WAØUZI

UNICALL

INSTRUCTION MANUAL

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4201-1194-001

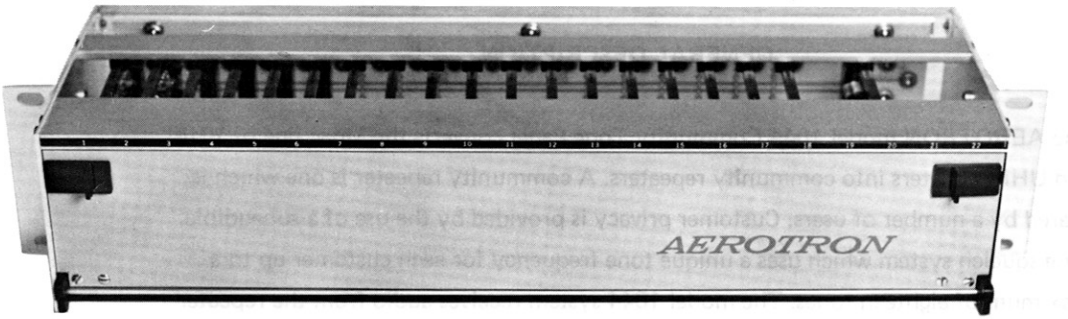
TABLE OF CONTENTS

GENERAL DESCRIPTION

The AEROTRON model 1044 Community Tone Panel converts the Mpac line of VHF and UHF repeaters into community repeaters. A community repeater is one which is shared by a number of users. Customer privacy is provided by the use of a subaudible tone squelch system which uses a unique tone frequency for each customer up to a maximum of eighteen tones. The model 1044 system receives audio from the repeater receiver and separates the band of frequencies used by the tone squelch (300 Hz and below). This processed audio is then distributed to the various tone decoders. Each tone decoder contains one receive filter and one transmit (encode) filter which may or may not be set to the same frequency. When a valid tone appears at the output of the receiver, the appropriate tone decoder enables the receive audio and the repeater function by removing the mute voltage from the terminals on the rear of the receiver. If and only if the repeater transmitter was off at the instant that the correct tone was received, the corresponding transmit tone will be enabled and applied to the tone terminal on the repeater transmitter. Otherwise, any transmit tone enabled remains on regardless of the received tone. The purpose of this operation ("Solo Call") is to prevent capture of the repeater by a stronger transmitter which does not happen to belong to the current customer. The AEROTRON Community repeater system serves customers on a first come first served basis regardless of signal strength. It is necessary to allow the repeater carrier to drop before aquisition by the next customer.

The 1044 is mounted in a 3½" high standard 19" wide rack panel with a drop down front panel. Positions one through eighteen inclusive are for tone decoder/gated encoder plug in printed circuit boards. Position nineteen is empty and position twenty is reserved for the tone interface board. The two additional blank locations are for the interconnection plug.

1044 TONE PANEL



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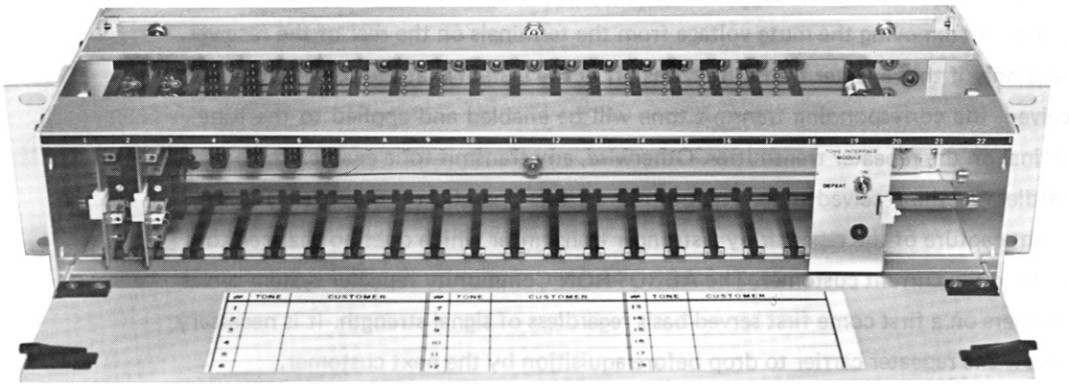

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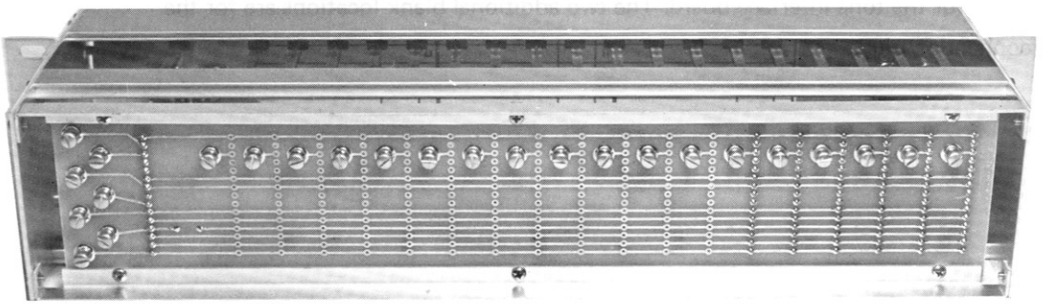


REAR VIEW

CIRCUIT DESCRIPTION

The tone decoder/gated encoder board consists of a receive filter (hybrid module) AF1, two detectors and a latch, and a transmit filter (hybrid module) AF2. Processed audio of .6 volts peak to peak amplitude is applied to pin 15 and through C1 to AF1. The frequency of AF1 is adjustable by R1 which is a ten turn potentiometer mounted over the card puller handle and accessible from the front when the card is installed. Wire jumpers W1 and W2 may be clipped to set the adjustment range to that shown in table one. The red and white jacks J2 and J3 monitor the output of the filter for adjustment purposes. Both detectors, Q1 and Q3 are similar in operation. When the output of the filter exceeds the base-emitter turn on voltage, Q1 conducts and charges C3. The charging rate is determined primarily by R6. When sufficient voltage is reached, Q2 and Q5, a Darlington pair, turn on. Pin Five is returned to the chassis ground on the tone interface card. This action grounds pin 6. A decode by any of the cards at any time will ground pin 6 which will cause the receiver to unmute. Q3 is also a detector but its action is gated by the voltage appearing on pin 4. If pin 4 had voltage applied before the tone appeared at the output of AF1, then D5 would be on and the base of Q3 would have enough voltage on it to prevent conduction. Pin 4 is normally connected to the transmit 12.5 volt supply through a resistor. If there were no voltage present at pin 4 at the instant that a tone appeared at the output of AF1, then Q3 would conduct and charge C4. This voltage is applied to the base of Q4. However, Q4 will not conduct until pin 3 is grounded which occurs when a transistor turns on in the tone interface card. This transistor is in turn controlled by the transmit 12.5 volt supply. If no other tone decoder cards are on and the transmitter is off, the sequence will be:

1) Tone appears at the output of AF1
2) Q1 and Q3 conduct and charge C3 and C4
3) Q2 and Q5 conduct and enable the receiver
4) The carrier operated relay turns the transmitter on
5) Pin 3 is grounded (pin 4 is delayed because of R10 and C2)
6) Q3 and Q4 latch on

When Q4 turns on, current is supplied to the base of Q3 through R15 and D1. This holds Q3 on which supplies current to the base of Q4 through R14 and D6. Thus Q3 and Q4 are latched on until the current path through pin three is interrupted when the transmitter turns off. Q4 also supplies current to D4, an LED which is used to indicate

which encoder is in use, and the operational amplifier IC1. When this amplifier turns on, a positive feedback path around AF2 is completed which starts this filter into oscillation. The frequency may be adjusted with R20 which is a ten turn potentiometer located below the card puller handle. The white test point monitors this tone output voltage. W3 and W4 may be clipped to set the range for R20 as in the table below. D2 and D3 are used to stabilize the output at a constant level.

The tone interface board consists of an active lowpass filter (IC1), a Schmidt trigger and buffer amplifiers, a latch enable switch (Q7), an output buffer amplifier (IC2B) and a voltage splitter which is required to supply the positive and negative supply needed for the operational amplifiers from the single supply voltage available from the receiver.

The active filter is a five pole Chebyshev with a cutoff frequency of three hundred hertz. This prevents interference by the voice modulation frequencies. R10, CR1 and CR2 form a limiter so that the filters always have a constant amplitude signal presented to them regardless of tone deviation in the transmitter. One consequence of the limiter is that one and only one tone may be present in the pass band at a time for the decoders to work properly.

When pin 6 is grounded by the decoder cards or the front panel switch, S1, the Schmidt trigger formed by Q1 and Q2 operates so that Q2 conducts and the voltage goes low on the collector of this transistor. This turns off Q3 and Q4 allows the receiver to be unmuted by the noise squelch in the normal manner. The purpose of the Schmidt trigger is to speed up the transition from mute to the unmuted condition and vice versa so that subaudible tone type squelch tail elimination systems will operate properly.

Q7 is connected via R27 to the transmit 12.5 volt supply. There is no delay in turn on. The collector of Q7 is connected to all the encode latches.

IC2B is a summing amplifier for the encoded tone outputs to the transmitter. The common negative feedback resistor is R24. The series summing resistors are R23 of the tone encoder boards. Thus the level of each tone may be adjusted independently of all others. A common level (deviation) control is the potentiometer R26.

The voltage splitting circuitry is IC2A, Q5 and Q6 which form a voltage follower for the resistive voltage divider of R28 and R29.

SYSTEM ADJUSTMENT

Equipment required is a tone generator, an oscilloscope or AC voltmeter and a frequency or interval counter capable of operation from 67 to 200 Hz. Alternately the generator may be synthesized (accurate and stable) but the oscilloscope should then be of the dual trace type if a counter is not available. Throw S1 on the tone interface board to the defeat position (up). The LED on this card should now be on. This will allow the repeater to remain in operation during the adjustment for those customers who may defeat their own tone systems. It will also allow you to monitor the frequency. Remove the wire coming from pin 1 of P1 to the receiver discriminator output from the receiver terminal strip (yellow) and connect this to the audio generator. Set the generator output to about 200 mv RMS. An oscilloscope connected to line (pin) 15 should show this tone in limiting at about .6 volts peak to peak. Remove the wire coming from pin 7 of P1 (red/white) to the transmitter low current 12.5 volt supply and connect this to a voltage source of 9 volts or greater which may be keyed on and off. A clip lead to receiver 9.5 or 13.6 volts may be used. Pull the tone decoder/encoder board which is about to be adjusted and clip the jumpers as required.

TABLE ONE

	67-71.9Hz	77-82.5Hz	88.5-110.9Hz	114.8-250.3Hz
Decode	W1 & W2	W2	W1	none
Encode	W3 & W4	W4	W3	none

UNICALL (CTCSS) Tone Frequencies (Hz)

Group A			Group B		
67.0	123.0	186.2	71.9	127.3	192.8
77.0	131.8	203.5†	82.5	136.5	210.7†
88.5	141.3	218.1	94.8	146.2	225.7
100.0	151.5	233.6	103.5	156.7	241.8
107.2	162.2	250.3	110.9	167.9	
114.8	173.8		118.8	179.9	

†Frequencies above 200 Hz should be avoided if possible.

These tone frequencies have been selected by EIA (Electronic Industries Association) to provide a maximum number of subaudible signaling tones while minimizing adjacent tone operation, tone harmonic and intermod response. It is recommended that only tones within group A or group B be used in any one repeater system to avoid falsing. Mixing of tones, while possible, requires upmost care in setting mobile tone deviation levels and all decoder/encoder frequencies.

If at all possible, tones above 203.5Hz should be avoided to avoid an audible buzz in the mobile radio. Due to the large amount of filtering used in the decoder to prevent falsing due to high levels of low frequency voice modulation, operation with tones above 225Hz may be unreliable.

Replace the board in the required socket. Adjust the generator to the proper frequency and connect the oscilloscope or the AC voltmeter to either the red or white test jacks on top of the card. Now adjust R1, then turn potentiometer at the top of the card for a maximum. A voltmeter connected to line (pin) 6 will show the voltage to go to a low value. Alternately the mute voltage at the receiver terminals should go to a low value if this is the only option connected to the mute terminals on the receiver (1044 community tone panel). Now apply voltage to the red/white wire. The LED on the same card and no other should turn on. A counter may be connected to the white test point (J4) at the bottom of the card and the ten turn potentiometer at the bottom (R20) adjusted to the proper frequency (±.1Hz). If this is the same as the decode frequency, the oscilloscope (dual trace or horizontal input for Lissajou figures) may be connected to J2 or J3 (vertical or channel one) and J4 (horizontal or channel two). Then the two channels may be compared and adjusted for zero frequency difference.

To set the deviation, adjust (on the first card tested only) R26 on the tone interface card to approximately the center. Then key the transmitter (encode LED on) and adjust R22 on the tone decode card to between ±0.5 KHz and ±0.75 KHz. It may be beneficial to defeat the repeat function on the repeater during this operation to avoid interference. Unkey the transmitter and remove the voltage from the red/white wire. This will allow that tone to unlatch. Then procede to the next card to be adjusted.

Enabling a Single Encode (Transmit) Tone

For test purposes, a single tone may be enabled without using the audio generator procedure given above. Remove all other tone decoder printed circuit boards from the 1044 frame to prevent two CTCSS tones from being latched up at the same time. Attach a clip lead from ground to the junction of D1 and R15. R15 is the 1kohm resistor on the lower edge near the printed circuit fingers and transistor Q4. The junction of the diode and resistor is on the side of R15 closest to the edge or "bottom" of the resistor. No damage will occur regardless of which side the ground wire is attached. Now key the transmitter and the LED should glow showing that the encoder latch is on. If you are to contact a mobile for test purposes, it would be best to defeat the tone decoder with the switch on the tone interface module. After contact is made you may return the switch to its normal position. Full operation may be checked by removing the ground clip lead. Have the mobile call you. If the local microphone PTT is depressed before the repeater drops out, then the proper tone will remain on and the mobile may test decode operation by hanging up their microphone while you remain on the air. Replace all other tone decoder printed circuit boards.

TROUBLESHOOTING

To service the tone interface board, refer to the schematic and the parts assembly drawing. There are five independent circuits on this module. On the rear of the 1044 card frame, beginning from the bottom, the wires and pins are numbered one through fifteen. Attach a VOM negative lead to pin/wire one or the chassis ground. Pin/wire nine should read 9.5 volts. If it does not, adjust the receiver 9.5 volt supply or trace the difficulty back in the harness or plug assemblies. Other voltage readings are below.

PIN	D.C.	A.C.	Comments
2	4.75	1mv max	
3	0	N/A	no tone detected
3	4	N/A	any tone detected AND no transmit function, otherwise zero
4	9.5	N/A	transmit only
5	0	N/A	
6	8.5	N/A	no tone detected
6	less 1	N/A	any tone detected or disable switch up (on)
9	9.5	N/A	
10	4.75	N/A	
15	4.75	300mv RMS	scope shows .6 volt P-P limited tone
14	0	note	receiver audio in/J20 only
13	0	note	tone out as set, tone enabled only/J20 only
7	9.4	N/A	no tone detected, disable off/J20 only
7	0	N/A	tone detected or disable on/J20 only

Any trouble with pin/wire 4, 9 or 14/J20 is in the harness or the repeater itself. Any trouble with pin/wire 6 is located in the tone decoder board and is not field repairable. Before checking any other function, inspect the voltage splitter (floating ground supply) as shown below.

VOLTAGE SPLITTER (pin/wire 10)

The voltage on pin 3 of IC2 should be 4.75 volts ± 5% and the 9.5 volt supply tolerance. The voltage on pin 2 of IC2 should be the same within a few millivolts of that on pin 3. If not, replace IC2. A hot or destroyed Q5 and/or Q6 may mean that C7 or C8 is shorted or that there is a short on one of the tone decoder boards. Remove them all before checking further. Replace both Q5 and Q6.

SUMMING AMPLIFIER

Incorrect voltages on this stage may be caused by trouble in the voltage splitter; see preceding page. A very sensitive oscilloscope on A.C. coupling will show a mv or so of tone P-P on pin 6 of IC2. No audio should appear on pin 5 and the D.C. reading to ground should be 4.75 volts. Pin 7 should be the same as 5 within a few millivolts. The audio on pin 7 should be about 4 volts P-P maximum but depends on the setting of the output control on the tone board. There must be tone at the output of test point J4 (white) on the tone encoder in use for there to be any tone at the output of IC2B. An inability to latch any tone on may be traced to the latch enable below. Otherwise replace IC2. Any further difficulty may be a shorted C6.

LATCH ENABLE (pin/wire 3)

With transmitter on, there should be 9.5 volts on pin 4 of the tone interface card. This voltage is not very critical. To disable the latches on the individual tone cards, the voltage on this pin should fall to less than 0.4 volts. The base of Q7 with the transmitter on should be 0.6 to 1.0 volt. The collector should saturate at less than 0.5 volt. Otherwise replace Q7.

SCHMIDT TRIGGER (pin/wire 7)

Pull all the tone decoder cards. If pin/wire 7 on the rear of the 1044 now switches between ground and 9 volts with the action of the disable switch, the difficulty is in one of the tone cards. With S1 open (down), the base and collector of Q1 should be about 1.5 volts. The collector of Q2 should be about 6 volts. With S1 closed (up), the base of Q1 should be 0 volts. The collector of this transistor should be about 9 volts. The collector of Q2 should now be about 1.5 volts. If these conditions are not met, replace Q1 and Q2. If the above conditions are met and pin/wire 7 does not switch, replace Q3 and Q4.

LOW PASS FILTER (pin/wire 15)

The voltage on pin 3 of IC1 should be 4.75 volts. Any deviation may indicate a shorted C1 or D.C. voltage on pin/wire 14. Pins 1, 2, 6, 5, and 7 of IC1 should all be 4.75 volts. Otherwise replace IC1. A further failure to indicate output signal when the receiver audio to pin/wire 14 is good may show that CR1 or CR2 is shorted. Note that in this case there will still be 4.75 volts D.C. at the output.

1114 DECODER/GATED ENDODER

To order complete assembly, use part number 5225-1114-010

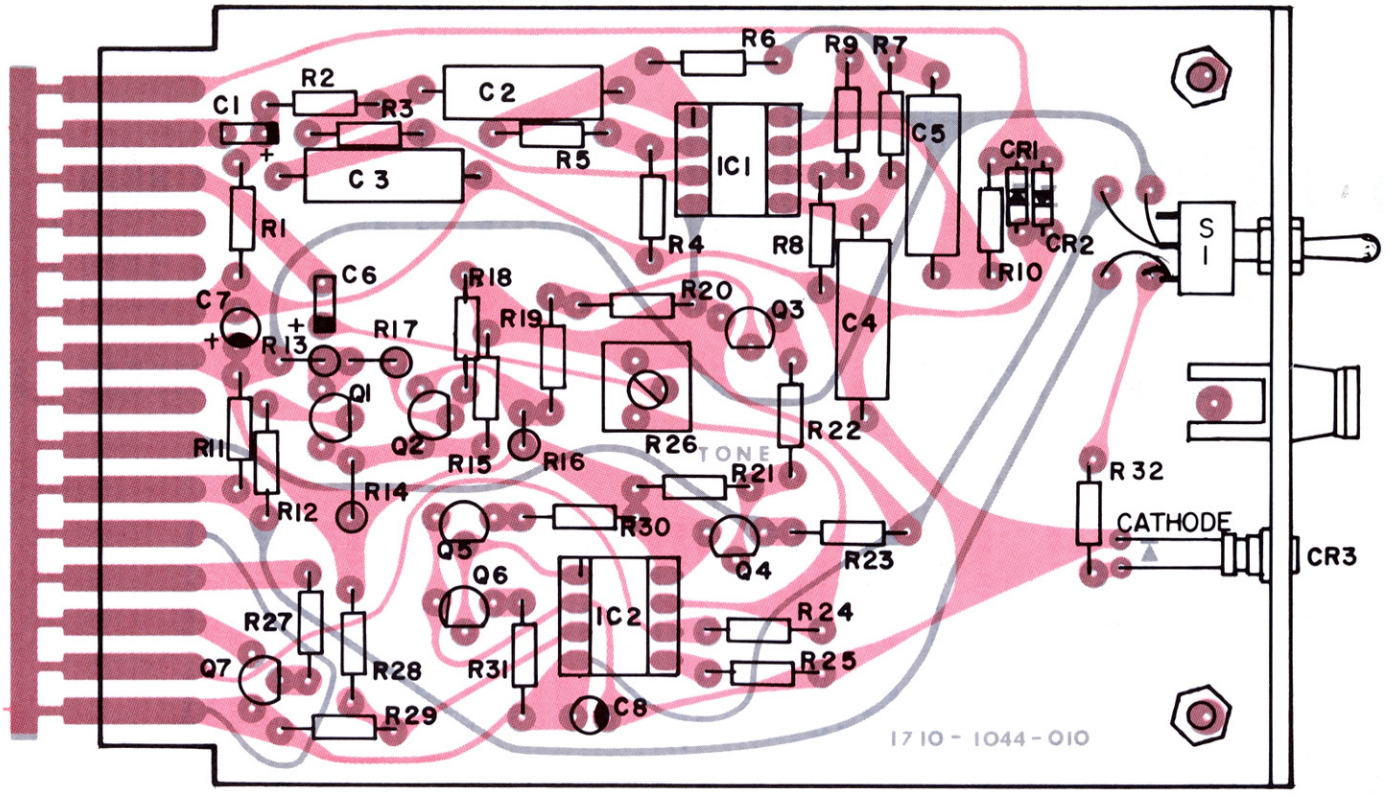
Item	Description	Part No.
AF1	Active Filter SP102-1	5225-1114-801
AF2	Active Filter SP102-21	5225-1114-802
IC1	Single op. Amp 741	5225-1114-803
Q1	Transistor PNP T1S91	5225-1114-804
Q2	Transistor NPN T1S90	5225-1114-805
Q3	Transistor PNP T1S91	5225-1114-806
Q4	Transitor NPN T1S90	5225-1114-807
Q5	Transistor NPN T1S90	5225-1114-808
D1 thru D7	Diode S1 IN914	5225-1114-809
D4	Diode LED (Red) ED209 (EEP)	5225-1114-810
C1	Capacitor 3.3 MFD	5225-1114-811
C2	Capacitor 3.3 MFD	5225-1114-812
C3	Capacitor 4.7 MFD	5225-1114-813
C4	Capacitor .33 MFD	5225-1114-814
C5	Capacitor 3.3 MFD	5225-1114-815
C6	Capacitor 10 MFD	5225-1114-816
C7	Capacitor 10 MFD	5225-1114-817
R1	Potentiometer 10K OHMS	5225-1114-818
R2	Resistor 9.8K * OHMS	5225-1114-819
R5	Resistor 5.1K OHMS	5225-1114-822
R6	Resistor 1K OHMS	5225-1114-831
R7	Resistor 100K OHMS	5225-1114-823
R8	Resistor 5.1K OHMS	5225-1114-824
R10	Resistor 10K OHMS	5225-1114-826
R11	Resistor 2K OHMS	5225-1114-827
R12	Resistor 1K OHMS	5225-1114-828
R13	Resistor 100K OHMS	5225-1114-829
R14	Resistor 5.1K OHMS	5225-1114-830
R15	Resistor 1K OHMS	5225-1114-831
R16	Resistor 51K OHMS	5225-1114-832
R17	Resistor 1M OHMS	5225-1114-833
R18	Resistor 27K OHMS	5225-1114-834
R19	Resistor 10K OHMS	5225-1114-835
R20	Potent. Mult. OHMS	5225-1114-836
R21	Resistor 9.8K * OHMS	5225-1114-837
R22	Potentiometer 10K OHMS	5225-1114-838
R23	Resistor 1K OHMS	5225-1114-839
R24	Resistor 620 OHMS	5225-1114-840
R25	Resistor 19.6K * OHMS	5225-1114-841
R26	Resistor 19.6K * OHMS	5225-1114-842

*1% TOLERANCE

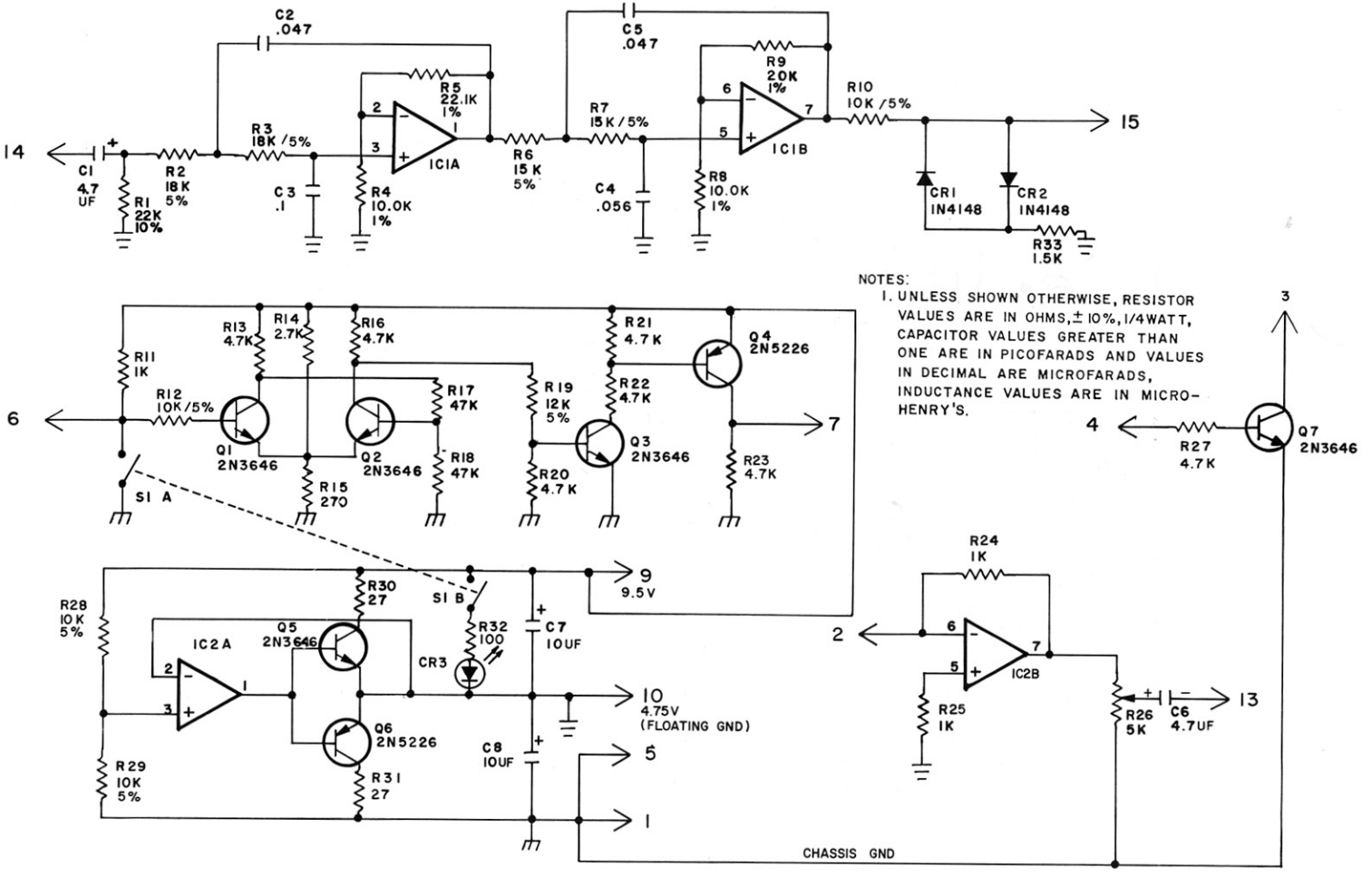
TONE INTERFACE BOARD

To order complete assembly, use part number 1939-1044-102

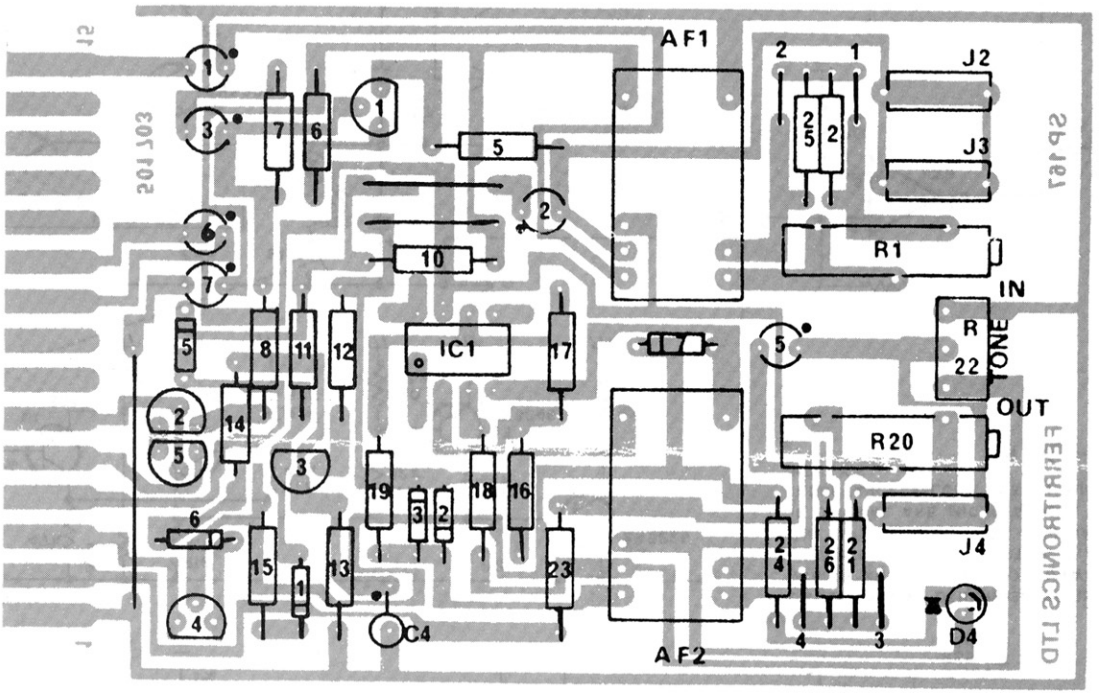
Item	Description	Part No.
C01	Capacitor, 4.7uf 20V	1538-4707-412
C02	Capacitor, .047uf 50V, ±5%	1537-4705-001
C03	Capacitor, .1uf, 50V, ±5%	1537-1006-001
C04	Capacitor, .056uf, 50V, ±5%	1537-5605-001
C05	Capacitor, .047uf, 50V, ±5%	1537-4705-001
C06	Capacitor, 4.7uf, 20V	1538-4707-412
C07 and C08	Capacitor, 10uf, 15V, ±20% Dip Tant	1538-1008-409
R01	Resistor, 22K, ¼w, ±5%	4764-2205-001
R02 and R03	Resistor, 18K, ¼w, ±5%	4764-1805-001
R04	Resistor, 10.0K, ¼w, ±1%	4707-1005-001
R05	Resistor, 22.1K, ¼w, ±1%	4706-2215-001
R06 and R07	Resistor, 15K, ¼w, ±5%	4764-1505-001
R08	Resistor, 10.0K, ¼w, ±1%	4706-1005-001
R09	Resistor, 20K, ¼w, ±5%	4764-2005-001
R10	Resistor, 10K, ¼w, ±5%	4764-1005-001
R11	Resistor, 1K, ¼w, ±5%	4764-1004-001
R12	Resistor, 10K, ¼w, ±5%	4764-1005-001
R13	Resistor, 4.7K, ¼w, ±5%	4764-4704-001
R14	Resistor, 2.7K, ¼w, ±5%	4764-2704-001
R16	Resistor, 4.7K, ¼w, ±5%	4764-4704-001
R17 and R18	Resistor, 47K, ¼w, ±5%	4764-4705-001
R19	Resistor, 12K, ¼w, ±5%	4764-1205-001
R20 thru R23	Resistor, 4.7K, ¼w, ±5%	4764-4704-001
R24 and R25	Resistor, 1K, ¼w, ±5%	4764-1004-001
R26	Pot 5K	4735-5004-003
R27	Resistor, 4.7K, ¼w, ±5%	4764-4704-001
R28 and R29	Resistor, 10K, ¼w, ±5%	4764-1005-001
R30 and R31	Resistor, 27 ohm, ±5%	4764-2702-001
R32	Resistor, 100 ohm, ¼w, ±5%	4764-1003-001
R33	Resistor, 1.5K, ¼w, ±5%	4764-1504-001
Q01 thru Q03	Transistor, 2N3646	4811-0000-005
Q04	Transistor, 2N5226	4811-0000-028
Q05	Transistor, 2N3646	4811-0000-005
Q06	Transistor, 2N5226	4811-0000-028
Q07	Transistor, 2N3646	4811-0000-005
S01	Switch, DPDT	5106-0000-009
IC01 and IC02	IC MC1458CP	4850-0000-017
	IC Socket, 8 Pin	4892-0000-006



1044 TONE INTERFACE

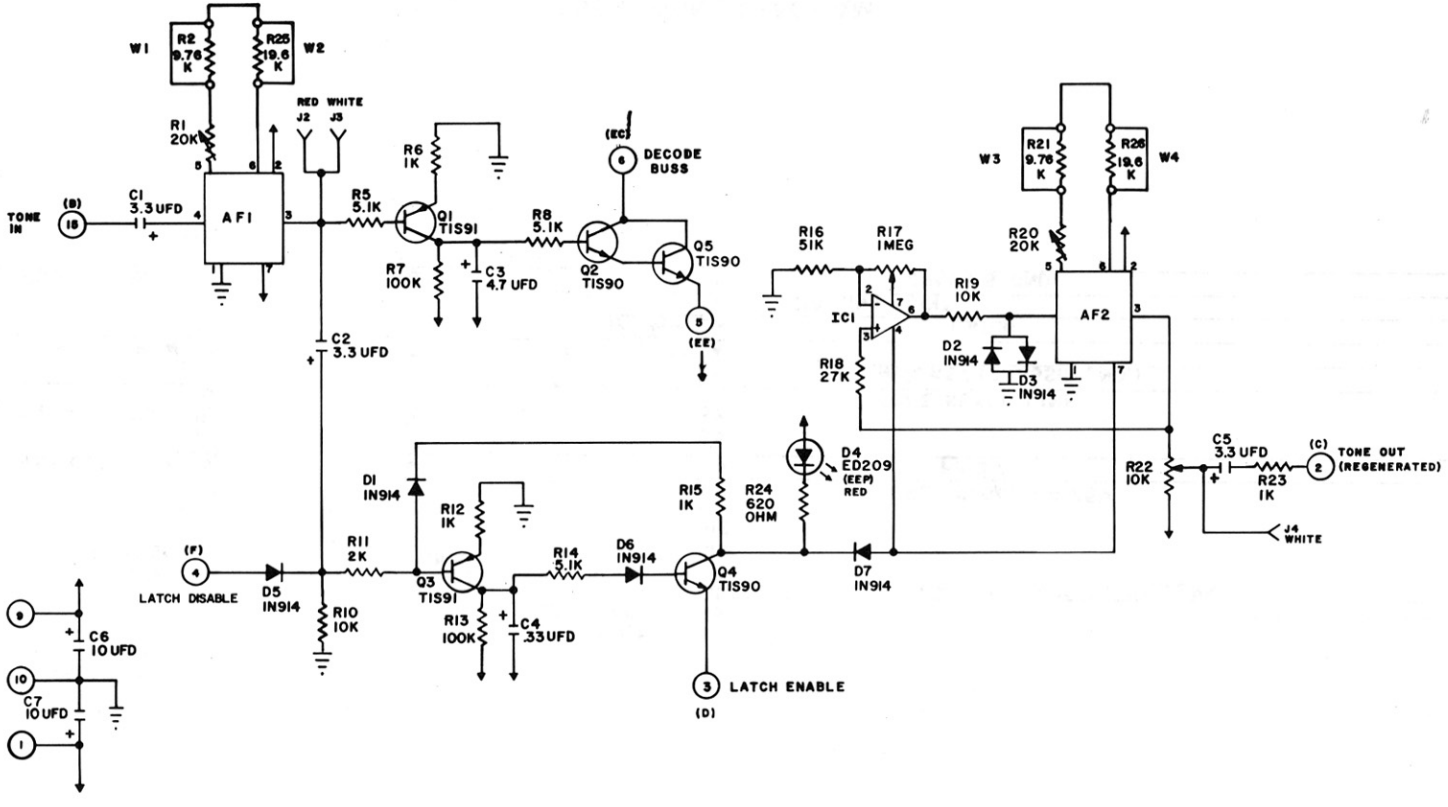


1044 TONE INTERFACE

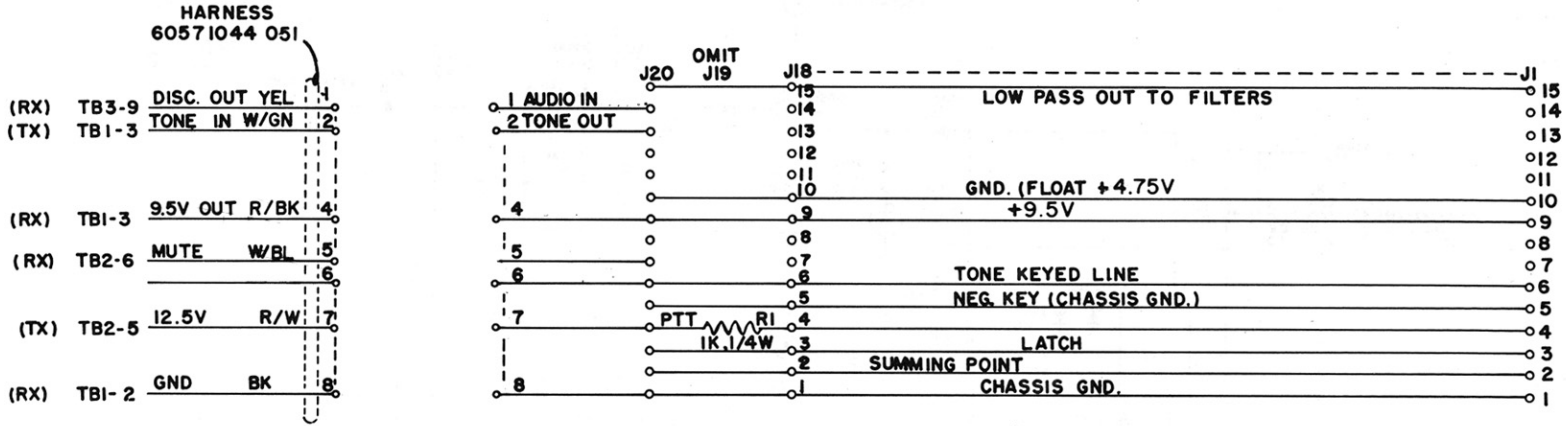


1114 DECODER/GATED ENCODER

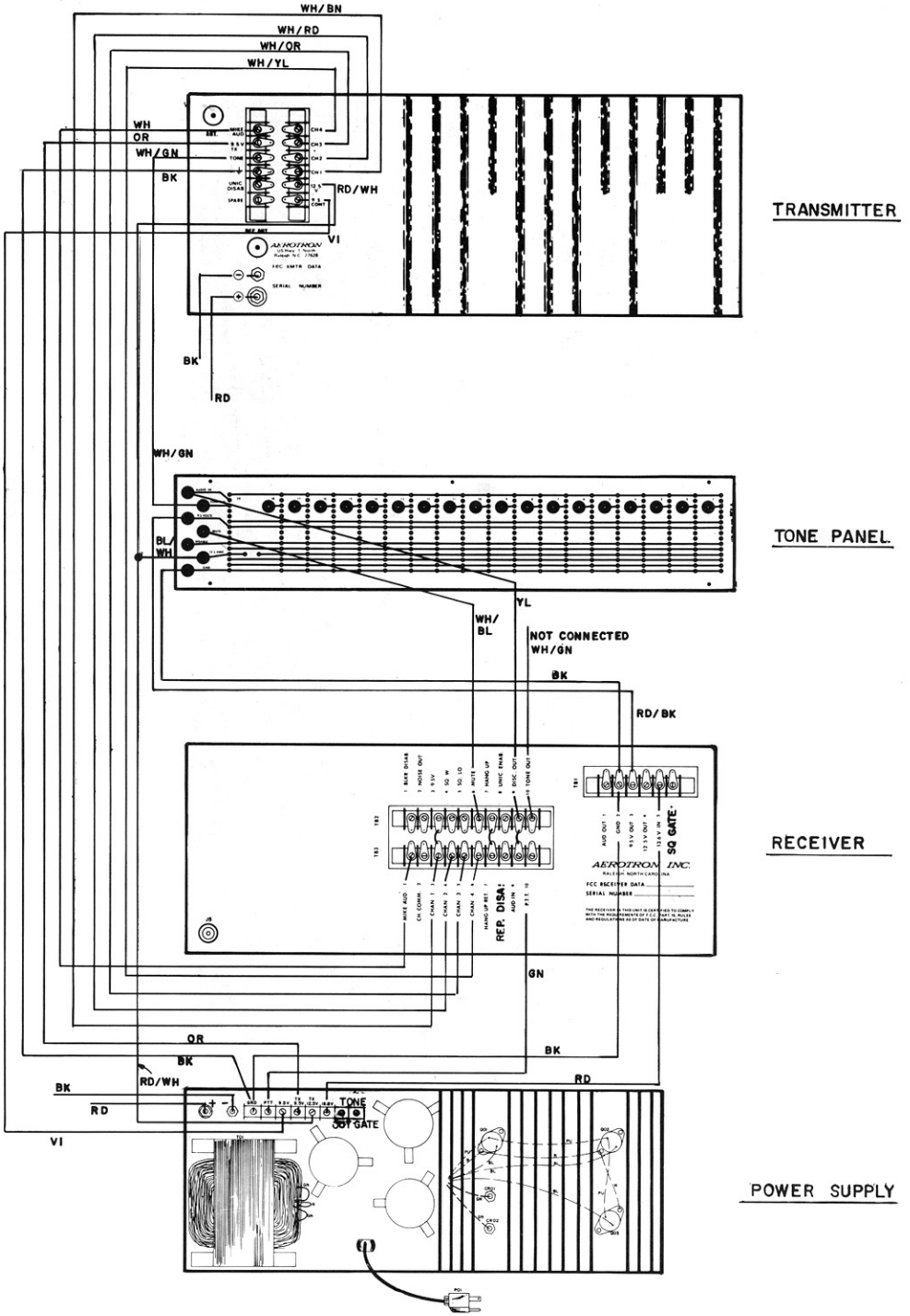
5225-1114-010



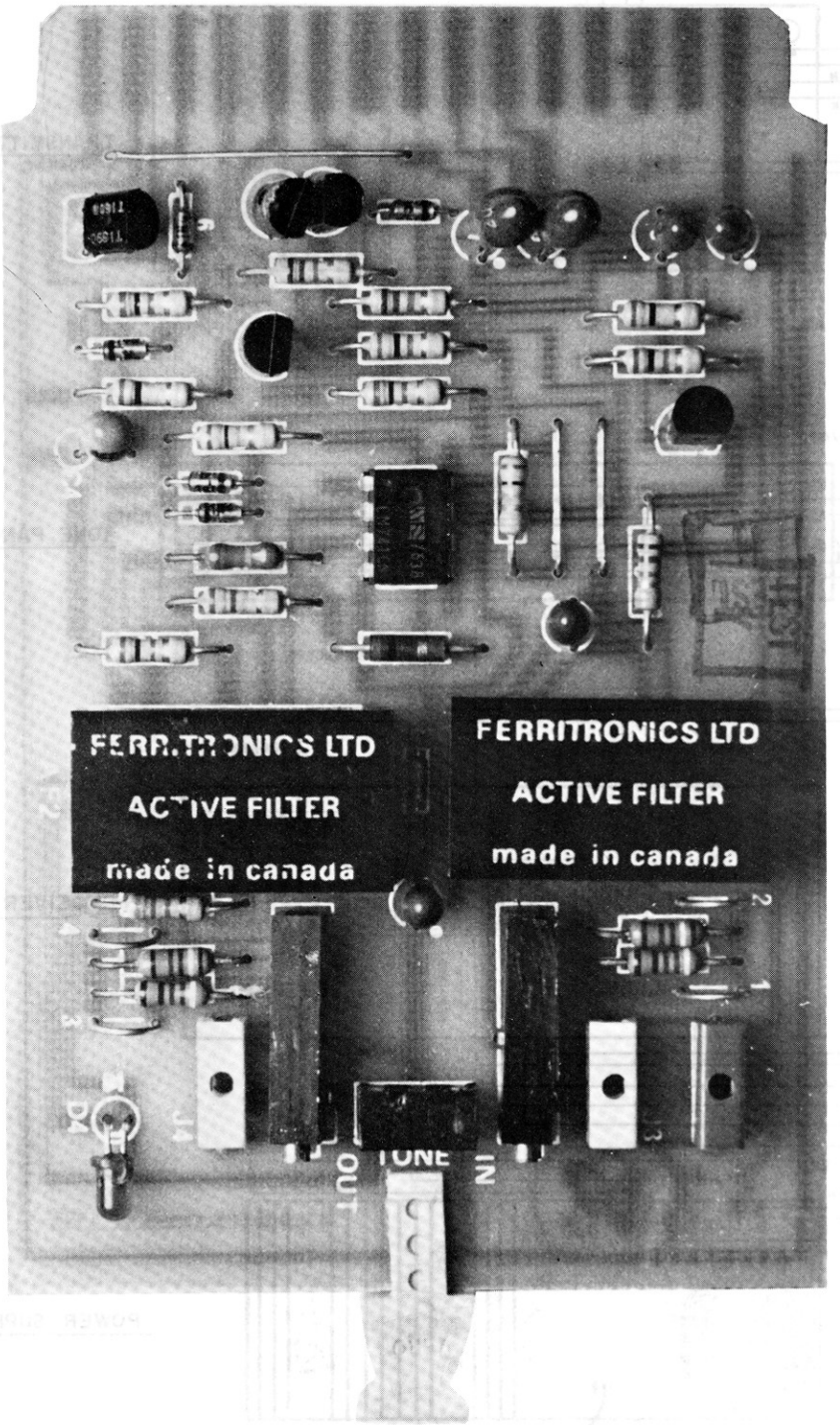
1114 DECODER/GATED ENCODER



STRAPPING DIAGRAM



1044 TONE PANEL INTERCONNECT DIAGRAM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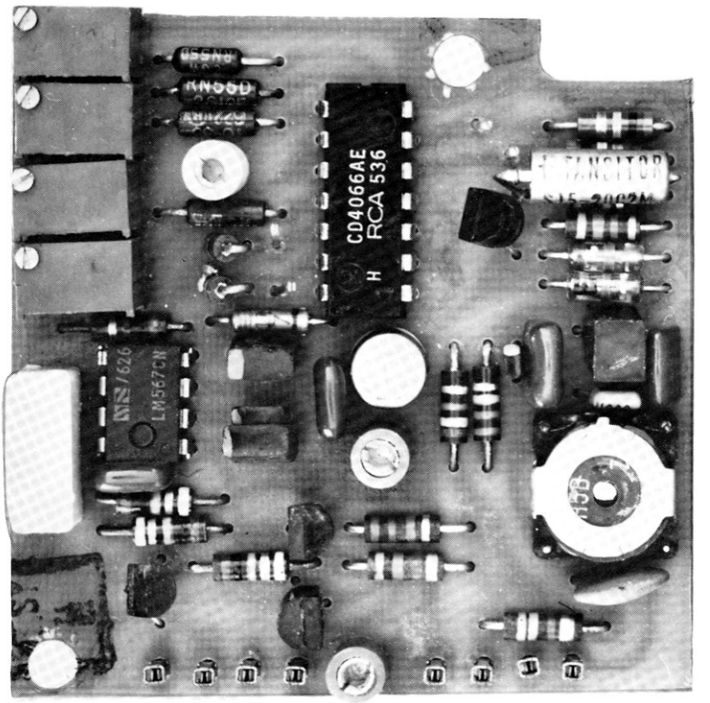
ACTIVE FILTER
made in canada
FERRITRONICS LTD
ACTIVE FILTER
made in canada
TONE
OUT
IN



1180 TONE DECODER

1180 Tone Decoder

Operation

Audio signals from the IF strip, entering the board at J03, are filtered by L01, C01, C02, and C03 which act as a low pass filter to remove all signals above 200 Hertz. Transistor Q1 limits the incoming signals to the phase lock loop to maintain a constant level with signal variations. IC2, the phase lock loop, compares the incoming information with an internal oscillator. The different tones are selected by control pins A, B, C, and D which enable four separately adjustable "R" constants (R06, R10, R14, and R18) via bilateral gate IC01. By applying +9.5 VDC to any one of these control inputs (A, B, C, and D) the internal oscillator (or VCO) is made to oscillate at one of four pre-determined frequencies, making the phase lock loop sensitive to these frequencies.

Thus when a tone of the same frequency as the internal VCO enters IC2, it is detected. Pin 8, the output, is pulled low via an internal pull down transistor indicating that the proper tone is present. Pin 8 can also be pulled low by Q3 which is connected to the mike hanger button. When the mike is lifted off its hanger, R26, (via R27), pulls the base of Q3 high causing Q3 to saturate and thus pull IC2 pin 8 low, therefore defeating the tone decoder.

In the C112 and C112A control heads, the mike hanger function has been defeated by a jumper wire from J04 to J07 on the 1251 Scan Board.

Adjustment Procedure

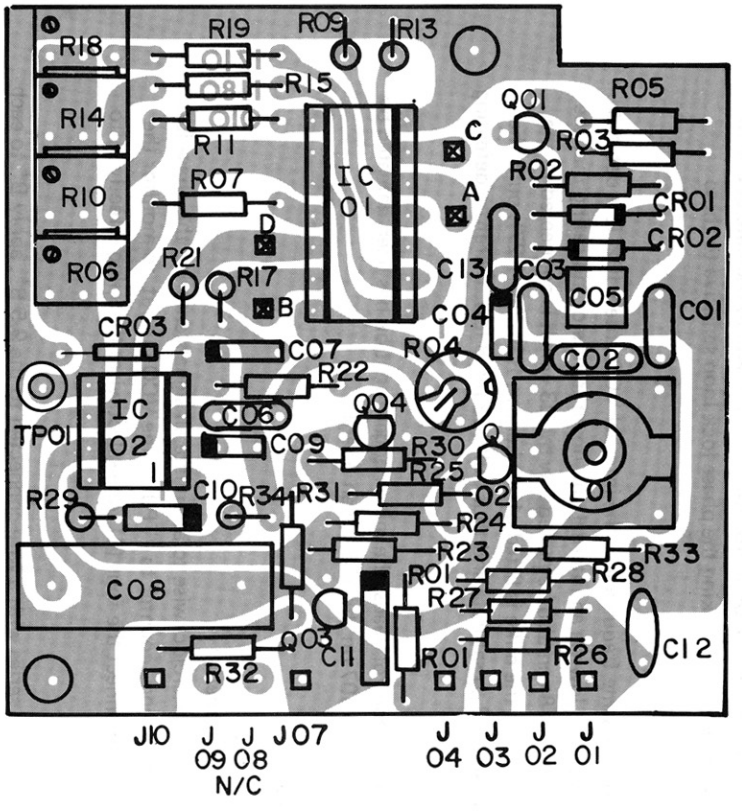
Decode Frequency Adjustment

A. Turn "R04" fully counterclockwise to attenuate all signals entering the phase lock loop. Connect a frequency counter to "TP01", the VCO output, to monitor the VCO frequency. Disconnect the four (4) tone select wires that plug directly onto the board.

B. With a 2.2K resistor in series with a wire connected to the 9.5 B^+, apply B^+ to each tone select pin, in order. Adjust the corresponding frequency on the frequency counter that is to be decoded. Adjust the frequencies in order from A to D. After completing all four, repeat the above procedures to take care of any interaction between frequencies.

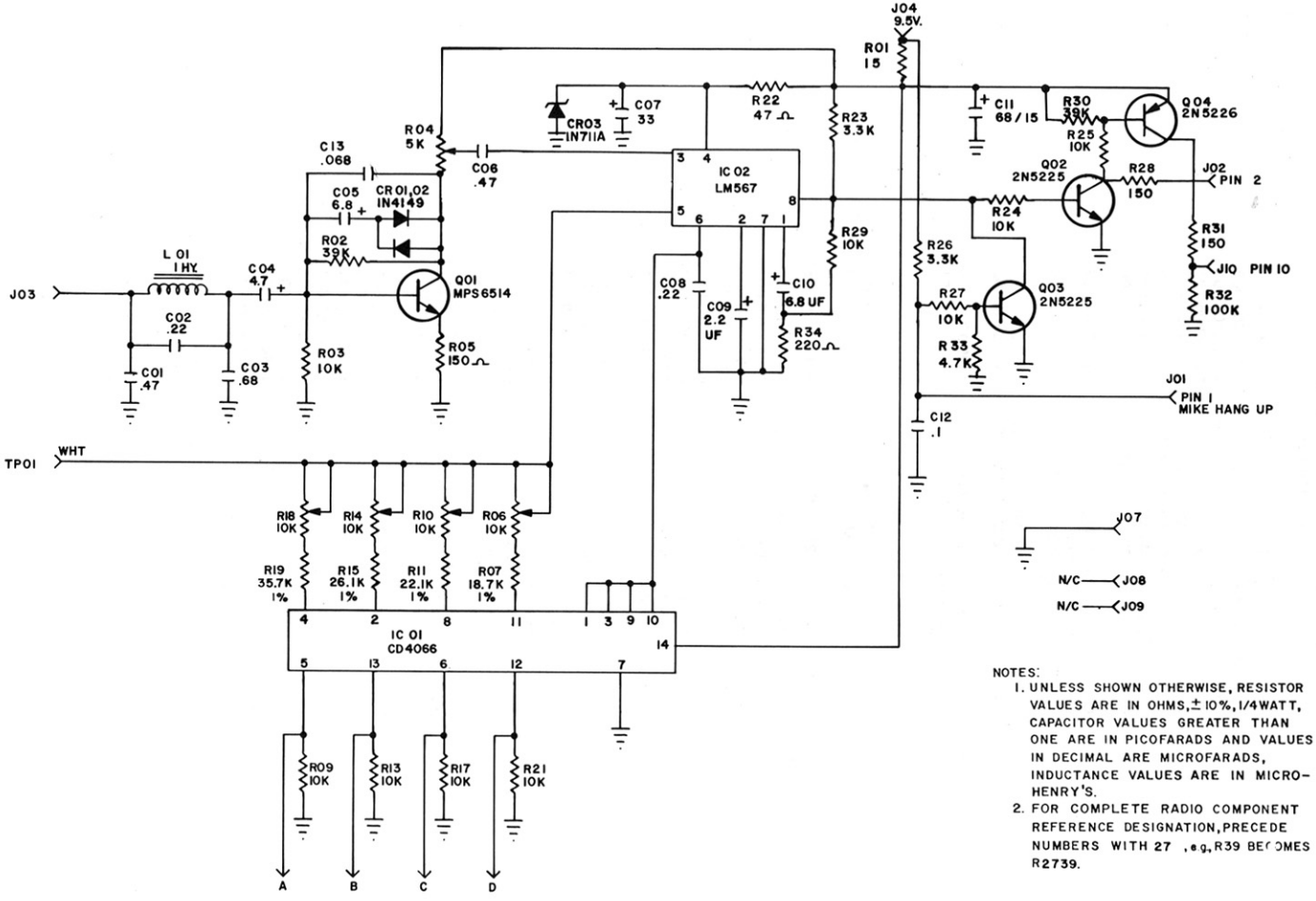
Input Level Adjust

Reconnect the tone select wires to their appropriate pins. Connect an RF signal generator to the radio while applying a proper sub-audible tone to the radio at a deviation level of 300 Hz. From its extreme counterclockwise position, adjust "R04" clockwise until the decoder is fully locked on with no dropping out. It may be necessary to slightly adjust the audio oscillator, used for the sub-audible tone source, back and forth to find the exact center frequency and increase sensitivity.



1180 UNICALL

1939-1180-101



NOTES:

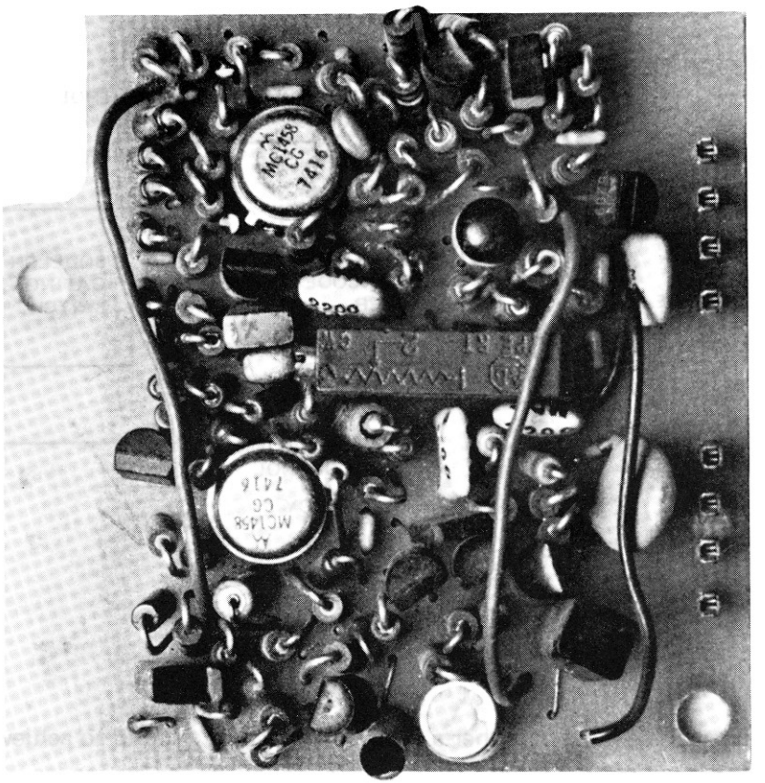
1. UNLESS SHOWN OTHERWISE, RESISTOR VALUES ARE IN OHMS, ±10%, 1/4WATT, CAPACITOR VALUES GREATER THAN ONE ARE IN PICOFARADS AND VALUES IN DECIMAL ARE MICROFARADS, INDUCTANCE VALUES ARE IN MICRO-HENRY'S.
2. FOR COMPLETE RADIO COMPONENT REFERENCE DESIGNATION, PRECEDE NUMBERS WITH 27 , e.g., R39 BECOMES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

J

4 Channel Tone Decoder
To order complete assembly, use part number 1939-1180-101

Item	Description	Part No.
C01	Capacitor, .47 MFD Stab.	1526-4706-002
C02	Capacitor, .22 MFD 50V Stab.	1526-2206-001
C03	Capacitor, .68MFD 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 ±20% Dip Tant.	1538-3308-406
C08	Capacitor, 22 MFD Polycarbonate	1537-2206-002
C09	Capacitor, 2.2 MFD 25V Tant ±20%	1538-2207-115
C10	Capacitor, 6.8 MFD .35V Tant	1532-6807-035
C11	Capacitor, 68 MFD 15V ±20% Dip tant	1538-6808-409
C12	Capacitor, .1 Disc. Cer	1505-1006-005
C13	Capacitor, .068 MFD 100V Stable	1526-6805-001
L01	Choke, 1HY	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	4764-1502-001
R02	Resistor, 39K	4764-3905-001
R03	Resistor, 10K	4764-1005-001
R04	5K Trim Pot	4735-5004-002
R05	Resistor, 150 ohm	4764-1503-001
R06	10K Pot, (25 Turn)	4735-1005-003
R07	Resistor, 18.7K, 1%, ¼W.	4706-1875-001
R09	Resistor, 10K	4764-1005-001
R10	10K Pot. (25 Turn)	4735-1005-003
R11	Resistor, 22.1K, 1%, ¼W	4706-2215-001
R13	Resistor, 10K	4764-1005-001
R14	10K Pot, (25 Turn)	4735-1005-003
R15	Resistor, 26.1K, 1%, ¼W	4706-2615-001
R17	Resistor, 10K	4764-1005-001
R18	10K Pot, (25 Turn)	4764-1005-003
R19	Resistor, 35.7K, 1%	4706-3575-001
R21	Resistor, 10K	4764-1005-001
R22	Resistor, 47 ohm	4764-4702-001
R23	Resistor, 3.3K	4764-3304-001
R24	Resistor, 10K	4764-1005-001
R25		
R26	Resistor, 3.3K	4764-3304-001
R27	Resistor, 10K	4764-1005-001
R28	Resistor, 150 ohm	4764-1503-001
R29	Resistor, 10K	4764-1005-001
R30	Resistor, 39K	4764-3905-001
R31	Resistor, 150K	4764-1503-001
R32	Resistor, 100K	4764-1006-001
R33	Resistor, 4.7K	4764-4704-001
R34	Resistor, 220 ohm	4764-2203-001
CR01	Diode 1N4148	4803-0000-004
CR02	Diode 1N4148	4803-0000-004
CR03	Diode 1N711A	4831-0001-001
IC01	IC CD4066AE	4850-0000-015
IC02	IC LM567	4850-0000-014
TP01	Test Point, white	2150-0000-007
	Male Pins	2150-0000-010
	Female Pins	2150-0000-011

NOTE: ALL 4764 PREFIX RESISTORS ARE ±5% ¼W.



1189 UNICALL

1189 UNICALL TONE SQUELCH

DESCRIPTION

The model 1189 Unicall consists of a low pass filter, decode and encode limiters, resonator, and squelch gating switch (see Figure 1). Audio and noise are reduced to an acceptable level by the low pass filter so that the decode limiter will drive the resonator and Q multiplier tuned to accept the desired CTCSS tone frequency. The squelch gating switch rectifies and filters the resonator output, compares this output with a threshold, and initiates switching (squelch gating) when this output is above the threshold.

UNICALL BLOCK DIAGRAM

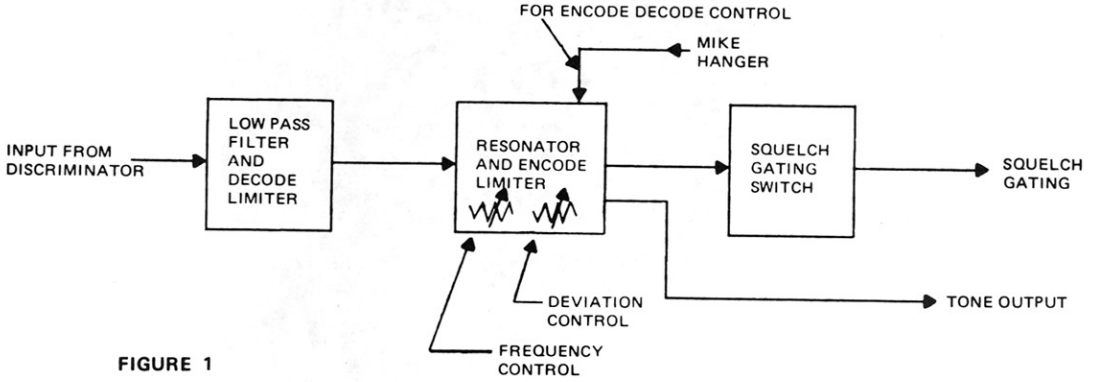


FIGURE 1

The microphone can be hung on either a positive or negative ground to achieve the decode function.

The encode function is achieved by taking the microphone from its hanger. This in effect increases the Q multiplier "loop gain" to the point where oscillation is sustained. Frequency is continuously adjustable using a 15 turn potentiometer from 67 Hz to 192.8 Hz in two ranges (frequency range is provided by cutting top of 10 ohm resistor adjacent nearest to the left of the frequency adjustment screw. The change-over frequency is approximately 90 Hz). The continuous frequency adjustment allows the unit to be easily changed to a new channel in the field; however, to maintain adjacent channel rejection, only those frequencies specified in RS220 should be used.

1189 ADJUSTMENT INSTRUCTIONS:

The tone level shall be adjusted to provide deviation within the range ±.75 KHz to ±.5 Khz, using the round potentiometer R43 on the Unicall Board. Voice modulation plus tone modulation must not exceed ±5 KHz deviation of the carrier.

The tone frequency should be set using R54 on the Unicall Board to one of the CTCSS frequencies listed below. Using a counter with a ten second count interval, the frequency can be set with an accuracy of ±0.1 Hertz.

UNICALL (CTCSS) TONE FREQUENCIES (Hz)
Use one group per system only.

Group A	Group B
67.0	71.9
77.0	82.5
88.5	94.8
100.0	103.5
107.2	110.9
114.8	118.8
123.0	127.3
131.8	136.5
141.3	146.2
151.5	156.7
162.2	167.9
173.8	179.9
186.2	192.8
203.5 *	210.7 *
218.1	225.7
233.6	241.8
250.3	

*Frequencies above 200 Hz should be avoided if possible.

FUNCTIONAL TEST:

1. To check ENCODE function:

   Remove microphone from hanger, and notice that the output, pin 9 rises to 2.5 VRMS typically. The chart shows what happens to SQUELCH GATING, pin 2 and the RESONATOR TEST POINT, pin 9.

2. To check DECODE function:

   The microphone may be hung on either ground or +13.6 VDC depending on polarity of Unicall Installation. With a tone modulation source fed into input pin 3, the RESONATOR TEST POINT, pin 9 should peak (at the desired tone frequency) at approximately 2 VRMS.

   Also, the SQUELCH GATING, pin 2 should be about 1.7 VDC MAX having previously been 9.5 VDC. The threshold may be evaluated by increasing (after lowering tone off resonance) the tone frequency while watching the RESONATOR TEST POINT voltage increase at pin 9. When 1 VRMS is reached at pin 9, the voltage at pin 2 will swing to 8.5 VDC.

   Hysteresis is provided so that a further increase in frequency past the resonance peak to a lower value of .8 VRMS will be reached before voltage at pin 2 returns to 8.5 VDC. At the returns to 8.5 VDC, the receiver is squelched.

CIRCUIT DESCRIPTION:

The AEROTRON 1189 UNICALL circuit has a dual operational amplifier, IC1A & B. The first section IC1A is used for an input follower which has high impedance input and low impedance output and is D.C. coupled to the second section IC1B. The coupling resistors and capacitors C4 and C6 attenuate all frequencies above 210 Hz. The gain of the second section is set by resistors R9 and R10. Bias for both sections is obtained from the main reference voltage divider R47, CR9, CR8, R69 and CR11. The output of the low pass filter-amplifier is limited by two back to back diodes CR1 and CR2.

This limited signal is then connected to the input of the resonator circuit. The second dual op-amp, IC2 section A is used as the main amplifier in the resonator circuit. This amplifier is biased from a separate 3.4 volt zener supply and D.C. gain is controlled by R32, R31 + R45 + R29. The thermistor R44 controls gain variations with temperature. Operating frequencies of the resonator is determined by the active twin "T" notch filter in the negative feed back loop. This filter consists of dual matched fet Q6A & B, precision resistors R59 and R60, matched capacitors C25 and C30 and output sections C24 with variable resistive leg R54 and R55. Frequency selection is made by adjusting the output resistive leg (110K is approximately 200 Hz 1.1 MEG approximately 60 Hz). Q7 is a source follower to prevent loading of the frequency selective circuit.

The resistors R30 and R65 determine the amount of feed back. (Bandwidth at depth of notch or selectivity).

A second AC feed back loop comes from the output of Q3 180^{o} out of phase (positive feed back) thru resistors R13 and R14. This is the loop that controls the AC gain-circuit Q. The input resistor R66 is factory selected to set the overall gain of the output amplifier Q4, Q5 and Q3 and positive feed back loop.

When the voltage is increased on diode CR6 (mike off hanger) it reduces the resistance of R14 increasing the positive feed back and the circuit will oscillate at the resonator frequency.

Q1 is used for positive or negative hang up. With mike button on GND, or +13.6 volts Q1 conducts and removes bias from CR6 and allows CR10 to conduct. This puts the system in decode mode. CR4, a 3.6 V zener, is used to prevent over drive of Q1 when unit is on positive GND. CR10 opens up on encode mode preventing any incoming signal from causing distortion of the oscillator signal.

Emitter follower Q2 isolates the output of the resonator from detector CR7.

The second section of the dual op-amp. IC2B is used as a switch with pin 5 biased above pin 6 by 0.5 volts. When the detected voltage of CR7 rises above this voltage reference the op-amp. changes to a low level (1.7V) for positive squelch gating, in the Aerocom series of radios.

Transistor Q9 is for negative squelch gating (current sink) on the other models of AEROTRON radios. On the "TT" series be sure the jumper from R51 to R52 is cut or that R52 & Q9 are removed from the board.

TROUBLESHOOTING THE UNICALL MODEL 1189

SCHEMATIC and PC BOARD (view from printed side), DIAGRAMS, are included which show voltage levels. Some measurements require a high impedance meter such as the Aerotron 1037 Test Set for DC measurements and the HP400 for AC measurements. An oscilloscope with 1 Meg ohm impedance is sufficient. Voltages shown are typical except for highly variable DC voltage readings at field effect transistor. Readings should be with ±10% except for these field effect transistors.

Troubleshooting should follow a logical sequence to be effective. If component replacement or any other soldering operation is required, it is necessary to re-seal the board against moisture. This can be done by painting the affected area with DOW Corning 630 compound. Because of the 85°F flash point of the DOW Corning 630, instructions on the Warning Label should be followed exactly. Due to very small traces on the board extreme caution must be used when replacing components.

The Capacitors C25 and C30 are matched at the factory to ±.25% with the highest value used for C25.

Precision resistors are used for accurate voltage division and temperature stability.

CONNECTOR PIN	DESCRIPTION	SIGNAL LEVELS
1	Mike Hanger	Input: GND or 13.5 VDC for DECODE "Open" for ENCODE
2 *	Negative Squelch Gating	8.5 VDC with receiver unsquelched 1.7 VDC MAX when squelched.
3	Tone Input	Input: 80 mv tone nominal level.
4	+10 VDC	
5	Not Used	
6	Not Used	
7	Ground	
8	Tone Output	2.5 VRMS MAX at ENCODE (typically 1 VRMS) adjustable by the cylindrical potentiometer.
9	Resonator Test Point	ENCODE: 2.5 VRMS nominal level @ f_o DECODE: 2 VRMS nominal level @ f_o (Also, approx. 1 V with 7.5 mv at pin 3)
10 *	Positive Squelch Gating	8.5 VDC with receiver squelched (0.7 VDC when negative squelch gating is used) 1.7 VDC MAX with receiver unsquelched (0.3 VDC MAX when negative squelch gating is used)

* For positive squelch gating pin 2 is not used. For negative squelch gating, pin 10 is not used.

1189 UNICALL

CAPACITORS

C 1	.luf, 20V, tant.	1532-1006-020
C 2	.47 mfd, 15V, tant.	1532-4706-015
C 3	820 pf 50V, stable	1526-8203-001
C 4	.luf, 20V, tant.	1532-1006-020
C 5	6.8uf, 35V, tant.	1532-6807-035
C 6	.01 uf, 50V, Gen. Pur. +80 to -20%	1526-1005-101
C 7	.luf, 20V, tant.	1532-1006-020
C 8	820 pf 50V, stable	1526-8303-001
C 9	.22mfd, 15V, tant.	1532-2206-015
C 10	820 pf 50V, stable	1526-8203-001
C 12	47 uf, 6V, tant.	1532-4708-001
C 13	820 pf 50V, stable	1526-8203-001
C 14	10 uf, 15V, tant.	1532-1008-015
C 15	4.7 mfd, 20V, tant.	1532-4704-001
C 16	47 uf, 6V, tant.	1532-4708-001
C 17	47 uf, 6V, tant.	1532-4708-001
C 19	2.2 uf, 15V, tant.	1532-2207-015
C 20	820 pf 50V, stable	1526-8203-001
C 21	820 pf 50V, stable	1526-8203-001
C 22	47 uf, 6V, tant.	1532-4708-001
C 23	820 pf 50V, stable	1526-8203-001
C 24	.0022, 100V, ±10%, ultra stable	1526-2204-002
C 25	Cap. Matched set of 2	1550-0000-001
C 26	4.7 mfd, 20V, tant.	1532-4704-001
C 27	820 pf, 50V, stable	1526-8203-001
C 28	6.8 uf, 15V, non polar	1536-6807-015
C 29	.005 mfd, ±20%, disc. cer.	1510-5004-001
C 30	Cap. Matched set of 2	1550-0000-001
C 31	.22 uf, 50V	1526-2206-101

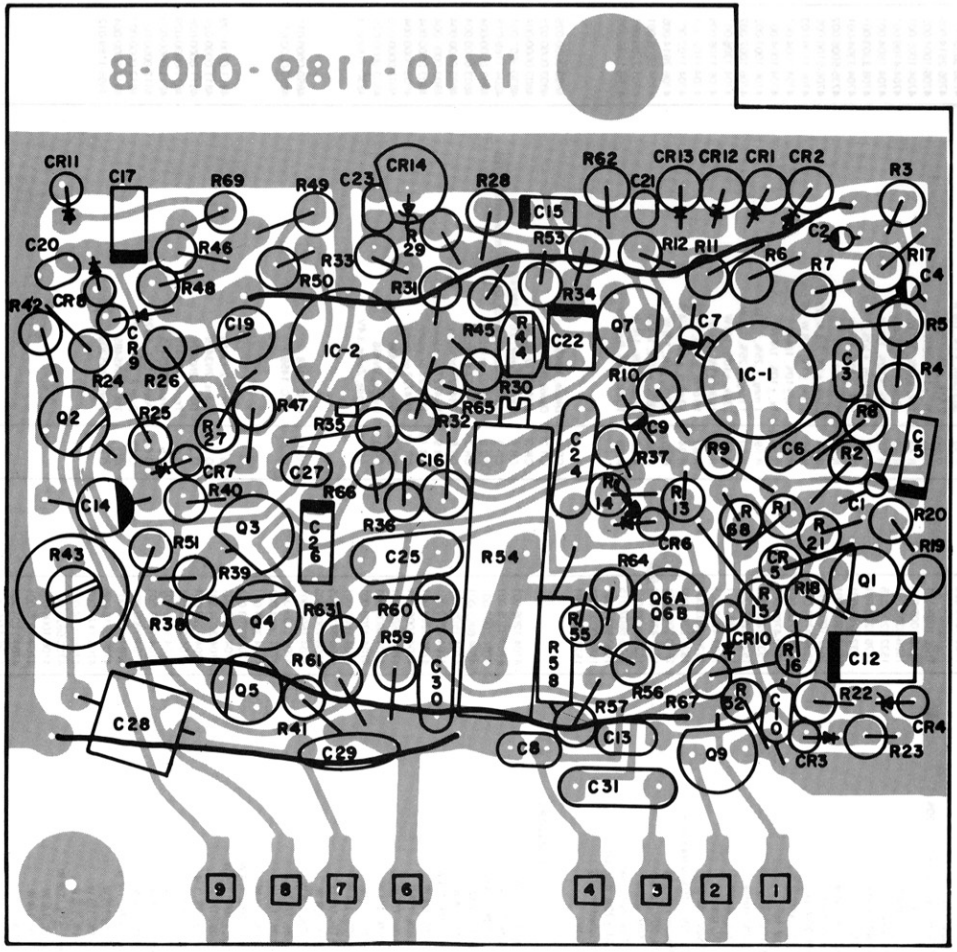
RESISTORS

R 1	120K, ±10%, 1/4 W	4704-1206-001
R 2	33k, ±10%, 1/4 W	4704-3305-001
R 3	1 meg., ±10%, 1/4 W	4704-1007-001
R 4	68k ±10%, 1/4 W	4704-6805-001
R 5	15k, ±10%, 1/4 W	4704-1505-001
R 6	22 ohm, ±10%, 1/4 W	4704-2202-001
R 7	8.2k, ±10%, 1/4 W	4704-8204-001
R 8	100k, ±10%, 1/4 W	4704-1006-001
R 9	5.6k, ±10%, 1/4 W	4704-5604-001
R 10	680k, ±10%, 1/4 W	4704-6806-001
R 11	47k, ±10%, 1/4 W	4704-4705-001
R 12	150k, ±10%, 1/4 W	4704-1506-001
R 13	68.1k, ±1%, 1/8 W	4706-6815-005
R 14	100k, ±1%, 1/8 W	4706-1006-005
R 15	150k, ±10%, 1/4 W	4704-1506-001
R 16	47k, ±10%, 1/4 W	4704-4705-001
R 17	5.6k, ±10%, 1/4 W	4704-5604-001
R 18	3.9k, ±10%, 1/4 W	4704-3904-001
R 19	680 ohm, ±10%, 1/4 W	4704-6803-001
R 20	560 ohm, ±10%, 1/4 W	4704-5603-001
R 21	3.9k, ±10%, 1/4 W	4704-3904-001
R 22	330 ohm, ±10%, 1/4 W	4704-3303-001
R 23	1k, ±10%, 1/4 W	4704-1004-001
R 24	10k, ±10%, 1/4 W	4704-1005-001
R 25	18k, ±10%, 1/4 W	4704-1805-001
R 26	39k, ±10%, 1/4 W	4704-3905-001
R 27	10 ohm, ±10%, 1/4 W	4704-1002-001
R 28	68.1k, ±1%, 1/8 W	4706-6815-005
R 29	1.47k, ±1%, 1/8 W	4706-1474-005
R 30	1.62k, ±1%, 1/8 W	4706-1624-005
R 31	562 ohm, ±1%, 1/8 W	4706-5623-005
R 32	100k, ±1%, 1/8 W	4706-1006-005
R 33	10k, ±10%, 1/4 W	4704-1005-001
R 34	2.2k, 1/4 W	4704-2204-001
R 35	422k, ±1%, 1/8 W	4706-4226-005
R 36	14.7k, ±1%, 1/8 W	4706-1475-005
R 37	100k, ±1%, 1/8 W	4706-1006-005
R 38	6.8k, ±10%, 1/4 W	4704-6804-001
R 39	6.8k, ±10%, 1/4 W	4704-6804-001
R 40	22 ohm, ±10%, 1/4 W	4704-2202-001
R 41	15k, ±10%, 1/4 W	4704-1505-001
R 42	8.2k, ±10%, 1/4 W	4704-8204-001
R 43	5k, Pot.	4735-5004-002
R 44	1k, thermistor	4750-1004-001
R 45	464 Ohm, ±1%, 1/8 W	4706-4643-005
R 46	383 ohm, ±1%, 1/8 W	4706-3833-005
R 47	2.61k, ±1%, 1/8 W	4706-2614-005
R 48	1k, ±1%, 1/8 W	4706-1004-005
R 49	10k, ±10%, 1/4 W	4704-1005-001
R 50	470k, ±10%, 1/4 W	4704-4706-001
R 51	1.8k, ±10%, 1/4 W	4704-1804-001
R 52	330 ohm, ±10%, 1/4 W	4708-3303-001
R 53	3.3k, ±10%, 1/4 W	4704-3304-001
R 54	500k, Pot.	4735-5006-002
R 55	510k, ±1%, 1/8 W, 25 ppm	4706-5106-005
R 56	110k, ±1%, 1/8 W, 25 ppm	4706-1106-003
R 57	1k, ±10%, 1/4 W	4704-1004-001
R 58	1k, ±10%, 1/4 W	4704-1004-001
R 59	1 meg, ±.25%, 1/8 W	4706-1007-002
R 60	1 meg, ±.25%, 1/8 W	4706-1007-002
R 61	330k, ±10%, 1/4 W	4704-3306-001
R 62	110k, ±1%, 1/8 W	4706-1106-005
R 63	10 ohm, ±10%, 1/4 W	4704-1102-001
R 64	10 ohm, ±10%, 1/4 W	4704-1102-001
R 65	2.61k, ±1%, 1/8 W	4706-2614-005
R 67	680k, ±10%, 1/4 W	4704-6806-001
R 68	220k, ±10%, 1/4 W	4704-2206-001
R 69	1.78k, ±1%, Resistor	4706-1785-005

CR 1	Diode, 1N456	4803-0000-025
CR 2	Diode, 1N456	4803-0000-025
CR 3	1N4727 or equiv.	4803-0000-004
CR 4	Diode, Zener, 3.6V, 1N747	4830-3601-001
CR 5	Semiconductor diode, Germanium, selected 1N198	4804-1169-018
CR 6	1N4727 or equiv.	4803-0000-004
CR 7	1N4727 or equiv.	4803-0000-004
CR 8	1N4727 or equiv.	4803-0000-004
CR 9	1N4727 or equiv.	4803-0000-004
CR 10	1N4727 or equiv.	4803-0000-004
CR 11	1N4727 or equiv.	4803-0000-004
CR 12	Diode, 1N456	4803-0000-025
CR 13	Diode, 1N456	4803-0000-025
CR 14	Diode, Zener 3.4V	4830-1169-013

IC 1	M. C. 1458	4850-0000-011
IC 2	M. C. 1458	4850-0000-011

Q 1	Trans. 2N3415	4811-0000-029
Q 2	Trans. 2N3415	4811-0000-029
Q 3	Trans. 2N5226	4811-0000-028
Q 4	Trans. 2N3415	4811-0000-029
Q 5	Trans. 2N3415	4811-0000-029
Q 6A	Duel F. E. T. E421	4812-0000-007
Q 6B	Duel F. E. T. E421	4812-0000-007
Q 7	Trans. 2N5485	4812-0000-004
Q 9	Trans. 2N5209	4865-1189-012



1189 UNICALL

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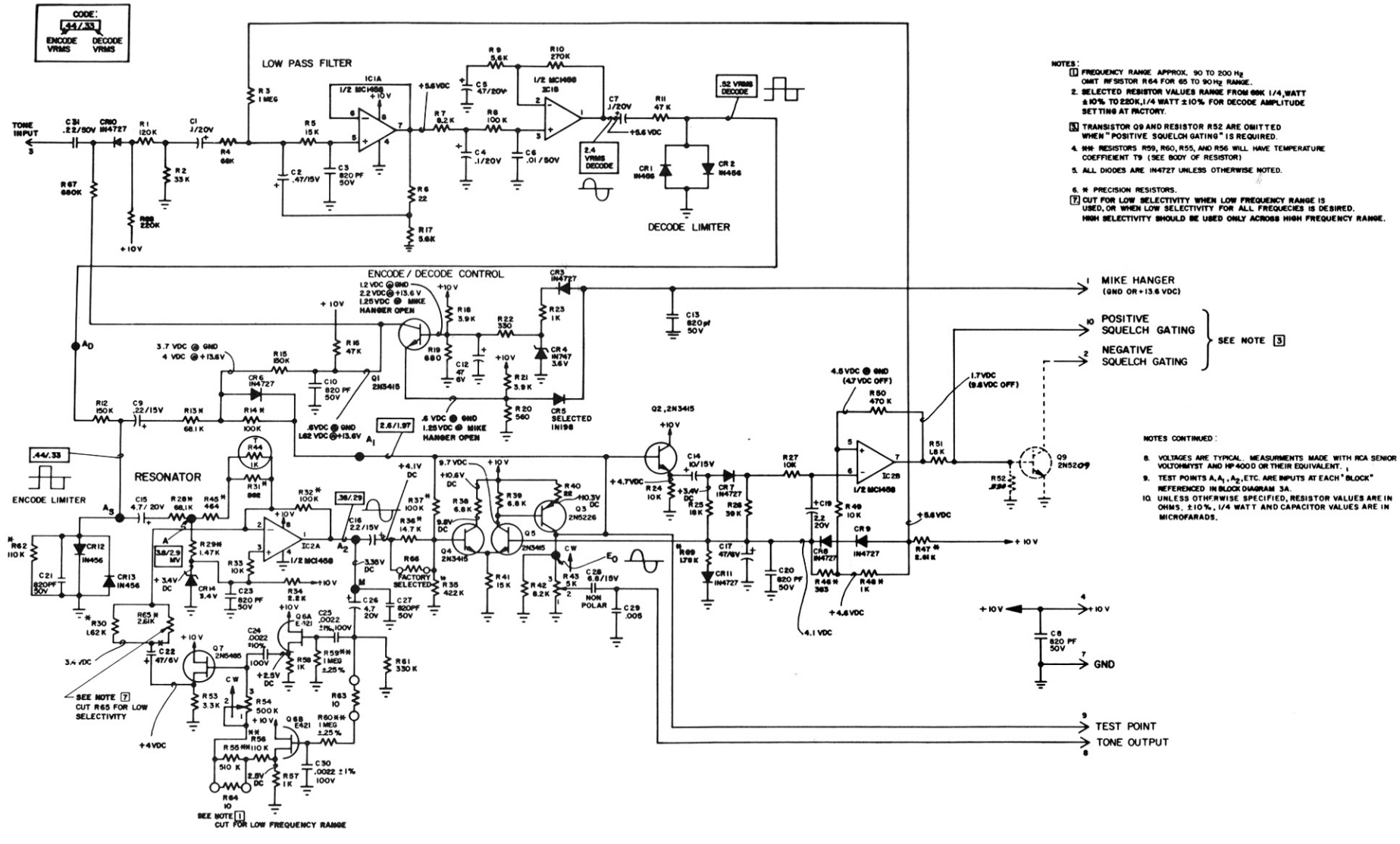
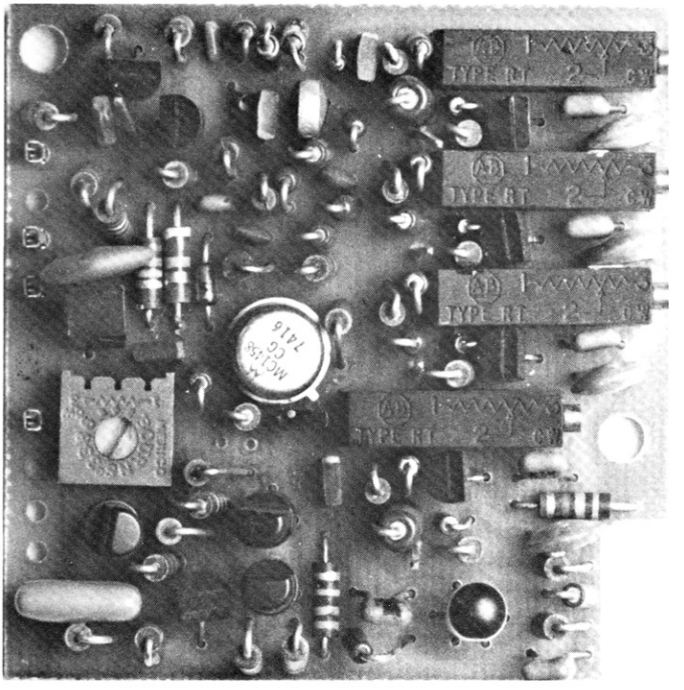

CODE:
44/33
ENCODE VRMS
DECODE VRMS
LOW PASS FILTER
IC1A
1/2 MC1458
IC1B
1/2 MC1458
TONE INPUT
C3I .22/50V
CR10 IN4727
R1 120K
C1 1/20V
R2 33K
R3 1 MEG
R4 68K
R5 15K
C2 .47/15V
C3 820 PF 50V
R6 22
R7 8.2K
R8 100K
R9 5.6K
R10 270K
C4 .1/20V
C5 47/20V
C6 .01/50V
C7 1/20V
R11 47K
.52 VRMS DECODE
2.4 VRMS DECODE
CR1 IN456
CR2 IN456
DECODE LIMITER
R17 5.6K
R67 680K
R66 220K
+10V
+5.6 VDC
ENCODE / DECODE CONTROL
1.2 VDC @ GND
2.2 VDC @ +13.6 V
1.25 VDC @ MIKE HANGER OPEN
CR3 IN4727
R18 3.9K
R19 680
R22 330
R23 1K
C12 47 6V
CR4 IN747 3.6V
R21 3.9K
R20 560
CR5 SELECTED IN198
C13 820 pf 50V
1 MIKE HANGER (GND OR +13.6 VDC)
10 POSITIVE SQUELCH GATING
NEGATIVE SQUELCH GATING
SEE NOTE 3
3.7 VDC @ GND
4 VDC @ +13.6V
R16 47K
R15 150K
CR6 IN4727
C10 820 PF 50V
Q1 2N3415
.6 VDC @ GND
1.62 VDC @ +13.6V
.6 VDC @ GND
1.25 VDC @ MIKE HANGER OPEN
2.6/1.97
A1
AD
Q2, 2N3415
4.8 VDC @ GND
(4.7 VDC OFF)
1.7 VDC
(9.8 VDC OFF)
R50 470 K
R51 L8 K
Q9 2N5209
R52 .22M
NOTES CONTINUED:
8. VOLTAGES ARE TYPICAL. MEASURMENTS MADE WITH RCA SENIOR VOLTOHMYST AND HP 4000 OR THEIR EQUIVALENT.
9. TEST POINTS A, A1, A2, ETC. ARE INPUTS AT EACH "BLOCK" REFERENCED IN BLOCK DIAGRAM 3A.
10. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 WATT AND CAPACITOR VALUES ARE IN MICROFARADS.
R12 150K
C9 .22/15V
R13 K 68.1K
R14 K 100K
R44 T 1K
R31 K 332
.44/33
ENCODE LIMITER
RESONATOR
AS
C15 4.7/ 20V
R28 K 68.1K
R45 K 464
CR12 IN456
CR13 IN456
C21 820PF 50V
R62 K 110K
R30 L62K
R65 K 2.61K
C22 47/6V
3.4 VDC
SEE NOTE 7 CUT R65 FOR LOW SELECTIVITY
+4VDC
R29 K 1.47K
CR14 3.4V
C23 820 PF 50V
R33 10K
IC2A
1/2 MC1458
R32 K 100K
38/29
R34 2.8K
C16 2.2/15V
R37 K 100K
R36 K 14.7K
R66 FACTORY SELECTED
R35 422K
C26 4.7 20V
C27 820PF 50V
3.36V DC
M
+4.1V DC
9.7 VDC
+10.6V DC
3.6V DC
R38 6.8K
R39 6.8K
R40 25
+10.3V DC
Q3 2N5226
Q4 2N3415
Q5 2N3415
R41 15K
R42 8.2K
R43 .5K
CW
C28 6.8/15V NON POLAR
C29 .005
Eo
+4.7VDC
C14 10/15V
R24 10K
+3.4V DC
R25 18K
CR7 IN4727
R27 10K
R26 39K
CR11 IN4727
C17 47/16V
C20 820 PF 50V
C19 2.2 20V
CR8 IN4727
R46 K 383
R48 K 1K
CR9 IN4727
R47 K 2.61K
+5.6VDC
+10V
+4.6VDC
4.1 VDC
R49 10K
R99 L78K
+10V
4
+10V
C8 820 PF 50V
7
GND
C24 .0022 ±10% 100V
C25 .0022 ±1% 100V
Q6A E-421
Q6B E421
R58 1K
R59 K 1 MEG ±.25%
R61 330K
R63 10
R60 K 1 MEG ±.25%
Q7 2N5485
+2.5V DC
R53 3.3K
R54 500K
R56 K 110K
510 K
2.8V DC
R57 1K
C30 .0022 ±1% 100V
R64 10
SEE NOTE 1 CUT FOR LOW FREQUENCY RANGE
9 TEST POINT
TONE OUTPUT
8

1190 AND 1191 CIRCUIT DESCRIPTION

The 1190 four tone subaudible encoder plugs into the Aerocom and Mpac series radio in the standard UNICALL position. IC01, Q11 along with passive components C13, C14, C21, R40 and R57 serve as a twin "T" bandpass filter. The remaining frequency determining "R" value for the twin "T" filter is switched in by Q03, Q04, Q05 and Q06. By applying 9.5 volts DC to control pins J02, J03, J04 and J05, separately adjustable trim pots will be inserted into the filter to change the frequency. Q07, Q08 and Q09 amplifies and inverts the signal and via CR04 applies positive feedback to the input leveling and biasing network for IC01 to sustain oscillation. Tone output at pin 8 is adjusted by R53 deviation control and oscillator stability is maintained over a wide temperature range by R14.

The 1191 four tone audible burst encoder operation is identical to the 1190 except for frequency determining components, the addition of Q1, Q2, and associated components. 9.5 volts DC is applied to pin 10 in the transmit mode only. This voltage initiates the tone burst which lasts .6 second typically, 1 second if R05 is cut and 1.5 seconds if R04 is cut. By grounding J01, a continuous tone is provided for adjustment purposes.



1190/1191 ENCODER

G

TONE ENCODER (Subaudible)

To order complete assembly, use part number 1939-1190-101

Item	Description	Part No.
C02	820pf. 50V Stable	1526-8203-001
C03	.22 ufd, 15V Tant	1532-2206-015
C04	820pf. 50V Stable	1526-8203-001
C05	4.7 ufd. .20V Tant	1538-4707-412
C06	820pf. 50V Stable	1526-8203-001
C07	4.7 ufd. 20V Tant	1538-4707-412
C08	Capacitor, 100 mf 12V	1505-1006-005
C12	820pf., 50V Stable	1526-8203-001
C13 and C14	Cap. Matched Set of 2	1550-0000-001
C15	2.2uf. 25V, Tant Dip. ±20%	1538-2207-115
C16	4.7 ufd. 20V Tant	1538-4707-412
C17	.068uf. Capacitor	1529-6805-002
C18	4.7 ufd. 20V Tant	1538-4707-412
C19	6.8uf 15V Non Polar	1536-6807-015
C20	Capacitor, .005 Disc. Cer.	1510-5004-001
C21	.0022 50V Ultra. Stable	1526-2204-002
J01 and J02	Amp Male Pins	2150-0000-010
Q03	Transistor, 2N5485	4812-0000-004
Q07 and Q08	Transistor, 2N3415	4811-0000-004
Q09	Transistor, MPS-H55	4810-0000-002
Q10	Transistor, 2N3415	4811-0000-004
R06	Resistor, 47K, ±5%, ¼w	4764-4705-001
R08	Resistor, 150K, ±5%, ¼w	4764-1506-001
R09	Resistor, 1K, ±5%, ¼w	4764-1004-001
R10	Resistor, 68, .1K, ±1%, 1/8w	4706-6815-005
R11	Resistor, 110K, ±1%, 1/8w	4706-1106-003
R12	Resistor, 68, 1K, ±1%, 1/8w	4706-6815-005
R13	Resistor, 464 ohm, ±1%, 1/8w	4705-4643-005
R14	Thermistor, 1K	4750-1004-001
R15	Resistor, 2.2K, ±5%, ¼w	4764-2204-001
R16	Resistor, 1.47K, ±1%, 1/8w	4706-1474-005
R17	Resistor, 1.62K, ±1%, 1/8w	4706-1624-005
R18	Resistor, 100 ohm, ±5%, ¼w	4764-1003-001
R22	Resistor, 3.3K, ±5%, ¼w	4764-3305-001
R23	Resistor, 10K, ±5%, ¼w	4764-1005-001
R24	Pot, 500K	4735-5006-002
R25	Resistor, 510K, ±1%, 1/8w	4706-5106-005
R26	Resistor, 10 ohm, ±5%, ¼w	4764-1002-001
R36	Resistor, 110K, ±1%, 1/8w	4706-1106-003
R40	Resistor, 1 Meg, ±1%, 1/8w	4706-1007-002
R41	Resistor, 100K, ±1%, 1/8w	4706-1006-005
R42	Resistor, Factory selected, ¼w	
R43	Resistor, 33K, ±5%, ¼w	4764-3305-001
R44	Resistor, 330K, ±5%, ¼w	4764-3306-001
R45 and R46	Resistor, 6.8K, ±5%, ¼w	4764-6804-001
R47	Resistor, 4.7K, +5%, ¼w	4764-4704-001
R48	Resistor, 22 ohm, ±5%, ¼w	4764-2202-001
R49	Resistor, 15K, ±5%, ¼w	4764-1505-001
R50	Resistor, 10K, ±5%, ¼w	4764-1005-001
R51	Resistor, 8.2K, ±5%, ¼w	4764-8204-001
R52	Resistor, 22K, ±5%, ¼w	4764-2205-001
R53	Pot, 5K, ±20%	4735-5004-003
R54	Resistor, 562 ohm, ±1%, 1/8w	4706-5623-005
R55	Resistor, 1K, ±5%, ¼w	4764-1004-001
R56	Resistor, 100K, ±1%, 1/8w	4706-1006-005
R57	Resistor, 1 Meg. ±1%, 1/8w	4706-1007-002
Q11A and Q11B	Duel F.E.T. E421	4812-0000-007
CR01 and CR02	Diode, IN456	4803-0000-025
CR03	Diode, 3.4V	4830-1169-013
CR04 and CR05	IN4727 or Equiv.	4803-0000-004
CR09	IN4727 or Equiv.	4803-0000-004
IC01	MC1458	4850-0000-011

Add following parts per additional tone required

Diode, IN4727	4803-0000-004
Transistor, 2N5485	4812-0000-004
Capacitor, 100pf, 12V	1505-1006-005
.0022, 50V Ultra Stable	1526-2204-002
Amp Male Pins	2150-0000-010
Resistor, 10 ohm, ±5%, ¼w	4764-1002-001
Resistor, 100 ohm, ±5%, ¼w	4764-1003-001
Resistor, 110K, ±1%, 1/8w	4706-1106-003
Resistor, 510K, ±1%, 1/8w	4706-5106-005
Pot, 500K	4735-5006-002

NOTE: Above parts will be required for each tone desired. Refer to schematic for parts designation.

F

TONE ENCODER (Audible)

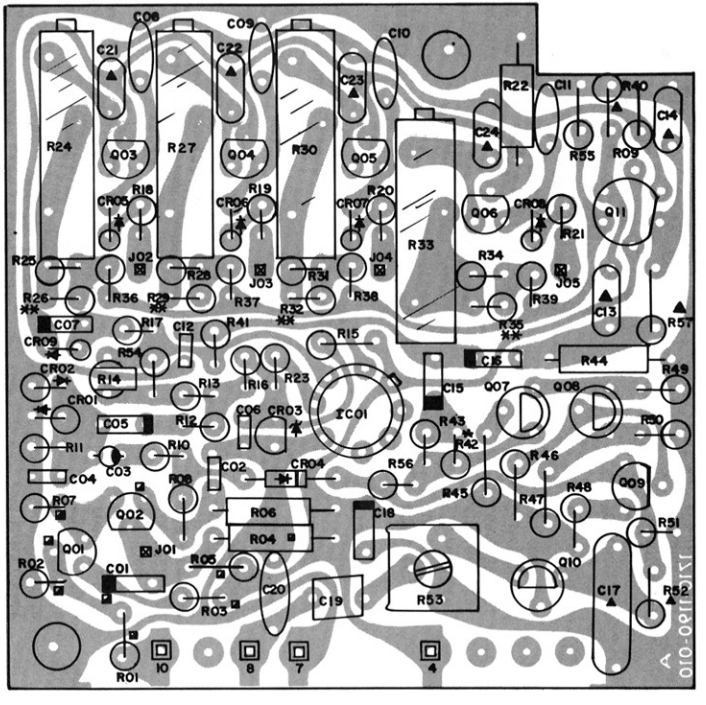
To order complete assembly, use part number 1939-1191-101

Item	Description	Part No.
C13/14	Cap., matched set of 470pf, 100V	1550-0000-002
C17	Capacitor, .027ufd	1529-2705-002
C21 thru C24	Capacitor, 470 pfd	1513-4703-001
Q1/Q2	Transistor MPS 6514	4811-0000-012
R02	Resistor, 10K, ±5%, ¼w	4764-1005-001
R03	Resistor, 1.8K, ±5%, ¼w	4764-1804-001
R04	Resistor, 270K, ±5%, ¼w	4764-2706-001
R05	Resistor, 390 ohm, ±5%, ¼w	4764-3903-001
R52	Resistor, 10K, ±5%, ¼w	4764-1005-001
R40/ R57	Resistor, 110K, ±1%, 1/8W	4706-1106-003

FOR COMPLETE RADIO COMPONENT REFERENCE DESIGNATION, PRECEDE NUMBERS WITH 27 , e.g. R39 BECOMES R2739

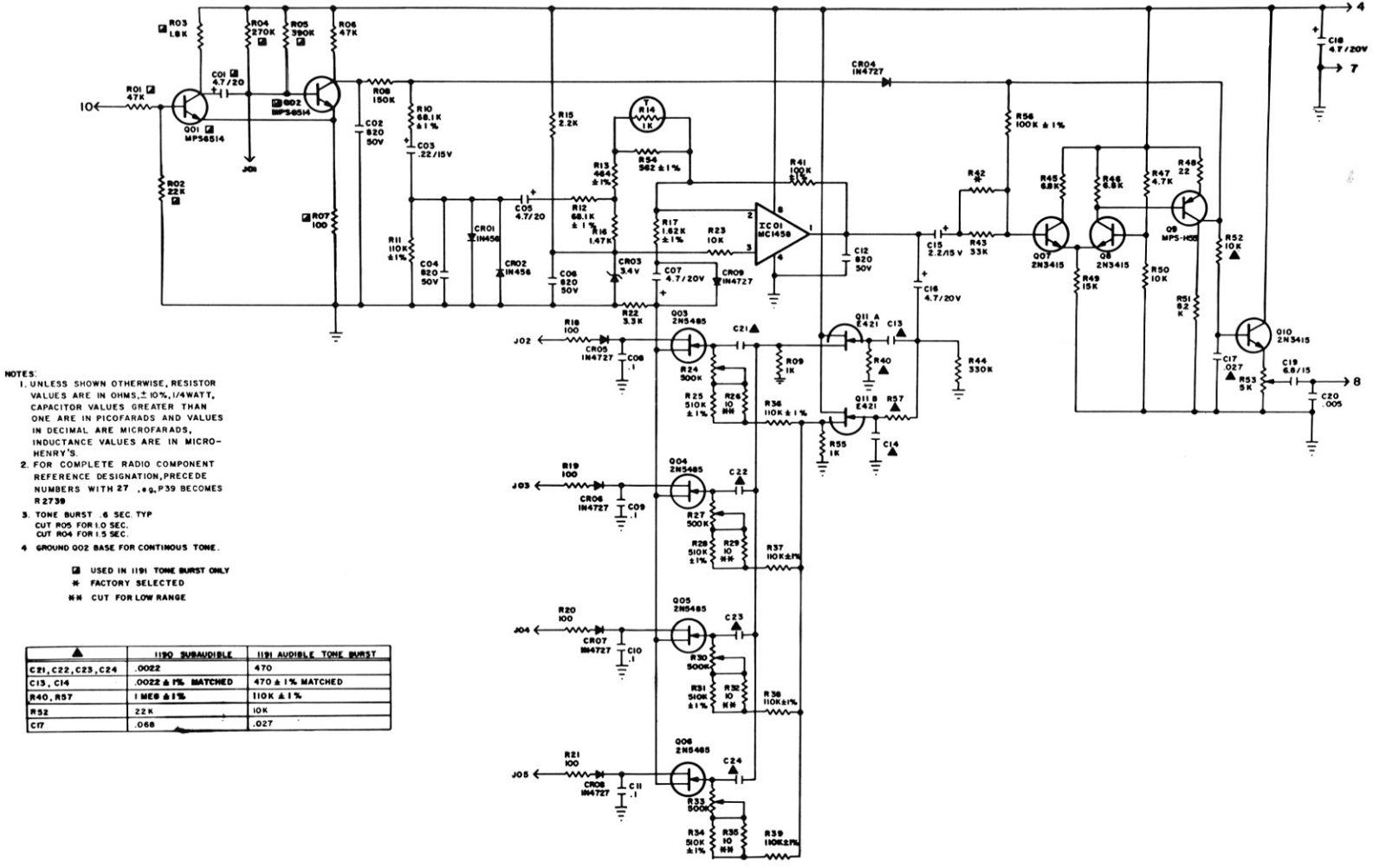
▣ USED IN 1191 TONE BURST ONLY.
* FACTORY SELECTED
** CUT FOR LOW RANGE.

B/M 1939-1190-101 SUBAUDIBLE
B/M 1939-1191-101 AUDIBLE TONE BURST



TONE ENCODER

1939-1191-101



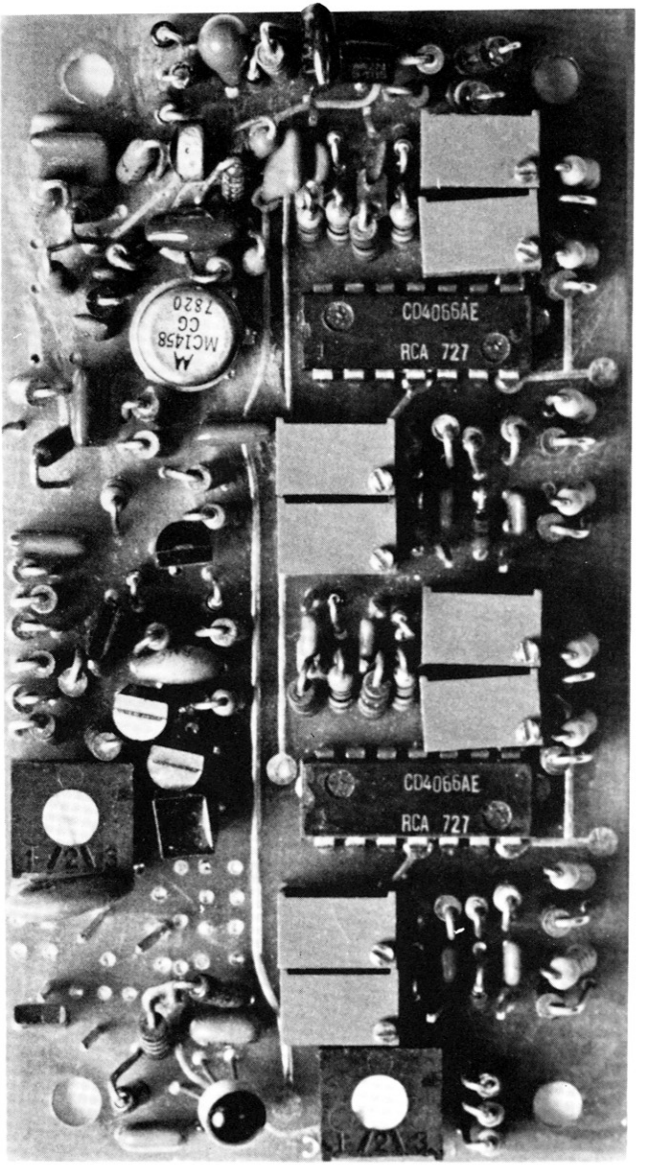
NOTES:

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. P39 BECOMES R2739.
3. TONE BURST .6 SEC. TYP
   CUT R05 FOR 1.0 SEC.
   CUT R04 FOR 1.5 SEC.
4. GROUND Q02 BASE FOR CONTINOUS TONE.

▲ USED IN 1191 TONE BURST ONLY
* FACTORY SELECTED
** CUT FOR LOW RANGE

▲	1190 SUBAUDIBLE	1191 AUDIBLE TONE BURST
C21, C22, C23, C24	.0022	470
C13, C14	.0022 ± 1% MATCHED	470 ± 1% MATCHED
R40, R57	1 MEG ± 1%	110K ± 1%
R52	22K	10K
C17	.068	.027

TONE ENCODER



1192 TONE ENCODER

1192A CIRCUIT DESCRIPTION

The 1192A Tone Encoder consists of an oscillator, phase reversible driver, and output buffer. IC01A, along with passive components C09, C10, C11, R24 and R27, serve as a twin "T" bandpass filter. The remaining frequency determining "R" value for the twin "T" filter is switched in by IC02 and IC03. By applying B^+, 9.5 volts DC to control pins T1 through T8, separately adjustable trim pots will be inserted into the filter to change the frequency. IC01B amplifies and inverts the signal and via R95 applied positive feedback to the input leveling and biasing network for IC01A to sustain oscillation.

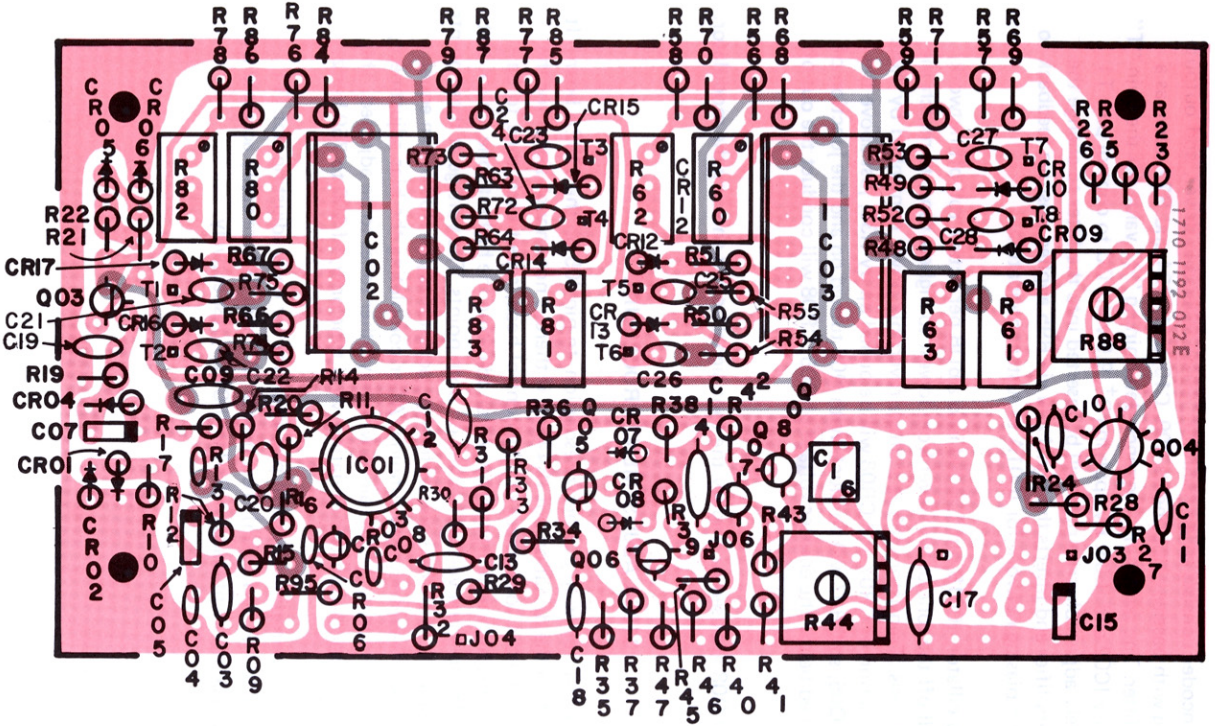
The output of the oscillator, IC01B pin 7, is fed into a 6DB per octave roll-off network, R34 and C18, to roll-off the tone output level from lowest to highest tone, to match the transmitter pre-emphasis. Transistor Q05 is a phase reversible driver controlled by A06. With Q06 off, the junction of CR07 and CR08 will be pulled up by R38, just above the collector voltage of Q05, so CR07 will conduct. With Q06 turned on and the junction of CR07 and CR08 pulled below the emitter voltage of Q05, CR08 will conduct the out-of-phase signal.

Transistors Q07 and Q08 are used to amplify the tone signal before entering the modulator.

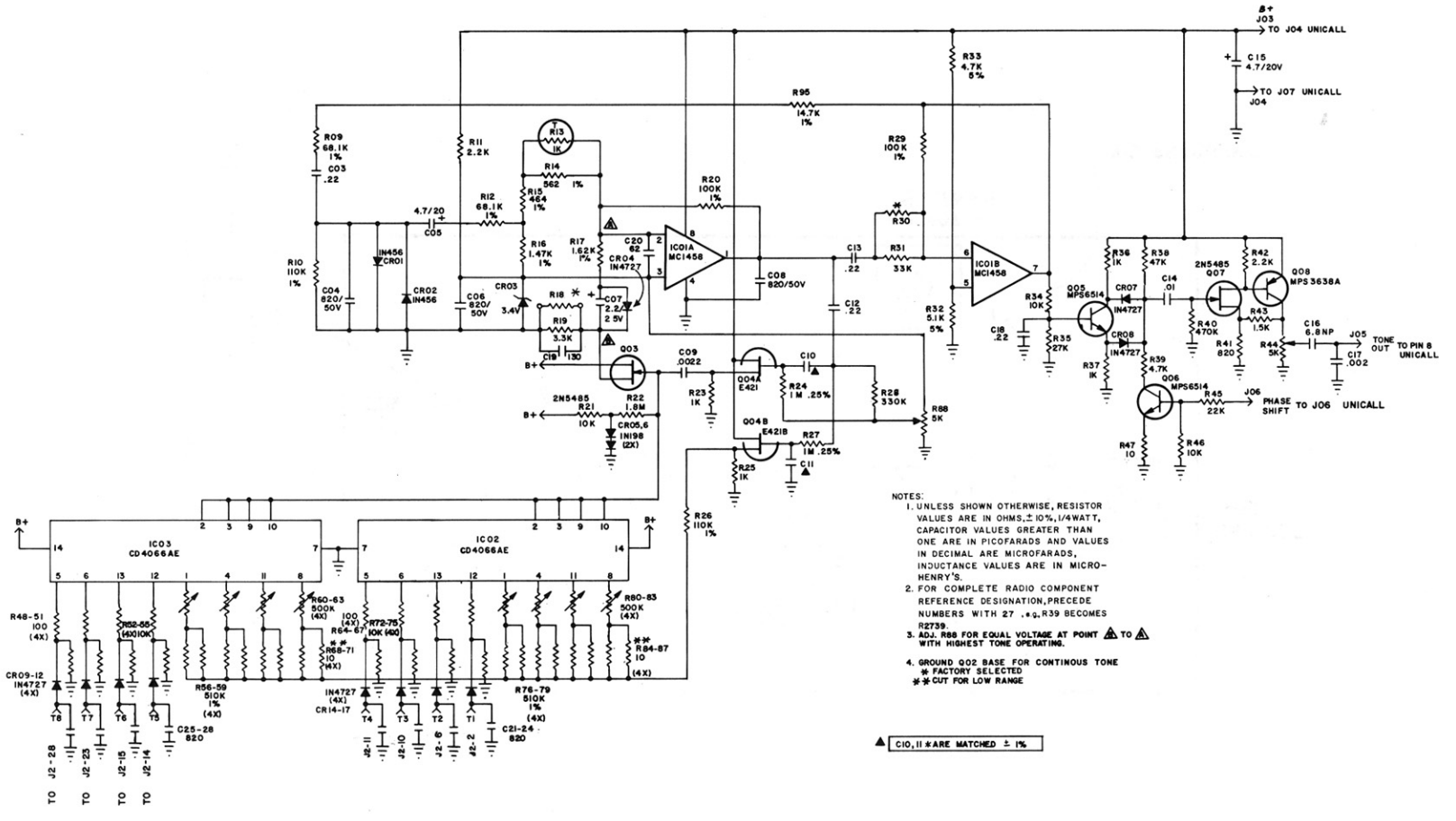
1192A ADJUSTMENT PROCEDURE

Connect a frequency counter, with a .1 hertz resolution, to pin J05 on the 1192A board. It may be necessary to turn the deviation pot (R44) up if there is not enough signal for the frequency counter. Using the tone select on the control head, select each tone to be adjusted starting with the high tone frequency. After adjusting the highest tone, check test points "A" and "B" for an equal voltage reading on both points. The voltage at these points will be around 3.4 volts DC. If there is any difference, adjust bias pot R88 for an equal reading, with the highest frequency still running. After completing the bias adjustment, readjust the highest tone frequency again along with any other tones to be adjusted. The deviation pot is set to a final transmitter deviation, with tone only, of 500 to 750 hertz.

The drawing shows the appropriate control pin locations for each adjusting pot (T1 corresponds to A1, T2 to A2, and so on). Test points "A" and "B" are easily accessed by using the top exposed component leads of R17 and CR04, respectively.



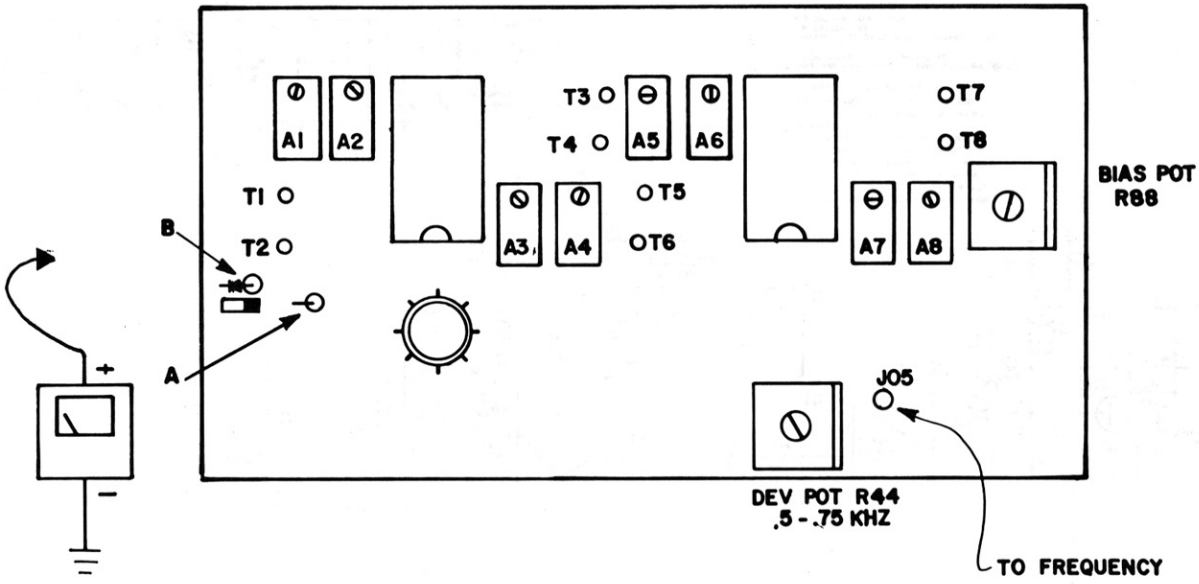
8 TONE ENCODER



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.
3. ADJ. R88 FOR EQUAL VOLTAGE AT POINT ⚠ TO ⚠ WITH HIGHEST TONE OPERATING.
4. GROUND Q02 BASE FOR CONTINOUS TONE
* FACTORY SELECTED
** CUT FOR LOW RANGE

▲ C10, 11 * ARE MATCHED ± 1%

8 TONE ENCODER



1192 TUNING DIAGRAM

G

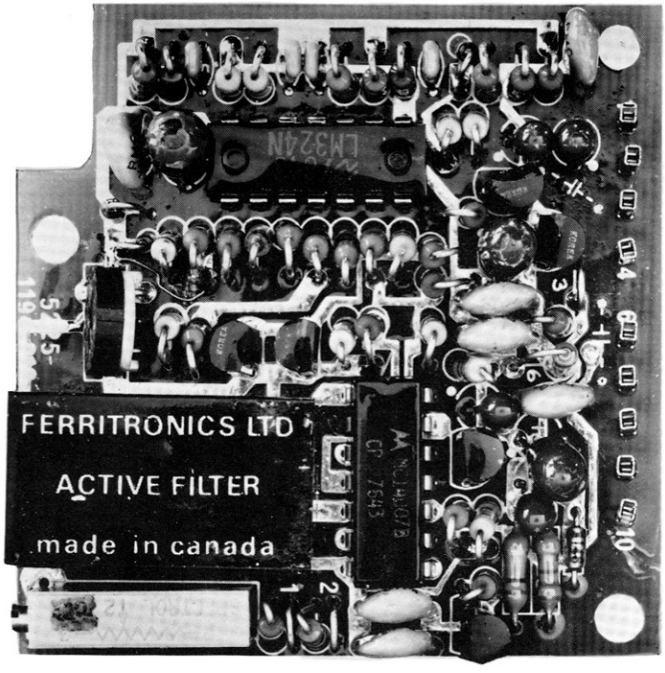
1-8 TONE ENCODER 1192A
(REPLACEABLE PARTS)

To order complete assembly, use part 1939-1192-102*

Item	Description	Part No.
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
C19	Capacitor, 130pf	1513-1303-006
C20	Capacitor, 62pf	1513-6202-006
C21		
thru	Capacitor, 820pf Stable	1526-8203-001
C28		
Q03	Field Effect Trans. 2N5485	4812-0000-004
Q04	Dual Fet. E421	4812-0000-007
Q05	Transitor, MPS6514	4811-0000-012
Q06		
Q07	Field Effect Trans. 2N5485	4812-0000-004
Q08	Transistor, MPS3638A	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	4764-2204-001
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	4706-1474-005
R17	Resistor, 1.62K, 1%, 1/8W	4706-1624-005
R18	Factory Selected (Specify Value)	4764-++++-001
R19	Resistor, 3.3K	4764-3304-001
R20	Resistor, 100K, 1%, 1/8W	4706-1006-05
R22	Resistor, 1.8 MEG	4764-1807-001
R23	Resistor, 1K, 10%, ¼W	4764-1004-001
R24	Resistor, 1 MEG, 25%, 1/8W	4706-1007-002
R25	Resistor, 1K	4764-1004-001
R26	Resistor, 110K, 1%, 1/8W	4706-1106-003
R27	Resistor, 1 MEG, 25%, 1/8W	4706-1007-002
R28	Resistor, 330K	4764-3306-001
R29	Resistor, 100K, 1%, 1/8W	4706-1006-005
R30	Factory Selected	4764-++++-001
R31	Resistor, 33K	4764-3305-001
R32	Resistor, 5.1K	4764-5104-001
R33	Resistor, 4.7K	4764-4704-002
R34	Resistor, 10K	4764-1005-001
R35	Resistor, 27K	4764-2705-001
R36	Resistor, 1K	4764-1004-001
R37		
R38	Resistor, 47K	4764-4705-001
R39	Resistor, 4.7	4764-4704-001
R40	Resistor, 470	4764-4706-001
R41	Resistor, 820 ohm	4764-8203-001
R42	Resistor, 2.2K	4764-2204-001
R43	Resistor, 1.5K	4764-1504-001
R44	Pot, 5K	4735-5004-003
R45	Resistor, 22K	4764-2205-001
R46	Resistor, 10K	4764-1005-001
R47	Resistor, 10 ohm	4764-1002-001
R48		
thru	Resistor, 100 ohm	4764-1003-001
R51		
R52		
thru	Resistor, 10K	4764-1005-001
R55		
R56		
thru	Resistor, 510K, 1%, 1/8W	4706-5106-005
R59		
R60		
thru	500K Potentiometer	4735-5006-003
R63		
R64		
thru	Resistor, 10 ohm	4764-1003-001
R67		
R68		
thru	Resistor, 10 ohm	4764-1002-001
R71		
R72		
thru	Resistor, 10K	4764-1005-001
R75		
R76		
thru	Resistor, 510K, 1%, 1/8W	4706-5106-005
R79		
R80		
thru	500K Pot	4735-5006-003
R83		
R84		
thru	Resistor, 10 ohm	4764-1002-001
R87		
R88	Pot, 5K	4735-5004-003
R95	Resistor, 14.7K, 1%, 1/8W	4706-1475-005
T1		
thru	Male Amp Pins	2150-0000-010
T8		
CR01	Diode, 1N456	4803-0000-025
CR02		
CR03	Zener Diode, 3.4V	4830-1169-013
CR04	Diode 1N4727	4803-0000-004
CR05	Diode 1N198	4804-0000-004
CR06		
CR07		
thru	Diode, 1N4727	4803-0000-004
CR17		
IC01	I.C. 1458	4850-0000-011
A & B		
IC02	I.C. 4066	4850-0000-015
IC03	I.C. 4066	4850-0000-015

*NUMBER OF TONES MUST BE SPECIFIED.

NOTE: ALL RESISTORS WITH A 4764 PREFIX ARE ± 5%, ¼W



1194 ENCODER/DECODER

CIRCUIT DESCRIPTION

The 1194 Subaudible Encoder/decoder has been designed to interface directly with several Aerotron radios. Incorporating the latest field-proven circuitry, it offers high reliability in a small size package.

The circuitry incorporates a low pass filter, a high gain switched amplifier limiter, a tunable, high stability narrow band pass active filter for tone detection and generation, reverse burst circuitry and tone rectification and DC switching to operate the audio squelch gate.

The power supply consists of a zener regulated internal ground circuit consisting of R37 and zener diode D6 and related de-coupling capacitors C14 through C17. This internal ground is utilized as an AC signal ground for the various filters within the unit.

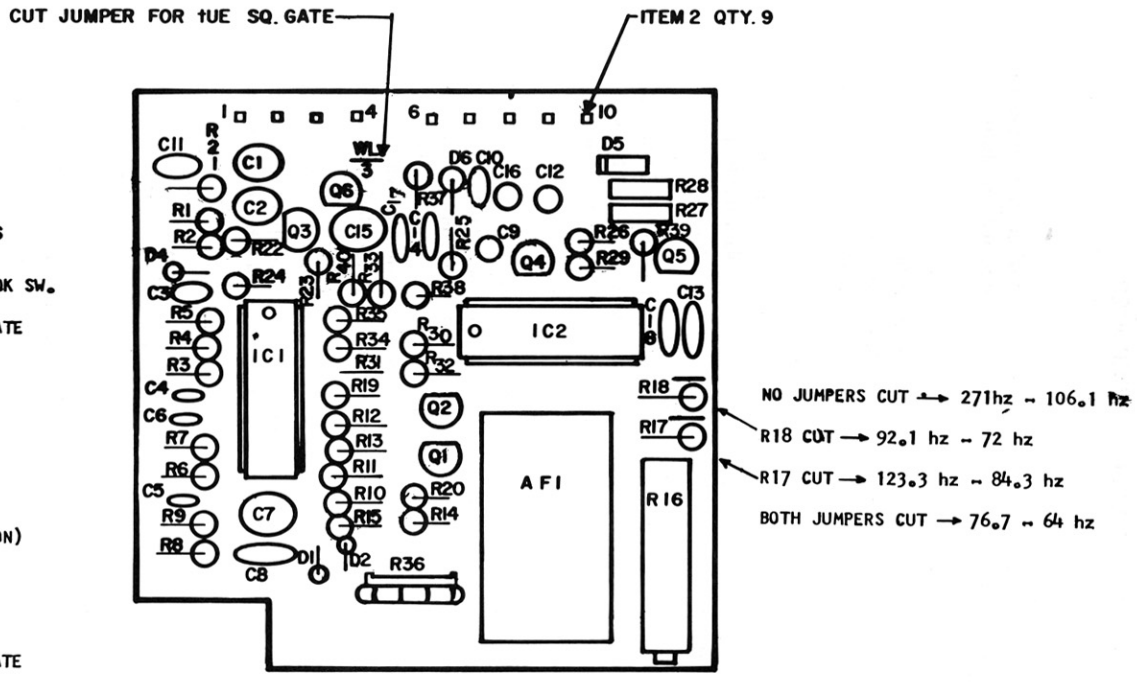
Input audio signal is coupled to the unit at Pin 3 through non-polar capacitors C1 and C2 to the two stage low pass filter consisting of IC1A, B and related passive components. The output of this filter is coupled via capacitor C7 to the negative input of the high gain switched amplifier limiter incorporated around IC1C.

IC1C is a high gain amplifier with input switched via Q1 and Q2. In the decode mode transistor Q1 is off while transistor Q2 is on allowing input signals to be coupled from the low pass filter through the high gain amplifier limiter into the inputs of high stability band pass filter AF1. The signal is limited to the appropriate level via R15 and D1 and D2. The mode is selected whenever Pin 1 of the 1194 is either grounded or at the positive supply. This is the normal decode mode. The frequency determining network coupled between 5 and 6 of AF1 utilizes the "two-jumper" tuning scheme for improved resolution. The fine adjust of frequency is accomplished with multiturn potentiometer R16 after the appropriate range has been selected. The output of active filter 1 at Pin 3 is coupled into the switched inverter non-inverter IC2 and also to the base of transistor Q4 where tone detection occurs.

Tone detection and rectification occur via the charging of capacitor C12 and the subsequent turning on of transistor Q5 and the turning off of transistor Q5 for the DC control of the squelch circuitry.

In the encode mode Pin 1 of the 1194 is allowed to float. This causes transistor Q1 to turn on and transistor Q2 to turn off thereby grounding the input from the decode circuitry and allowing the output of active filter to be coupled to the input forming a high stability positive feedback loop and thereby an oscillator. This output is coupled via R36, a single turn potentiometer utilized to set the deviation, to the phase inversion non-inversion network. The signal is coupled through IC1-D, resistor R38 and C9 to Pin 8 which is coupled to the tone input section of the transceiver. The phase inversion at the end of the transmission is controlled via Pin 6 of the 1194 and this signal, when the push to talk is released, enables the reversal of phase and thereby the damping of oscillations in any receiving subaudible tone unit. This damping provides squelch tail elimination.

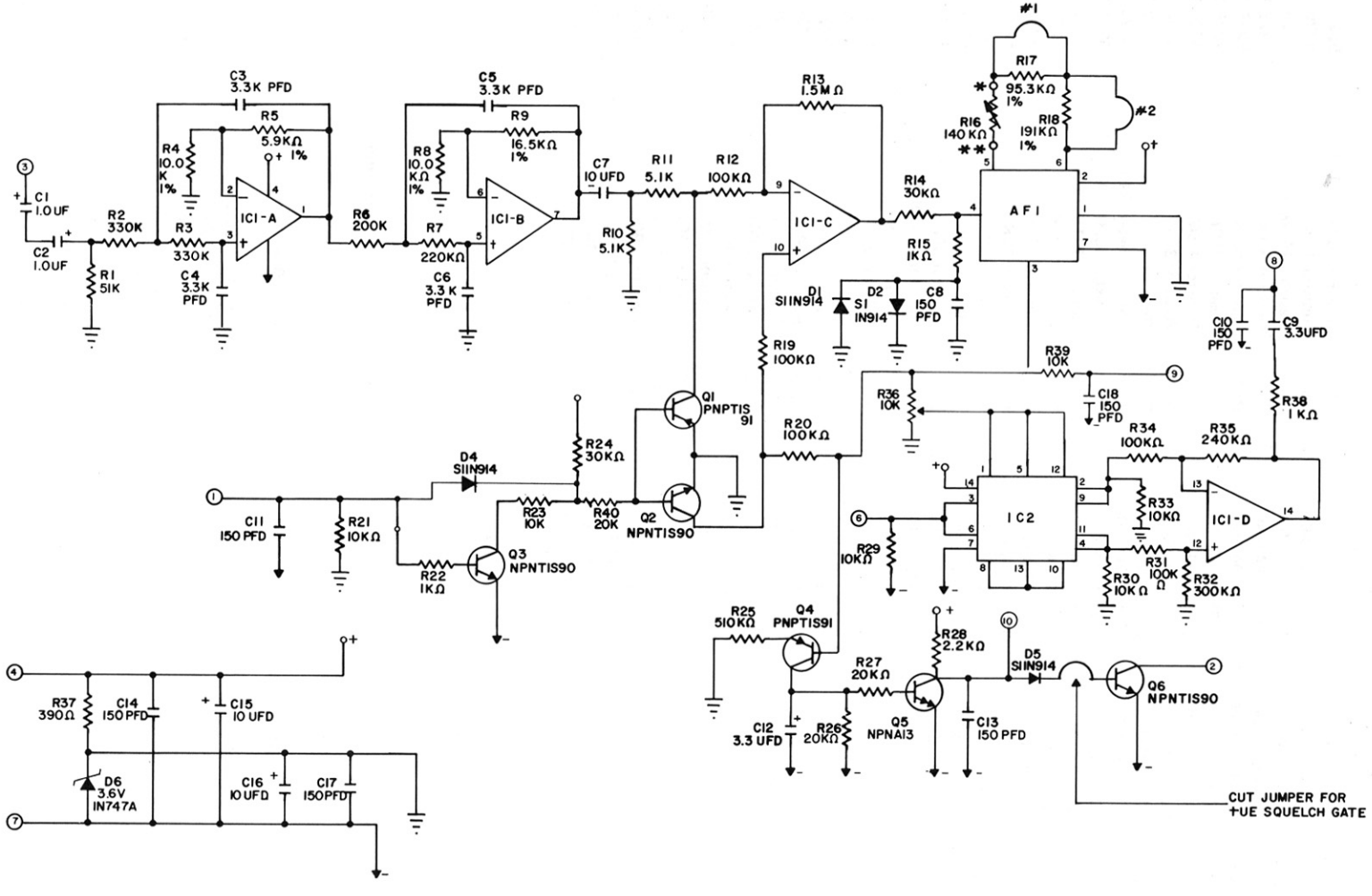
NOTE: *Jumper number 3 must be cut when using the 1194 in an Aerocom unit.*



NOTE(S).

1. ADD D4 (7.5V ZENER) IN PLACE OF WIRE JUMPER FOR +UE HOOK SWITCH MODE ONLY.

1194 TONE SQUELCH 5225-1194-010



**,* CONNECTIONS USED WITH 1197.

1194 TONE SQUELCH

PARTS LIST
1194 UNICALL
To order complete assembly, use part number
5225-1194-010

Item	Description	Part No.
AF1	Active Filter M1110-1	5225-1194-801
C-1	Capacitor, 1.0 ufd, TANT	5225-1194-802
C2	Capacitor, 1.0 ufd, TANT	5225-1194-803
C3	Capacitor, 3.3k pfd, CK05	5225-1194-804
C4	Capacitor, 3.3k pfd, CK05	5225-1194-805
C5	Capacitor, 3.3k pfd, CK05	5225-1194-806
C6	Capacitor, 3.3k pfd, CK05	5225-1194-807
C7	Capacitor, 10 ufd TANT	5225-1194-808
C8	Capacitor, 150 pfd CER	5225-1194-809
C9	Capacitor, 3.3 ufd TANT	5225-1194-810
C10	Capacitor, 150 pfd CER	5225-1194-811
C11	Capacitor, 150 pfd CER	5225-1194-812
C12	Capacitor, 3.3 ufd TANT	5225-1194-813
C13	Capacitor, 150 pfd CER	5225-1194-814
C14	Capacitor, 150 pfd CER	5225-1194-815
C15	Capacitor, 10 ufd TANT	5225-1194-816
C16	Capacitor, 10 ufd TANT	5225-1194-817
C17	Capacitor, 150 pfd CER	5225-1194-818
C18	Capacitor, 150 pfd CER	5225-1194-819
D1	Diode IN914	5225-1194-820
D2	Diode IN914	5225-1194-821
D4	Diode, zener 7.5v, IN755	5225-1194-822
D5	Diode IN914	5225-1194-823
D6	Diode, zener, 3.6v, IN747A	5225-1194-824
IC1	Quad OP AMP LM324N	5225-1194-825
IC2	Integrated circuit CD4007AE	5225-1194-826
R1	Resistor 51K, I10%	5225-1194-827
R2	Resistor 330K, I10%	5225-1194-828
R3	Resistor 330K ±10%	5225-1194-829
R4	Resistor 10K 1%	5225-1194-830
R5	Resistor 5.9K 1%	5225-1194-831
R6	Resistor 200K, 10%	5225-1194-832
R7	Resistor 200K, ±10%	5225-1194-833
R8	Resistor 10K 1%	5225-1194-834
R9	Resistor 16.5K 1%	5225-1194-835
R10	Resistor 5.1K	5225-1194-836
R11	Resistor 5.1K	5225-1194-837
R12	Resistor 100K	5225-1194-838
R13	Resistor 1.5M	5225-1194-839
R14	Resistor 30K	5225-1194-840
R15	Resistor 1K	5225-1194-841
R16	Potentiometer, 140K	5225-1194-842
R17	Resistor 95.3K 1%	5225-1194-843
R18	Resistor 191K 1%	5225-1194-844
R19	Resistor 100K	5225-1194-845
R20	Resistor 100K	5225-1194-846
R21	Resistor 10K	5225-1194-847
R22	Resistor 1K	5225-1194-848
R23	Resistor 10K	5225-1194-849
R24	Resistor 30K	5225-1194-850
R25	Resistor 510 OHM	5225-1194-851
R26	Resistor 20K	5225-1194-852
R27	Resistor 20K	5225-1194-853
R28	Resistor 2.2K	5225-1194-854
R29	Resistor 10K	5225-1194-855
R30	Resistor 10K	5225-1194-856
R31	Resistor 100K	5225-1194-857
R32	Resistor 300K	5225-1194-858
R33	Resistor 10K	5225-1194-859
R34	Resistor 100K	5225-1194-860
R35	Resistor 240K	5225-1194-861
R36	Potentiometer 10K	5225-1194-862
R37	Resistor 390 OHM	5225-1194-863
R38	Resistor 1K	5225-1194-864
R39	Resistor 10K	5225-1194-865
R40	Resistor 20K	5225-1194-866

PARTS LIST
4 TONE ENCODE/DECODE UNICALL EXPANDER
To order complete assembly, use part number
1939-1197-101

Item	Description	Part No.
C101	Capacitor, 33 ufd ±20% 10V	1532-3308-025
C102 thru C109	Capacitor, .01 ufd 50V S.M. cer.	1526-1005-101
C110	Capacitor, .01 uf 16V ±20%	1502-1005-004
CR101 thru CR108	Diode	4803-0000-004
IC101	IC CD4066	4850-0000-015
IC102	IC 4019	4851-4019-001
Q101	Transistor, 2N5225	4811-0000-027
Q102	Transistor, 2N5226	4811-0000-028
R101 R102 thru R105 R1	Resistor, 33 ohm ±10% ¼w	4764-3302-001
	Resistor, 10K ±10% ¼w	4764-1005-001
R106	Resistor, 95.3K 1%	4774-9535-001
R107	Resistor, 191K 1%	4774-1916-001
R108	Pot, 200K 20 turn	4735-2006-001
R109	Resistor, 95.3K 1%	4774-9535-001
R110	Resistor, 191K 1%	4774-1916-001
R111	Pot, 200K 20 turn	4735-2006-001
R112	Resistor, 95.3K 1%	4774-9535-001
R113	Resistor, 191K 1%	4774-1916-001
R114	Pot, 200K 20 turn	4735-2006-001
R115	Resistor, 95.3K 1%	4774-9535-001
R116	Resistor, 191K 1%	4774-1916-001
R117	Pot, 200K 20 turn	4735-2006-001
R118 thru R121 R122 thru R124	Resistor, 10K ±10% ¼w	4764-1005-001
	Resistor, 2.2K ±10% ¼w	4764-2204-001
R125	Resistor, 4.7K ±10% ¼w	4764-4704-001
R126	Resistor, 2.2K ±10% ¼w	4764-2204-001
R127	Resistor, 10K ±10% ¼w	4764-1005-001

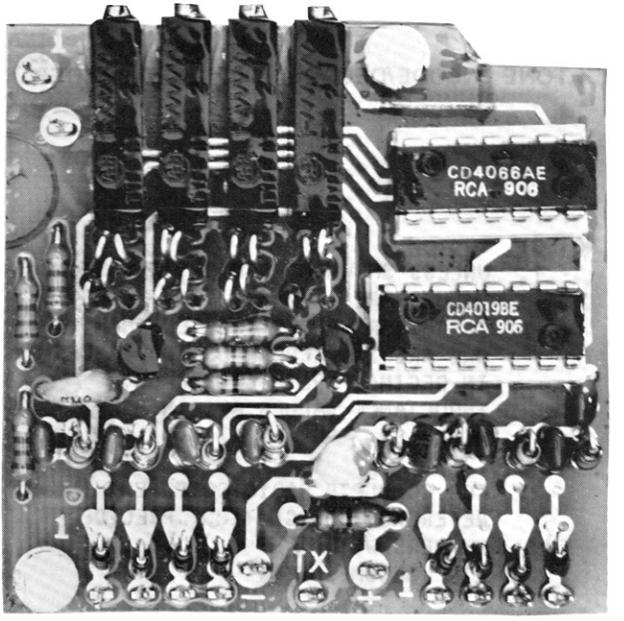
1197 4 TONE ENCODER/DECODER

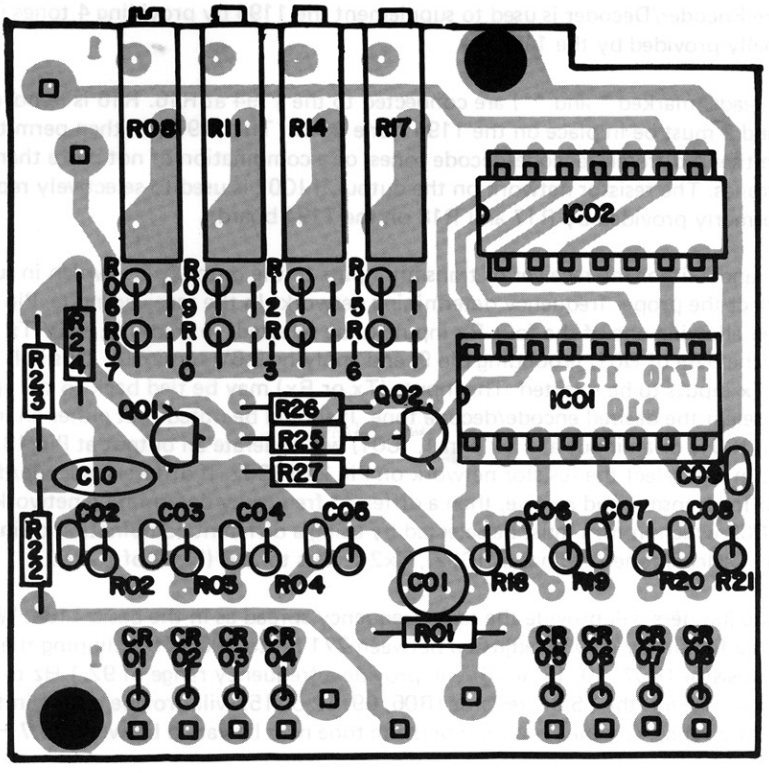
The 1197 4 Tone Encoder/Decoder is used to supplement the 1194 by providing 4 tones instead of the one normally provided by the 1194.

The two output leads (marked * and **) are connected to the 1194 at R16. R16 is removed, and and jumpers 1 and 2 must be in place on the 1194 tone board. The 1197 will then permit the 1194 to utilize either 4 different encode/decode tones, or a combination of not more than 4 encode/decode tones. The resistor network on the output if IC02 is used to selectively replace the resistance formerly provided by R17 and R18 on the 1194 board.

IC01 is used to "and" either the receiver or transmit inputs to the output pins, which in turn drive IC02 to select the proper frequency determining network. In the receiver mode, Pin 9 of IC01 will be High allowing one of the four Rx inputs to be selected. In transmit, 9.5V Tx will be applied to R22 (the base of Q01) grounding pin 9, and applying 9.5V to pin 14. This will allow one of the four Tx inputs to be selected. The inputs (Tx or Rx) may be tied back to the appropriate TCXO to select the desired encode/decode tone. It should be noted that either an input at Rec 1 (pin 15, IC01) or an input at Tx1 (Pin 1, IC01) will generate an output at Pin 13 of IC01 which in turn will select the resistor network on Pin 2 of IC02. If different encode/decode tones are desired for transmit and receive, then a different frequency determining network must be selected by IC02 which in turn must be selected by using a different combination of inputs to IC01, i.e. Rec 1 selects tone A (Pin 2 of IC02), Tx2 selects tone B (Pin 4 of IC02).

The cutting of the jumpers will provide the same frequency spread as in the basic 1194. With no jumpers cut the frequency may be adjusted between 271 Hz to 106.1 Hz. Clipping the jumper across the 191K resistor (R07, 10, 13 or 16) will provide a frequency range of 92.1 Hz to 72 Hz. Clipping the jumper around the 95.3K resistor (R06, 09, 12 or 15) will provide a tone in the 123.3 Hz to 84.3 Hz range. Clipping both jumpers the tone may be varied between 76.7 Hz and 64 Hz.





4 TONE ENCODE/DECODE UNICALL EXPANDER

NOTES:

1. UNLESS SHOWN OTHERWISE, RESISTOR VALUES ARE IN OHMS, ±10%, ¼WATT, 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 I , e.g. , R39 BECOMES R[illegible]

NOTES:
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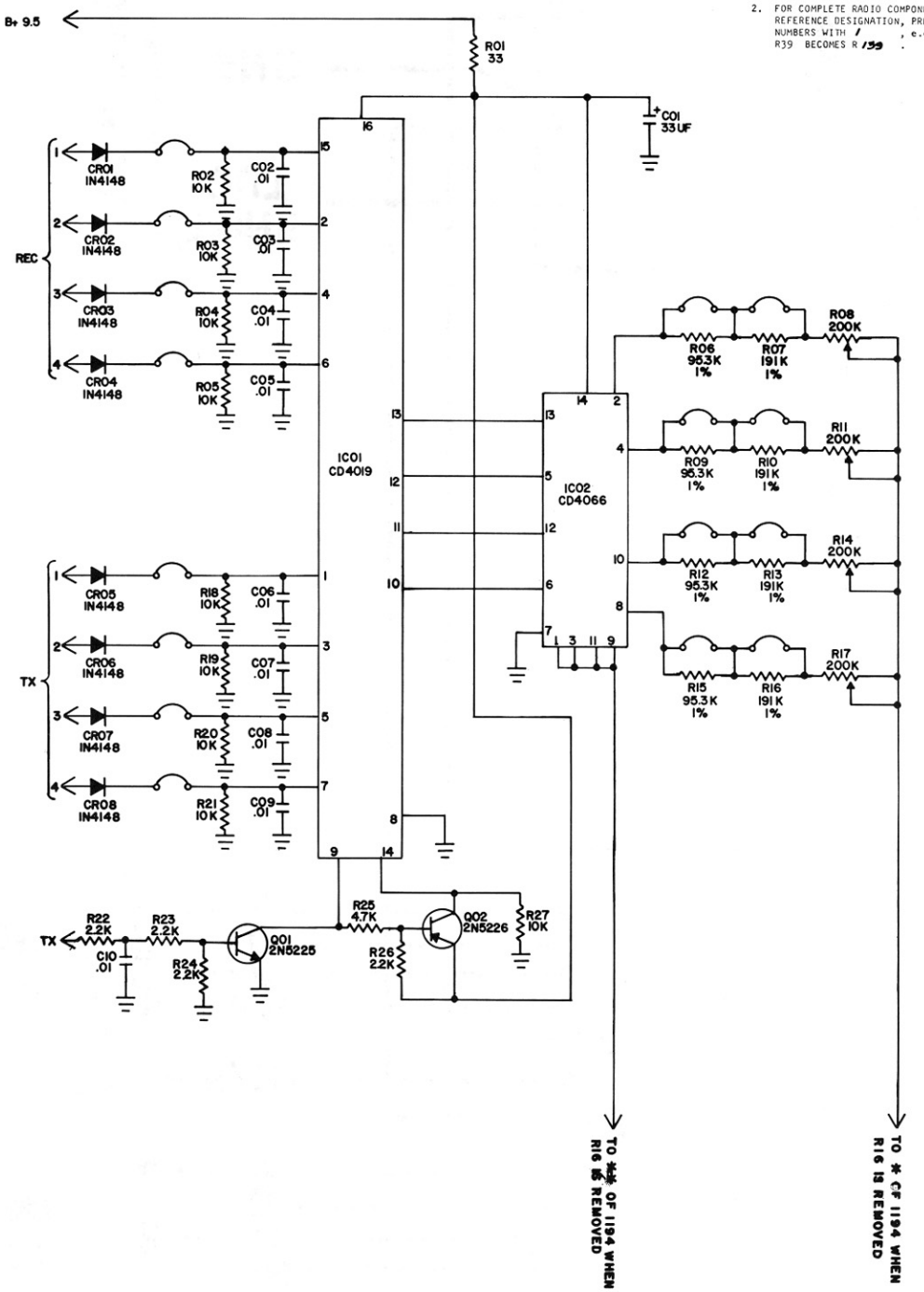
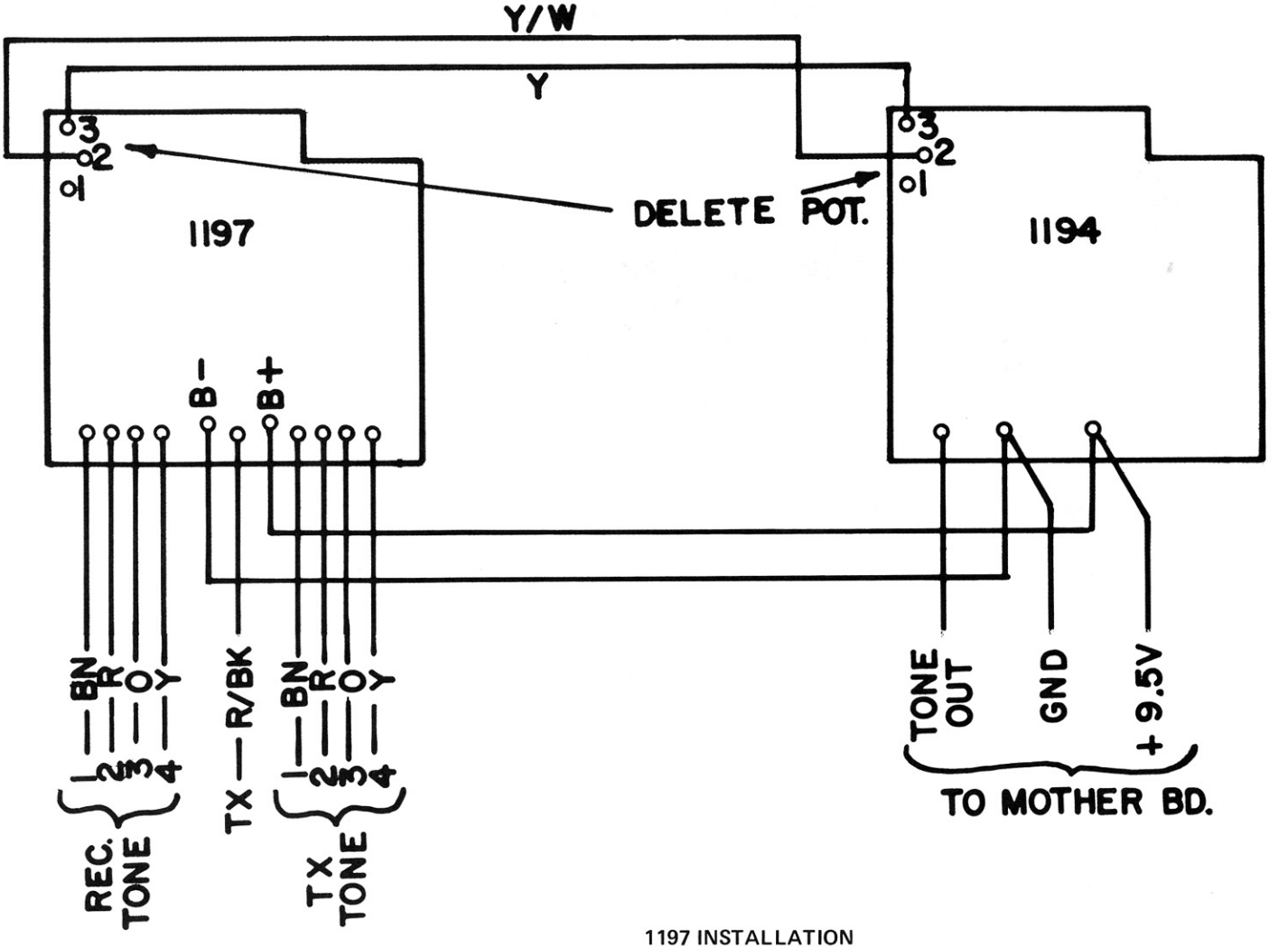
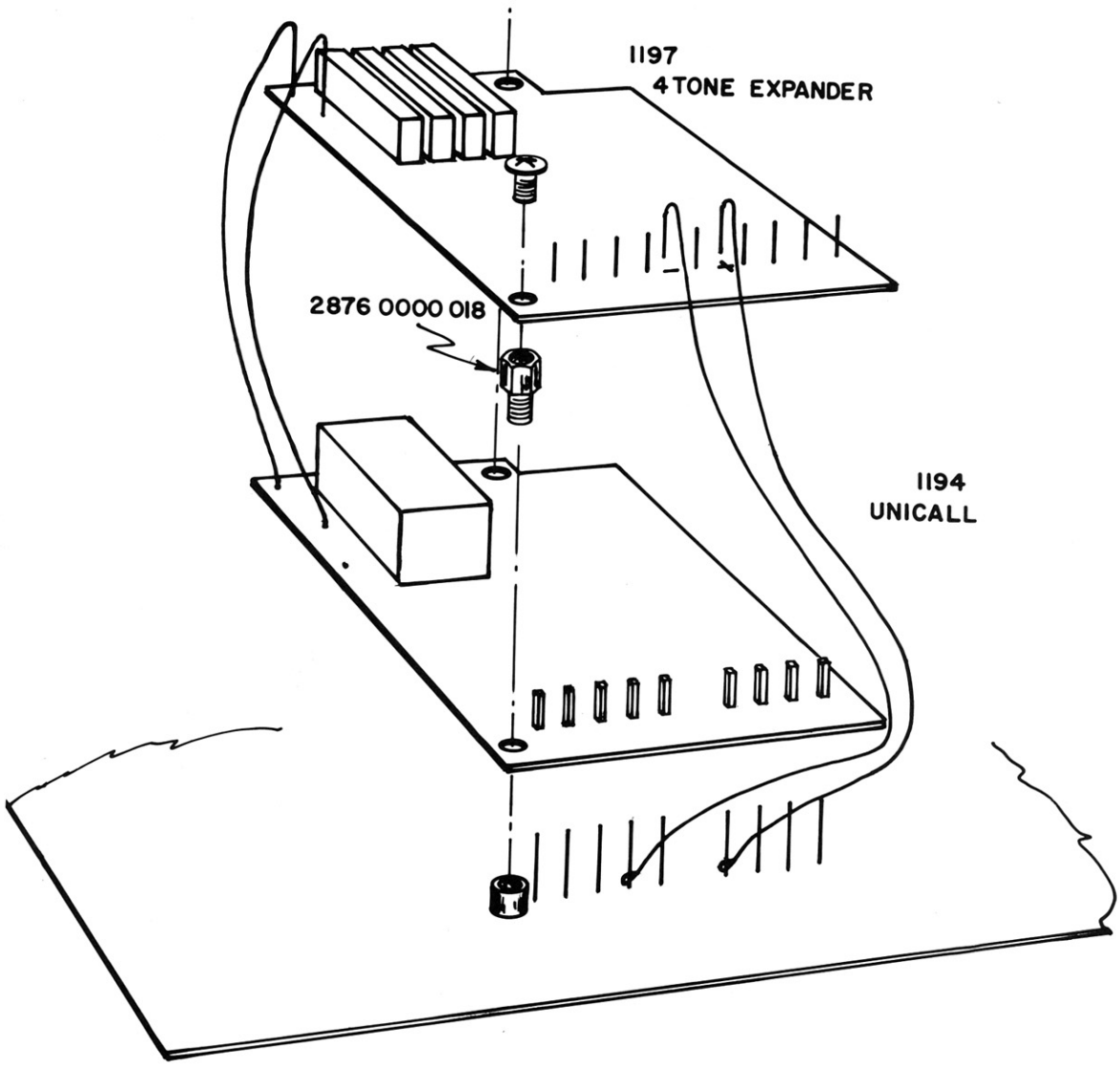




1197 INSTALLATION



1197 INSTALLATION

SERVICE BULLETIN

DATE: APRIL 19, 1979
SB - 04 - 03 - 79

APPLICABLE TO: 1114 DECODER/GATED ENCODER MODULE (5225-1114-010)

SUBJECT: AID TO SETTING TONE FREQUENCY

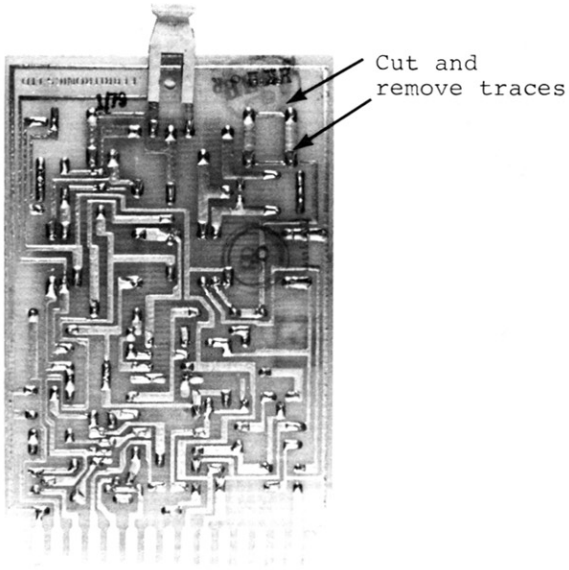
To facilitate setting the encode tone frequency of the 1114 tone module, the following modification should prove beneficial. (Refer to the attached pictorials and schematics for clarification).

(1) On the bottom of the 1114 module, cut and remove the foil traces connecting J2 and J3.

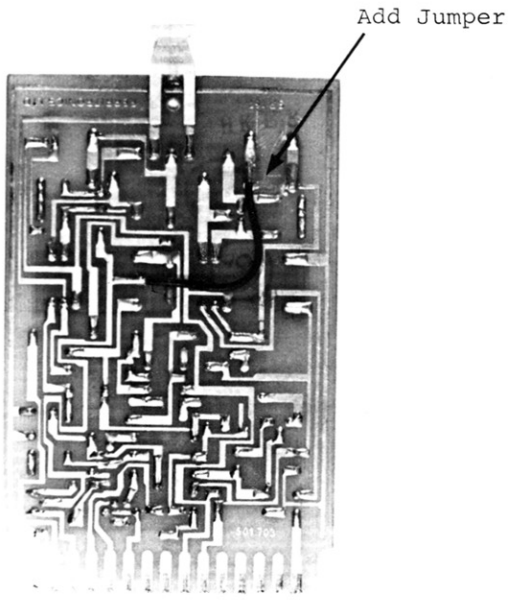
(2) Solder a jumper wire on the bottom of the module from J3 to the collector of Q4.

This will eliminate the requirement of having to attach a ground clip to the D1-R15 trace of the board in order to bring up the tone.

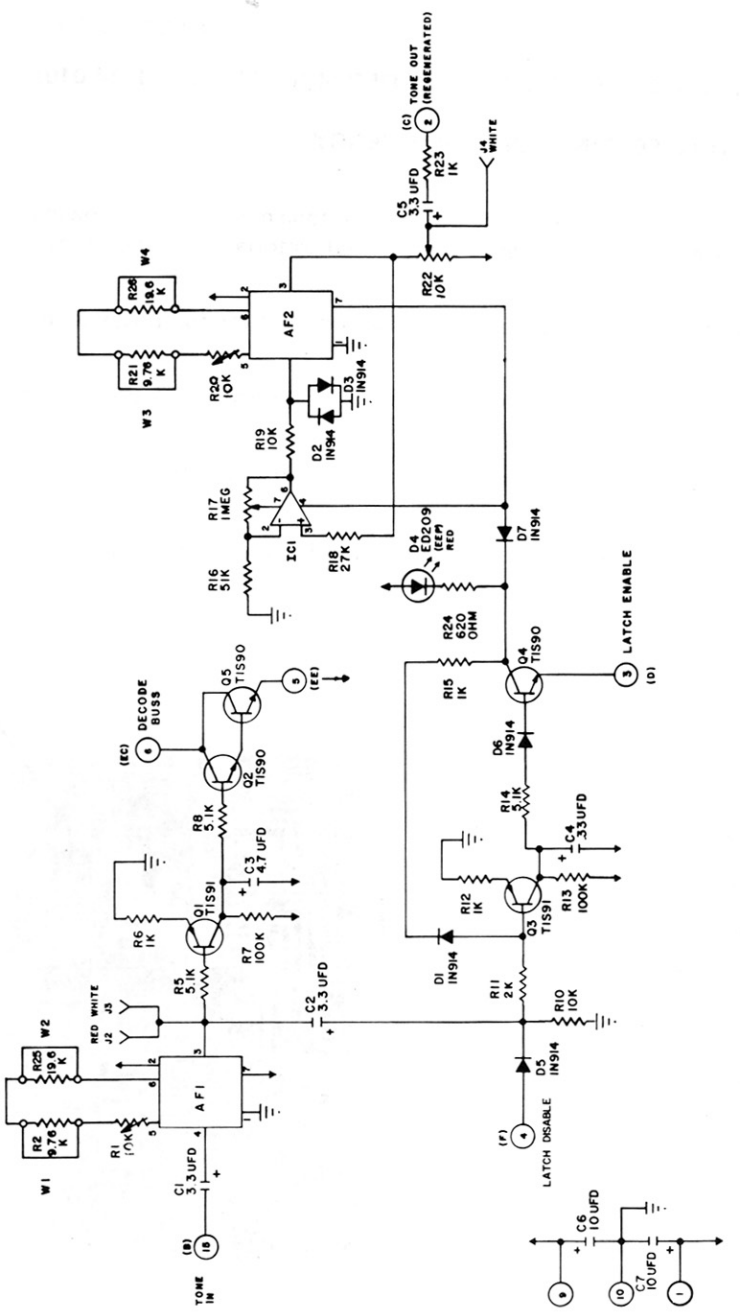
The collector of Q4 can now be grounded by merely plugging a lead into J3 and running it to ground.



BEFORE MODIFICATION

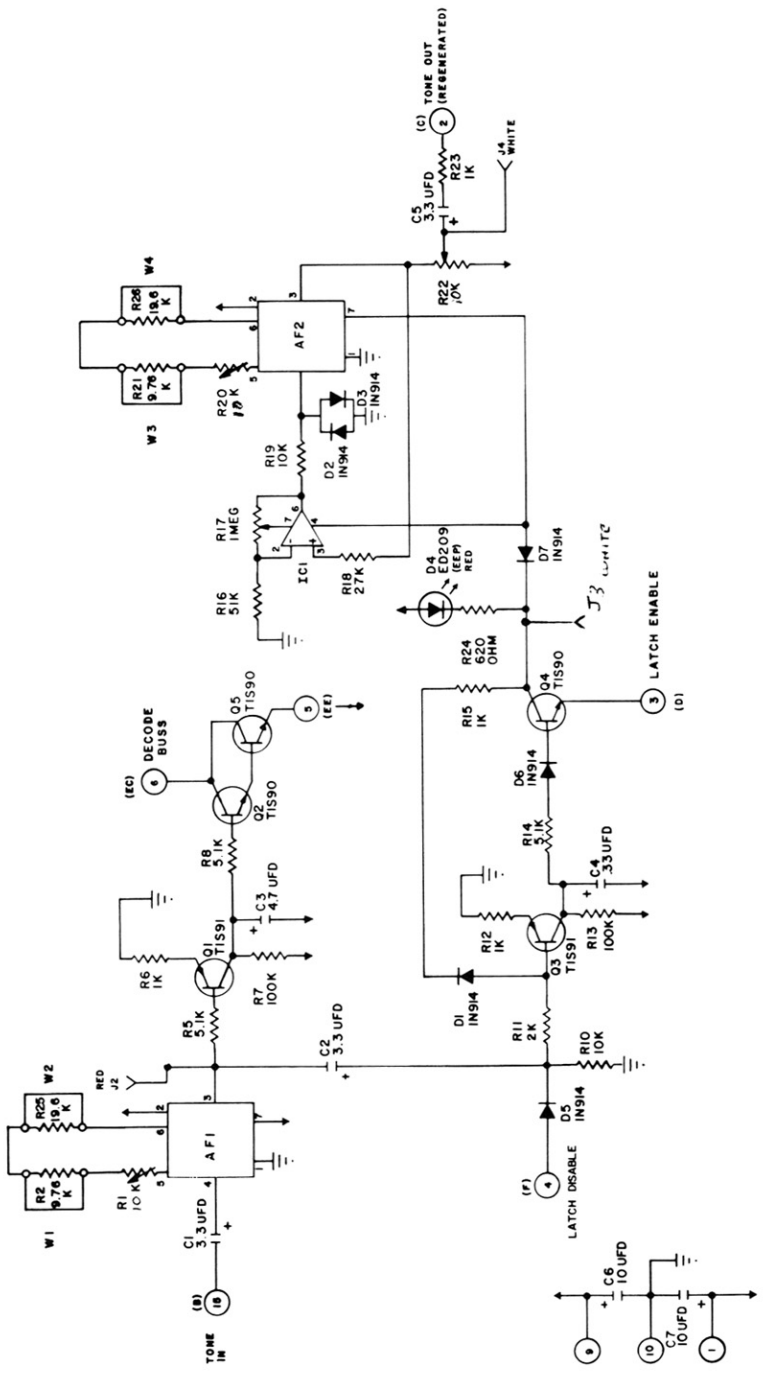


AFTER MODIFICATION



DECODER/GATED ENCODER SCHEMATIC

STANDARD



DECODER/GATED ENCODER SCHEMATIC
MODIFIED

SERVICE BULLETIN

DATE: MARCH 19, 1979
SB - 03 - 02 - 79
PAGE 1 OF 3

APPLICABLE TO: 1194 UNICALL (5225-1194-010)

SUBJECT: DECODE DELAY

Due to vendor design change of the 1194 UNICALL tone module, a portion of the artwork on the PC board has been found incorrect.

This condition results in increased delay time for the tone squelch module to operate below .6 KHz deviation.

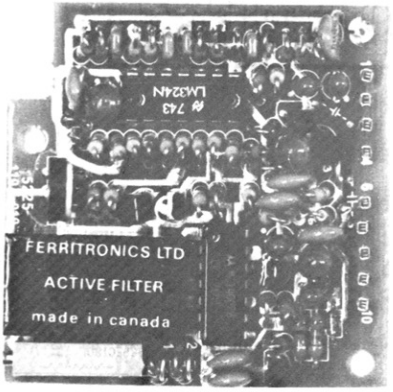
The remedy for this condition is as follows:

(1) Locate R_{10} and D_2 (see attached parts layout)

(2) Solder a insulated jumper from the top of R_{10} to the top of D_2.

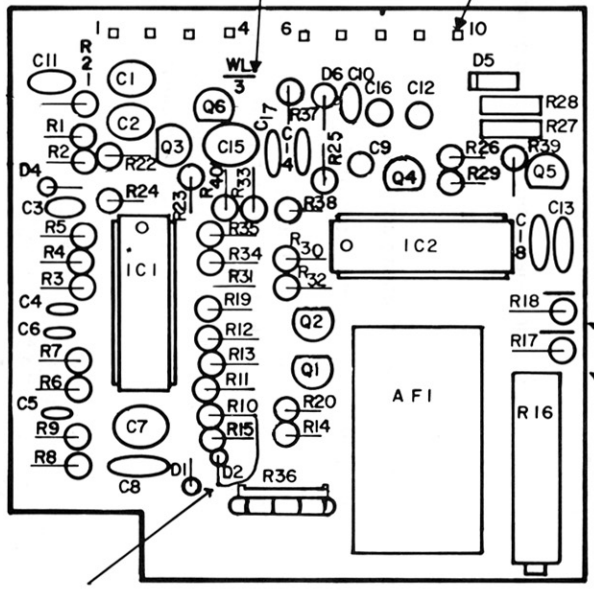
This places R_{10} into the output circuit of IC1-B instead of being "floating". This condition could possibly exist on all 1194 UNICALLs delivered from the factory after August 1, 1978.

With this change incorporated into the affected 1194 tone boards, a deviation setting of .5 to .75 KHz can be made with the 1194 tone squelch operating within the specified 250 MSEC.



CUT JUMPER FOR +UE SQ. GATE

ITEM 2 QTY. 9



NO JUMPERS CUT → 271hz - 106.1 hz

R18 CUT → 92.1 hz - 72 hz

R17 CUT → 123.3 hz - 84.3 hz

BOTH JUMPERS CUT → 76.7 - 64 hz

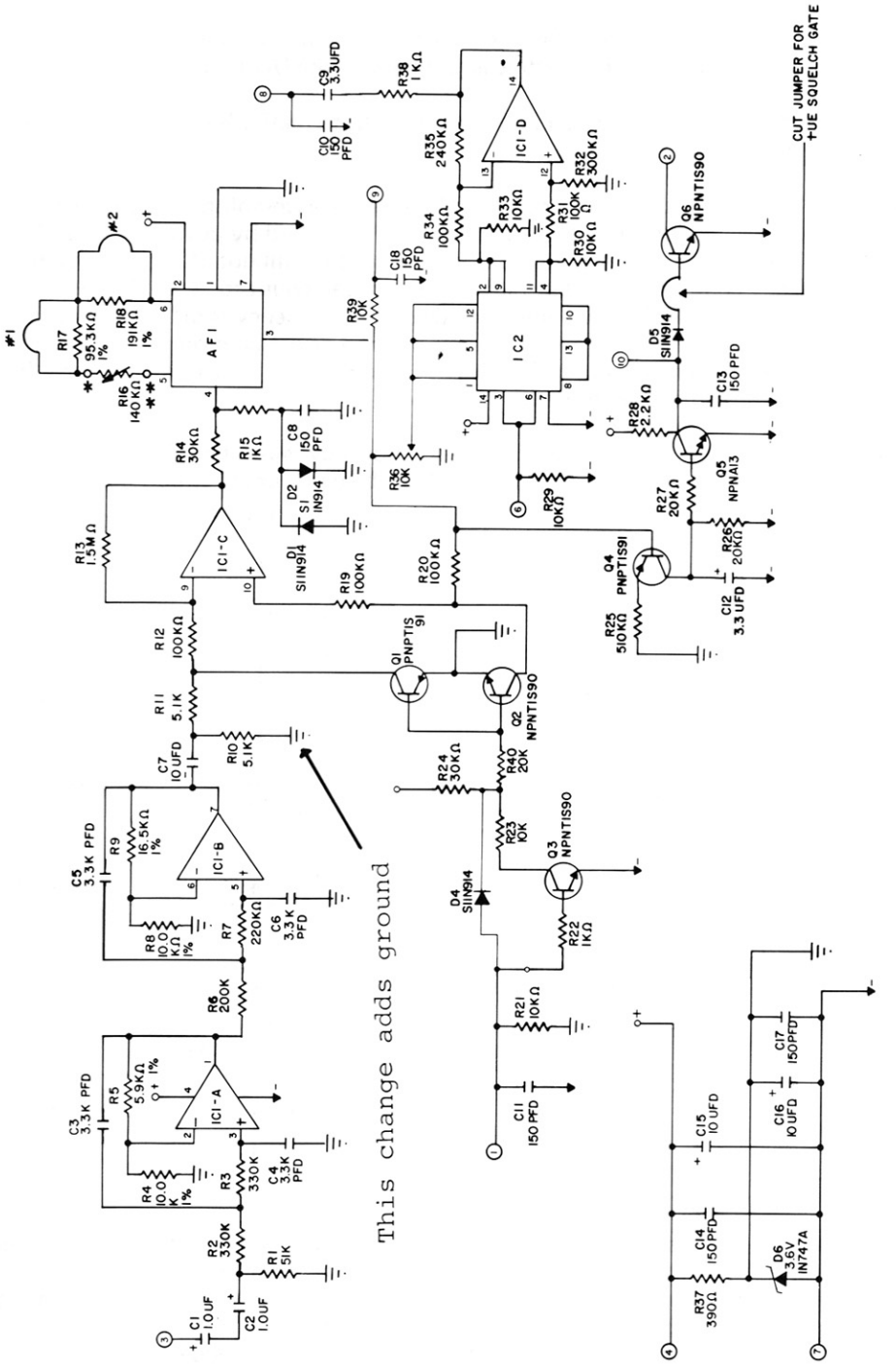
PIN DESIGNATIONS

1. (+) OR (-) HOOK SW.
2. (-) SQUELCH GATE
3. TONE IN
4. (+) 12V DC
5. NC
6. PHASE REVERSE
7. (-) GND (COMMON)
8. TONE OUT
9. LEVEL TEST
10. (+) SQUELCH GATE

Add jumper due to artwork mistake

NOTE(S).

1. ADD D4 (7.5V ZENER) IN PLACE OF WIRE JUMPER FOR +UE HOOK SWITCH MODE ONLY.


This change adds ground
CUT JUMPER FOR +UE SQUELCH GATE
**,* CONNECTIONS USED WITH 1197.

SERVICE BULLETIN

APPLICABLE TO: ALL 1189 AND 1194 UNICALLS

DATE: JUNE 1, 197[illegible]
SB - 06 - 03 - 78

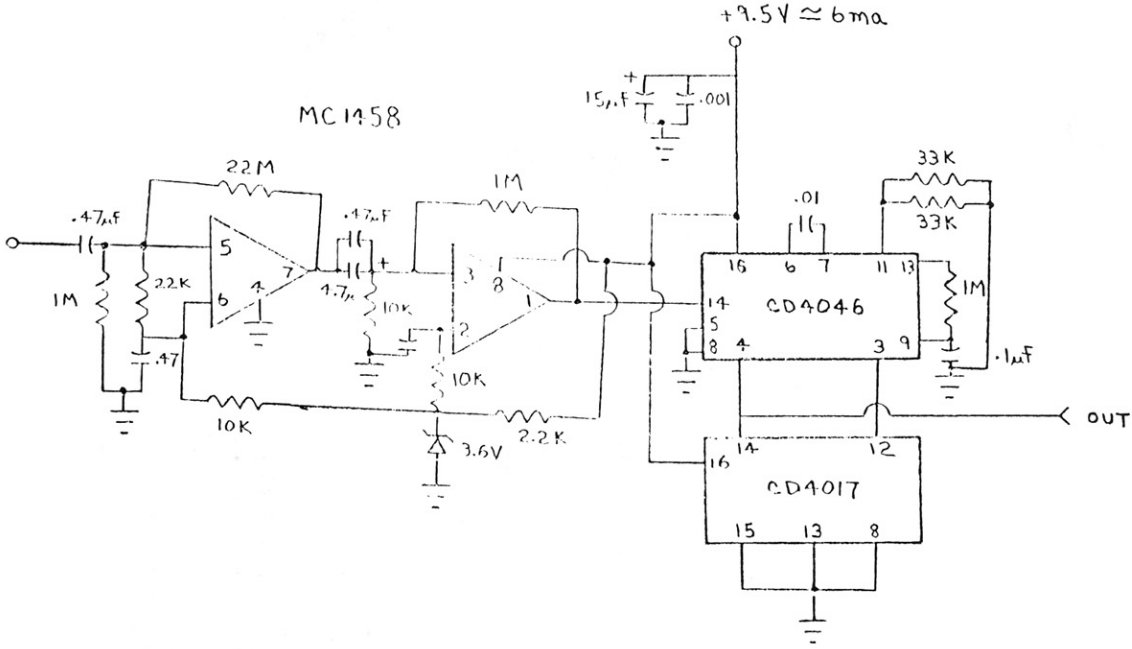
SUBJECT: HOW TO SET FREQUENCY OF UNICALLS

It has become apparent to the Product Service Department that many dealers do not understand how critical the frequency setting adjustment of the UNICALL is.

Two different methods will be described in this bulletin. Both methods will work and one is not necessarily better than the other.

METHOD ONE. The UNICALL can be counted. This can be accomplished in one of two ways. First, you can count the output directly off of the board by putting your probe on Pin 9. This is a constant output so the deviation control will not affect your readings. If your frequency counter has a 10 second count, you can count to .1 Hz. This is a must considering that the UNICALL will not work when the frequency is off by more than .2 Hz. If this method is not satisfactory, the output of a deviation monitor can be connected to the frequency counter. This way the radio has to be working properly for the sub-audible tone to be transmitted.

The following schematic is of an exact times ten frequency multiplier. This circuit is not critical when it comes to layout so vector board can be used for construction.



METHOD TWO. A synthesized audio generator should be connected to the horizontal input of a scope and the audio from a deviation monitor will be connected to the vertical input. When the transmitter is keyed, a pattern will appear. When the output of the tone module is the same as the output of the audio generator, a circular lissajous pattern is displayed. When the pattern stands still, the two frequencies are equal.