hex Nuts | 2831-0408-601 |
| | No. 6 Flat Washer | 2881-0613-001 |
| | No. 4 Internal Tooth Lockwasher | 2882-0408-201 |
| | Grommet | 2807-0000-013 |
| | Screw ¼-20 x ¾ Allen Screw | 2851-2524-933 |
| | Knob (pointer) | 2409-0000-040 |
| | Knob (round) | 2409-0000-041 |
| | Hole Button | 2808-0000-010 |
| | Screw, No. 6-32 x ¼ | 2851-0608-512 |
| | Washer Flat | 2881-0000-005 |
| | Red Lens | 3950-0000-026 |
| | Wiring Harness Ass'y | 6057-1249-019 |
| | Cable Ignition w/fuse Holder | 5160-0000-005 |
| | Allen Wrench 3/16" | 5404-0000-002 |