UHF LAND MOBILE RADIOTELEPHONE

IC-435

MAINTENANCE MANUAL

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SECTION 1 SPECIFICATIONS

GENERAL:

Frequency Coverage	:	One of the following segments 450MHz ~ 460MHz 460MHz ~ 470MHz
Operation	:	Simplex/Semi-duplex (Any separation programmable)
Antenna Impedance	:	50 Ohms unbalanced
Power Supply Requirements	:	DC 13.8V ±15% Negative Ground 9.0A Max.
Current Drain	:	Transmitting: Approx. 8.5A Receiving: At Max. Audio Approx. 0.7A Squelched Approx. 0.3A
Operating Temperature	:	−30°C to +55°C
Dimensions	:	50mm(H) x 170mm(W) x 260mm(D)
Net Weight	:	2.6Kg

TRANSMITTER:

Transmitting Frequency	:	2 Channels (12 channel version is available)
Channel Spread	:	6MHz maximum
Channel Spacing	:	5KHz spacing (12.5KHz spacing available)
Frequency Stability	:	±0.0005%
Emission Mode	:	$16F_3$ (F3E 16K0)
Output Power	:	35W
Max. Frequency Deviation	:	5KHz
Modulation System	:	Variable reactance frequency modulation
Spurious Emission	:	More than 70dB below carrier (Less than 2.5μW)
Microphone	:	Impedance: 600 Ohms Input level: 10mV typical Dynamic microphone

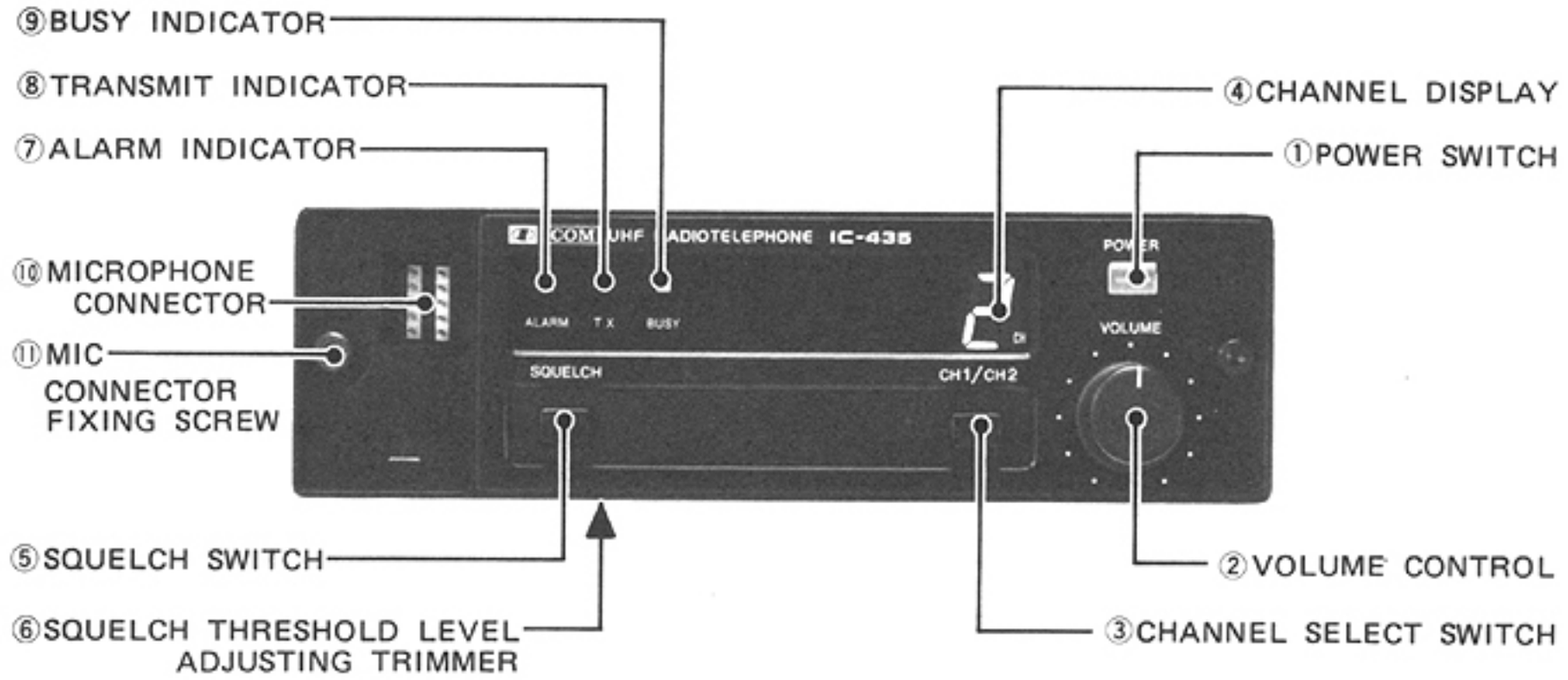
RECEIVER:

Receiving Frequency	:	2 Channels (12 channel version is available)
Channel Spread	:	2.5MHz maximum
Modulation Acceptance	:	$16F_3$ (F3E 16K0)
Receiving System	:	Double superheterodyne
Intermediate Frequency	:	First IF 21.4MHz Second IF 455KHz
Sensitivity	:	Less than 0.3μV for 12dB SINAD
Squelch Sensitivity	:	Less than 0.3μV
Spurious Response Rejection Ratio	:	More than 75dB
Adjacent Channel Rejection Ratio	:	More than 75dB
Intermodulation Rejection Ratio	:	More than 70dB
Selectivity	:	±6KHz at the −6dB point ±12.5KHz at the −70dB point
Squelch	:	Dual: Noise Compensated squelch Continuous Sub audible Tone squelch or 2805Hz Tone squelch option
Audio Output Power	:	More than 5 Watts with 4 ohm load at 10% distortion
Audio Output Impedance	:	4 ~ 8 Ohms

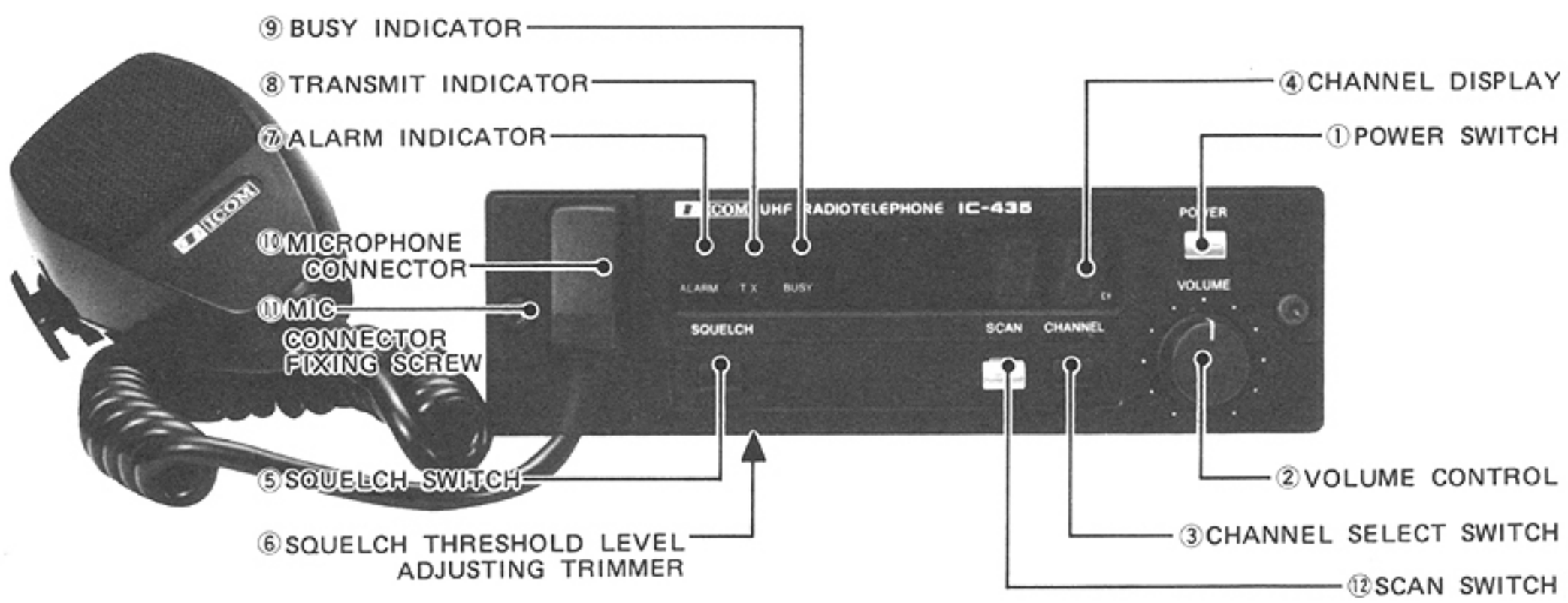
SECTION 2 OPERATING CONTROLS

FRONT PANEL

2 CHANNEL TYPE



12 CHANNEL TYPE



1. POWER SWITCH — Turns the power to the radio ON and OFF.

2. VOLUME CONTROL — Controls audio level of the radio. By turning it clockwise, the audio level will be increased.

3. CHANNEL SELECT SWITCH — Selects an operating channel. The selected channel number will be shown on the display.

4. CHANNEL DISPLAY — Displays the selected channel number with seven-segment LED(s).

During the next 30 seconds after an operating channel has been selected, the display will light brighter than usual.

5. SQUELCH SWITCH — When the busy indicator is not illuminated, by pushing this switch, the busy indicator will be illuminated, and audio muting which is caused by the squelch function and CTCSS or 2805Hz decoder function (if installed), will be released and it will allow to monitor on the operating channel.

6. SQUELCH THRESHOLD LEVEL ADJUSTING TRIMMER — The squelch threshold level can be adjusted by turning the adjusting trimmer located underneath of the switch (bottom side).

7. ALARM INDICATOR — Illuminates when a specified CTCSS tone signal or 2805Hz signal is received (when CTCSS unit or 2805 tone unit is installed), or the microphone is removed from the microphone hanger.

8. TRANSMIT INDICATOR — Illuminates when the radio is transmitting.

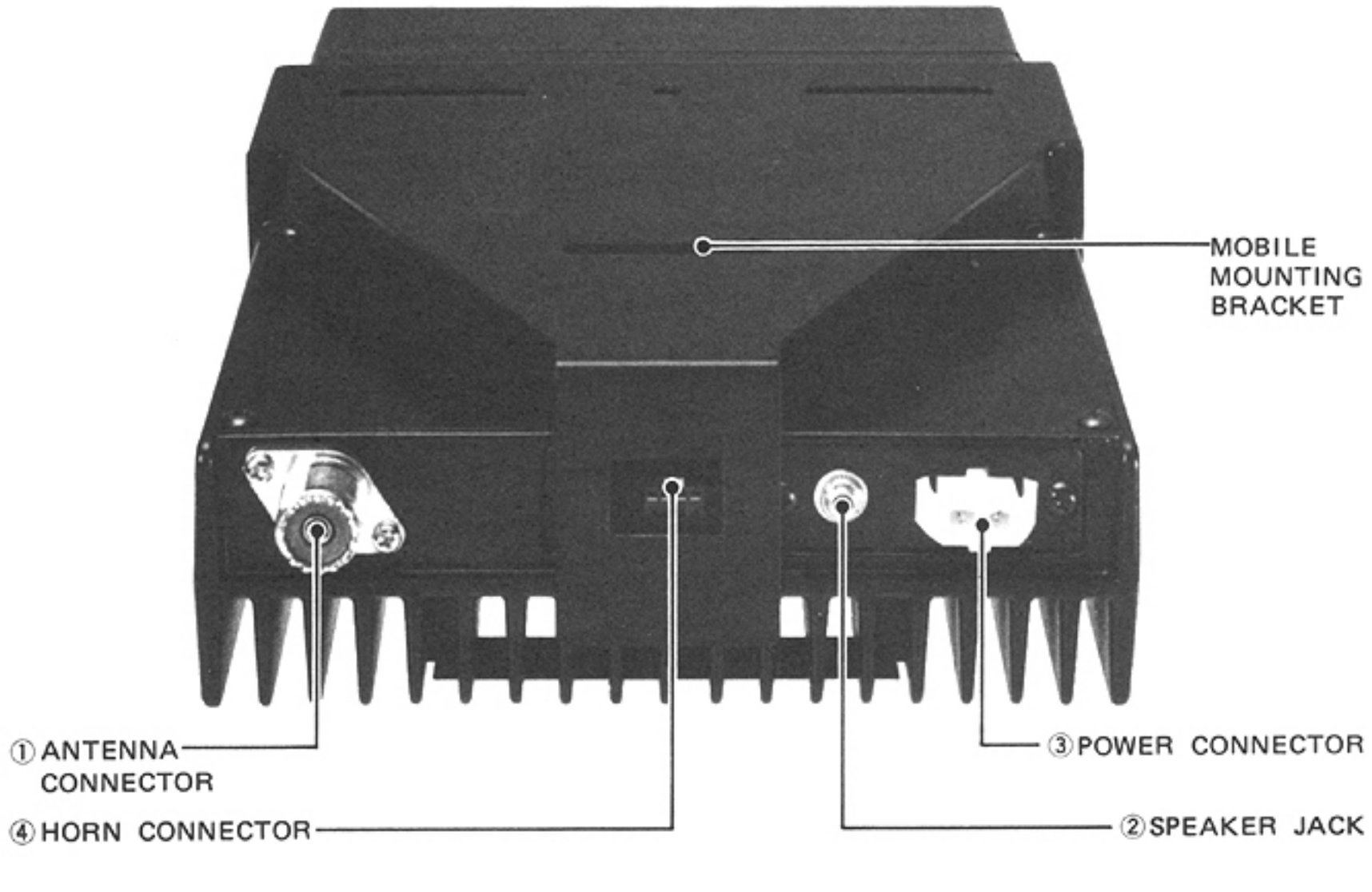
9. BUSY INDICATOR — Illuminates when the radio is receiving a signal. (This means that the channel is in use with another party when CTCSS or 2805 tone unit is installed.)

10. MICROPHONE CONNECTOR — Connects the supplied microphone.

11. MIC CONNECTOR FIXING SCREW — Fixes the microphone connector with the supplied screw. (This screw is screwed on the front panel.).

12. SCAN SWITCH (12 channel version only) — Starts and stops the scan function alternately. However, when the microphone is removed from the microphone hanger, the scan function does not actuate even if this switch has been depressed.

REAR PANEL



1. ANTENNA CONNECTOR — Connects the antenna to the set. Its impedance should be 50 ohms and connect it with a PL-259 connector.

2. SPEAKER JACK — Connects the supplied speaker, IC-SP5, or other suitable 4 ~ 8 ohm speaker.

3. POWER CONNECTOR — Connects the supplied power cord.

4. HORN CONNECTOR — Connects an external horn as an alarm. (Car horn can be used for this purpose.)

SECTION 3 CIRCUIT DESCRIPTION

3-1 RECEIVER CIRCUITS

1. PA UNIT

Signal from the antenna connector, J2, is fed to Low-Pass Filter consisting of C34 through C36, L5 and L6, antenna switching relay, RL1, then to the RF unit through P2.

2. RF UNIT

Signal input to J3 from the PA unit, is fed to the helical cavity band-pass filter consisting of L1, L2, C6 and C7, then RF amplifier, Q1. The amplified signal is fed to the other helical cavity filter consisting L3 through L5 and C8 through C10 which reduces interference and intermodulation from out of the band signals.

The filtered signal is then fed to the first gate of Q2, first mixer, and the first local oscillator signal from the PLL unit is fed to the second gate to obtain 21.4MHz first IF signal. This signal is fed to the MAIN unit through J1.

3. MAIN UNIT

The first IF signal from the RF unit is fed to the matched pair crystal filter, FI1, then IF amplifiers Q2 through Q4. The amplified signal is fed to pin 16 of IC1. IC1 is composed of the second local oscillator, second mixer, limiter amplifier, quadrature detector and active filter circuits.

The second local oscillator oscillates at 20.945MHz with X1, and is fed to the second mixer with the first IF signal to convert into 455KHz second IF signal. The second IF signal is put out from pin 3, and fed to external ceramic filter FI2 which has excellent selectivity, then fed to IC1 (pin 5) again to amplify and detect. The detected AF signal is put out from pin 9.

The detected AF signal is put 6dB/Octave de-emphasis by integral circuit consisting of R17 and C60, and fed to AF amplifier, a half of IC3. The amplified signal is fed to the low-pass filter, Q5 and high-pass filter, the other half of IC3 to filter out unnecessary component. Then the signal is fed to pin 5 of IC5 through P6 and C1 or optional CTCSS unit.

IC5 is an AF attenuator which is controlled by a DC voltage applied to pin 2. This DC voltage is fed from the volume control on the front panel, and adjusted by the control to get proper AF output. The controlled AF signal is then fed to AF power amplifier, IC6, and amplified to drive the speaker.

A part of the detected signal from pin 9 of IC1 is filtered about 20KHz noise component and amplified by a filter-amplifier in IC1. Then it is rectified by D2 and D3. The rectified signal is fed to squelch trigger in IC1, and a squelch control signal is put out from pin 14. This signal is fed to Q8 then Q7 and applied to pin 2 of IC5, AF attenuator to control AF output from the speaker.

3-2 TRANSMITTER CIRCUITS

1. MAIN UNIT

Audio signal from the microphone is amplified by a half of IC4 and differentiated by R46 and C43, then fed to the other half of IC4 which is a limiter amplifier and has 6dB/octave response between 300Hz and 3KHz. This output is fed to the splatter filter, IC7 to cut components above 3KHz, then fed to varactor diode in the PLL unit for modulation. R41 is a trimmer for waveform adjustment and R48 is for deviation adjustment.

2. PA UNIT

A transmit signal from the PLL unit is fed to IC1, power module, then Q1 to obtain 35 watts output. Q1 employs strip lines at input and output circuits. The amplified transmit signal is fed to the RF detection circuit consisting of L4, C19 through C24 and D1 through D4, then low-pass filter consisting of L5, L6 and C34 through C38, which reduces harmonic radiations, through the transmit/receive antenna switching relay, RL1, then the antenna connector.

The RF detection circuit stabilizes the output power, even when the power supply voltage or the antenna load is fluctuated. The variation of the output of Q1 is detected at D1 and D4 in the PA unit, the voltage is amplified by differential amplifier Q2 and Q3. The output voltage from Q2 and Q3 is fed to Q6 then Q7.

This lowers IC1's driver stage voltage and input excitation level to the power amplifier Q1, and reduces input power to the final stage, thus preventing damage to the module and PA transistor due to high current. The output power can be adjusted by R4.

Q4 and Q5 are controlled by R8V and drive the antenna switching relay, RL1.

3-3 PLL CIRCUITS

The PLL circuit employs a mixed down system. The VCO oscillates a half of the transmit frequency in the transmit mode, and a half of the first local oscillator frequency in the receive mode respectively.

1. LOCAL OSCILLATOR CIRCUIT

Q8 oscillates at 52.79375MHz with X2 in the receive mode, and 55.46875MHz with X3 in the transmit mode. This signal is multiplied 2 times by Q8 and Q9 respectively. Thus, 211.175MHz is obtained in the receive mode, and 221.875MHz in the transmit mode. Then this signal is fed to the mixer, Q6.

For 460MHz - 470MHz version, X2 is 54.04375MHz and X3 is 56.71875MHz. Thus, 216.175MHz is obtained in the receive mode, and 226.875MHz in the transmit mode.

2. MIXER, LOW-PASS FILTER, and AMPLIFIER CIRCUITS

The output signal from the local oscillator circuit and the VCO signal amplified by Q5 are mixed by the MOS FET mixer Q6. The output signal is fed to low-pass filter to filter out only the signal below 15MHz. The output signal from the filter is amplified to the proper drive level of the programmable divider IC1 by Q7. Then the signal is fed to pin 2 of IC1.

3. PROGRAMMABLE DIVIDER

The programmable divider IC1 is called a programmable counter (1/N counter) and BCD input equal N (frequency dividing ratio). The input signal at pin 2 of IC1 is divided by BCD input signals from the matrix circuit at pin 3 through pin 16.

4. REFERENCE FREQUENCY GENERATOR CIRCUIT

Reference frequency generator, IC3, consists of a crystal oscillator and a high speed divider. X1 oscillates at 2.56 MHz, which is divided by 1024 to get 2.5KHz reference frequency. This 2.5KHz reference frequency is fed to the phase detector, IC2.

This 2.5KHz reference frequency decides the variation step of the PLL output frequency and the divided number, N, decides the PLL output frequency.

PLL Output Freq. = Local Oscillator Freq. (MHz) + 0.0025MHz (Reference Freq.)
x N (Divide Number of Programmable Divider)

5. PHASE DETECTOR and LOOP FILTER CIRCUITS

Digital phase detector, IC2, detects the phase difference of the pulse signals of the 2.5KHz reference frequency and the output signal of the programmable divider, and proportionally puts out pulse signals at pin 3, which becomes high impedance when the PLL is locked.

Pin 4 is for detecting the lock failures and changes to ground level according to the phase difference of the two pulse signals. When the lock fails, the pulse signal from pin 4 is integrated by R48 and C81. When the integrated voltage exceeds the junction voltage of Q12's base, Q12 is turned ON, and a voltage is applied to the PTT switch line. Thus the radio keeps in the receive mode to prevent transmitting unwanted signals.

The loop filter, consisting of R1 through R4 and C1 through C4, converts the pulse signal from pin 3 into a DC voltage and decides the response time of the whole loop. The output signal is fed to the tuning diodes D1 and D2 of the VCO circuit as the control voltage for the VCO frequency set.

6. VCO CIRCUITS

There are 2 VCO's in the circuit. One is for transmit, and it consists of Q1, D1, L3, etc., and oscillates between 225MHz and 230MHz. The other is for receive, and it consists of Q2, D2, L4, etc., and oscillates between 214MHz and 219MHz.

In the transmit mode, T8V is applied to the source of Q2 through D4 to stop the oscillation of the VCO for receive.

In the receive mode, R8V is applied to the source of Q1 through D3 to stop the oscillation of the VCO for transmit.

The output of the VCO is amplified by Q3 and Q4. Then a part of the output is fed to the mixer in the loop and the other is fed to the low-pass filter FI1.

7. MULTIPLIER CIRCUITS

In the transmit mode, D5 is turned ON and the filtered signal is fed to the multiplier, Q14, and the frequency is doubled (between 450MHz and 460MHz). Then this signal is fed to the amplifiers, Q15 through Q17, to get 23dBm output.

In the receive mode, D6 is turned ON and the filtered signal is fed to the multiplier, Q10, to double the frequency (between 428MHz and 438MHz), then buffer amplifier, Q11. This signal is then fed to the mixer in the receiver circuit.

3-4 CONTROL CIRCUITS

1. 2-CHANNEL CONTROL UNIT

By pushing or releasing S1, the channel select switch, one of the Channel 1 and Channel 2 can be selected, and the selected channel number is displayed. At this time, the timer, IC1, is reset and its output turns Q1 ON during next 30 seconds. This shunts R14 and the channel display lights brighter than usual.

S2 is the squelch switch. When this switch is pushed in, audio muting which is caused by the squelch function and CTCSS or 2805Hz decoder function (if installed), will be released and it will allow to monitor on the operating channel.

2. 16-CHANNEL CONTROL UNIT

Each push of the channel select switch generates a pulse. This pulse is waveform-shaped by IC6, then fed to CLOCK terminal of IC1, up/down counter. This counter counts each pulse and output the number with BCD code. This BCD signals are fed to hexadecimal to 7-segment decoder-driver, IC2, and two 2-input AND gates, IC5. IC2 drives lower digit display, and IC5 decodes upper digit and control Q1. Q1 drives upper digit display. The number of usable channels can be selected by the control sub unit.

Dimmer circuit is provided in this unit. When switching the channel select switch or scan switch, or th scan stops on a signal, hooking-off to channel 1 during scan operation, the timer, IC3 is reset and turns Q2 ON during 30 seconds. This shunts R4 and display lights brighter than usual.

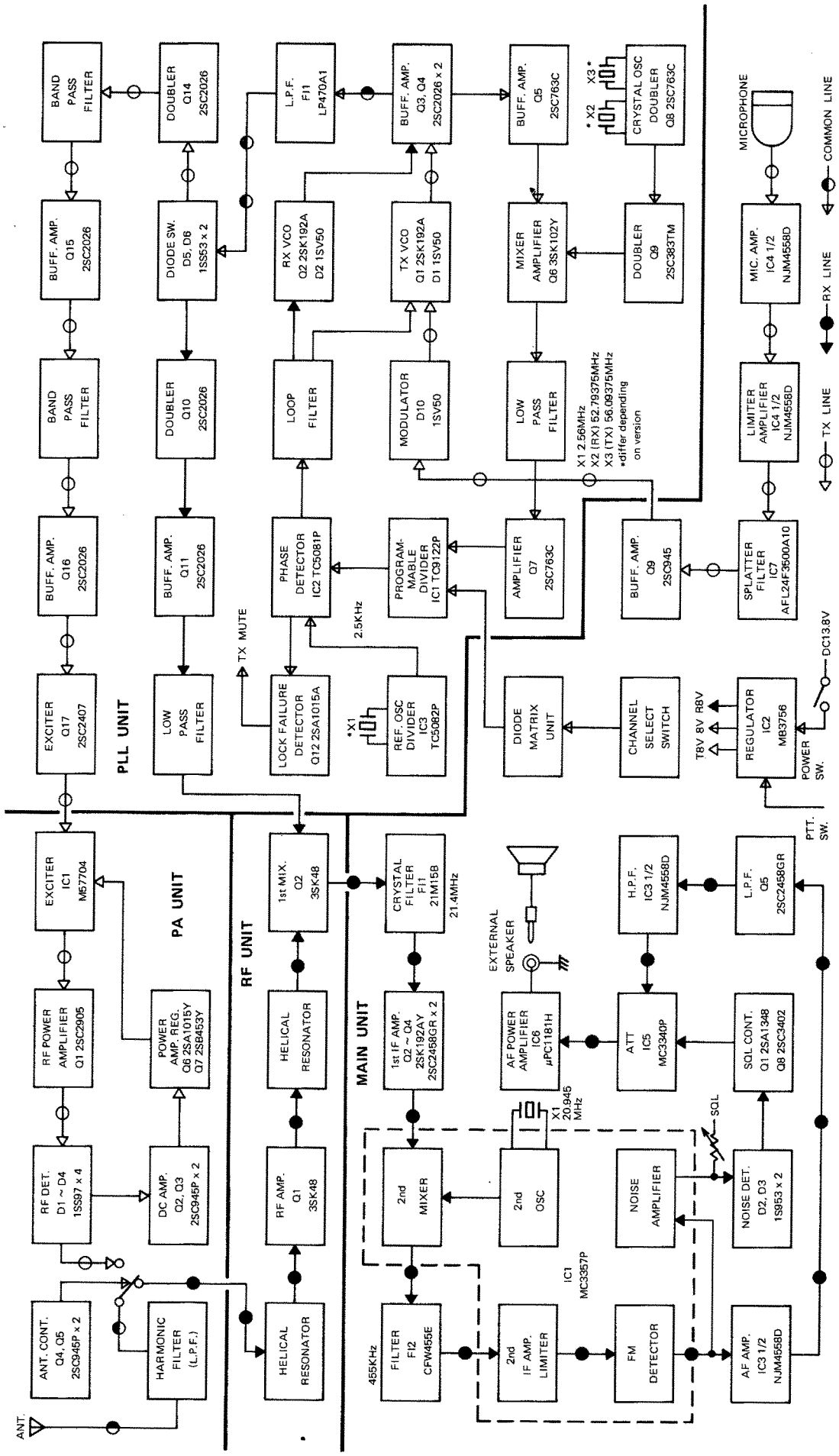
By pushing the scan switch, a pulse is fed to the CP terminal of IC4, and Q terminal is turned its state and switches the oscillator consisting of IC5 and IC6. The output of the oscillator is fed to CLOCK terminal of IC1 and it counts pulses from the oscillator. This provides scan function.

When a signal is received on a channel, pin 1 of IC6, inverter, becomes low level and Q4 is turned ON. Q4 shunts pin 2 of IC5, 2-input gate, through R31 and D9 to ground. This stops the oscillation of the oscillator and stops scan function. C18 and R30 decides the scan-stop interval. When the scan-stop interval has been passed, pin 2 of IC5 becomes high level and the scan function is resumed. When the incoming signal is disappeared, Q4 is turned OFF and the scan will restart. During the radio is in the scan mode, the decimal point of the display will be blinked.

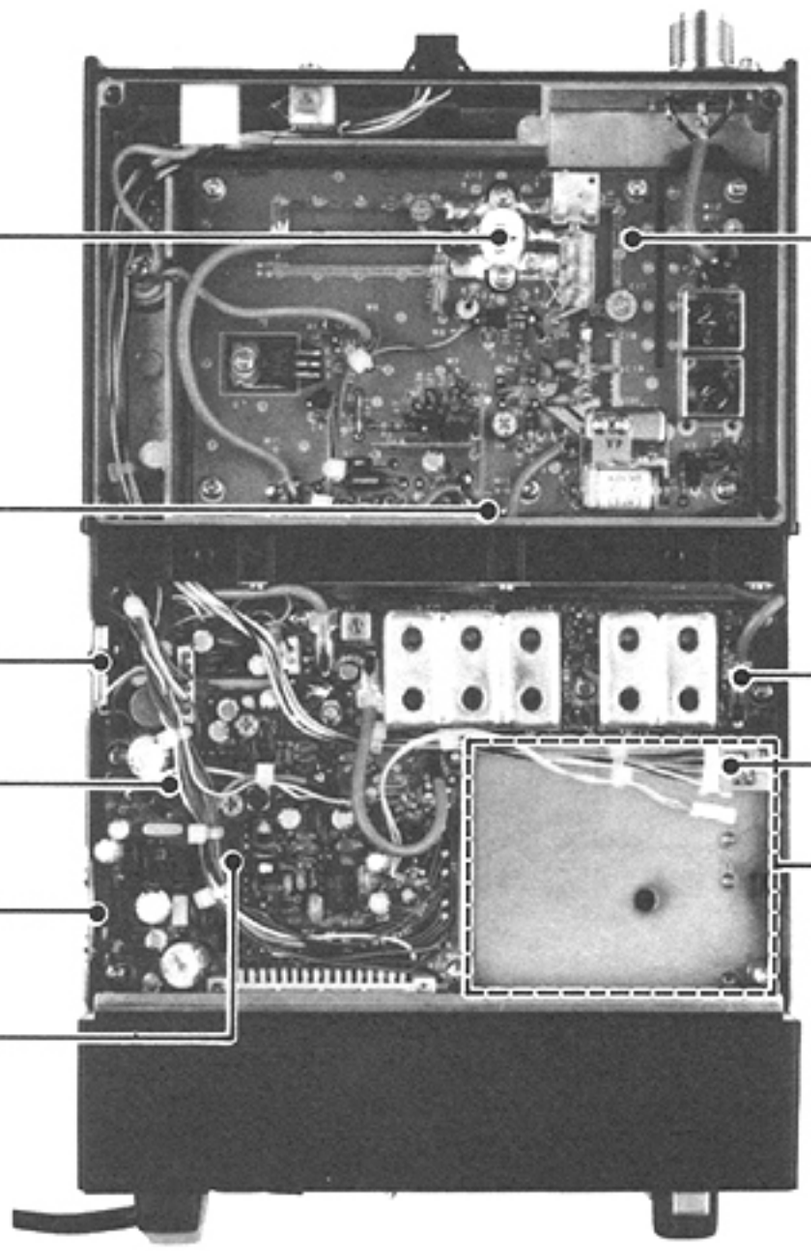
3. CONTROL SUB UNIT

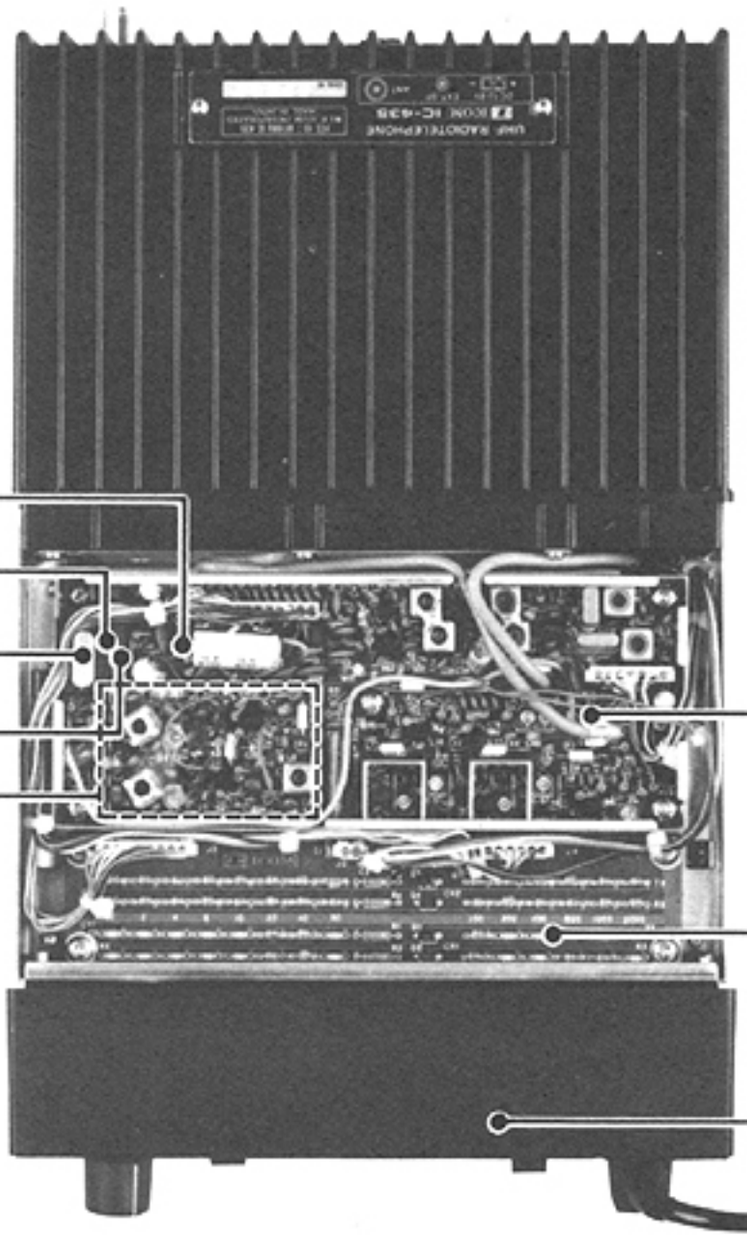
IC1 on the control sub unit is a BCD to decimal decoder and by changing its wiring, number of usable channels can be preset. When the counter, IC1 of the 16-channel control unit, counts a number more than the preset number, IC1 of the sub unit sends a pulse to pin 1 of IC1 of the control unit, and the counter return to "1" and the operating channel is returned to the channel 1.

SECTION 4 BLOCK DIAGRAM



SECTION 5 INSIDE VIEWS





SECTION 6 FREQUENCY PROGRAMMING

The transceiver has 2 (or 12) channels, both transmit and receive. The channel select switch selects one transmit and one receive channel in each.

The amount of frequency spread between any two receiving frequencies should not exceed 2.5MHz, and any two transmitting frequencies should not exceed 6MHz. Since the receiver and transmitter are independent of each other, you may have any practical amount of frequency separation you wish here. Only two or more widely spaced frequencies for the receiver alone or for the transmitter alone need be considered under the 2.5MHz or 6MHz limitation.

Desired operating frequency can be programmed by mounting certain diode(s) on the MATRIX board.

1. Calculate the "N" number of the desired operating frequency, using the programming fomula for each version shown below. ("N" is divided number of the programmable divider in the Phase Locked Loop, and is determined by the BCD code.)

   For 450MHz ~ 460MHz version:

   $$\text{Transmit;}\quad N = \frac{\text{Desired Frequency (MHz)} / 2 - 221.875}{0.0025^*}$$

   $$\text{Receive;}\quad N = \frac{(\text{Desired Frequency (MHz)} - 21.4) / 2 - 211.175}{0.0025^*}$$

   For 460MHz ~ 470MHz version:

   $$\text{Transmit;}\quad N = \frac{\text{Desired Frequency (MHz)} / 2 - 226.875}{0.0025^*}$$

   $$\text{Receive;}\quad N = \frac{(\text{Desired Frequency (MHz)} - 21.4) / 2 - 216.175}{0.0025^*}$$

   * For 12.5KHz channel spacing version, use "0.00625" instead of "0.0025".

2. Convert each digit of the "N" number to BCD, using the conversion table shown below.

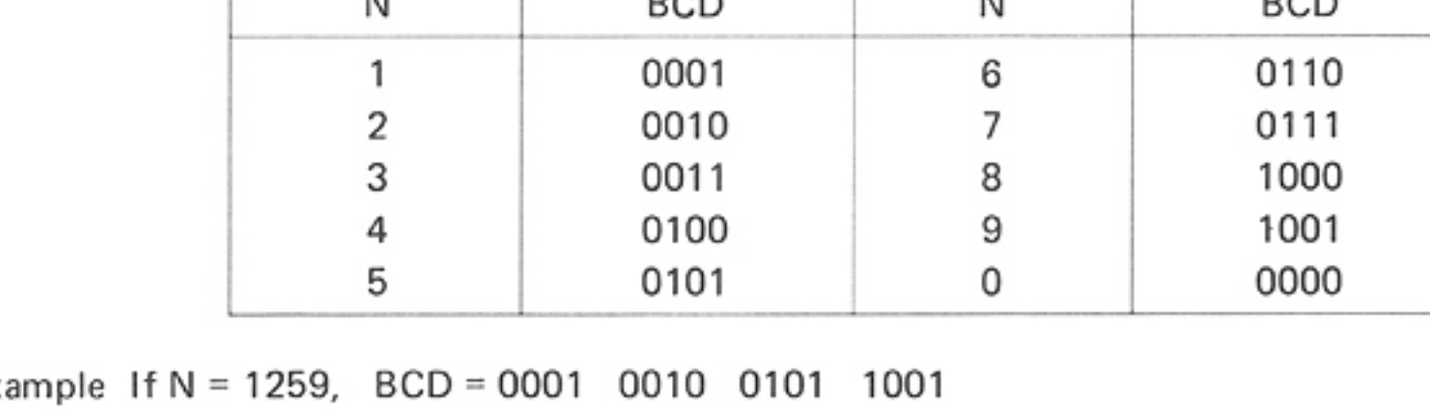
N	BCD	N	BCD
1	0001	6	0110
2	0010	7	0111
3	0011	8	1000
4	0100	9	1001
5	0101	0	0000

   For example If N = 1259, BCD = 0001 0010 0101 1001

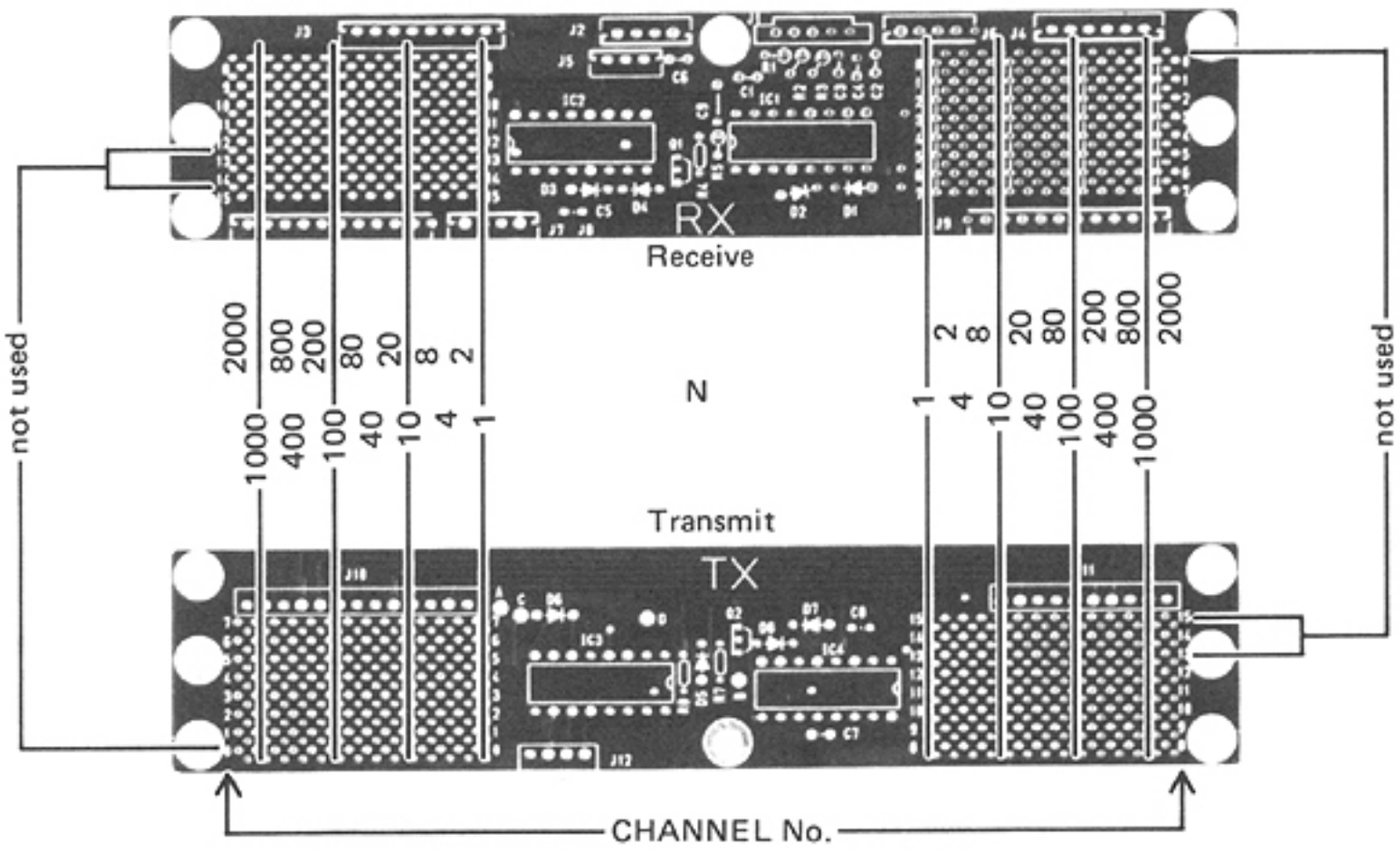
3. Mount diodes corresponding to the chosen channel, using the BCD number, when "1" = diode mounted, and "0" = diode not mounted (cut the lead of the mounted diode).

The first digit of the BCD corresponds to the first row (N = 1), where is on the MATRIX board, the second digit to the second row (N = 2), the third digit to the third row (N = 4), the forth digit to the forth row (N = 8) and so on.

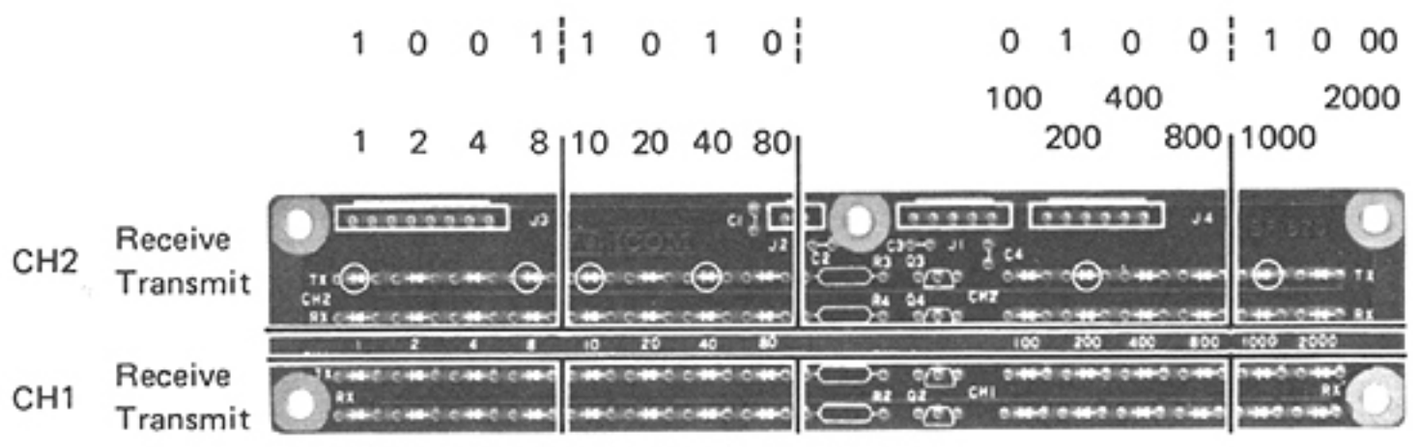
2 CHANNEL VERSION



12 CHANNEL VERSION



For example: When N = 1259, BCD = 0001 0010 0101 1001, so mount diodes as follows.



○ : Diode is mounted.
X : Diode is not mounted. (Cut the lead of the mounted diode.)

4. Complete programming for additional desired channel(s) in the same manner. The receive and transmit frequencies must be programmed individually, even if the both frequencies are the same.

n Numbers for IC-435 (450 ~ 460MHz)

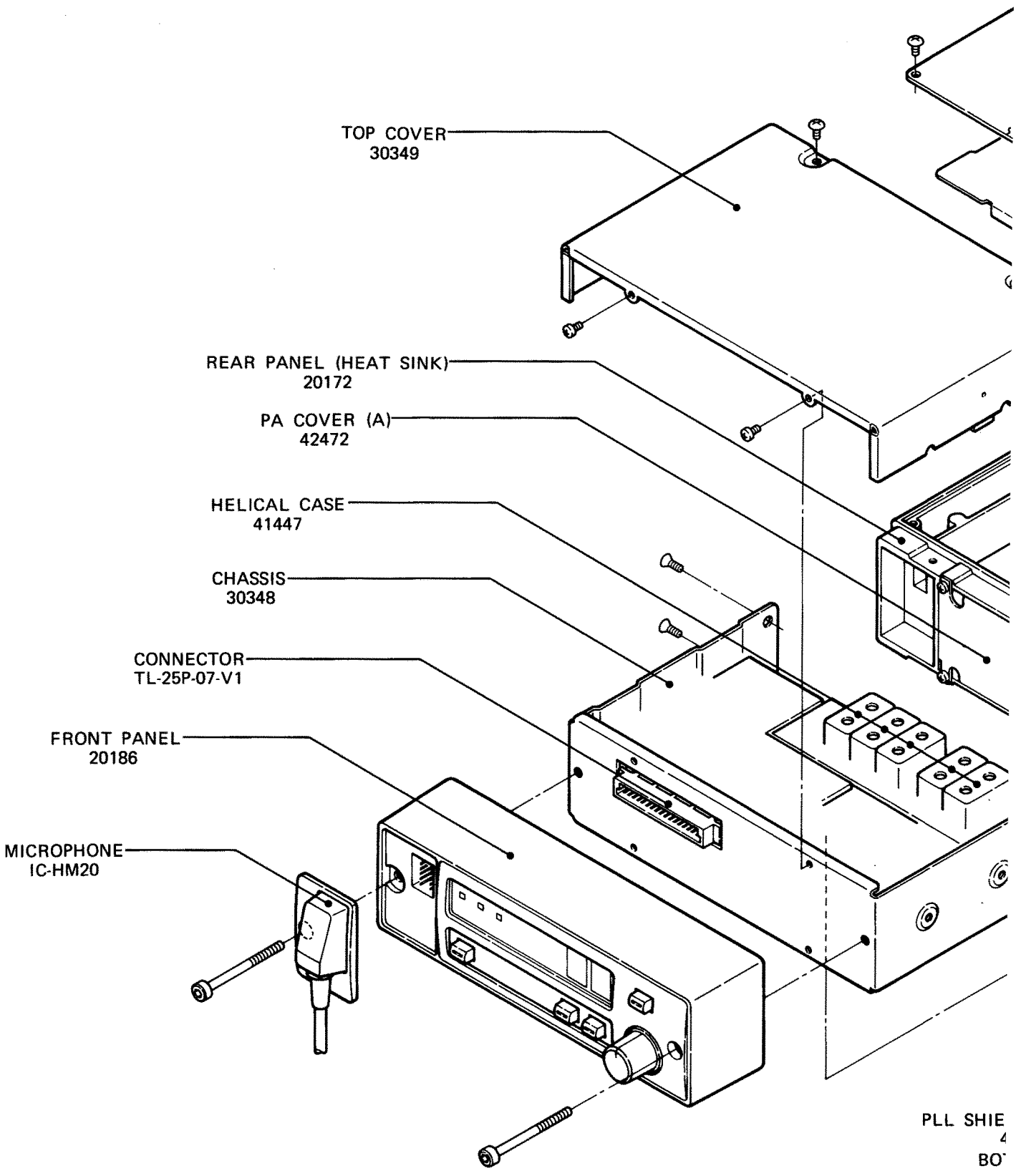
Frequency	n Number	Frequency	n Number	Frequency	n Number	Frequency	n Number
450.000	1250	450.025	1255	450.050	1260	450.075	1265
450.100	1270	450.125	1275	450.150	1280	450.175	1285
450.200	1290	450.225	1295	450.250	1300	450.275	1305
450.300	1310	450.325	1315	450.350	1320	450.375	1325
450.400	1330	450.425	1335	450.450	1340	450.475	1345
450.500	1350	450.525	1355	450.550	1360	450.575	1365
450.600	1370	450.625	1375	450.650	1380	450.675	1385
450.700	1390	450.725	1395	450.750	1400	450.775	1405
450.800	1410	450.825	1415	450.850	1420	450.875	1425
450.900	1430	450.925	1435	450.950	1440	450.975	1445
451.000	1450	451.025	1455	451.050	1460	451.075	1465
451.100	1470	451.125	1475	451.150	1480	451.175	1485
451.200	1490	451.225	1495	451.250	1500	451.275	1505
451.300	1510	451.325	1515	451.350	1520	451.375	1525
451.400	1530	451.425	1535	451.450	1540	451.475	1545
451.500	1550	451.525	1555	451.550	1560	451.575	1565
451.600	1570	451.625	1575	451.650	1580	451.675	1585
451.700	1590	451.725	1595	451.750	1600	451.775	1605
451.800	1610	451.825	1615	451.850	1620	451.875	1625
451.900	1630	451.925	1635	451.950	1640	451.975	1645
452.000	1650	452.025	1655	452.050	1660	452.075	1665
452.100	1670	452.125	1675	452.150	1680	452.175	1685
452.200	1690	452.225	1695	452.250	1700	452.275	1705
452.300	1710	452.325	1715	452.350	1720	452.375	1725
452.400	1730	452.425	1735	452.450	1740	452.475	1745
452.500	1750	452.525	1755	452.550	1760	452.575	1765
452.600	1770	452.625	1775	452.650	1780	452.675	1785
452.700	1790	452.725	1795	452.750	1800	452.775	1805
452.800	1810	452.825	1815	452.850	1820	452.875	1825
452.900	1830	452.925	1835	452.950	1840	452.975	1845
453.000	1850	453.025	1855	453.050	1860	453.075	1865
453.100	1870	453.125	1875	453.150	1880	453.175	1885
453.200	1890	453.225	1895	453.250	1900	453.275	1905
453.300	1910	453.325	1915	453.350	1920	453.375	1925
453.400	1930	453.425	1935	453.450	1940	453.475	1945
453.500	1950	453.525	1955	453.550	1960	453.575	1965
453.600	1970	453.625	1975	453.650	1980	453.675	1985
453.700	1990	453.725	1995	453.750	2000	453.775	2005
453.800	2010	453.825	2015	453.850	2020	453.875	2025
453.900	2030	453.925	2035	453.950	2040	453.975	2045
454.000	2050	454.025	2055	454.050	2060	454.075	2065
454.100	2070	454.125	2075	454.150	2080	454.175	2085
454.200	2090	454.225	2095	454.250	2100	454.275	2105
454.300	2110	454.325	2115	454.350	2120	454.375	2125
454.400	2130	454.425	2135	454.450	2140	454.475	2145
454.500	2150	454.525	2155	454.550	2160	454.575	2165
454.600	2170	454.625	2175	454.650	2180	454.675	2185
454.700	2190	454.725	2195	454.750	2200	454.775	2205
454.800	2210	454.825	2215	454.850	2220	454.875	2225
454.900	2230	454.925	2235	454.950	2240	454.975	2245
455.000	2250	455.025	2255	455.050	2260	455.075	2265
455.100	2270	455.125	2275	455.150	2280	455.175	2285
455.200	2290	455.225	2295	455.250	2300	455.275	2305
455.300	2310	455.325	2315	455.350	2320	455.375	2325
455.400	2330	455.425	2335	455.450	2340	455.475	2345
455.500	2350	455.525	2355	455.550	2360	455.575	2365
455.600	2370	455.625	2375	455.650	2380	455.675	2385
455.700	2390	455.725	2395	455.750	2400	455.775	2405
455.800	2410	455.825	2415	455.850	2420	455.875	2425
455.900	2430	455.925	2435	455.950	2440	455.975	2445
456.000	2450	456.025	2455	456.050	2460	456.075	2465
456.100	2470	456.125	2475	456.150	2480	456.175	2485
456.200	2490	456.225	2495	456.250	2500	456.275	2505
456.300	2510	456.325	2515	456.350	2520	456.375	2525
456.400	2530	456.425	2535	456.450	2540	456.475	2545
456.500	2550	456.525	2555	456.550	2560	456.575	2565
456.600	2570	456.625	2575	456.650	2580	456.675	2585
456.700	2590	456.725	2595	456.750	2600	456.775	2605
456.800	2610	456.825	2615	456.850	2620	456.875	2625
456.900	2630	456.925	2635	456.950	2640	456.975	2645
457.000	2650	457.025	2655	457.050	2660	457.075	2665
457.100	2670	457.125	2675	457.150	2680	457.175	2685
457.200	2690	457.225	2695	457.250	2700	457.275	2705
457.300	2710	457.325	2715	457.350	2720	457.375	2725
457.400	2730	457.425	2735	457.450	2740	457.475	2745
457.500	2750	457.525	2755	457.550	2760	457.575	2765
457.600	2770	457.625	2775	457.650	2780	457.675	2785
457.700	2790	457.725	2795	457.750	2800	457.775	2805
457.800	2810	457.825	2815	457.850	2820	457.875	2825
457.900	2830	457.925	2835	457.950	2840	457.975	2845
458.000	2850	458.025	2855	458.050	2860	458.075	2865
458.100	2870	458.125	2875	458.150	2880	458.175	2885
458.200	2890	458.225	2895	458.250	2900	458.275	2905
458.300	2910	459.325	2915	458.350	2920	459.375	2925
458.400	2930	458.425	2935	458.450	2940	458.475	2945
458.500	2950	458.525	2955	458.550	2960	458.575	2965
458.600	2970	458.625	2975	458.650	2980	458.675	2985
458.700	2990	458.725	2995	458.750	3000		

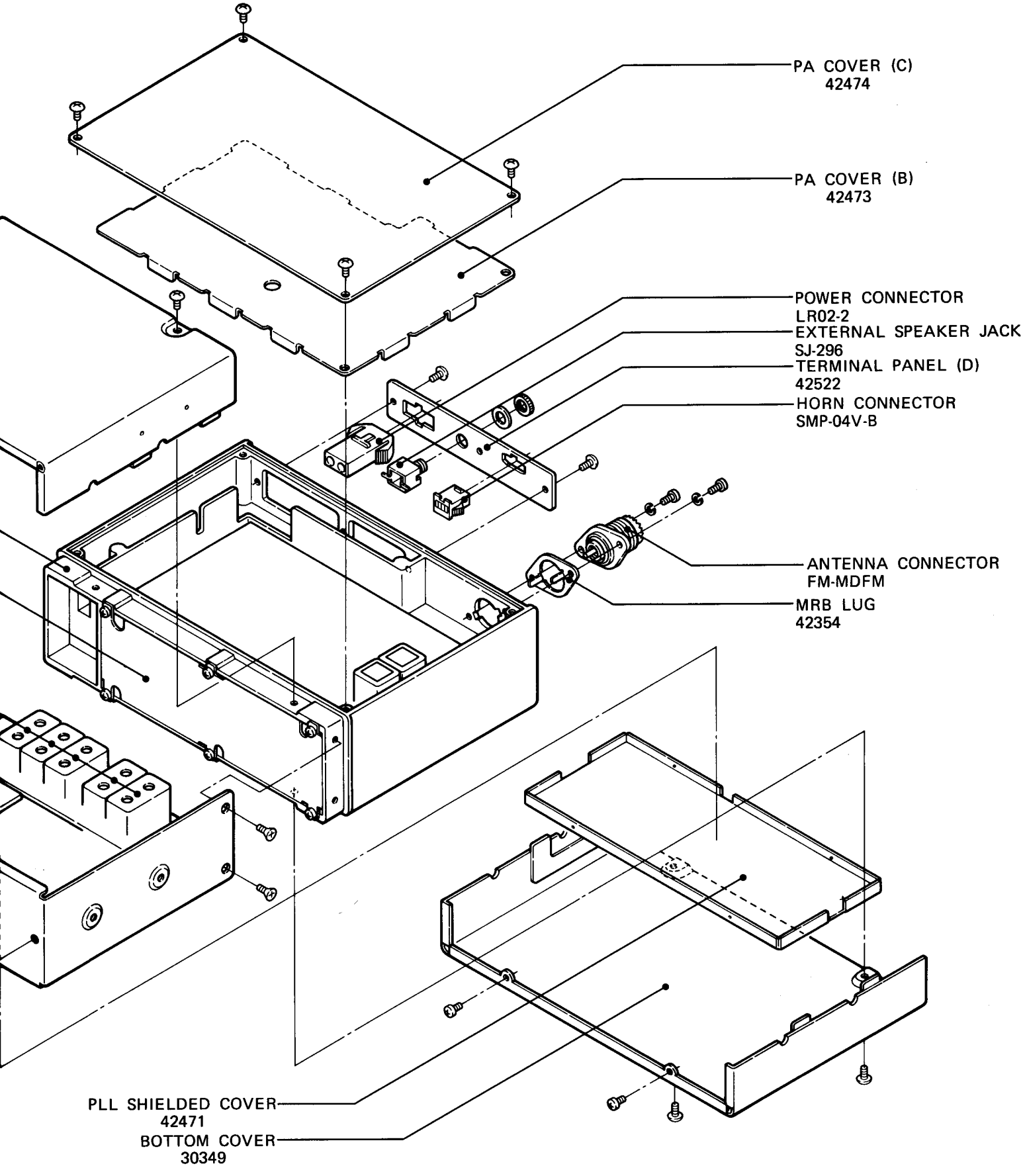
n Numbers for IC-435 (460 ~ 470MHz)

Frequency	n Number	Frequency	n Number	Frequency	n Number	Frequency	n Number
460.000	1250	460.025	1255	460.050	1260	460.075	1265
460.100	1270	460.125	1275	460.150	1280	460.175	1285
460.200	1290	460.225	1295	460.250	1300	460.275	1305
460.300	1310	460.325	1315	460.350	1320	460.375	1325
460.400	1330	460.425	1335	460.450	1340	460.475	1345
460.500	1350	460.525	1355	460.550	1360	460.575	1365
460.600	1370	460.625	1375	460.650	1380	460.675	1385
460.700	1390	460.725	1395	460.750	1400	460.775	1405
460.800	1410	460.825	1415	460.850	1420	460.875	1425
460.900	1430	460.925	1435	460.950	1440	460.975	1445
461.000	1450	461.025	1455	461.050	1460	461.075	1465
461.100	1470	461.125	1475	461.150	1480	461.175	1485
461.200	1490	461.225	1495	461.250	1500	461.275	1505
461.300	1510	461.325	1515	461.350	1520	461.375	1525
461.400	1530	461.425	1535	461.450	1540	461.475	1545
461.500	1550	461.525	1555	461.550	1560	461.575	1565
461.600	1570	461.625	1575	461.650	1580	461.675	1585
461.700	1590	461.725	1595	461.750	1600	461.775	1605
461.800	1610	461.825	1615	461.850	1620	461.875	1625
461.900	1630	461.925	1635	461.950	1640	461.975	1645
462.000	1650	462.025	1655	462.050	1660	462.075	1665
462.100	1670	462.125	1675	462.150	1680	462.175	1685
462.200	1690	462.225	1695	462.250	1700	462.275	1705
462.300	1710	462.325	1715	462.350	1720	462.375	1725
462.400	1730	462.425	1735	462.450	1740	462.475	1745
462.500	1750	462.525	1755	462.550	1760	462.575	1765
462.600	1770	462.625	1775	462.650	1780	462.675	1785
462.700	1790	462.725	1795	462.750	1800	462.775	1805
462.800	1810	462.825	1815	462.850	1820	462.875	1825
462.900	1830	462.925	1835	462.950	1840	462.975	1845
463.000	1850	463.025	1855	463.050	1860	463.075	1865
463.100	1870	463.125	1875	463.150	1880	463.175	1885
463.200	1890	463.225	1895	463.250	1900	463.275	1905
463.300	1910	463.325	1915	463.350	1920	463.375	1925
463.400	1930	463.425	1935	463.450	1940	463.475	1945
463.500	1950	463.525	1955	463.550	1960	463.575	1965
463.600	1970	463.625	1975	463.650	1980	463.675	1985
463.700	1990	463.725	1995	463.750	2000	463.775	2005
463.800	2010	463.825	2015	463.850	2020	463.875	2025
463.900	2030	463.925	2035	463.950	2040	463.975	2045
464.000	2050	464.025	2055	464.050	2060	464.075	2065
464.100	2070	464.125	2075	464.150	2080	464.175	2085
464.200	2090	464.225	2095	464.250	2100	464.275	2105
464.300	2110	464.325	2115	464.350	2120	464.375	2125
464.400	2130	464.425	2135	464.450	2140	464.475	2145
464.500	2150	464.525	2155	464.550	2160	464.575	2165
464.600	2170	464.625	2175	464.650	2180	464.675	2185
464.700	2190	464.725	2195	464.750	2200	464.775	2205
464.800	2210	464.825	2215	464.850	2220	464.875	2225
464.900	2230	464.925	2235	464.950	2240	464.975	2245
465.000	2250	465.025	2255	465.050	2260	465.075	2265
465.100	2270	465.125	2275	465.150	2280	465.175	2285
465.200	2290	465.225	2295	465.250	2300	465.275	2305
465.300	2310	465.325	2315	465.350	2320	465.375	2325
465.400	2330	465.425	2335	465.450	2340	465.475	2345
465.500	2350	465.525	2355	465.550	2360	465.575	2365
465.600	2370	465.625	2375	465.650	2380	465.675	2385
465.700	2390	465.725	2395	465.750	2400	465.775	2405
465.800	2410	465.825	2415	465.850	2420	465.875	2425
465.900	2430	465.925	2435	465.950	2440	465.975	2445
466.000	2450	466.025	2455	466.050	2460	466.075	2465
466.100	2470	466.125	2475	466.150	2480	466.175	2485
466.200	2490	466.225	2495	466.250	2500	466.275	2505
466.300	2510	466.325	2515	466.350	2520	466.375	2525
466.400	2530	466.425	2535	466.450	2540	466.475	2545
466.500	2550	466.525	2555	466.550	2560	466.575	2565
466.600	2570	466.625	2575	466.650	2580	466.675	2585
466.700	2590	466.725	2595	466.750	2600	466.775	2605
466.800	2610	466.825	2615	466.850	2620	466.875	2625
466.900	2630	466.925	2635	466.950	2640	466.975	2645
467.000	2650	467.025	2655	467.050	2660	467.075	2665
467.100	2670	467.125	2675	467.150	2680	467.175	2685
467.200	2690	467.225	2695	467.250	2700	467.275	2705
467.300	2710	467.325	2715	467.350	2720	467.375	2725
467.400	2730	467.425	2735	467.450	2740	467.475	2745
467.500	2750	467.525	2755	467.550	2760	467.575	2765
467.600	2770	467.625	2775	467.650	2780	467.675	2785
467.700	2790	467.725	2795	467.750	2800	467.775	2805
467.800	2810	467.825	2815	467.850	2820	467.875	2825
467.900	2830	467.925	2835	467.950	2840	467.975	2845
468.000	2850	468.025	2855	468.050	2860	468.075	2865
468.100	1870	468.125	2875	468.150	2880	468.175	2885
468.200	2890	468.225	2895	468.250	2900	468.275	2905
468.300	2910	468.325	2915	468.350	2920	468.375	2925
468.400	2930	468.425	2935	468.450	2940	468.475	2945
468.500	2950	468.525	2955	468.550	2960	468.575	2965
468.600	2970	468.625	2975	468.650	2980	468.675	2985
468.700	2990	468.725	2995	468.750	3000		

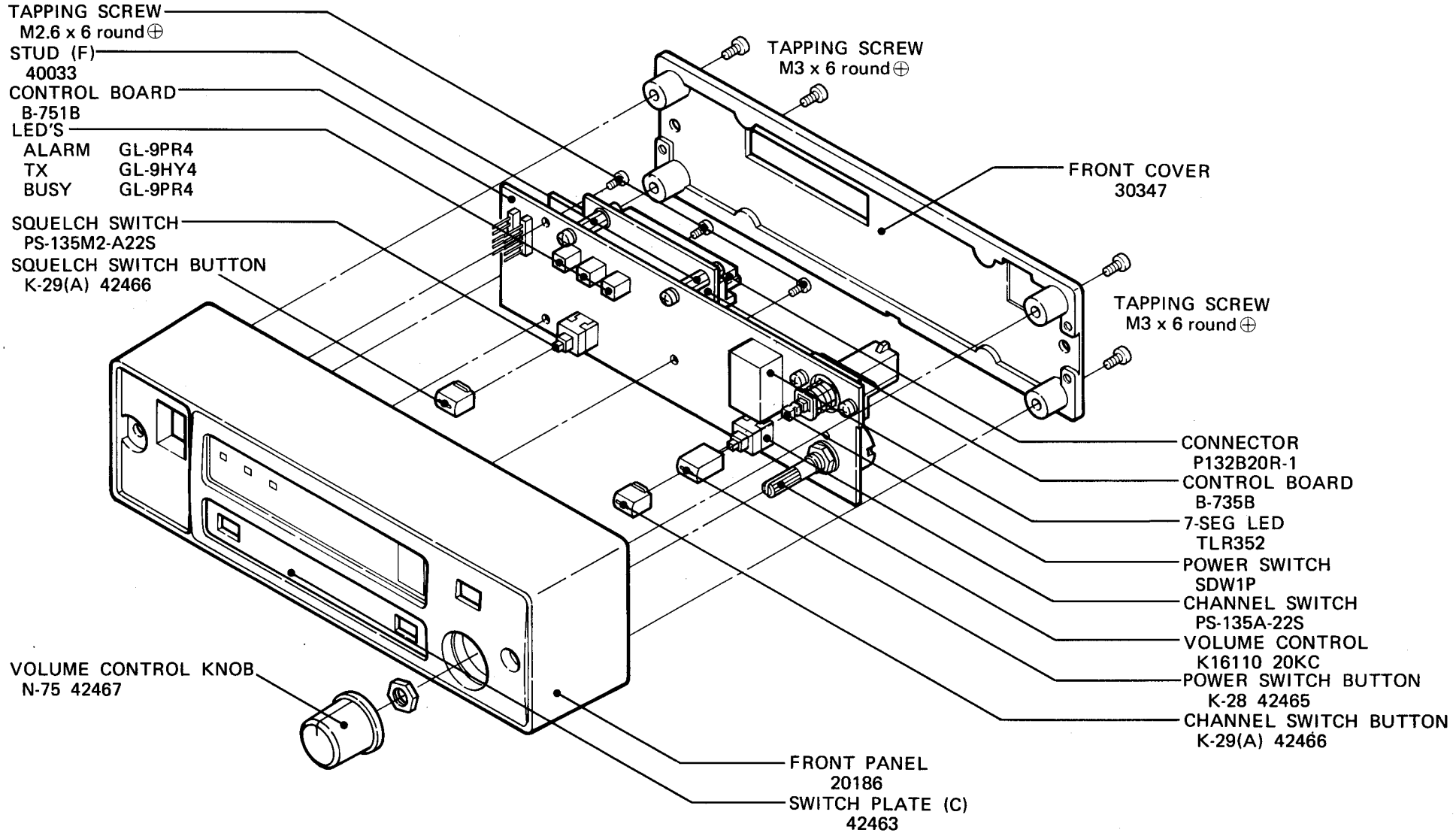
SECTION 7 MECHANICAL PARTS AND DISASSEMBLY

CHASSIS DISASSEMBLY

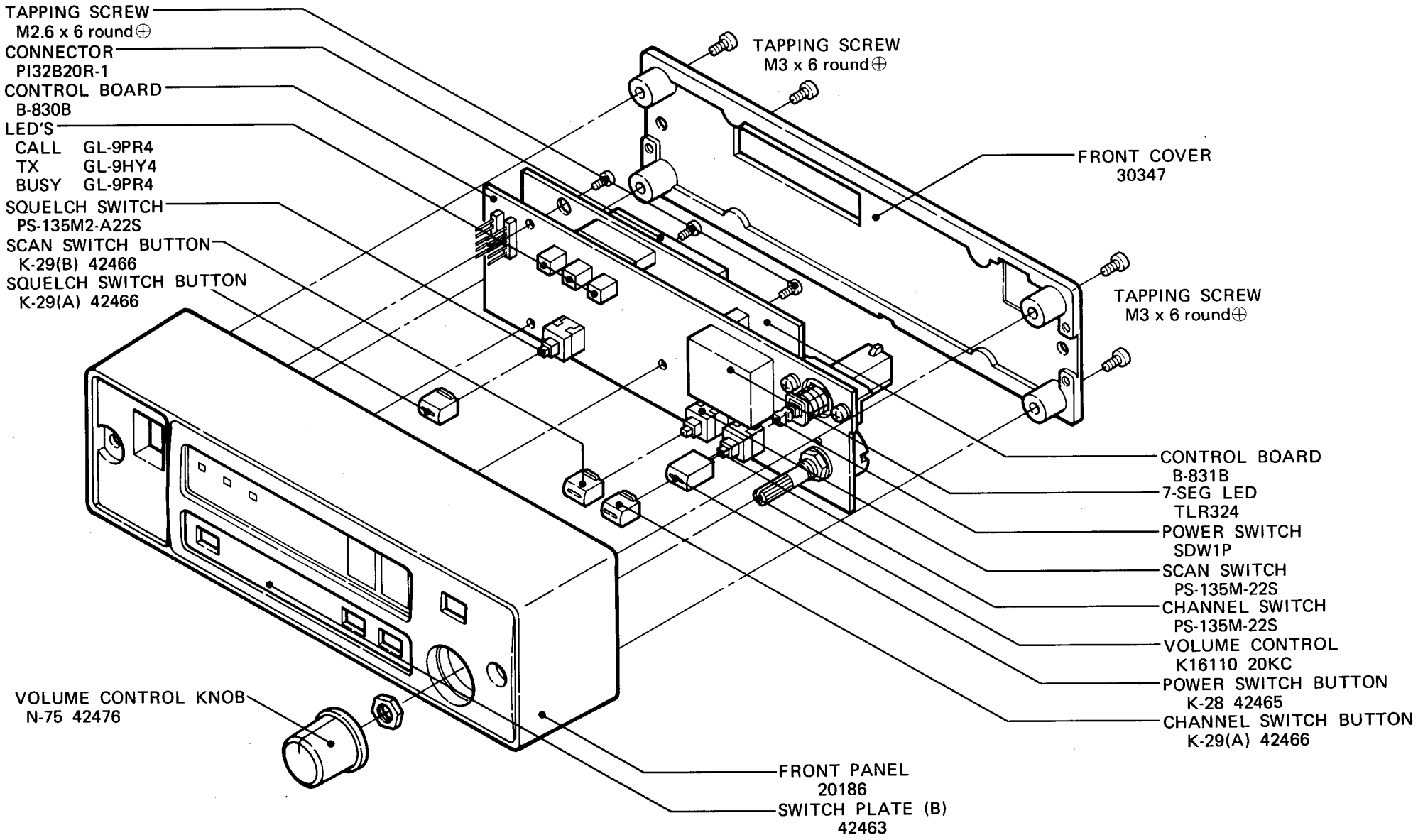



PA COVER (C)
42474
PA COVER (B)
42473
POWER CONNECTOR
LR02-2
EXTERNAL SPEAKER JACK
SJ-296
TERMINAL PANEL (D)
42522
HORN CONNECTOR
SMP-04V-B
ANTENNA CONNECTOR
FM-MDFM
MRB LUG
42354
PLL SHIELDED COVER
42471
BOTTOM COVER
30349

FRONT PANEL DISASSEMBLY (2 Channel Type)



FRONT PANEL DISASSEMBLY (12 Channel Type)



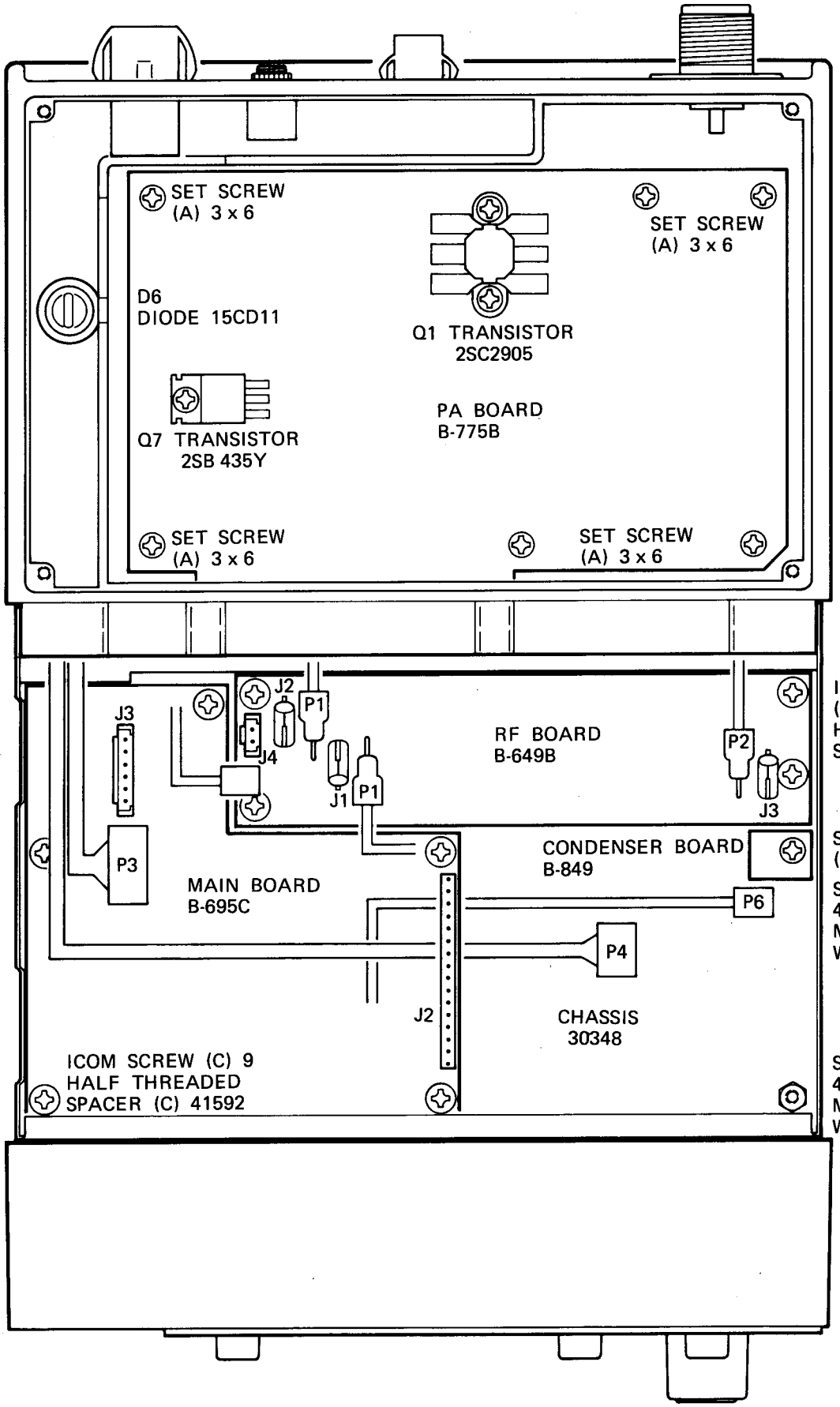
MAIN UNIT WIRING

J1
POWER CONNECTOR
LR02-2

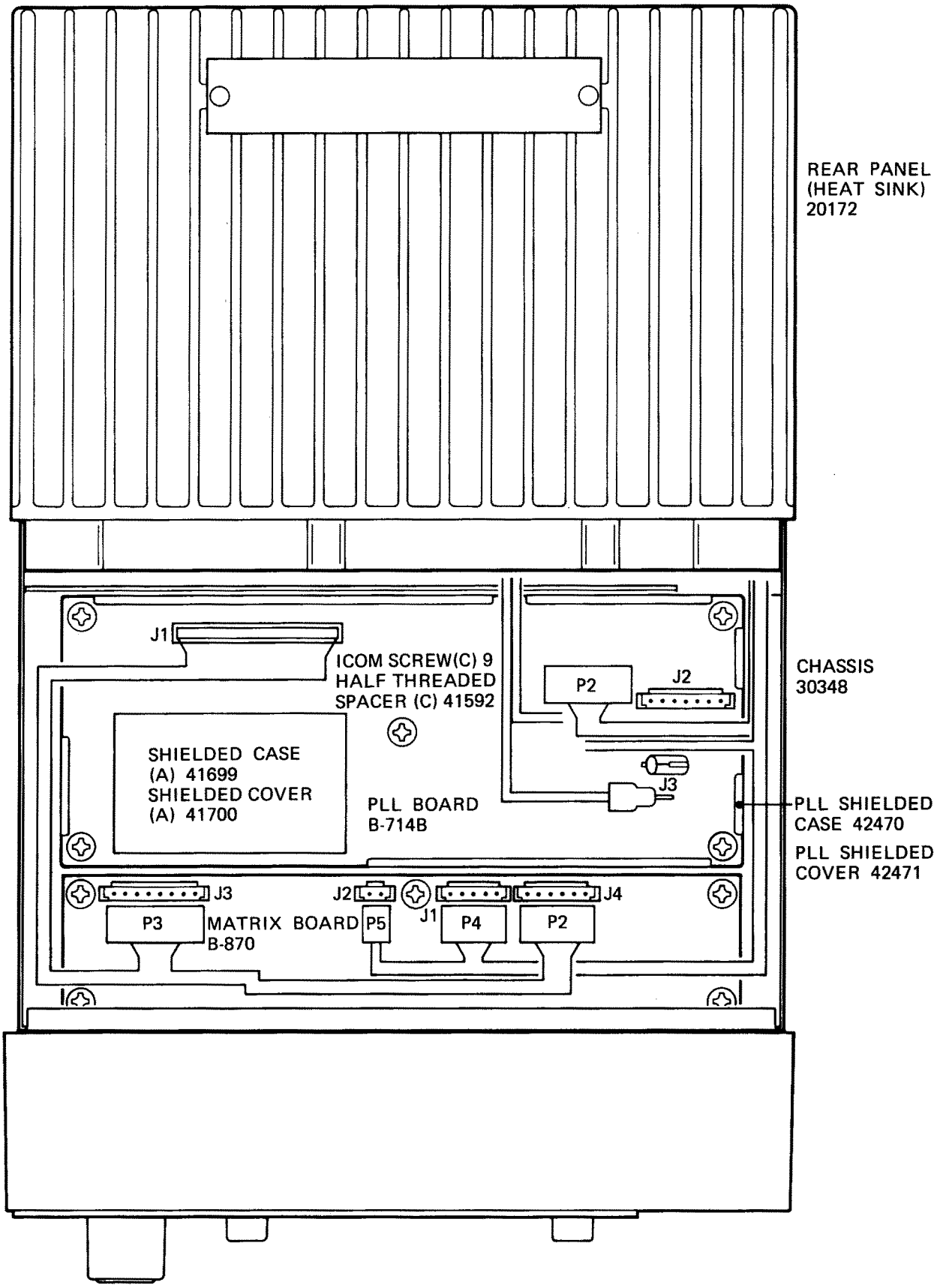
J3
EXTERNAL
SPEAKER JACK
SJ-296

J4
HORN CONNECTOR
SMP-04V-B

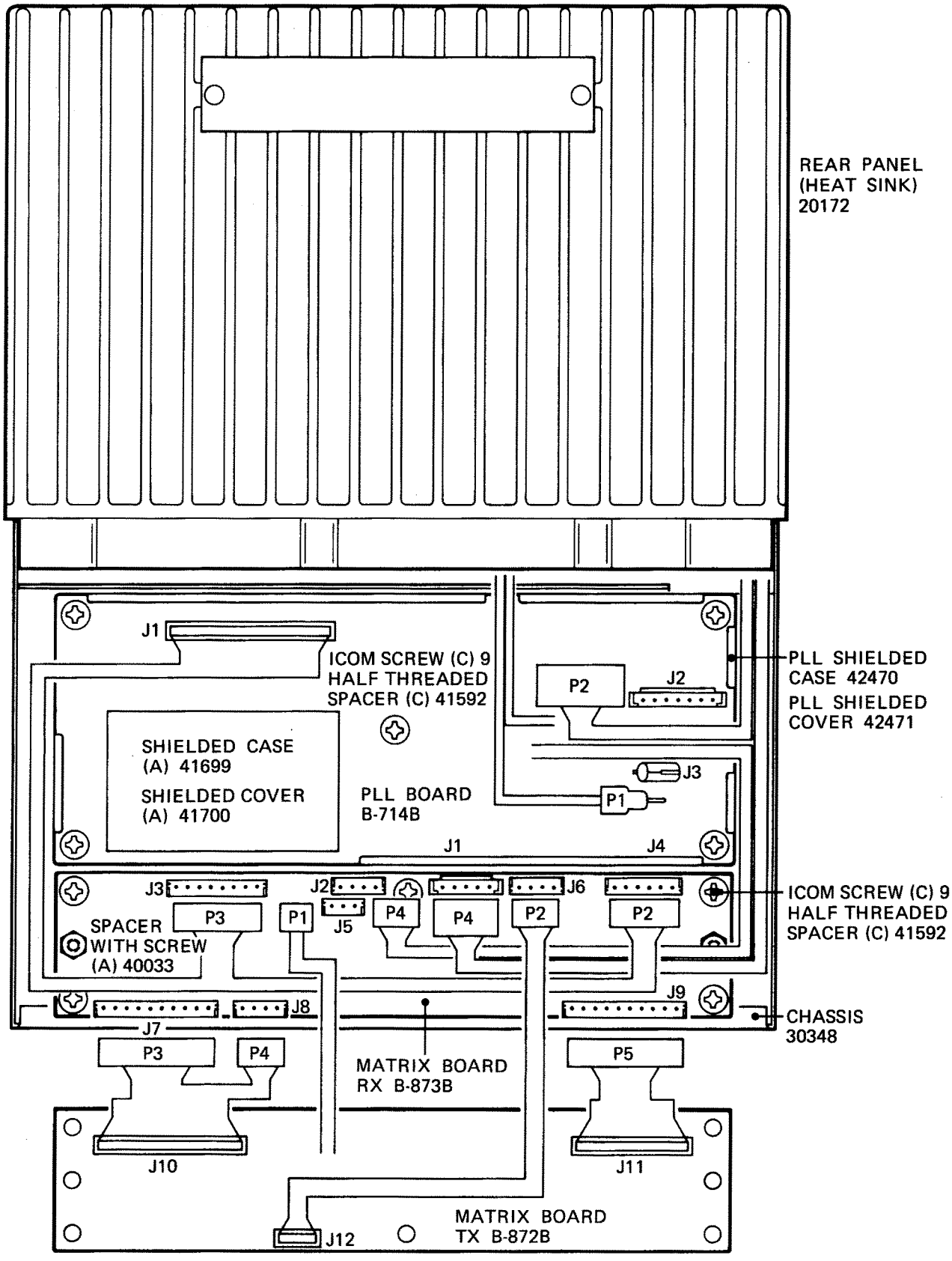
J2
ANTENNA
CONNECTOR
FM-MDFM



PLL UNIT WIRING (2 Channel Type)



PLL UNIT WIRING (12 Channel Type)



SECTION 8 MAINTENANCE AND ADJUSTMENT

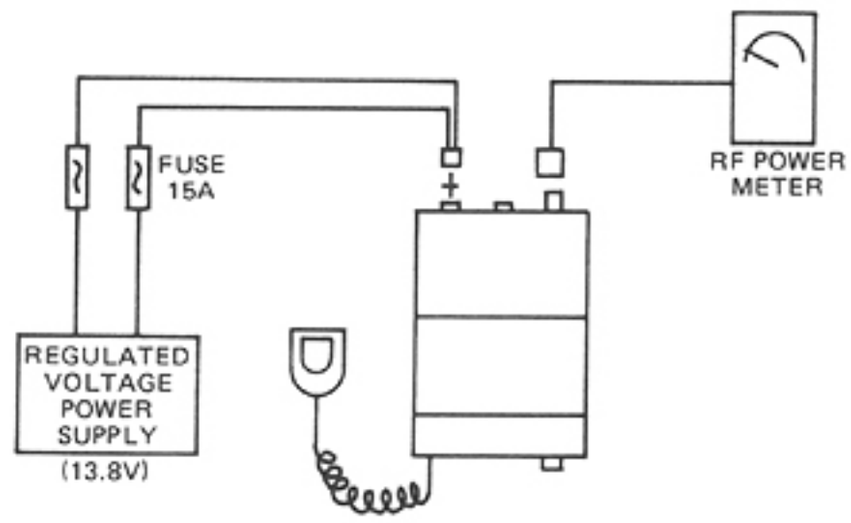
8 - 1 CAUTION

1. Before performing any work on the radio, make sure that the power cord is detached from the radio and the power switch is turned off.
2. During adjustment, the power will be supplied, so take care not to make any short circuit in the radio.
3. Use an insulating adjustment screwdriver for adjustment.
4. Rough adjustment may cause malfunction. Make adjustment correctly.
5. If you could not get a correct result, return to the first procedure and repeat adjustment until you get the correct result.
6. When adjustment is completed, check the conditions of the connectors, soldering and screws, and that each component does not touch each other.
7. There are some versions of the radio. Adjustment conditions and results for each version may be different. Make sure the radio's version and adjust it according to informations of this manual.

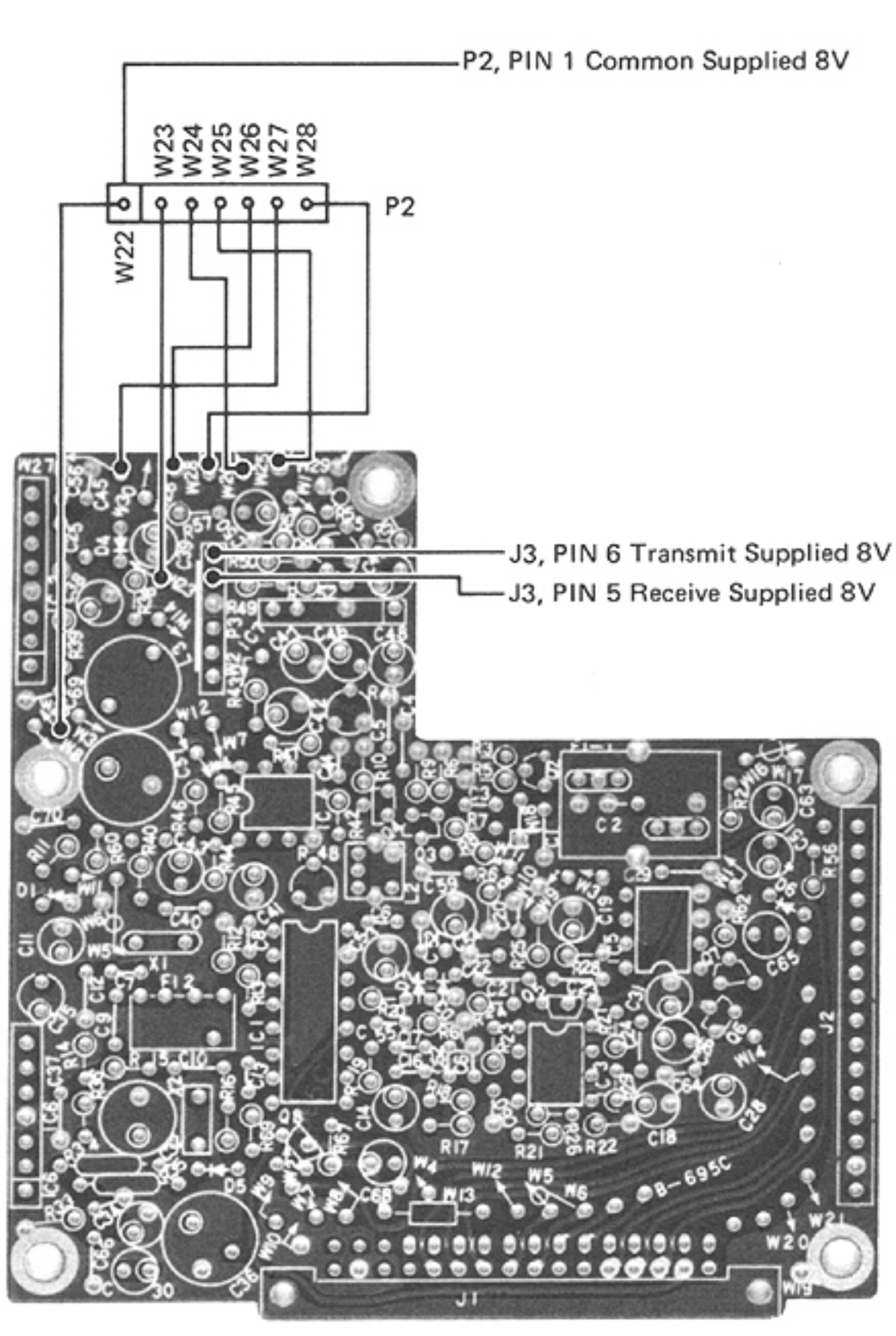
8 - 2 MEASURING INSTRUMENTS REQUIRED FOR ADJUSTMENT

(1) FREQUENCY COUNTER	FREQUENCY RANGE	0.1 - 500MHz
	ACCURACY	BETTERY THAN ±1 ppm
	SENSITIVITY	100mV or BETTER
(2) SIGNAL GENERATOR	FREQUENCY RANGE	0.1MHz - 500MHz
	OUTPUT VOLTAGE	−20 - 90dB (0dB = 1μV)
(3) MULTIMETER	50KΩ/Volt or better	
(4) AC MILLIVOLTMETER	MEASURING RANGE	10mV - 2V
(5) RF VOLTMETER	FREQUENCY RANGE	0.1 - 500MHz
	MEASURING RANGE	0.001 - 10V
(6) RF WATTMETER (Terminated Type)	MEASURING RANGE	50 Watts/500 milliwatts
	FREQUENCY RANGE	150 ~ 500MHz
	IMPEDANCE	50 OHMS
	SWR	LESS THAN 1.1
(7) AF OSCILLATOR	OUTPUT FREQUENCY	200 - 3000Hz
	OUTPUT VOLTAGE	0 - 200mV
	DISTORTION	LESS THAN 0.1%
(8) OSCILLOSCOPE	FREQUENCY RANGE	DC – 10MHz
	MEASURING RANGE	0.01 – 10V
(9) FM DEVIATION METER	FREQUENCY RANGE	150 ~ 500MHz
	MEASURING RANGE	0 ~ ±10KHz
(10) DIRECTIONAL COUPLER	FREQUENCY RANGE	150 ~ 500MHz
(11) DUMMY LOAD OR EXTERNAL SPEAKER	IMPEDANCE	8 OHMS
(12) VARIABLE VOLTAGE REGULATED POWER SUPPLY	OUTPUT VOLTAGE	11.0V ~ 16.5V DC (Variable)
	CAPACITY	9A OR MORE

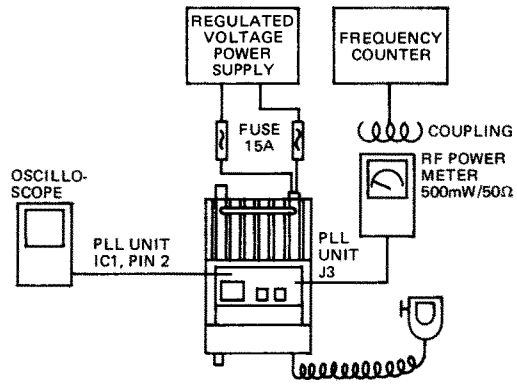
8 - 3 POWER SUPPLY CHECKING

Item for Checking	Conditions	Unit	Points for Measurement	Instrument Reading	Unit	Adjustment Location
PREPARATION	• Connect the supplied microphone to the mic connector on the front panel. • Check the fuses (15A each) of the power cable. • Connect the negative lead of the multimeter to the chassis. • Connect the power supply to the power socket on the rear panel with taking care to its polarity. • Connect the RF power meter to the antenna connector. • Turn on the power switch on the front panel and confirm that the channel display is illuminated, and the consumption current is less than 1A.					
Checking R8V	• In receive mode.	MAIN	Connect the multimeter (DC 10V range) to pin 5 of J3.	8.2V		Confirming
	NOTE: If the meter reading is different more than 0.6V, check if IC2 is deffective or a short circuit is present.					
Checking common supplied 8V.	• In receive mode.	MAIN	Connect the multimeter (DC 10V range) to pin 1 of P2.	8.2V		Confirming
	NOTE: If the meter reading is different more than 0.6V, check if IC2 is deffective or a short circuit is present.					
Checking T8V	• Connect the RF power meter to the ANT connector and set in transmit mode.	MAIN	Connect the multimeter (DC 10V range) to pin 6 of J3.	8.2V		Confirming
	NOTE: If the meter reading is different more than 0.6V, check if IC2 is deffective or a short circuit is present.					

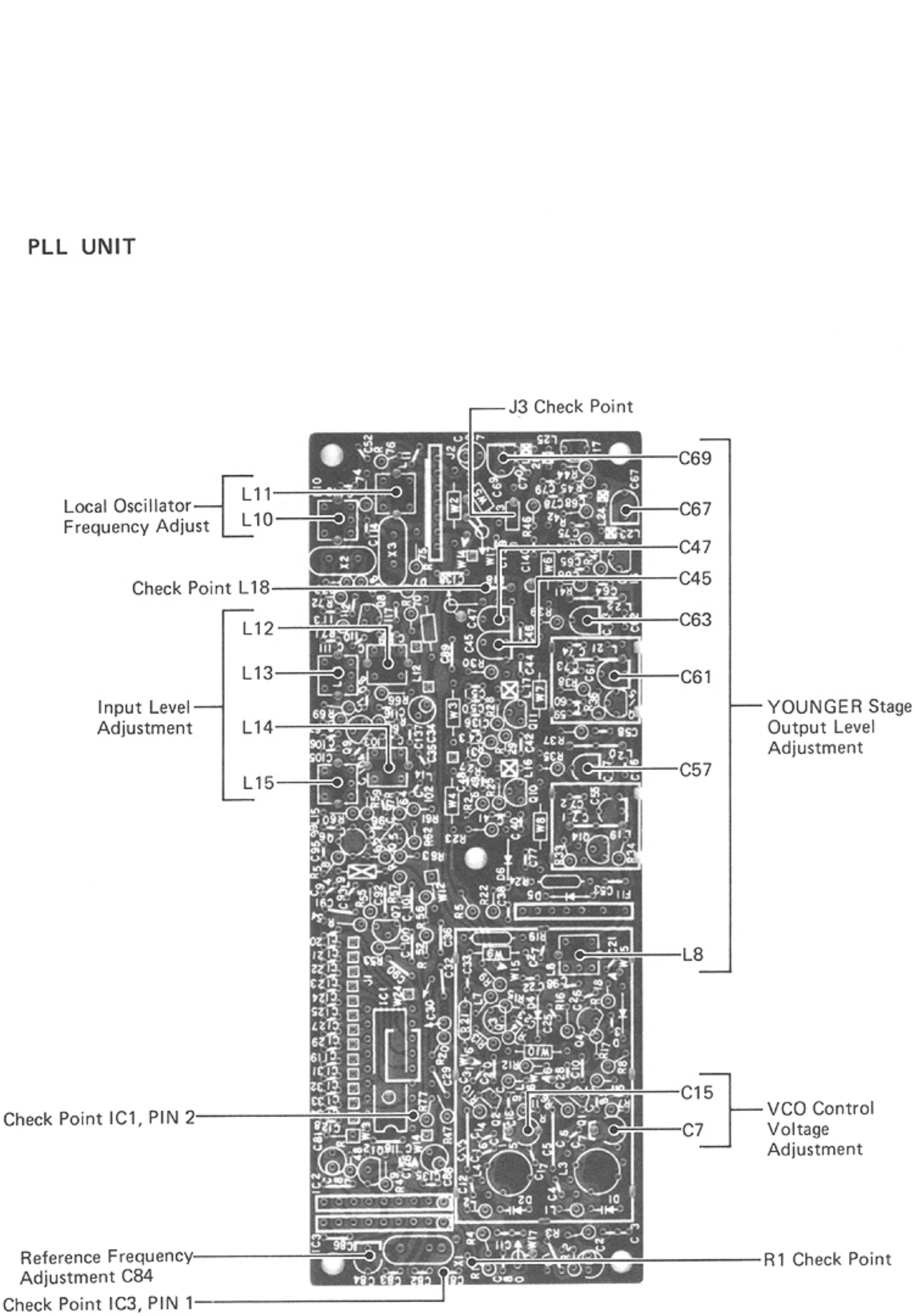
MAIN UNIT



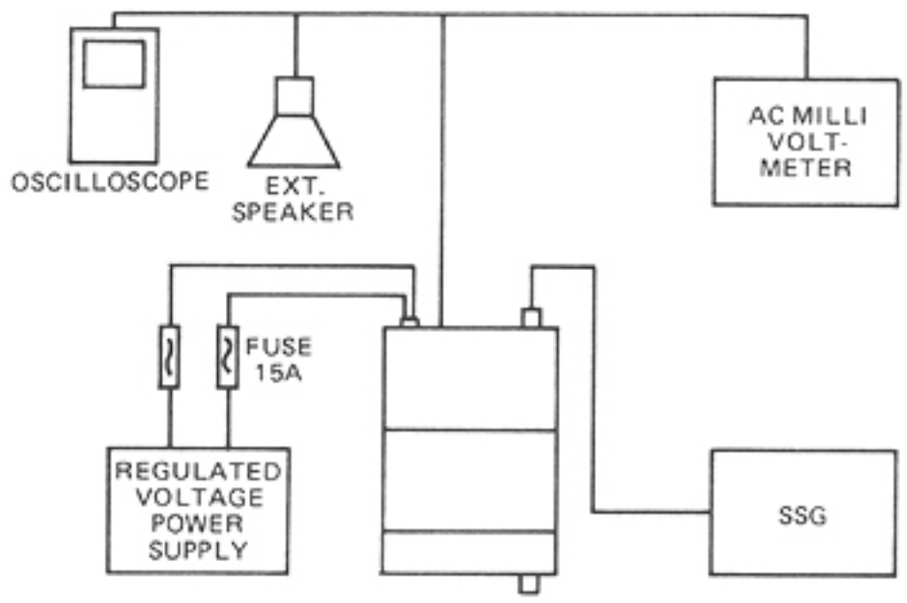
8 - 4 PLL ADJUSTMENT

Item for Adjustment	Conditions	Unit	Points for Measurement	Instrument Reading	Unit	Adjustment Location
PREPARATION	• Unplug the connector inserted to J3 of the PLL unit, then connect an RF power meter (500mW, 50 ohms) or RF voltmeter to J3. • Couple the input cable of the frequency counter to the RF power meter or RF voltmeter. • Connect the oscilloscope to pin 2 of IC1 on the PLL unit. • Program the center frequency range (N=2250) on the matrix unit.					
Reference frequency adjustment.	• Set the operating channel to the channel programmed N= 2250, and in receive mode.	PLL	Connect the frequency counter to pin 1 of IC3.	2.5600MHz	PLL	C84
	NOTE: The adjustment value may be differ depending on the version. Adjust the frequency accurately for the crystal unit's one.					
Divider input level adjustment.	• Set the operating channel to the channel programmed N= 2250, and in receive mode.	PLL	Connect the oscilloscope to pin 2 of IC1.	Adjust for maximum waveform on the oscilloscope (about 800mV P-P).	PLL	L12 ~ L15
	• Set the operating channel to the channel programmed N= 2250, and in transmit mode.			Adjust for the same level in receive mode (about 800mV).		L13
VCO control voltage adjustment and confirming.	• Program the high end frequency of the operating frequency range (N=3900) on the matrix unit. Set the radio at that channel and in transmit mode.	PLL	Connect the multimeter (DC 10V range) to R1.	5.5V	PLL	C7
	• Set the radio in receive mode.			5.5V	PLL	C15
	• Program the low end frequency of the operating frequency range (N=1200) on the matrix unit. Set the radio at that channel and in transmit mode and receive mode alternately.			0.8V ~ 1.5V		Confirming
Younger stage output level adjustment.	• Set the operating channel to the channel programmed N= 2250, and in transmit mode.	PLL	Connect the RF power meter or RF voltmeter to J3.	Adjust for maximum output level.	PLL	L8, C55, C57, C61, C63, C67, C69
	• Set the operating channel to the channel programmed N= 2250, and in receive mode.			Adjust for maximum output level.	PLL	C45, C47
Local oscillator frequency adjustment.	**Caution:** The operation frequency differs depending on the version. Adjust the operation frequency for the installed nominal frequency.					
a) (Version: 2 Channels 450~460MHz)	• Select channel 1 and set in transmit mode.	PLL	Couple the frequency counter to the RF power meter.	459.025MHz	PLL	L11
	• Set in receive mode.		Connect the frequency counter to L18.	432.625MHz		L10
b) (Version: 2 Channels 460~470MHz)	• Select channel 1 and set in transmit mode.	PLL	Couple the frequency counter to the RF power meter.	468.550MHz	PLL	L11
	• Set in receive mode.		Connect the frequency counter to L18.	442.150MHz		L10
c) (Version: 12 Channels 450~460MHz)	• Select channel 2 and set in transmit mode.	PLL	Couple the frequency counter to the RF power meter.	456.800MHz	PLL	L11
	• Set in receive mode.		Connect the frequency counter to L18.	435.400MHz		L10
d) (Version: 12 Channels 460~470MHz)	• Select channel 2 and set in transmit mode.	PLL	Couple the frequency counter to the RF power meter.	464.500MHz	PLL	L11
	• Set in receive mode.		Connect the frequency counter to L18.	443.100MHz		L10

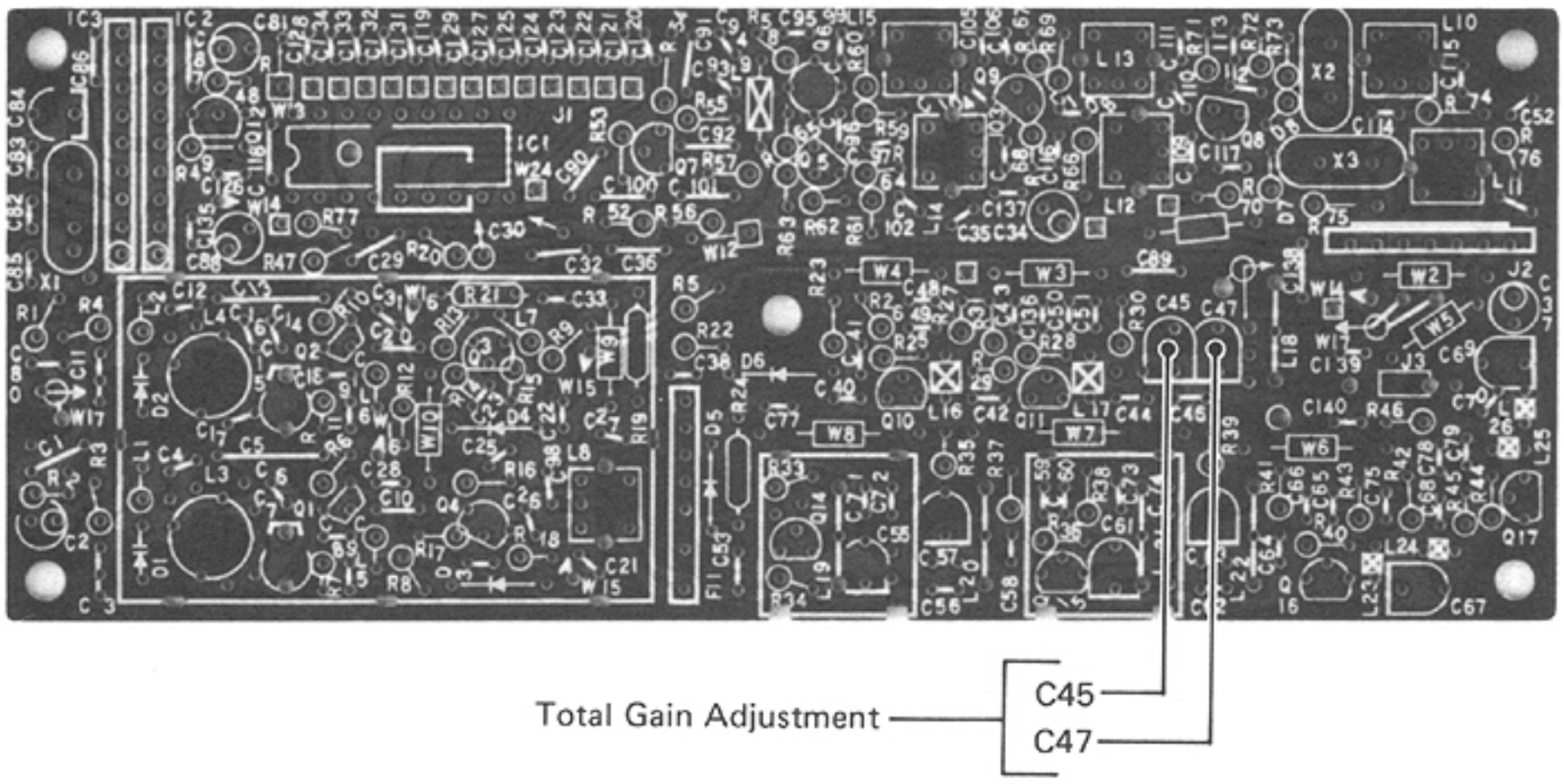
PLL UNIT


J3 Check Point
C69
C67
C47
C45
C63
C61
C57
L8
YOUNGER Stage Output Level Adjustment
L11
L10
Local Oscillator Frequency Adjust
Check Point L18
L12
L13
L14
L15
Input Level Adjustment
C15
C7
VCO Control Voltage Adjustment
Check Point IC1, PIN 2
Reference Frequency Adjustment C84
Check Point IC3, PIN 1
R1 Check Point

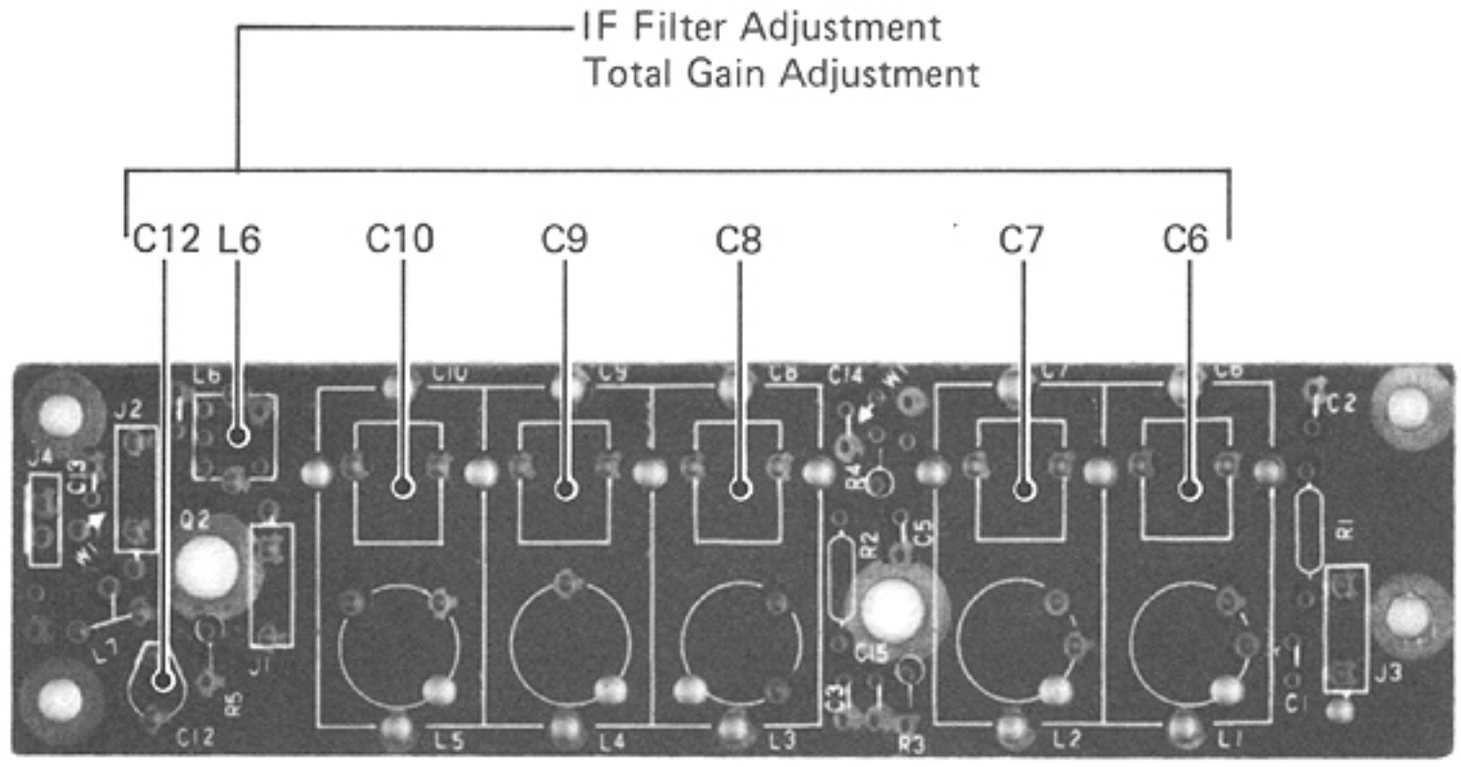
8 - 5 RECEIVER ADJUSTMENT

Item for Adjustment	Conditions	Unit	Points for Measurement	Instrument Reading	Unit	Adjustment Location
PREPARATION	• Connect the AC millivoltmeter and oscilloscope to the external SP terminal in parallel with 8-ohm speaker. • Connect SSG to the ANT connector. (Output level is shown in loaded value.)					
Total gain adjustment.	• Set the operating channel for desired one. • Turn off the squelch switch. • Set the output level of the SSG for +60dB with no modulation.		Connect AC millivoltmeter to EXT SP terminal.	Adjust for maximum noise quieting.	RF PLL MAIN	C6 ~ C12, C12, L6 C45, C47 L2
	NOTE: When the SSG output level is too high, it is difficult to find the best point. So reduce the output level as low as possible and repeat this adjustment 2 or 3 times.					
IF filter adjustment.	• Adjust the SSG output level for 10dB noise quieting. Then make modulation for specified maximum deviation with 1KHz audio.		Connect AC millivoltmeter to EXT SP terminal.	Adjust for maximum audio output.	MAIN RF	L2 L6
	NOTE: Repeat above adjustments several times, and confirm that the sensitivity is less than 0.3 microvolts for 12dB SINAD.					
Squelch adjustment.	• Adjust the SSG output level for 10dB signal to noise ratio with modulation for 3.5KHz deviation with 1KHz audio. Turn R21, squelch control trimmer fully counterclockwise, and confirm squelch is opened.	FRONT PANEL		Adjust to open the squelch with the signal and to close squelch without signal.	FRONT PANEL (bottom side).	R21
	Confirm: That squelch is opened with a signal and closed without signal. When the squelch switch is turned off, the squelch is opened and audio output is not intermittent.					

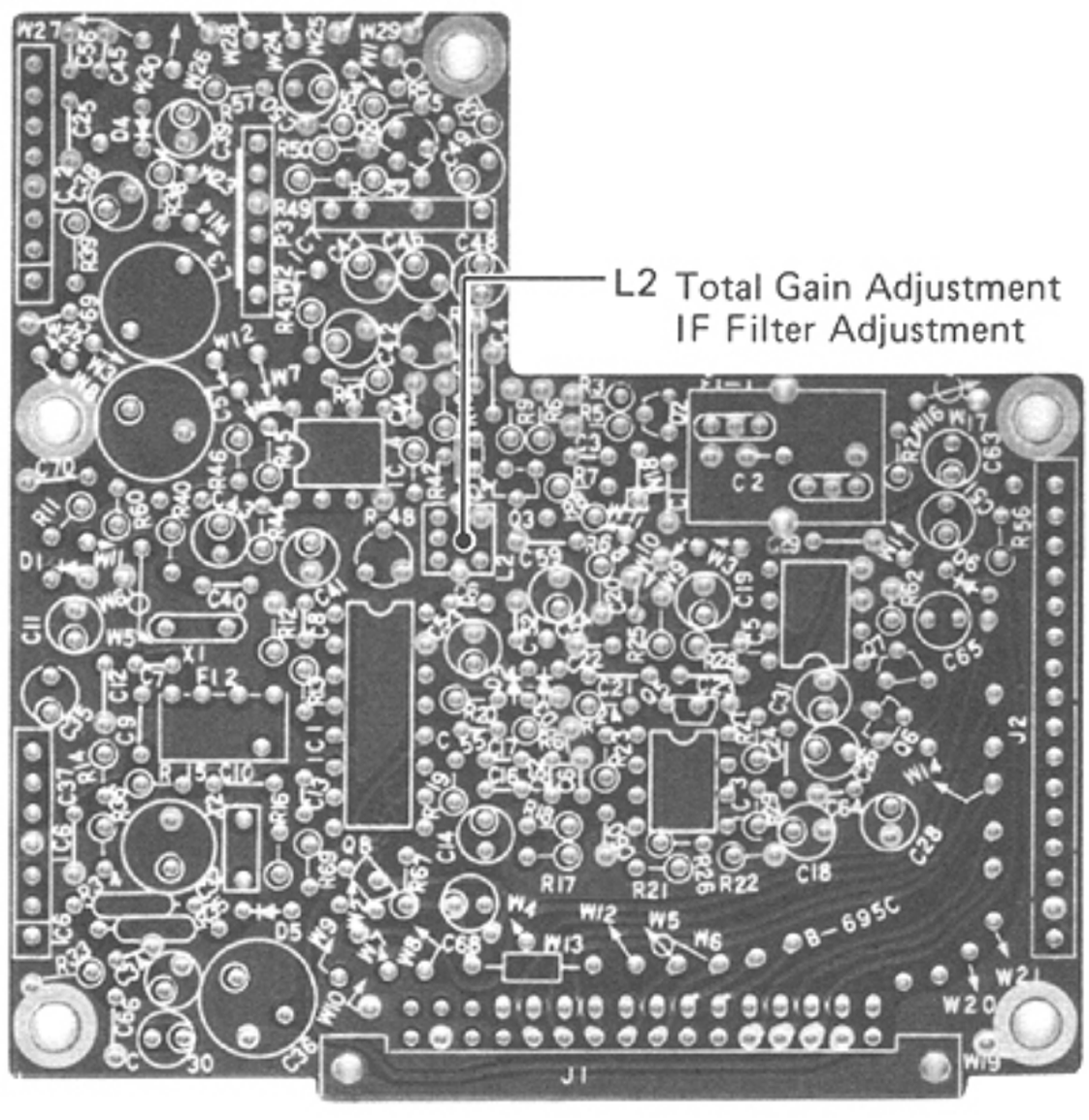
PLL UNIT



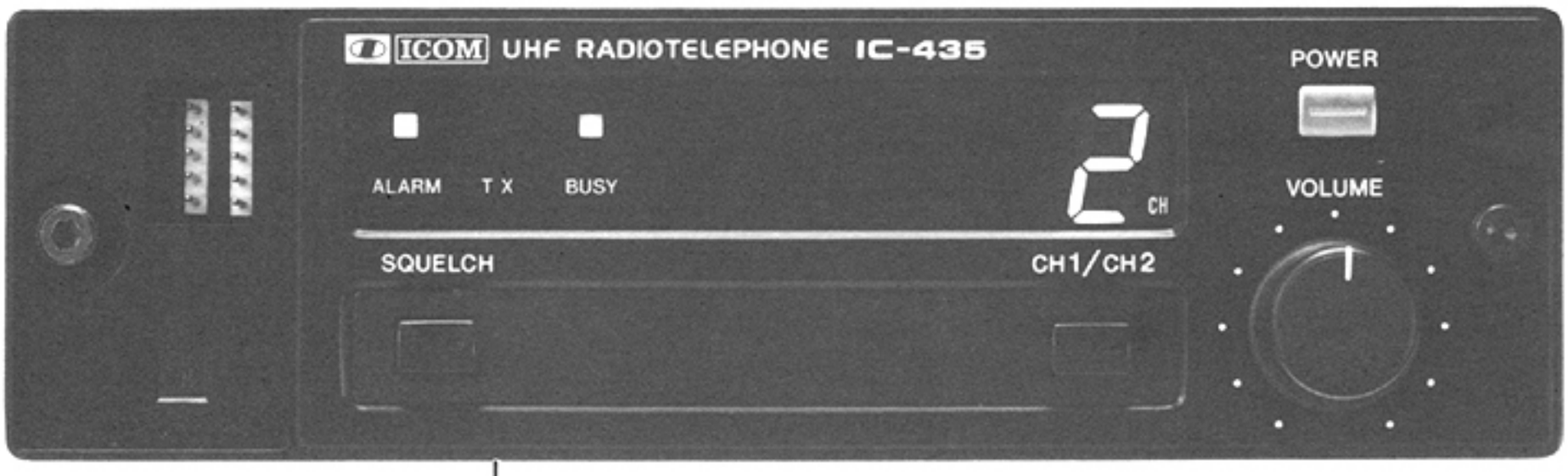
RF UNIT



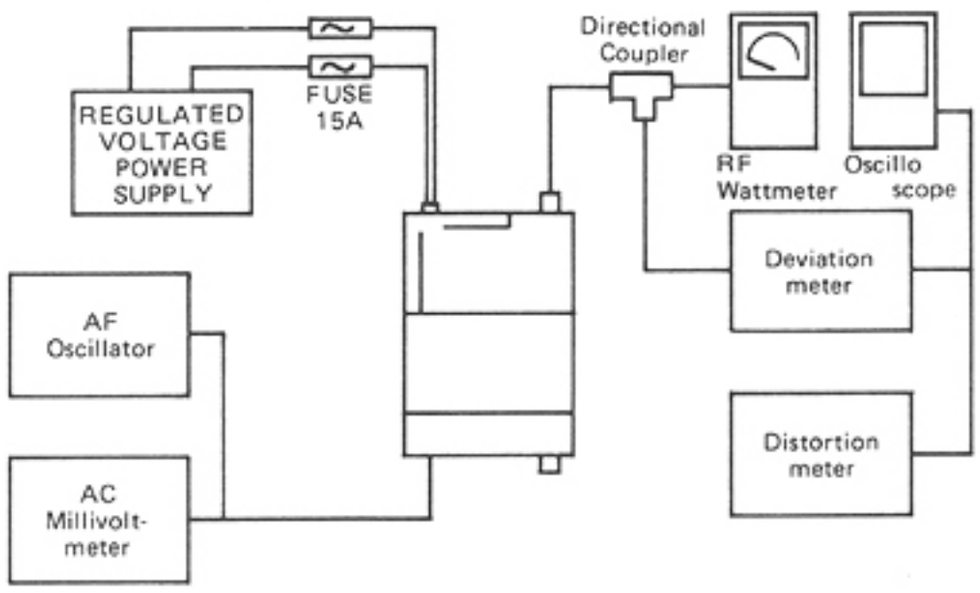
MAIN UNIT



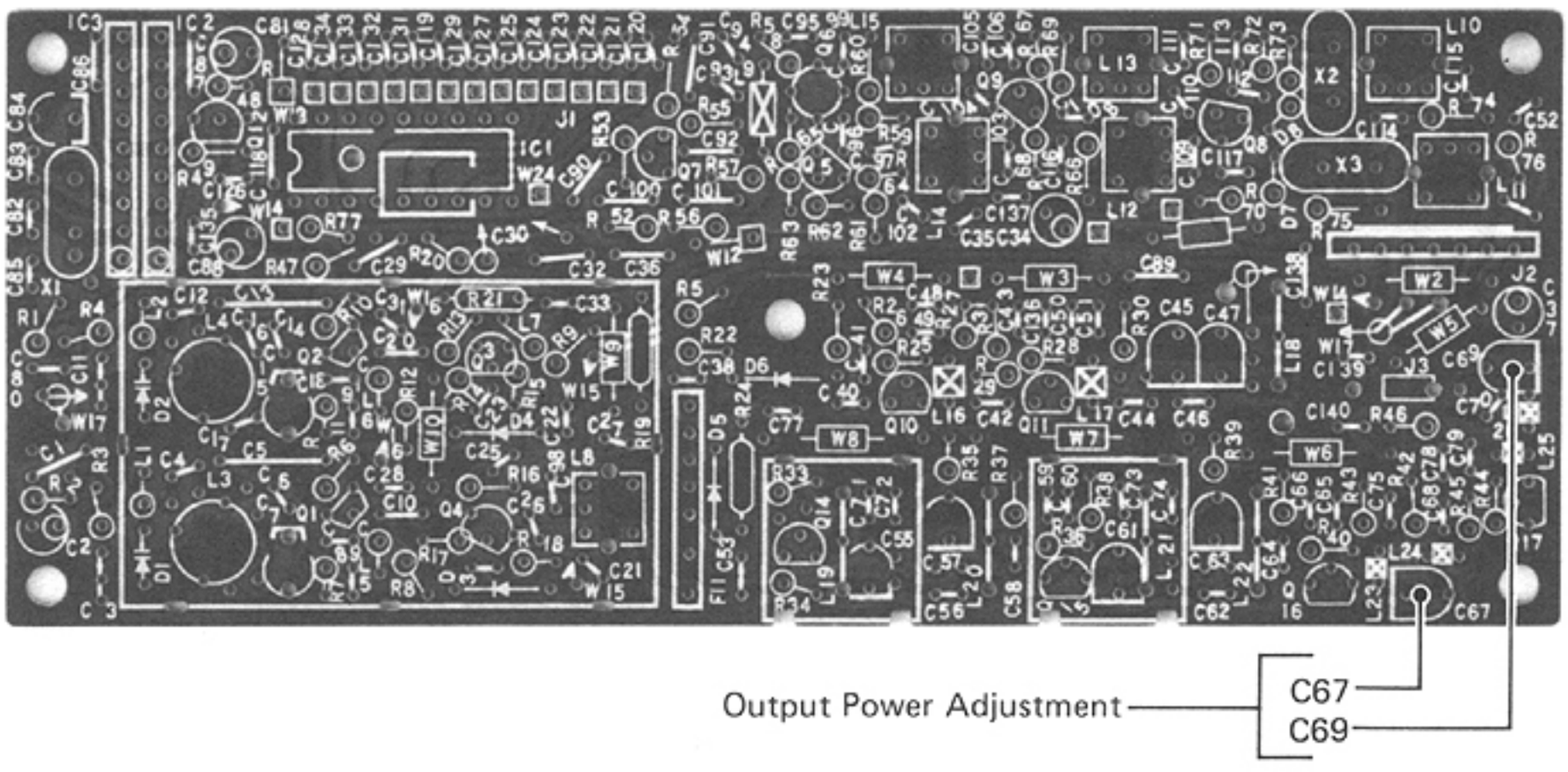
FRONT PANEL (BOTTOM SIDE)



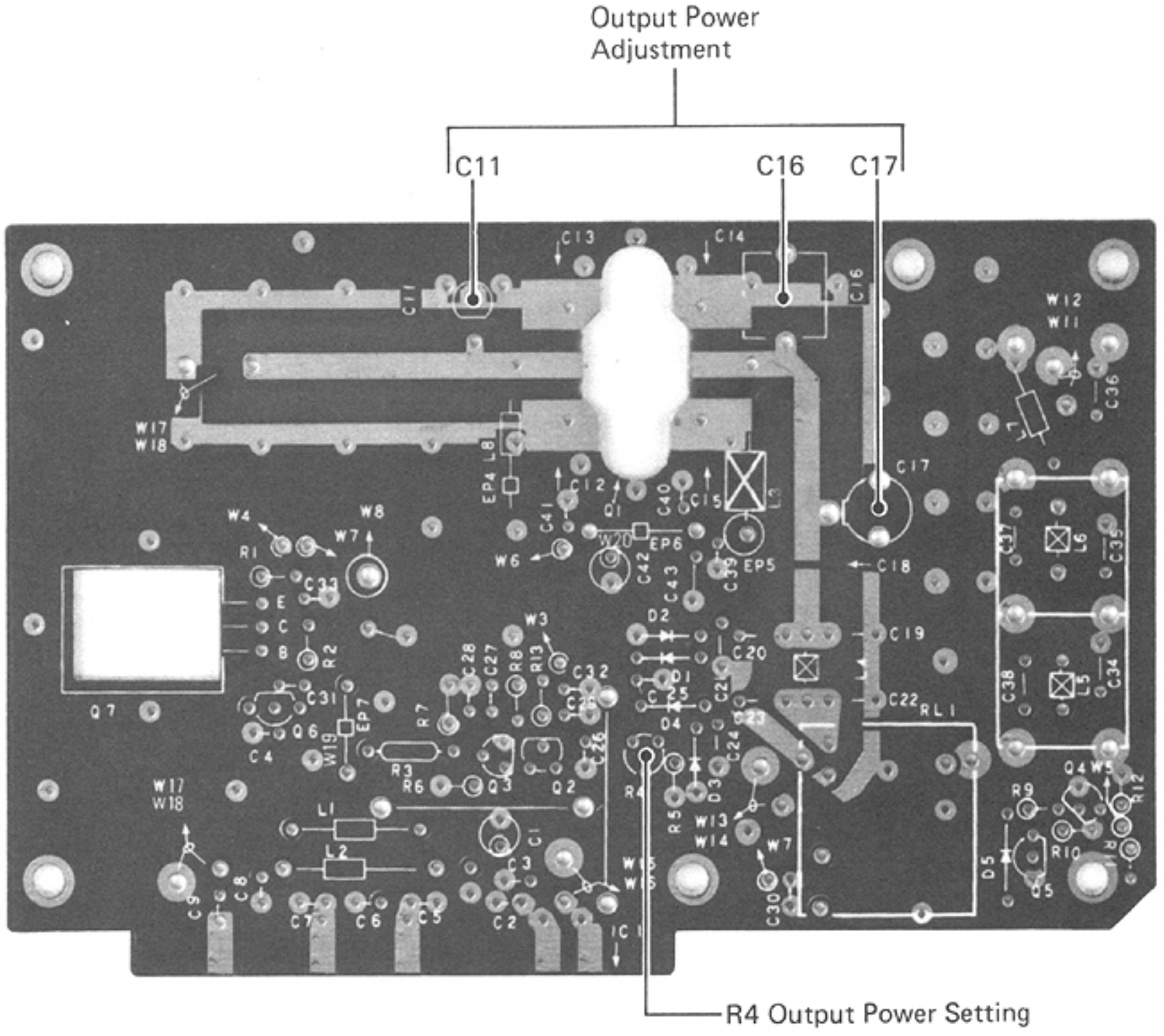
8 - 6 TRANSMITTER ADJUSTMENT

Item for Adjustment	Conditions	Unit	Points for Measurement	Instrument Reading	Unit	Adjustment Location
PREPARATION	• Connect the AF oscillator and AC millivoltmeter to the MIC connector. • Connect the RF wattmeter (terminated type) and FM deviation meter (through a directional coupler) to the antenna connector. • Connect the oscilloscope and AC millivoltmeter (or distortion meter) to the output terminal of the deviation meter. Set the controls or switches of the deviation meter as follows: LPF: 20KHz HPF: OFF DE-EMPHASIS: OFF DEVIATION RANGE: 10KHz DEVIATION SENSE: P-P/2					
Output power adjustment.	• Turn R4 of the PA unit fully clockwise and set the radio in transmit mode.		Connect the RF wattmeter to the antenna connector.	Adjust for maximum output power (40 watts or more).	PA PLL	C11, C16, C17 C67, C69
	NOTE: Repeat this adjustment several times.					
Output power setting.	• Set the radio in transmit mode. • Change the power supply voltage between 12 volts and 16 volts.		Connect the RF wattmeter to the antenna connector.	35 watts 32 watts - 38 watts	PA	R4 Confirming
Modulation adjustment.	• Tune the deviation meter to the transmit frequency and set the radio in transmit mode. Adjust the output of the AF oscillator for 1.5 millivolts at 1KHz.		Connect the oscilloscope to the AF output terminal of the deviation meter.	Adjust for maximum waveform and minimum distortion (It should be less than 6% and S/N ratio should be more than 40dB.)	MAIN	R41
	• Set the output level of the AF oscillator for 15 millivolts at 1KHz.		Read the meter of the deviation meter.	4.5KHz (or specified maximum deviation).	MAIN	R48
	• Set the output level of the AF oscillator for 1.5 millivolts at 1KHz.			70% of the maximum deviation.		Confirming

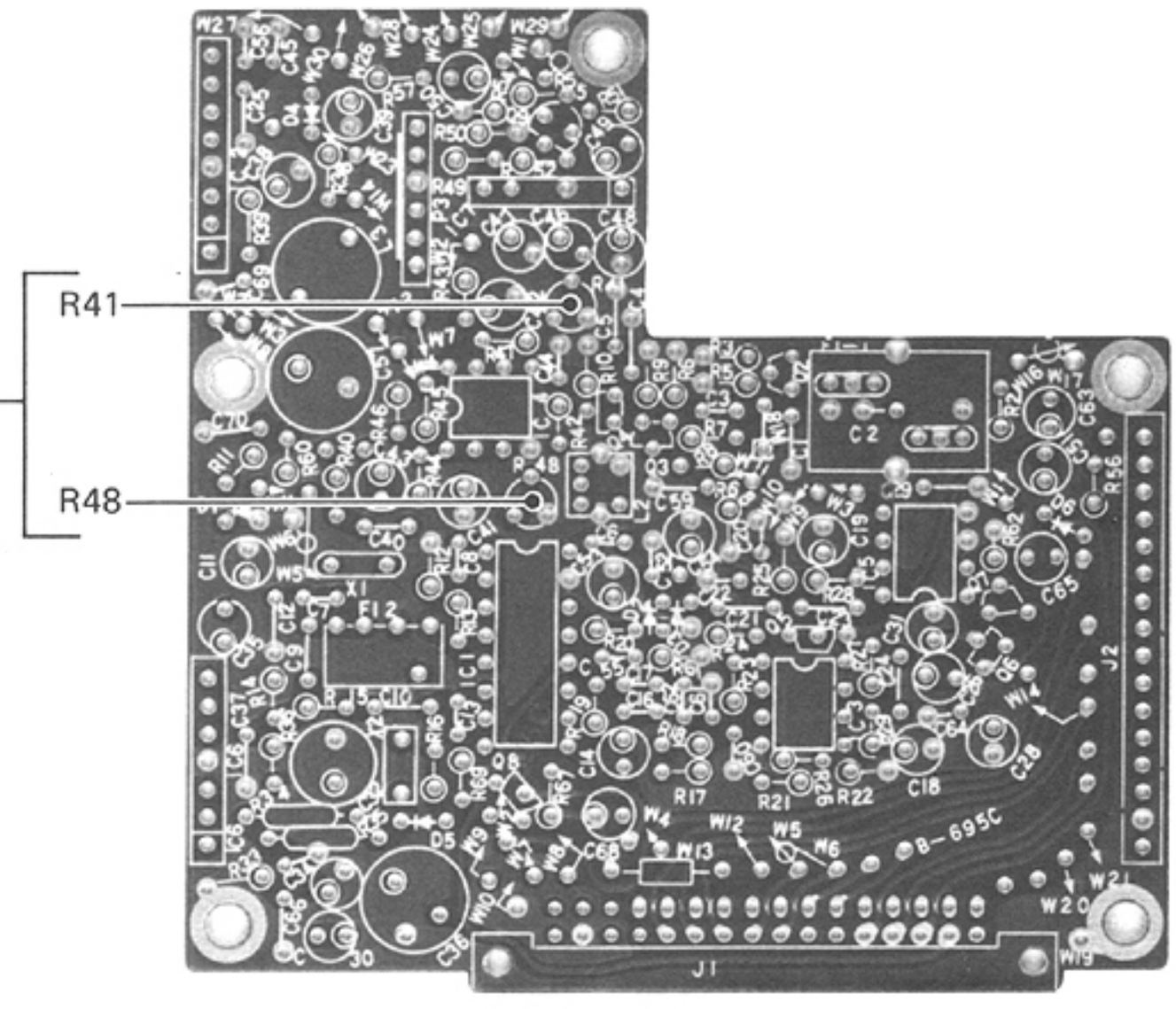
PLL UNIT



PA UNIT

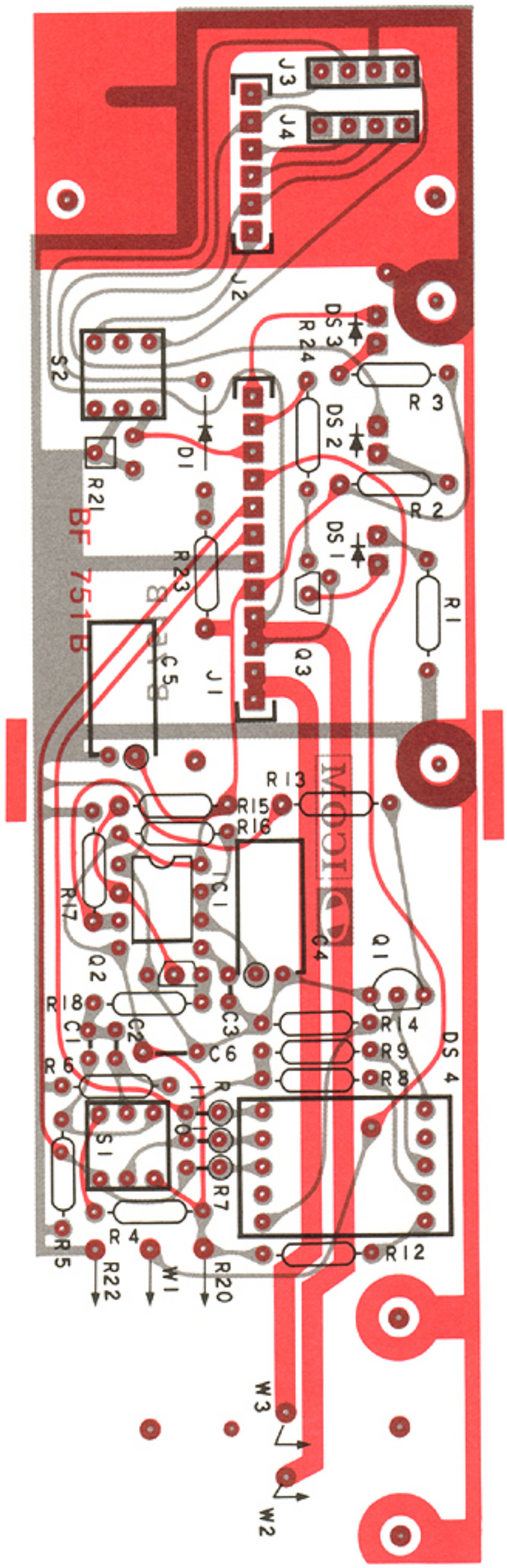


MAIN UNIT

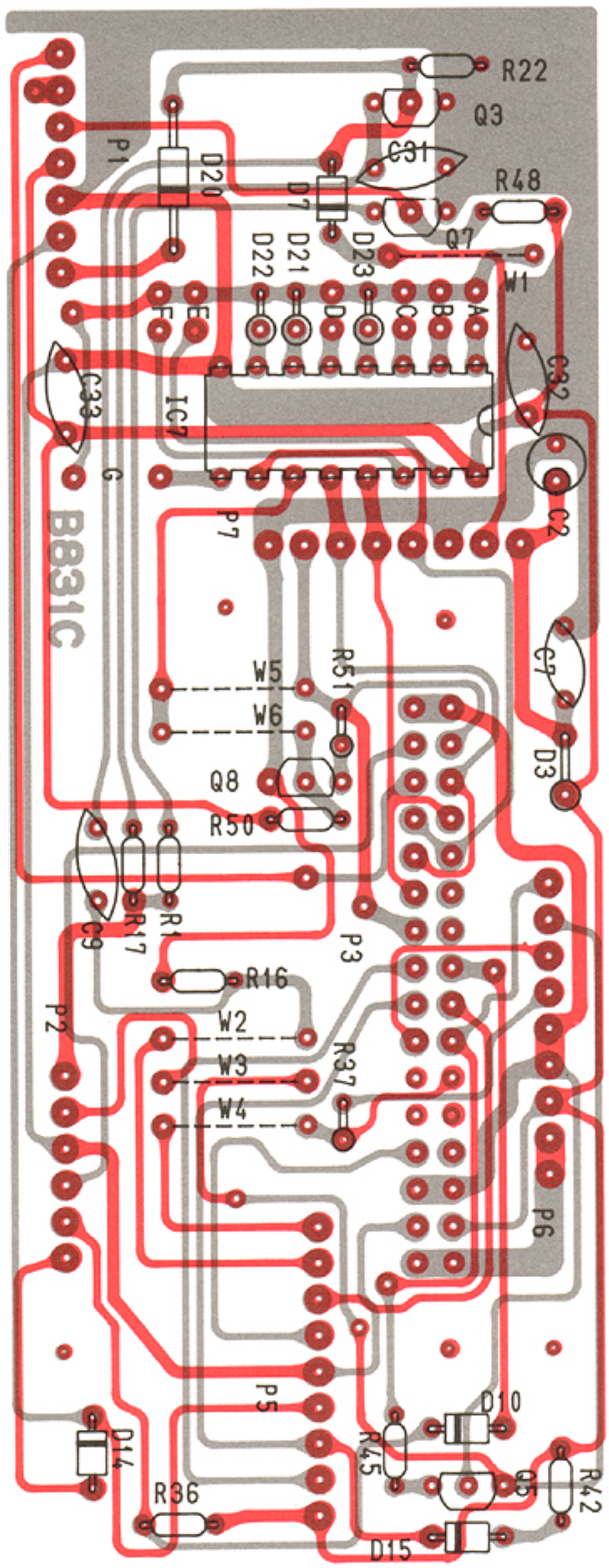


SECTION 9 BOARD LAYOUT

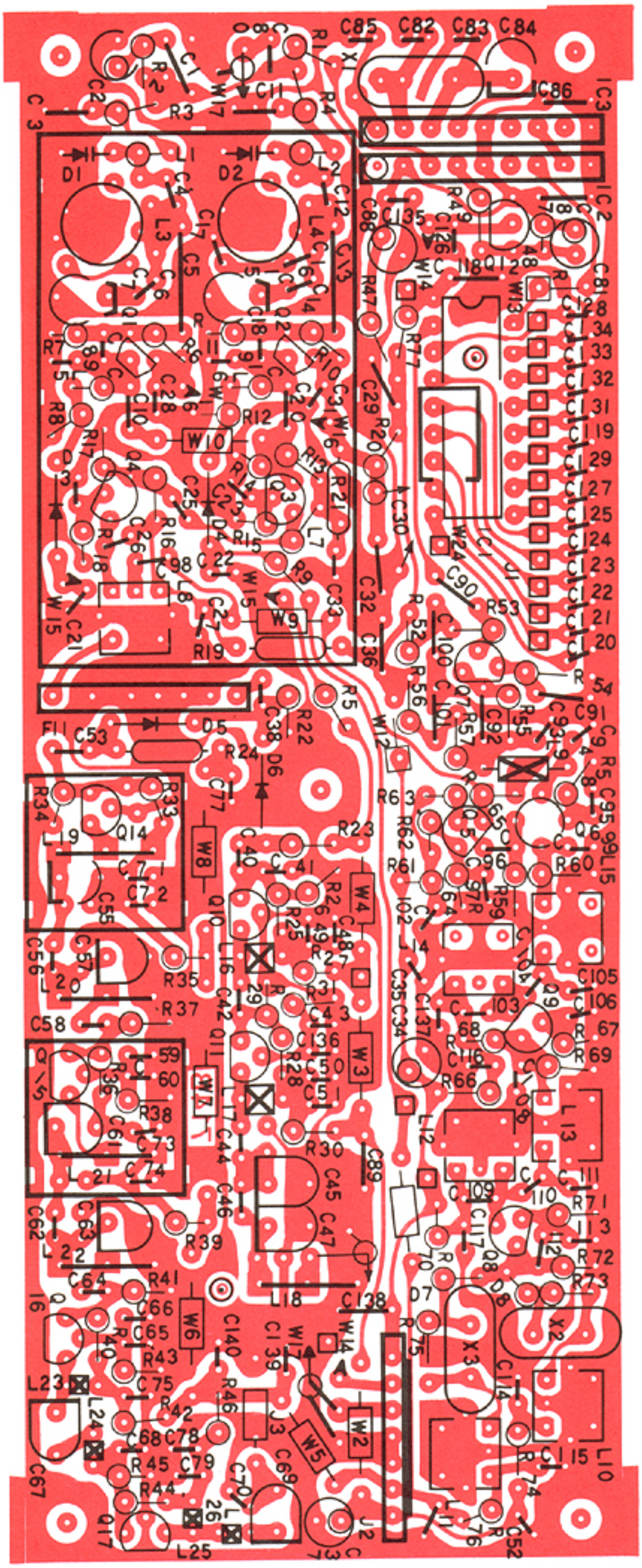
IC-435-2ch Control Board



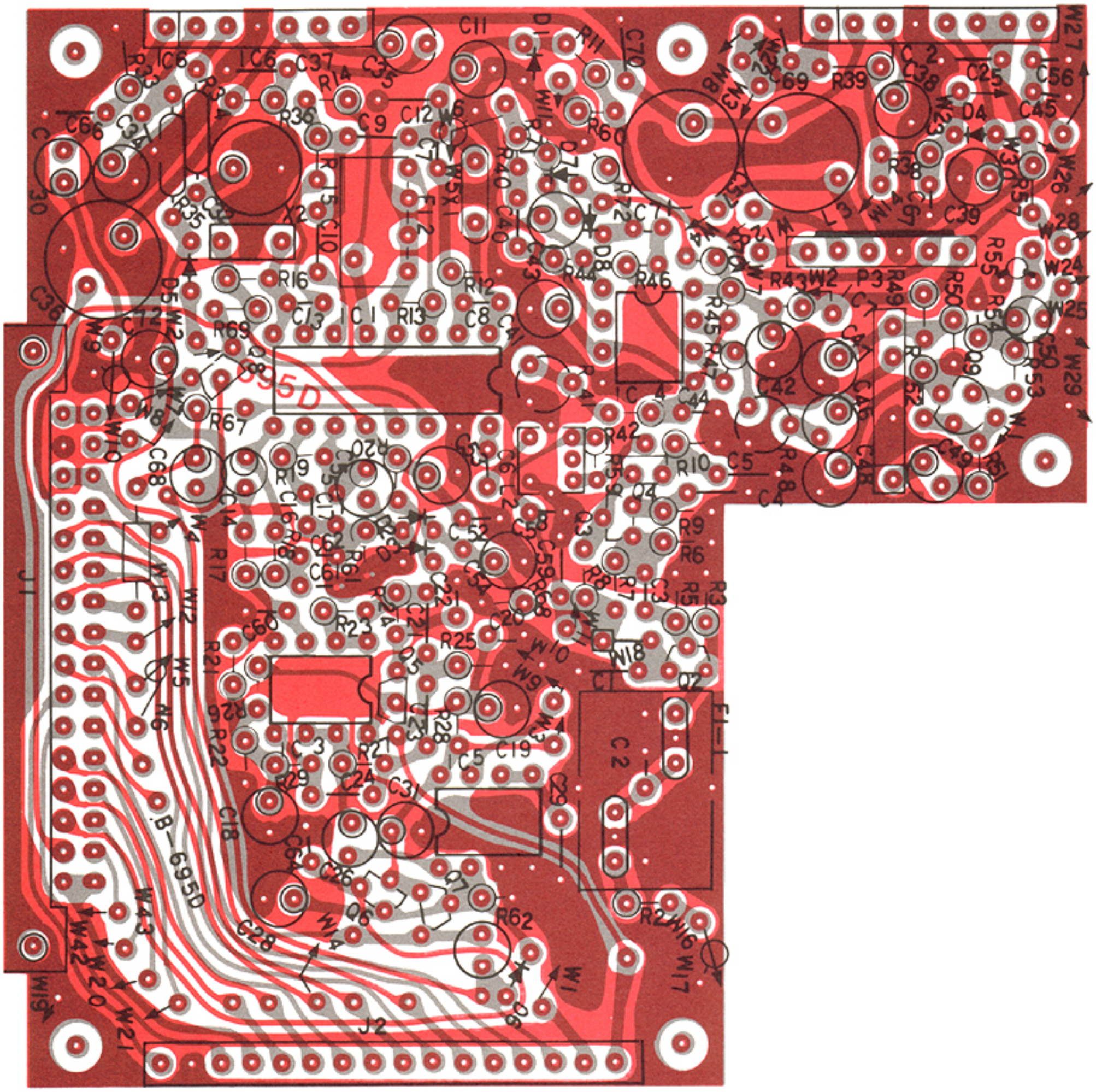
IC-435-12ch Control Board



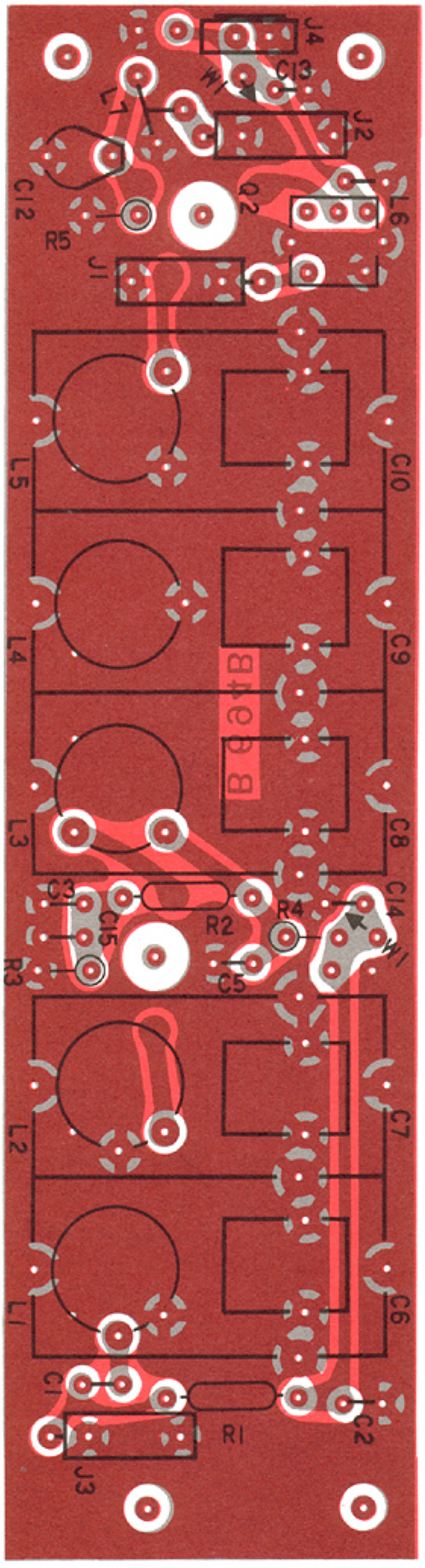
IC-435-2/12ch PLL/Driver Board



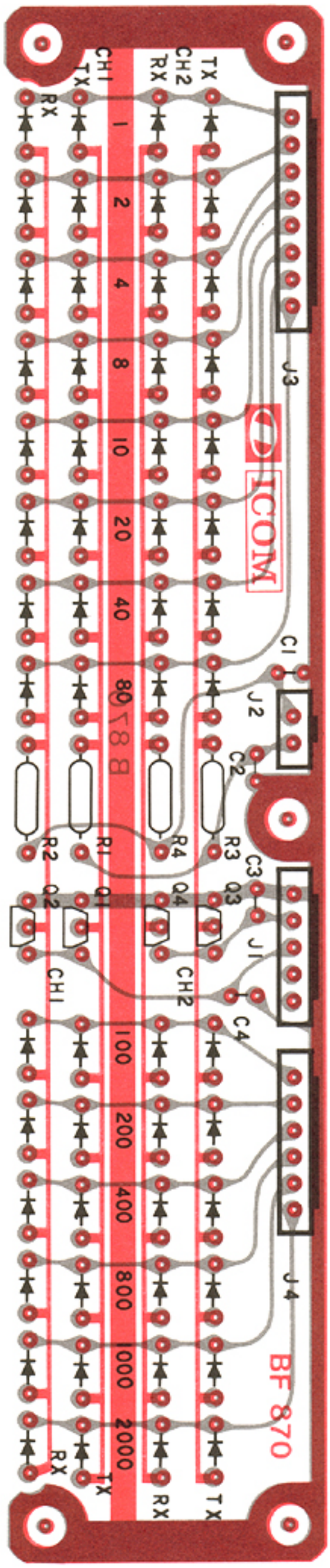
IC-435-2/12 Main Board



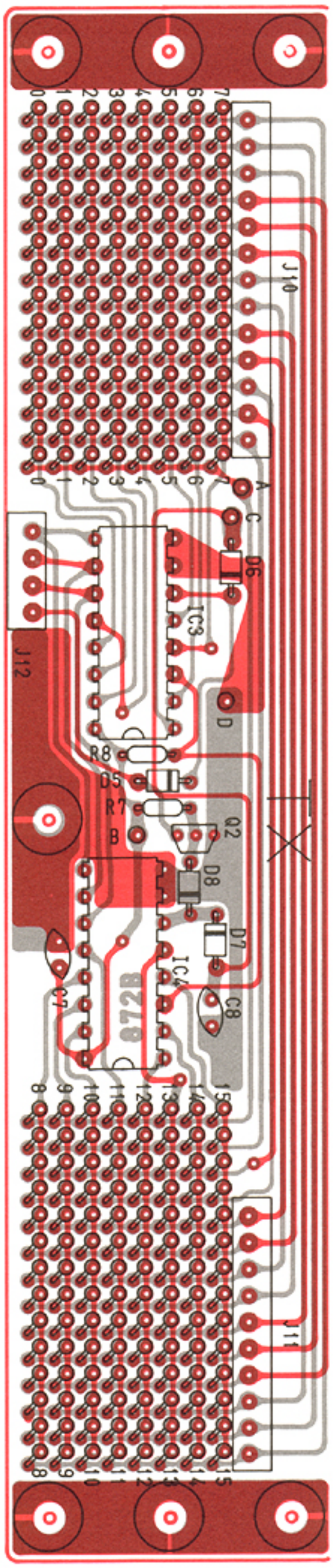
IC-435-12 RF Board



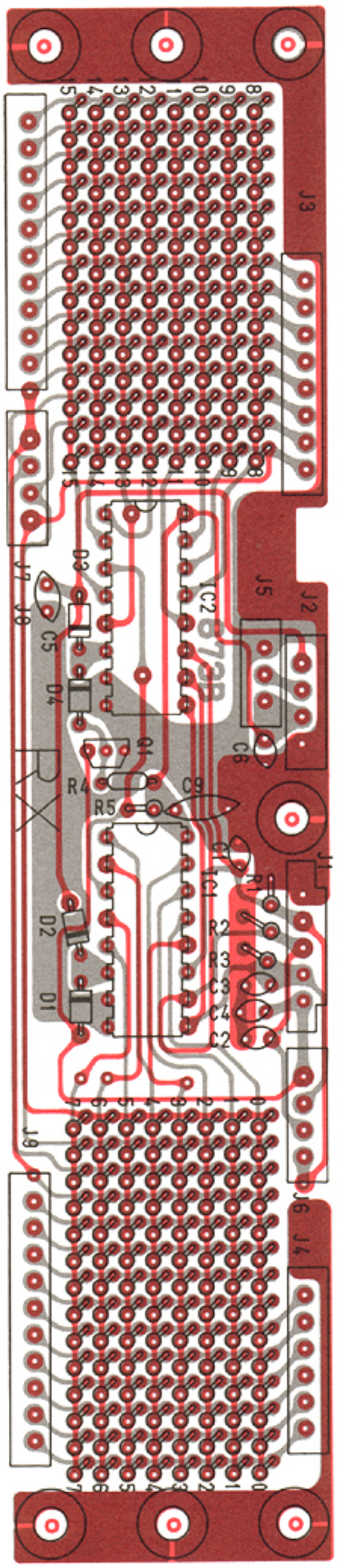
IC-435-2ch Matrix Board



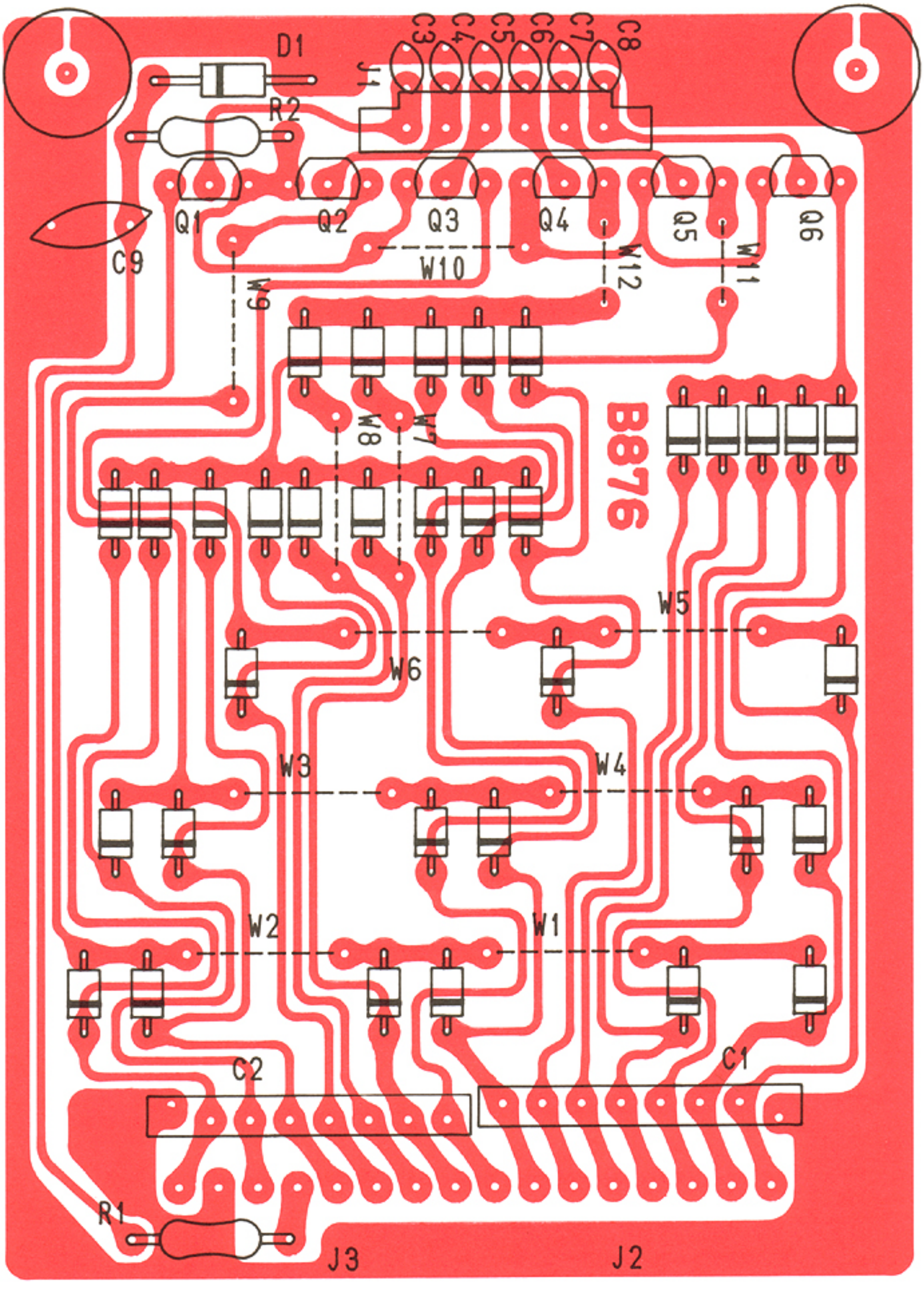
IC-435-12ch Transmit Matrix Board

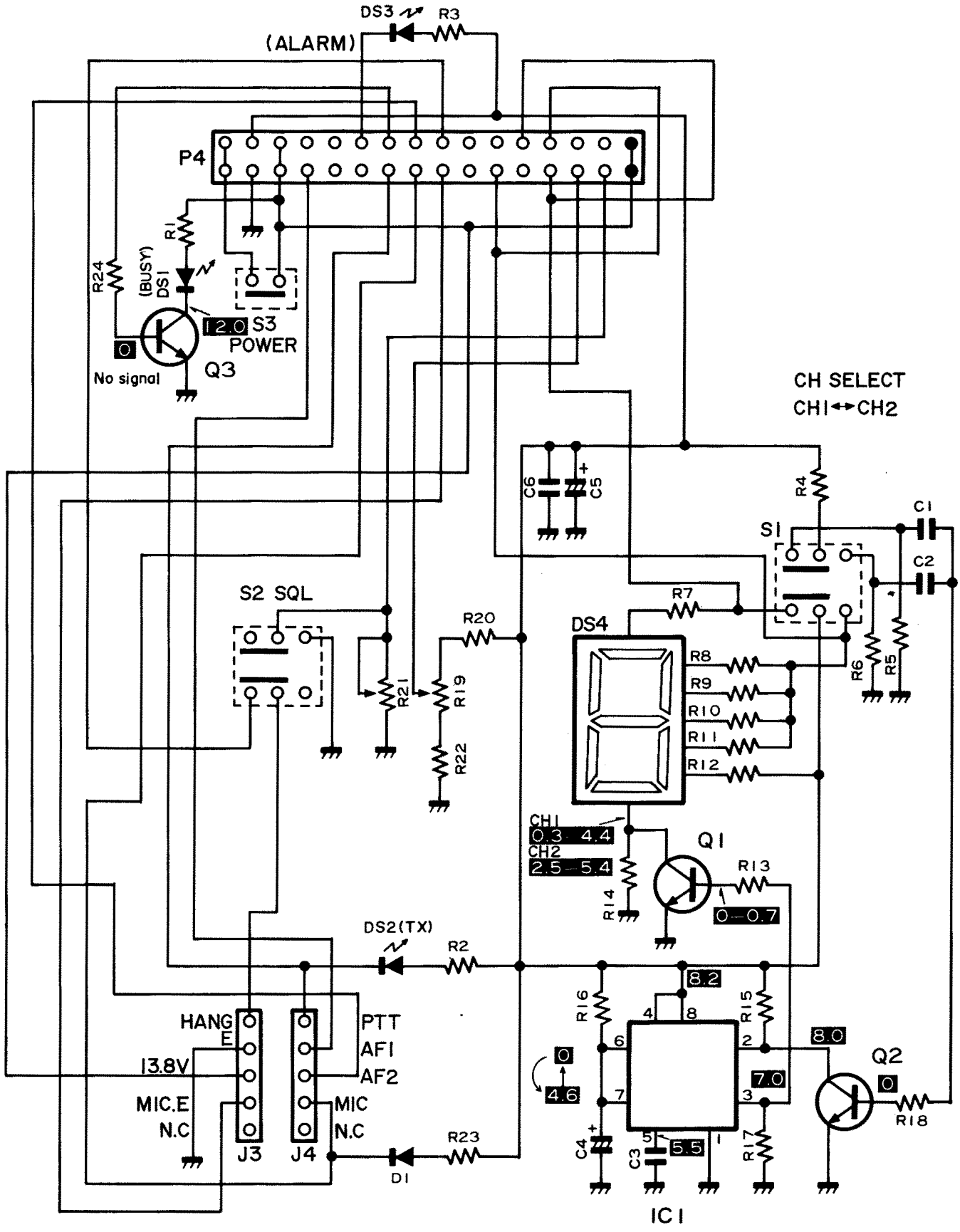


IC-435-12ch Receive Matrix Board



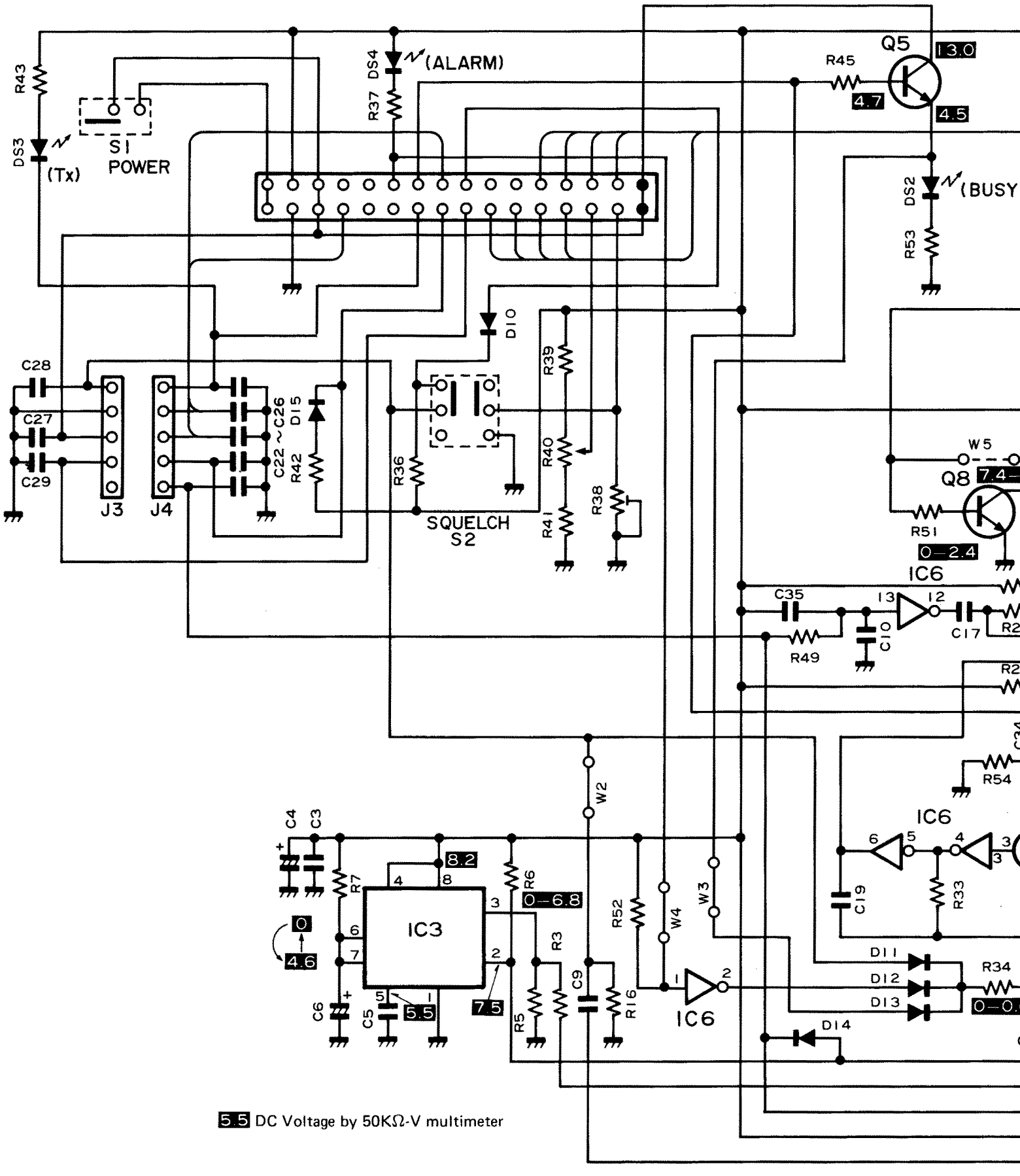
IC-435-S Matrix Board



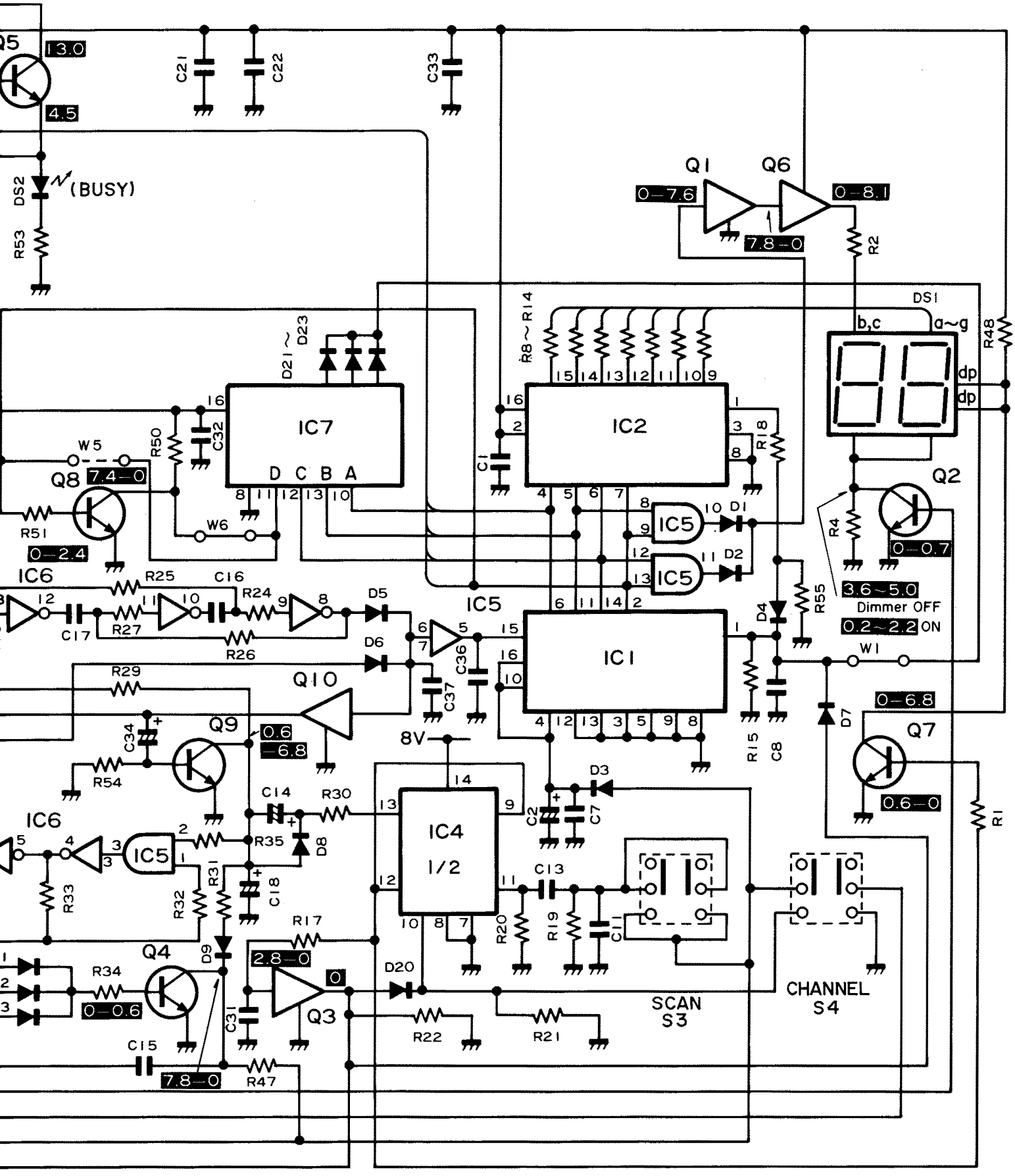


8.0 DC Voltage by 50KΩ-V multimeter

CONTROL 2ch

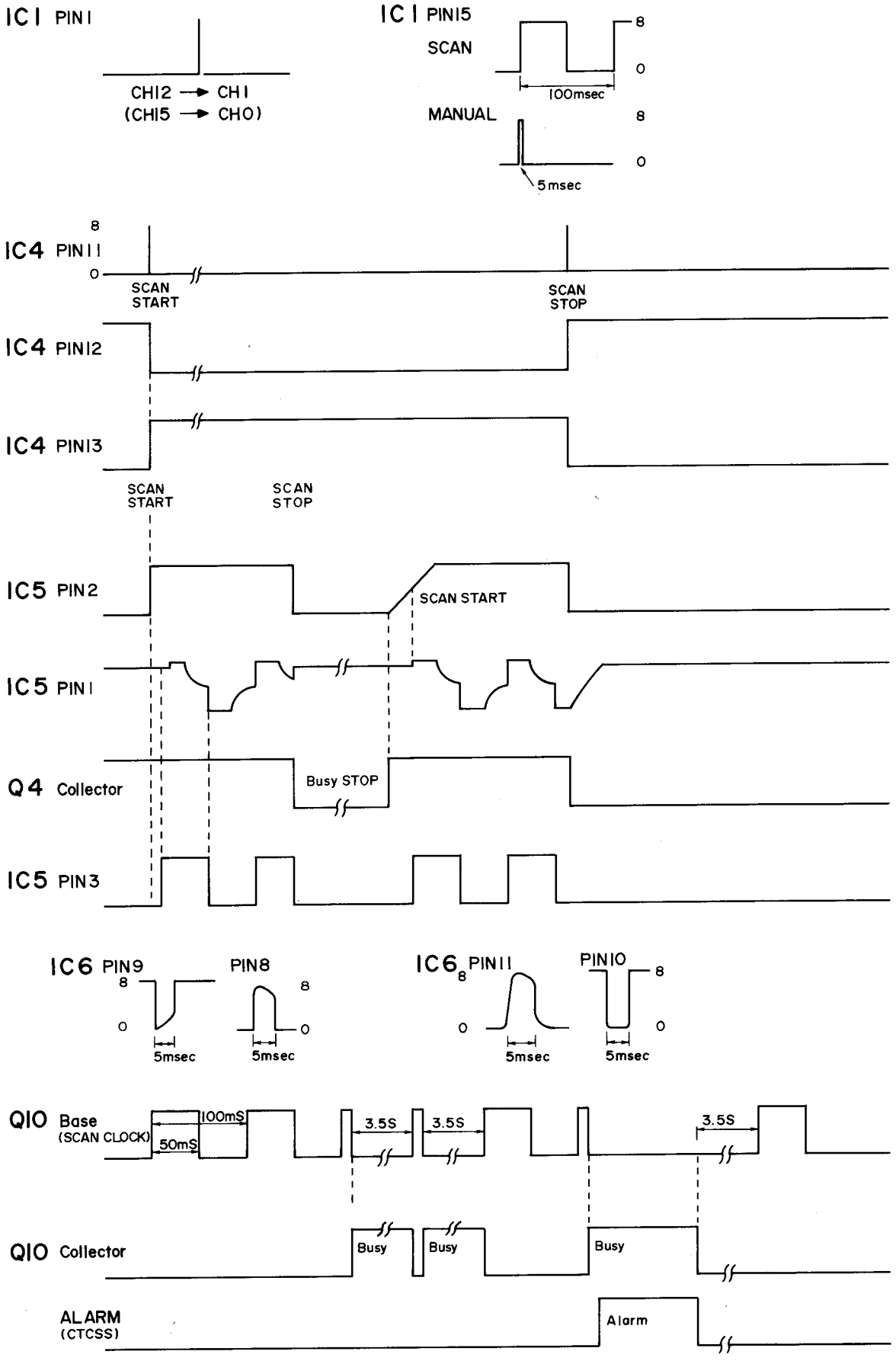


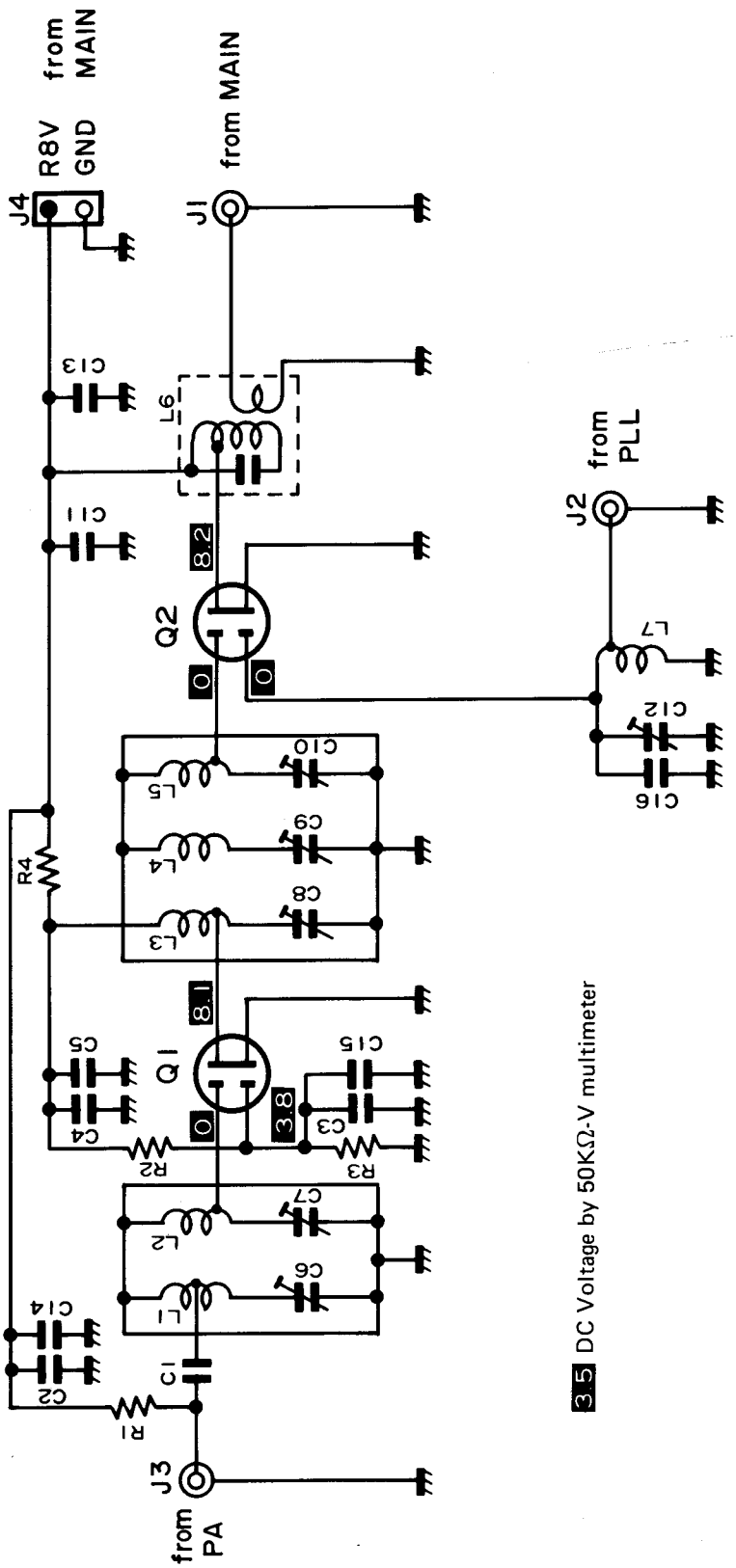
5.5 DC Voltage by 50KΩ-V multimeter

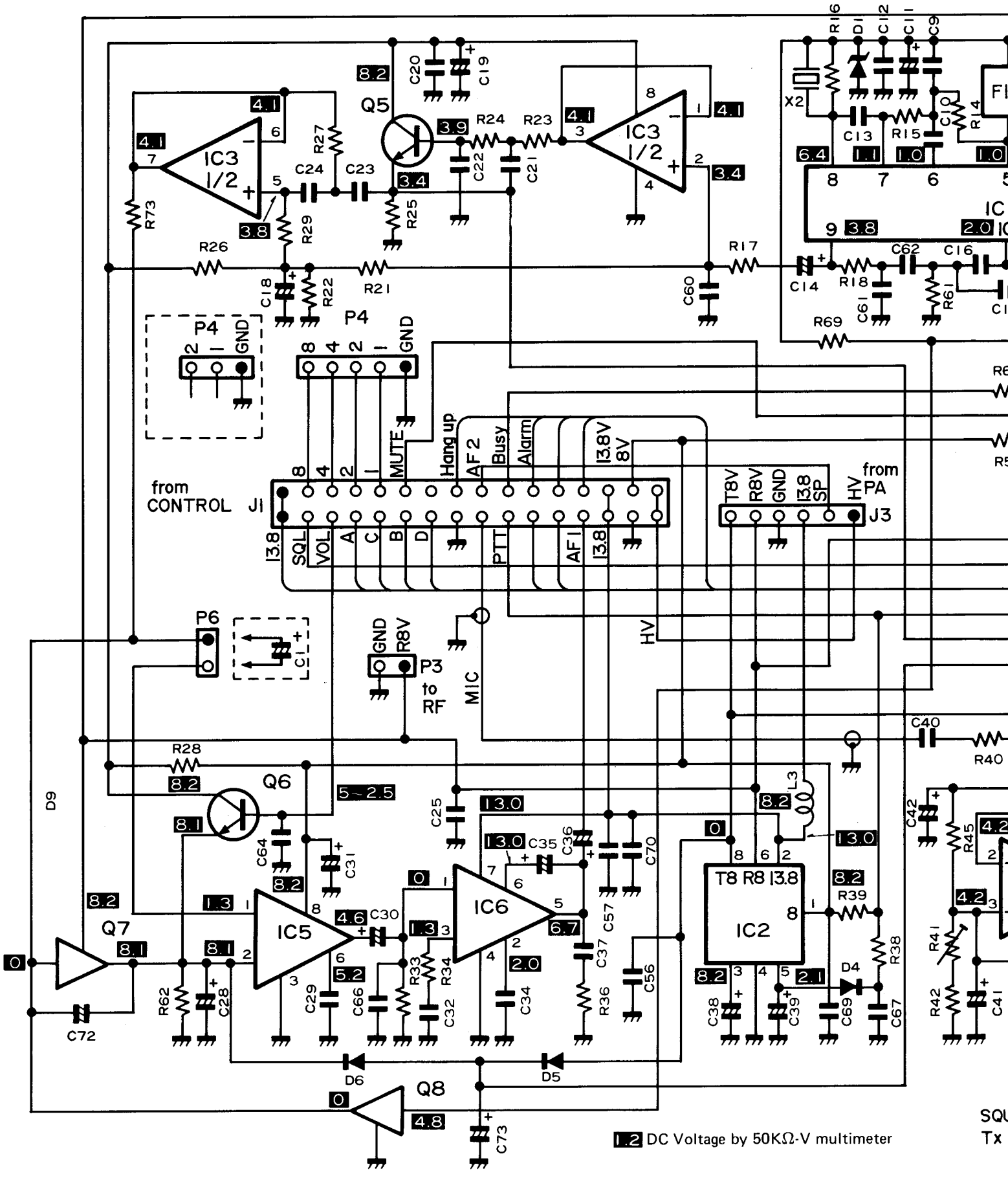


CONTROL 12ch

CONTROL 12ch Voltage Chart (2)

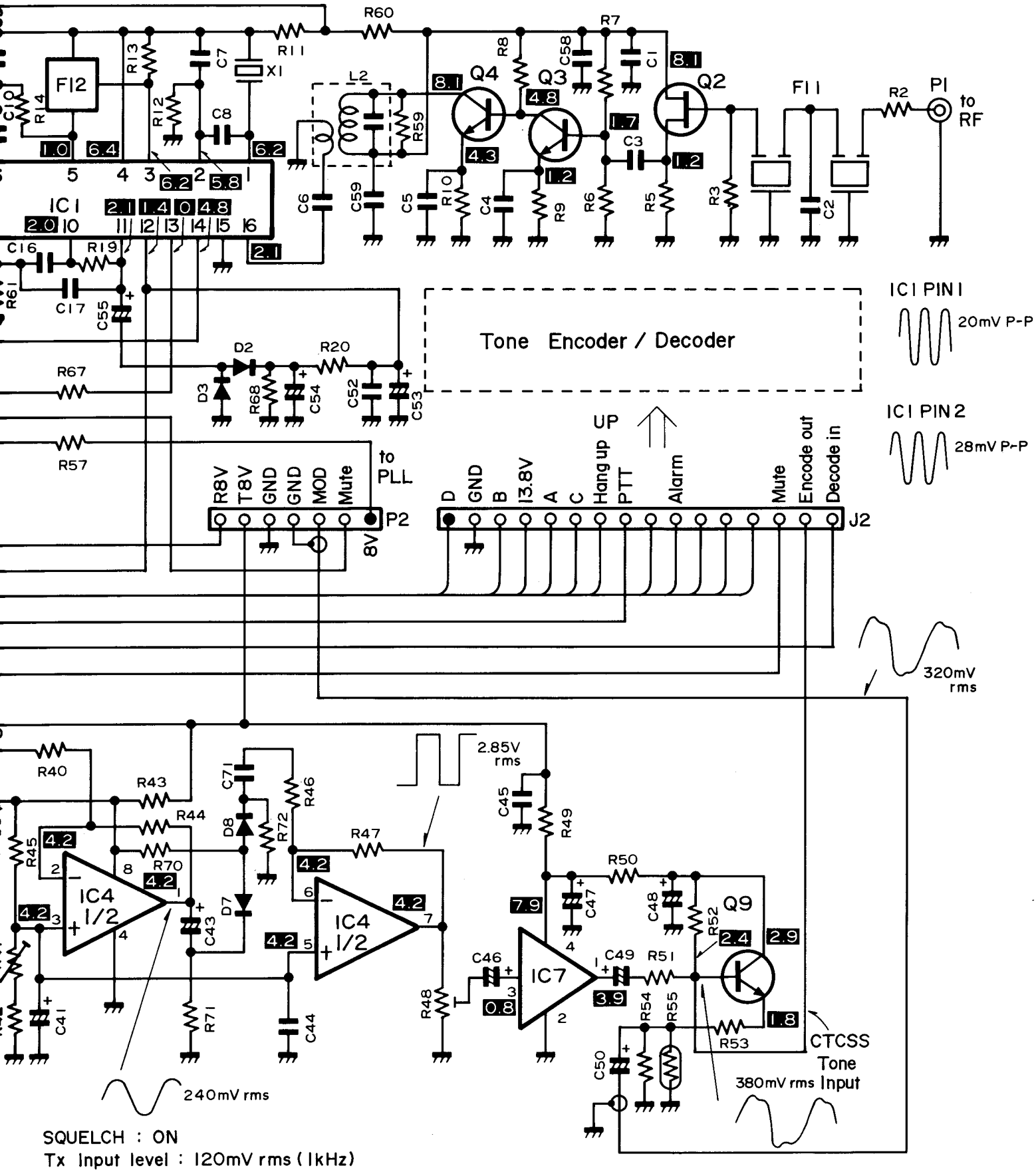



RF
J4
R8V
GND
from MAIN
J1
from MAIN
J2
from PLL
J3
from PA
C13
C11
L6
8.2
Q2
0
0
L7
C12
C16
C10
L5
C9
L4
C8
L3
R4
8.1
Q1
C5
C4
0
3.8
C15
C3
R2
R3
C7
L2
C6
L1
C14
C2
C1
R1
3.5 DC Voltage by 50KΩ-V multimeter

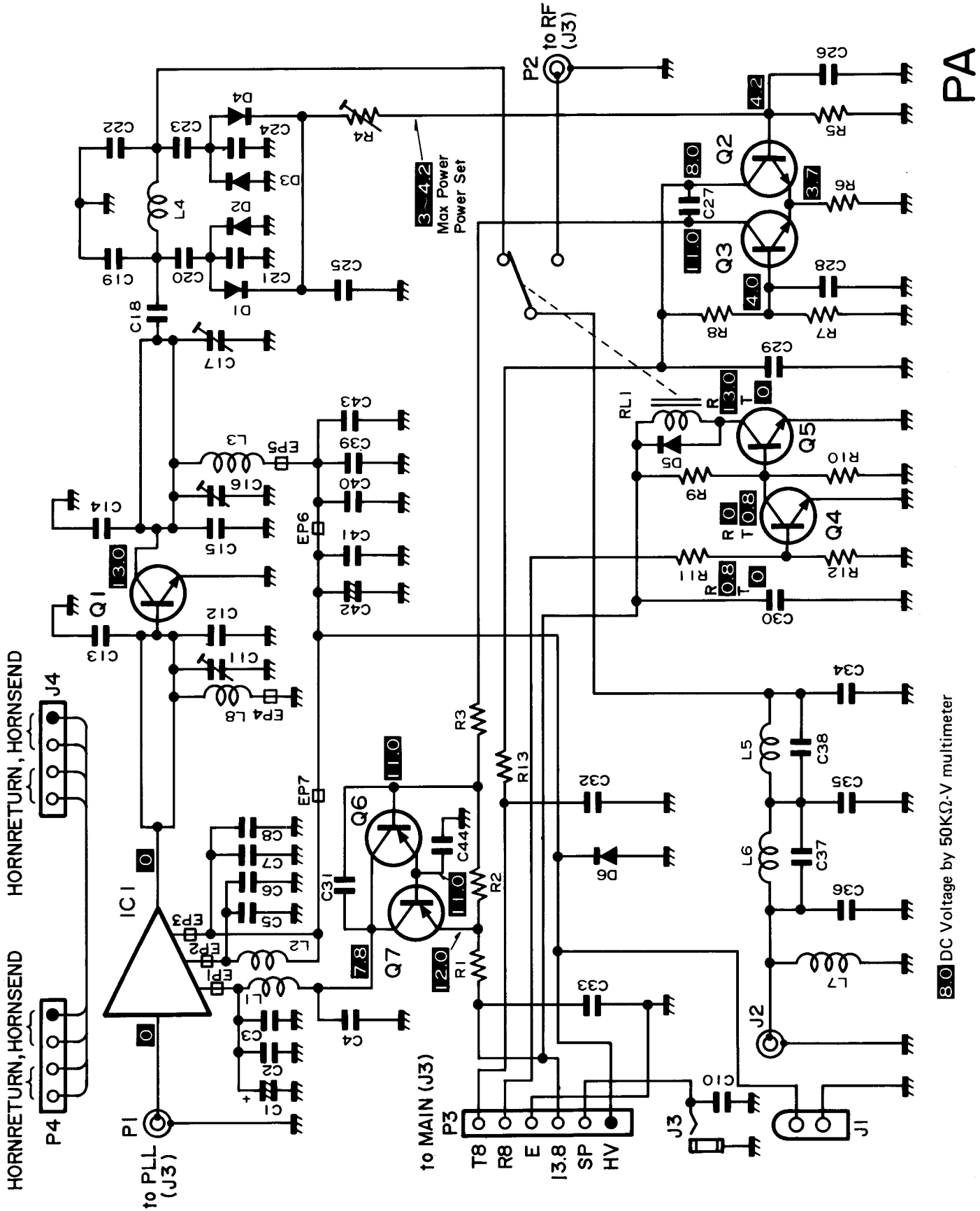


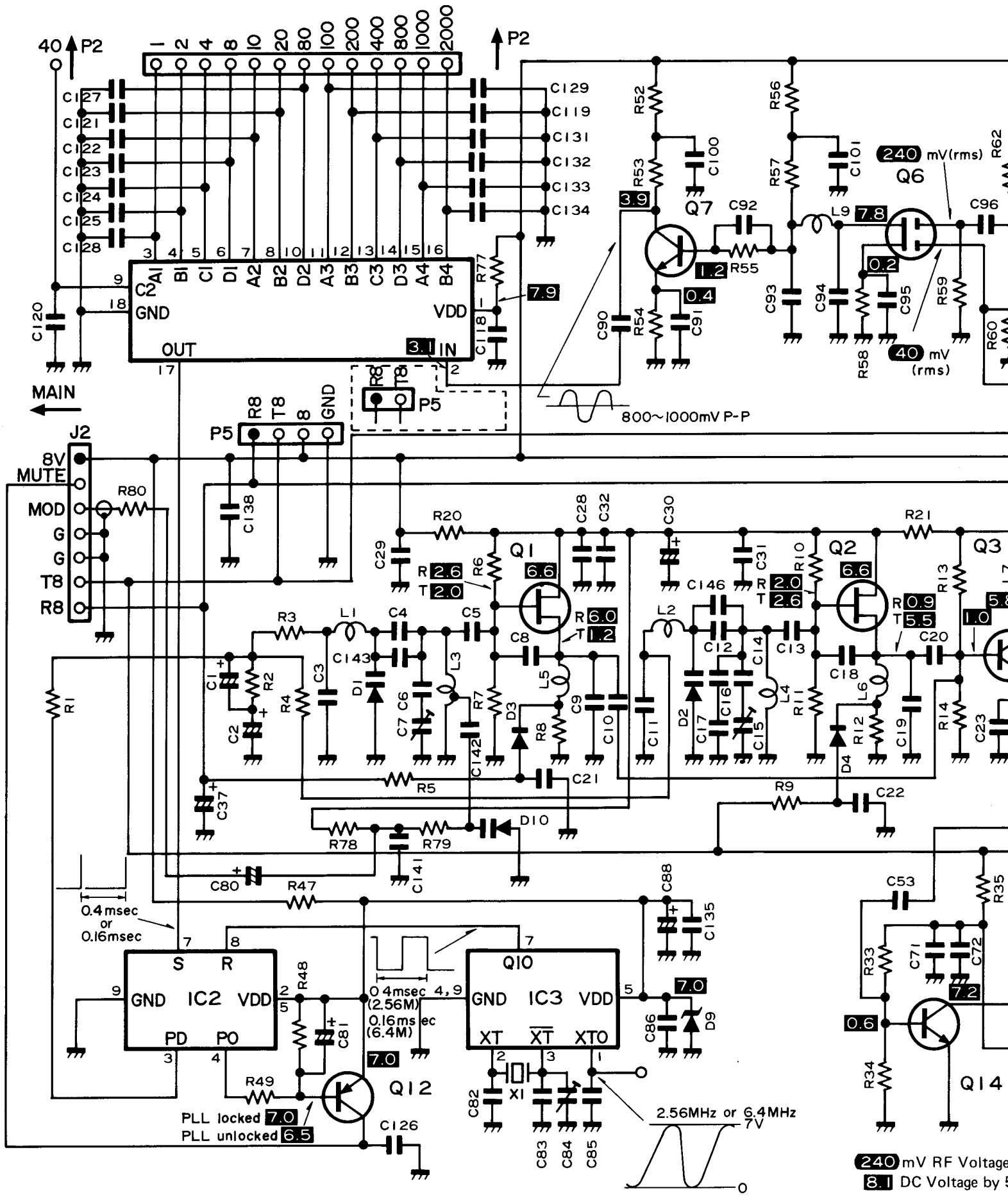
1.2 DC Voltage by 50KΩ-V multimeter

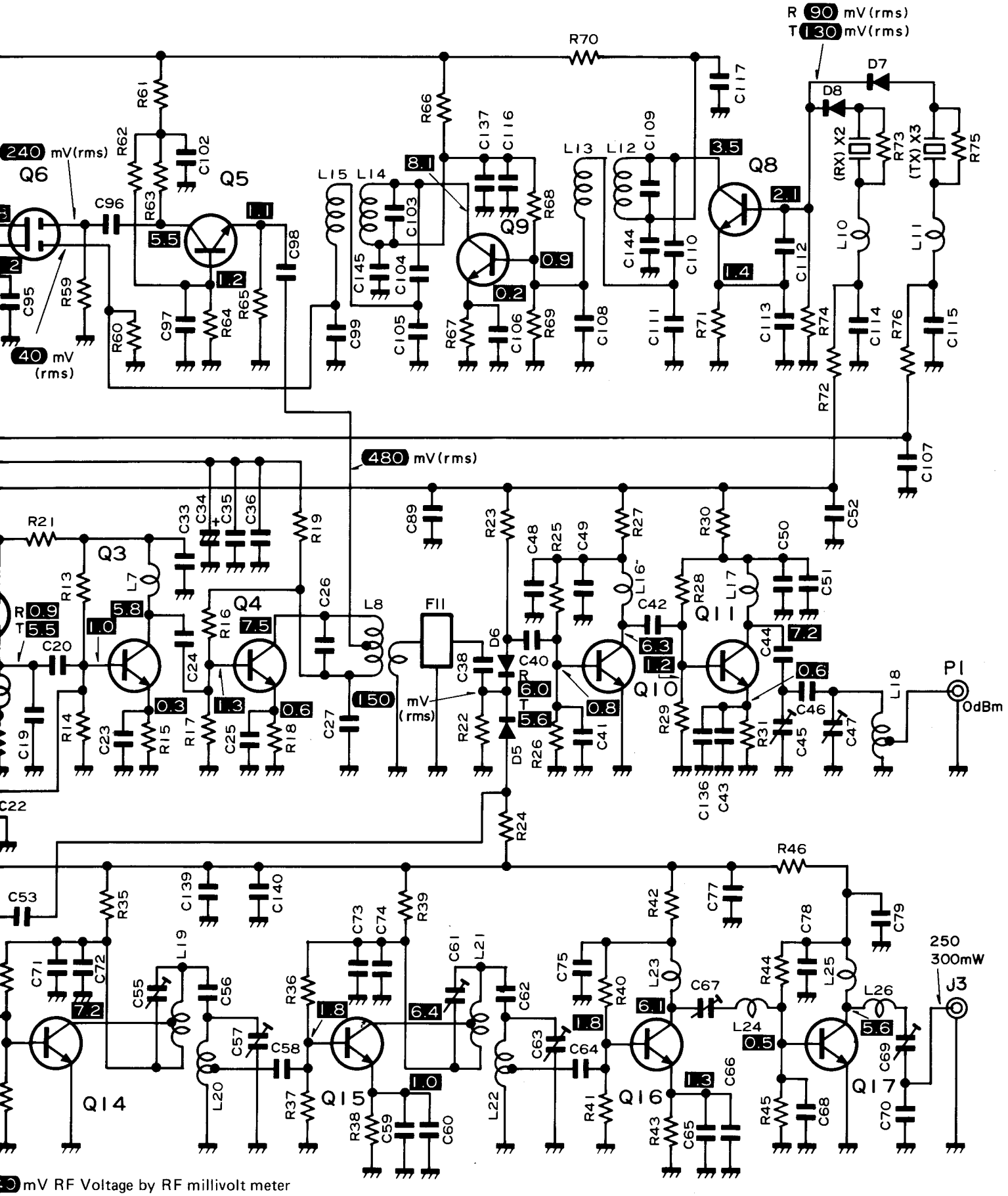
SQU
Tx


F12
X1
L2
IC1
Q4
Q3
Q2
F11
P1
to RF
R60
R7
R8
R11
R13
C7
C8
R12
R14
C58
C1
C3
R59
C6
C59
C5
R10
C4
R9
R6
R5
R3
C2
R2
C16
R19
C17
R61
C55
D2
R20
D3
R68
C54
C52
C53
R67
R57
Tone Encoder / Decoder
IC1 PIN1
20mV P-P
IC1 PIN2
28mV P-P
UP
R8V
T8V
GND
GND
MOD
Mute
to PLL
P2
8V
D
GND
B
13.8V
A
C
Hang up
PTT
Alarm
Mute
Encode out
Decode in
J2
320mV rms
2.85V rms
R40
R43
R44
R45
R70
R46
R72
C71
D8
D7
C43
R47
IC4 1/2
C45
R49
R50
C47
C48
Q9
R52
C46
IC7
C49
R51
R54
R55
R53
C50
R48
C41
R71
C44
240mV rms
CTCSS Tone
380mV rms Input
SQUELCH : ON
Tx Input level : 120mV rms (1kHz)

MAIN


PA
8.0 DC Voltage by 50KΩ·V multimeter
P2 to RF (J3)
3~4.2 Max Power Power Set
R4
D4
C22
C23
C24
D3
D2
L4
C19
C20
C21
D1
C25
C18
C17
C43
C39
C40
C41
C42
L3
EP5
EP6
C16
C15
C14
C13
C12
C11
EP4 L8
Q1
13.0
EP7
Q6
11.0
C44
11.0
R2
C31
Q7
7.8
12.0
R1
R3
R13
C32
D6
C33
C4
C8
C7
C6
C5
EP3
EP2
EP1
L2
L1
C3
C2
C1
IC1
0
0
P1
to PLL (J3)
P4
HORNRETURN, HORNSEND
J4
HORNRETURN, HORNSEND
to MAIN (J3)
P3
T8
R8
E
13.8
SP
HV
J3
C10
J1
J2
L5
C38
C34
C35
L6
C37
C36
L7
C26
R5
4.2
Q2
8.0
C27
3.7
R6
11.0
Q3
C28
4.0
R8
R7
C29
RL1
R
13.0
T
0
D5
Q5
R10
R9
R
0
T
0.8
Q4
R11
R12
R
0.8
T
0
C30

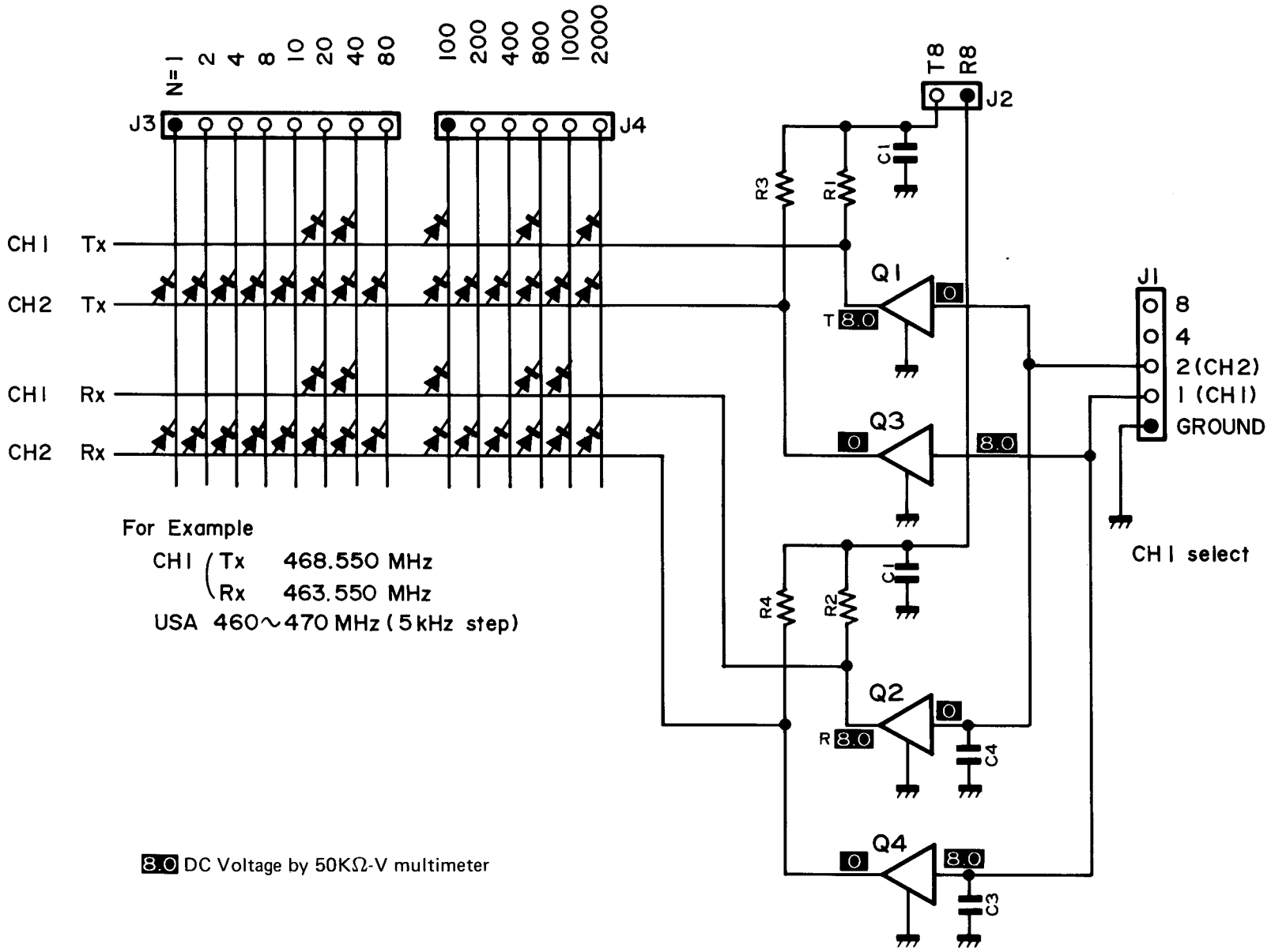

40 P2
P2
— 2 4 8 10 20 80 100 200 400 800 1000 2000
C127
C121
C122
C123
C124
C125
C128
C129
C119
C131
C132
C133
C134
C120
C2
GND
VDD
OUT
IN
3.1
7.9
R77
C118
MAIN
P5
R8 T8 8 GND
J2
8V
MUTE
MOD
G
G
T8
R8
R80
C138
R20
C28
C32
C30
R21
Q1
6.6
R 2.6
T 2.0
R6
C29
Q2
6.6
R 2.0
T 2.6
R10
C31
C146
Q3
R 0.9
T 5.5
R13
5.8
1.0
C20
R3
L1
C4
C5
C8
L2
C12
C14
C13
C18
L6
C143
C1
R2
C3
D1
L3
C6
C7
R7
D3
L5
C9
C10
C11
D2
C17
C16
C15
L4
R11
D4
R12
C19
R14
C23
R1
C142
C21
R5
C37
R9
C22
D10
R78
R79
C141
C80
R47
0.4msec
or
0.16msec
C88
C135
C53
R35
R33
C71
C72
7.2
0.6
R34
Q14
S R
GND IC2 VDD
PD PO
R48
C81
R49
Q12
7.0
PLL locked 7.0
PLL unlocked 6.5
C126
0.4msec 4,9
(2.56M)
0.16msec
(6.4M)
Q10
GND IC3 VDD
XT XT XTO
C82
X1
C83
C84
C85
C86
D9
2.56MHz or 6.4MHz
7V
0
240 mV(rms)
Q6
C92
L9
7.8
C96
R62
R52
R53
3.9
Q7
C100
R56
R57
C101
1.2
R55
0.4
C90
R54
C91
C93
C94
0.2
C95
R59
R60
R58
40 mV
(rms)
800~1000mV P-P
240 mV RF Voltage
8.1 DC Voltage by 5



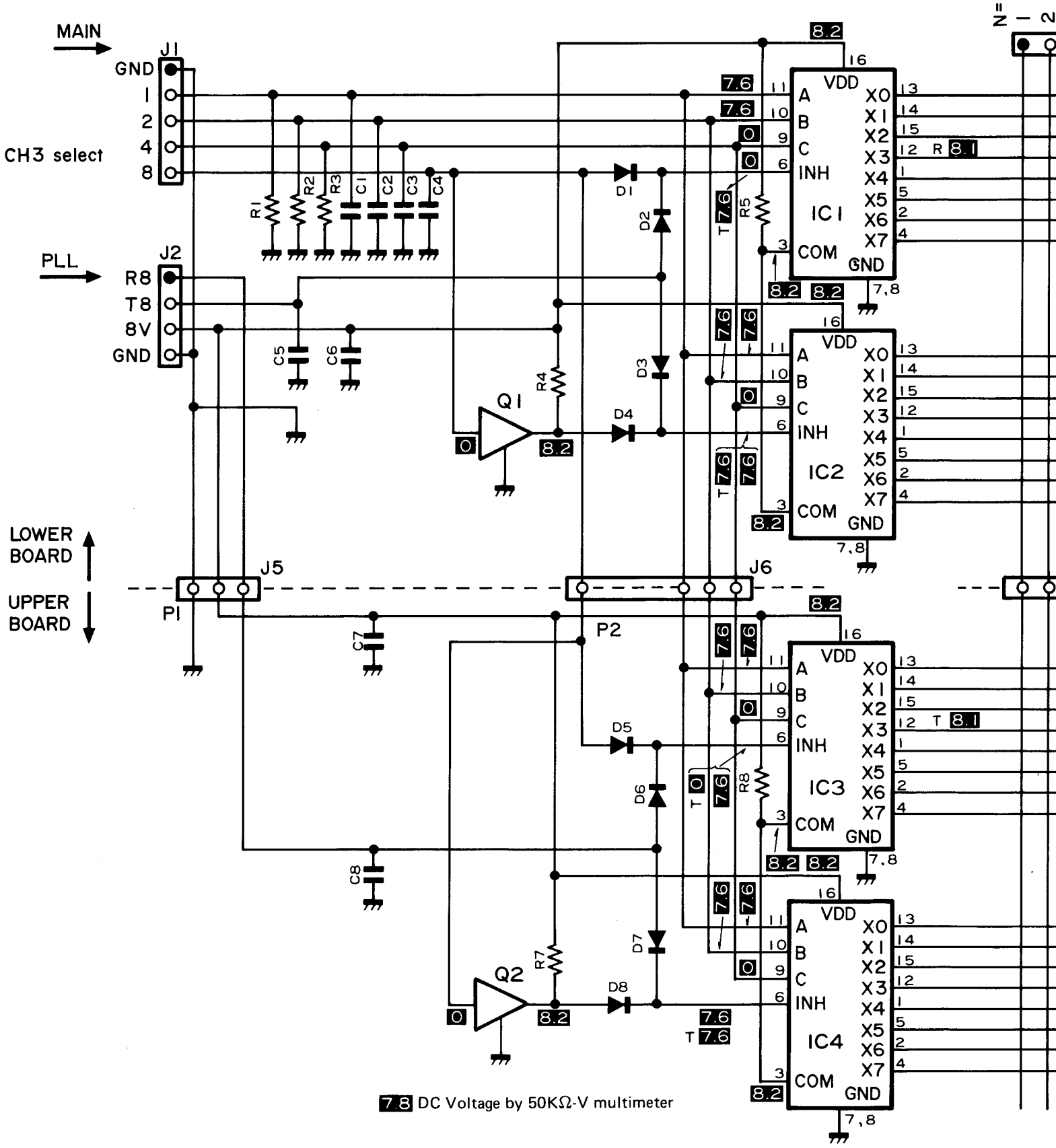
mV RF Voltage by RF millivolt meter

DC Voltage by 50KΩ-V multimeter

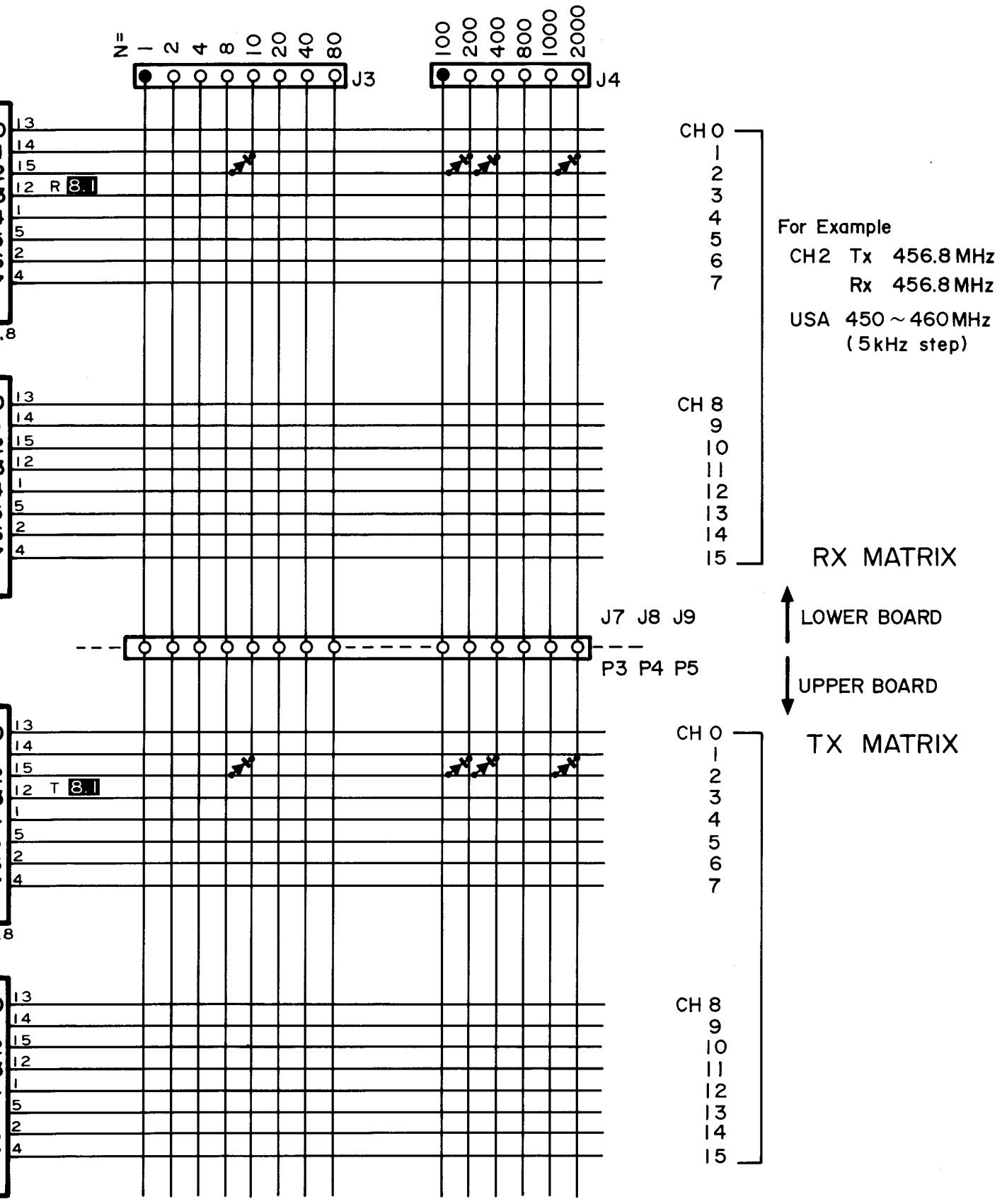
PLL


N= 1
2
4
8
10
20
40
80
100
200
400
800
1000
2000
J3
J4
J2
T8
R8
J1
8
4
2(CH2)
1 (CH1)
GROUND
CH1 Tx
CH2 Tx
CH1 Rx
CH2 Rx
R3
R1
C1
Q1
T 8.0
0
Q3
0
8.0
R4
R2
C1
Q2
R 8.0
0
C4
Q4
0
8.0
C3
CH1 select
For Example
CH1 (Tx 468.550 MHz
Rx 463.550 MHz
USA 460~470 MHz (5kHz step)
8.0 DC Voltage by 50KΩ-V multimeter

MATRIX 2ch

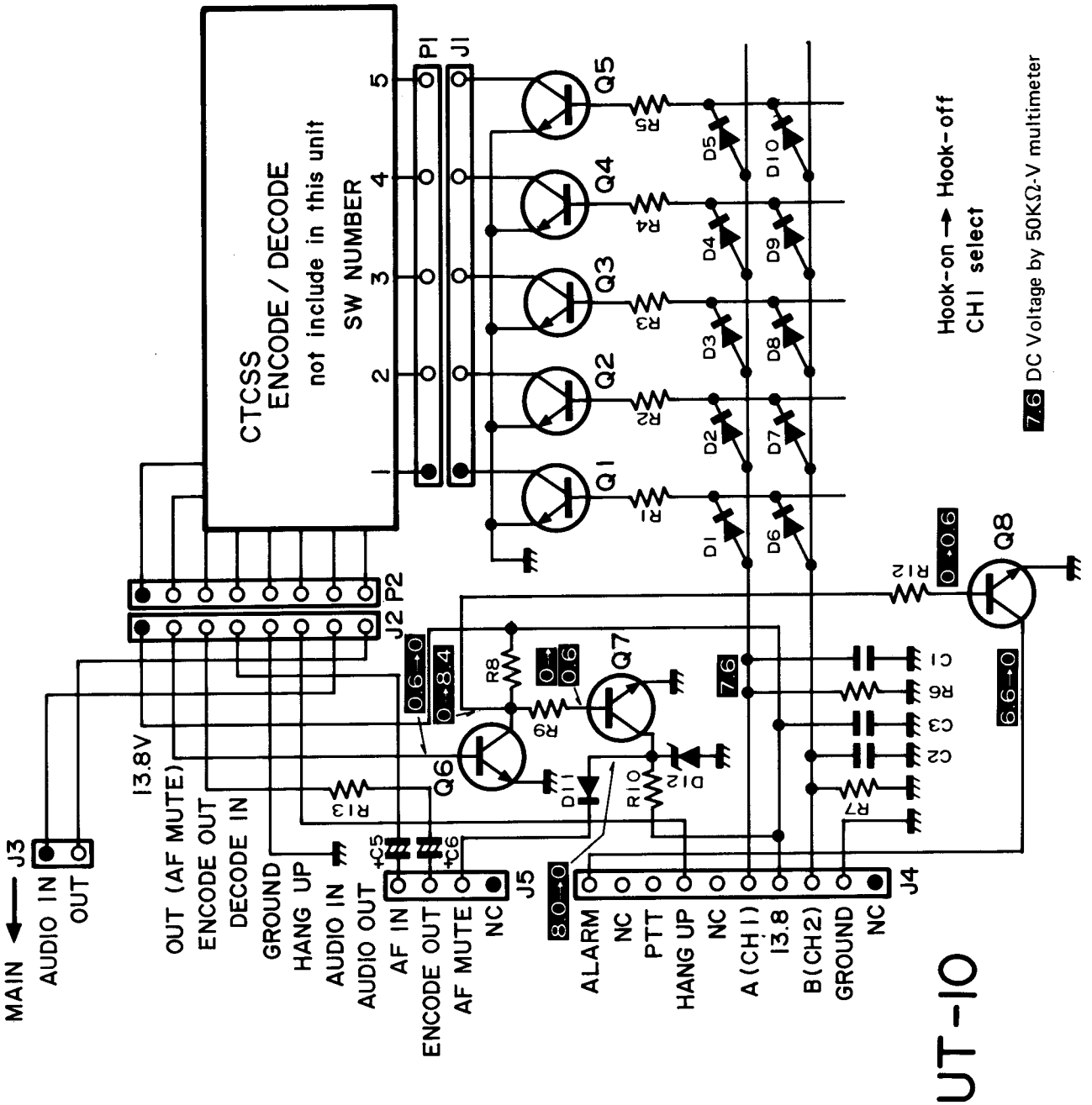


7.8 DC Voltage by 50KΩ-V multimeter

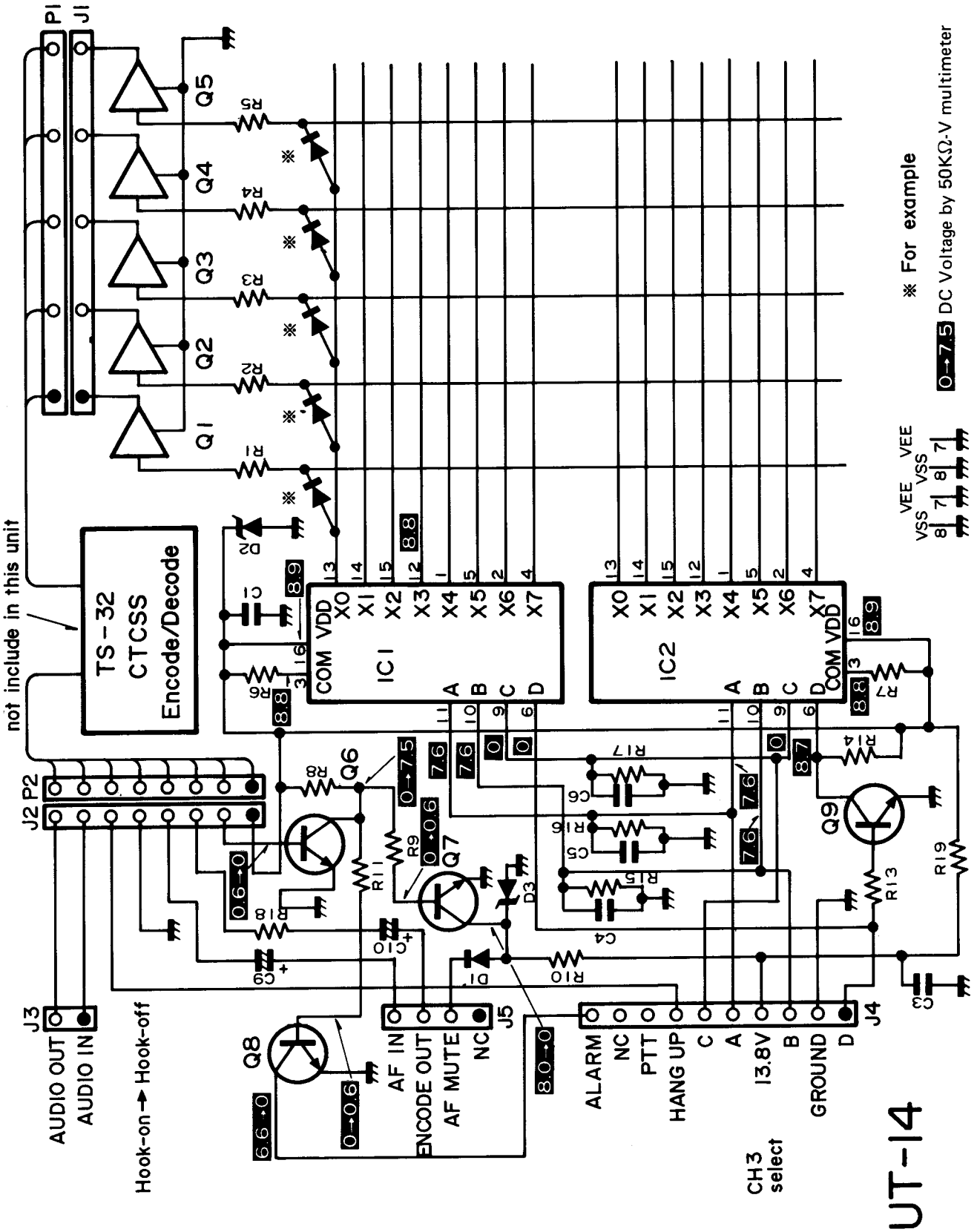

N= 1 2 4 8 10 20 40 80
J3
100 200 400 800 1000 2000
J4
13
14
15
12 R 8.1
1
5
2
4
CH 0
1
2
3
4
5
6
7
For Example
CH2 Tx 456.8MHz
Rx 456.8MHz
USA 450~460MHz
(5kHz step)
CH 8
9
10
11
12
13
14
15
RX MATRIX
J7 J8 J9
P3 P4 P5
LOWER BOARD
UPPER BOARD
12 T 8.1
TX MATRIX

MATRIX 12ch

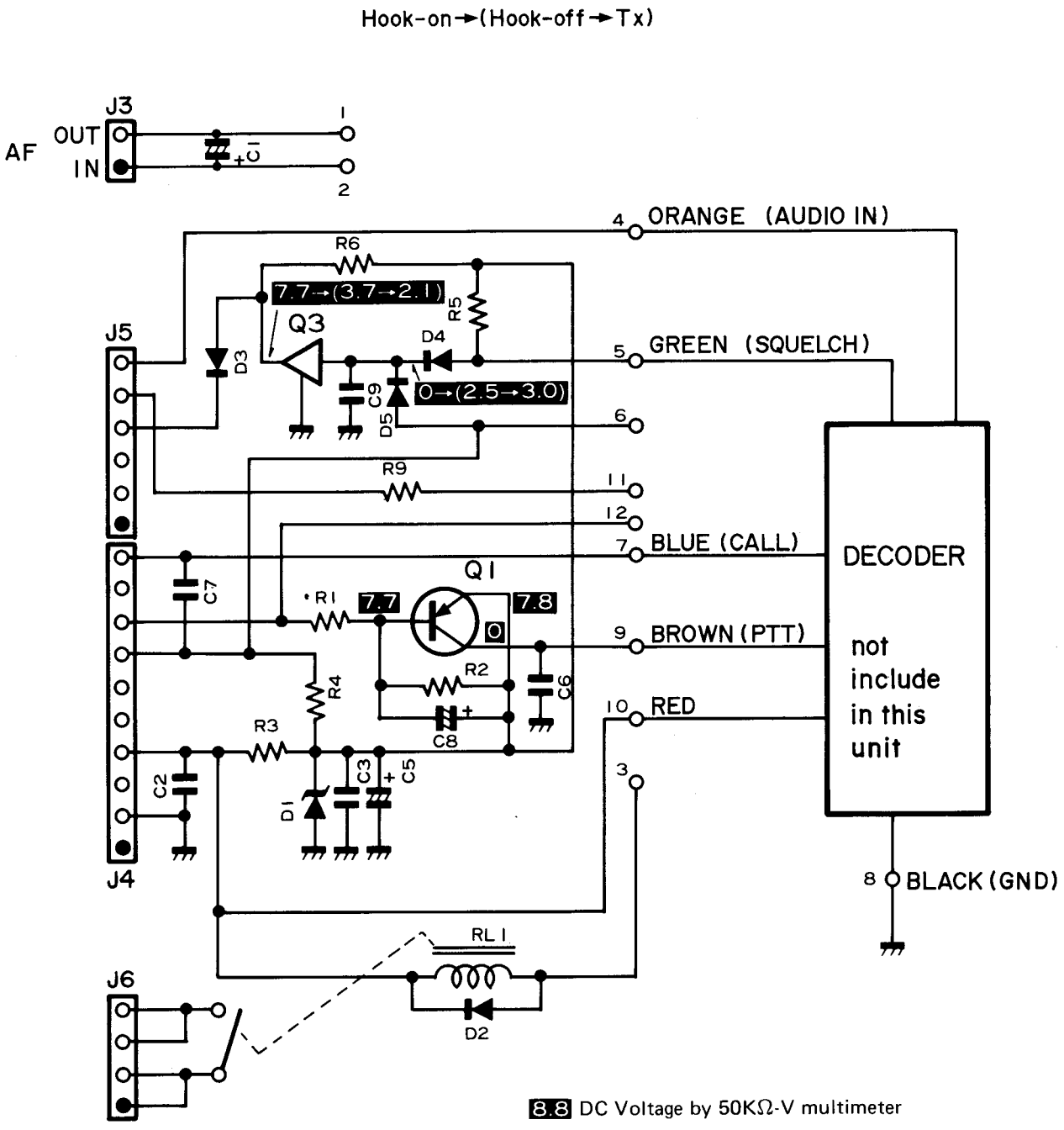
(not included in this unit)

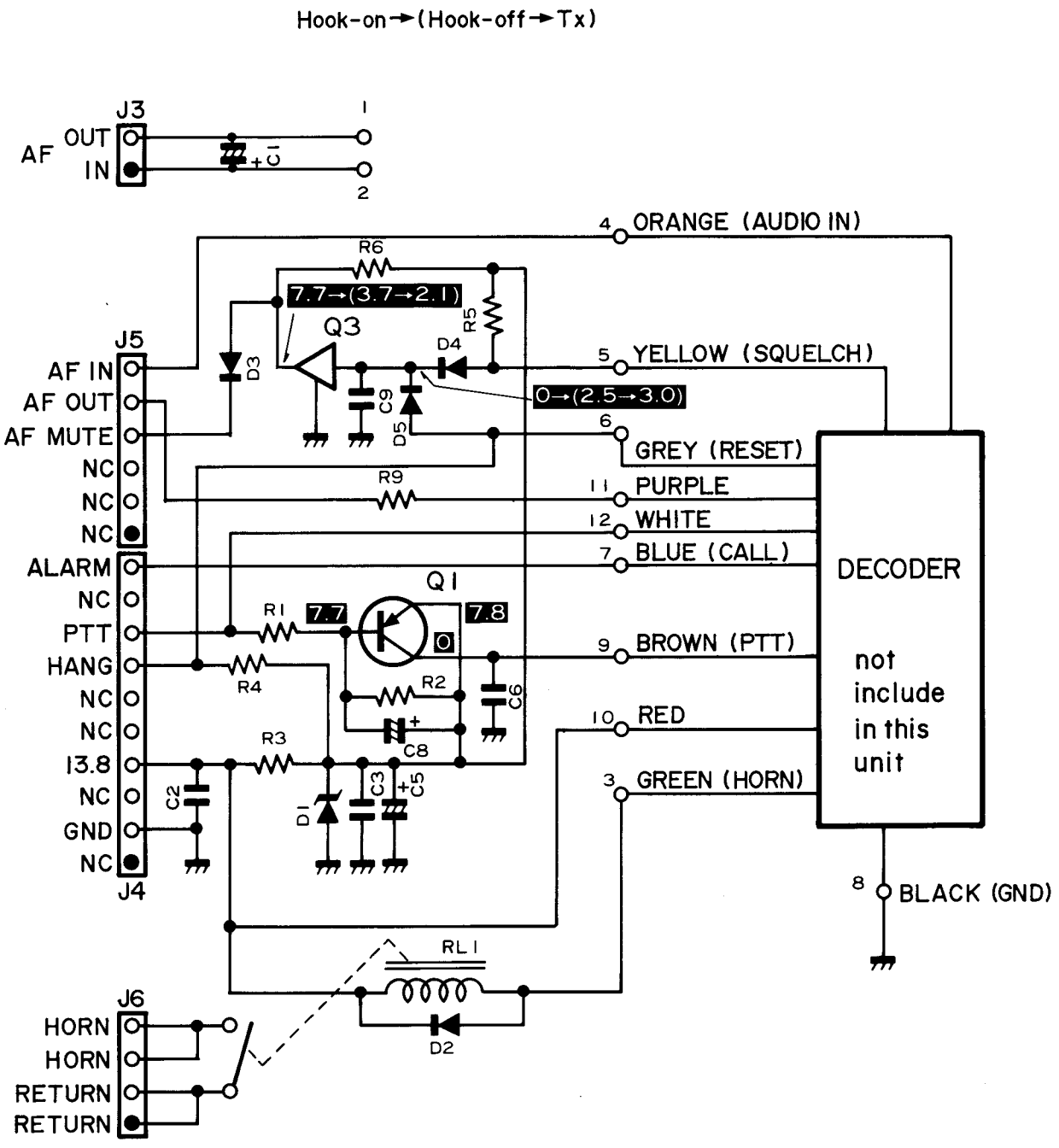


(not included in this unit)



(Figure 4)


Hook-on→(Hook-off→Tx)
J3
AF
OUT
IN
1
2
C1
4 ORANGE (AUDIO IN)
R6
7.7→(3.7→2.1)
R5
Q3
D4
5 GREEN (SQUELCH)
J5
D3
C9
D5
0→(2.5→3.0)
6
R9
11
12
7 BLUE (CALL)
DECODER
not include in this unit
C7
Q1
*R1
7.7
7.8
0
9 BROWN (PTT)
R2
C6
R4
10 RED
R3
C8
C2
C3
C5
D1
3
J4
8 BLACK (GND)
RL1
J6
D2
8.8 DC Voltage by 50KΩ-V multimeter



R4 : TTD-2 used only

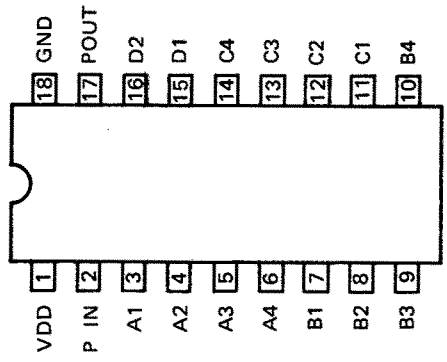
UT-11, UT-12

TC-9122P (BCD PROGRAMMABLE COUNTER)

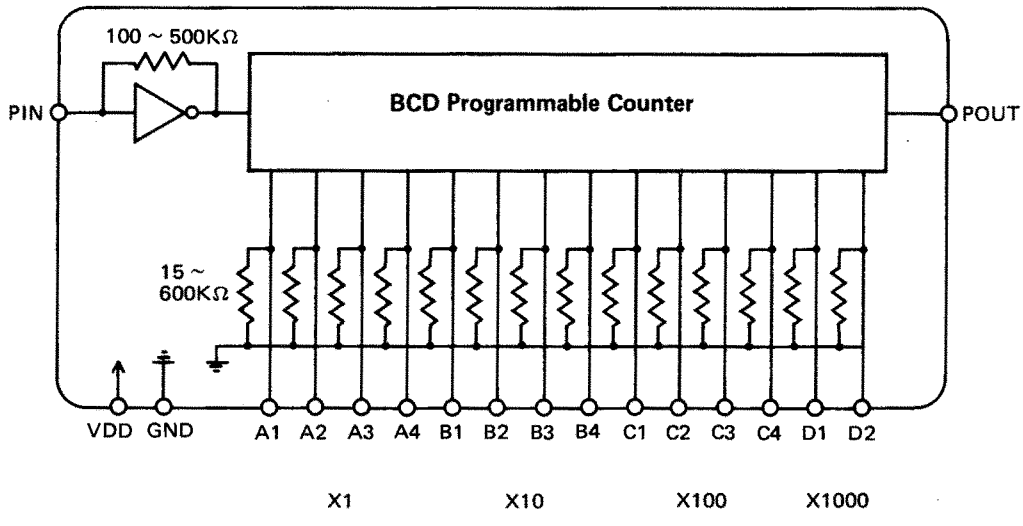
MAXIMUM RATINGS (Ta = 25°C)

SYMBOL	DESCRIPTION	RATINGS	UNIT
VDD	Supply Voltage	10	V
VIN	Input Voltage	−0.3 ~ VDD+0.3	V
TOPR	Operating Temperature	−30 ~ 75	°C
TSTR	Storage Temperature	−55 ~ 125	°C

PIN CONNECTION



BLOCK DIAGRAM

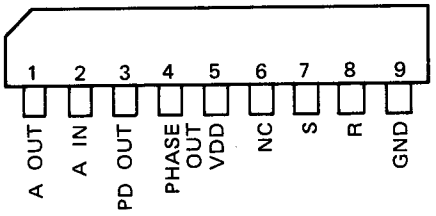


TC-5081 (OSCILLATOR AND 10 STAGE DIVIDER)

MAXIMUM RATINGS (Ta = 25°C)

SYMBOL	DESCRIPTION	RATINGS	UNIT
VDD	Supply Voltage	10	V
VIN	Input Voltage	−0.3 ~ VDD+0.3	V
TOPR	Operating Temperature	−30 ~ 75	°C
TSTR	Storage Temperature	−55 ~ 125	°C

PIN CONNECTION

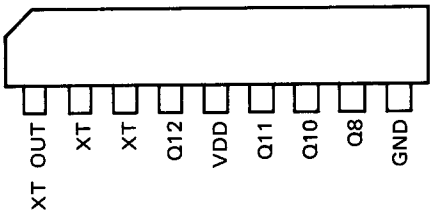


TC-5082 (PHASE COMPARATOR)

MAXIMUM RATINGS (Ta = 25°C)

SYMBOL	DESCRIPTION	RATINGS	UNIT
VDD	Supply Voltage	10	V
VIN	Input Voltage	−0.3 ~ VDD+0.3	V
TOPR	Operating Temperature	−30 ~ 75	°C
TSTR	Storage Temperature	−55 ~ 125	°C

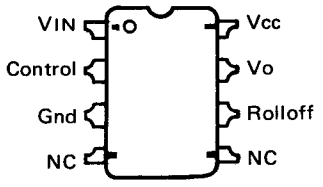
PIN CONNECTION



MC3340P ELECTRONIC ATTENUATOR

MAXIMUM RATINGS (Ta = +25°C unless otherwise noted.)

Rating	Value	Unit
Power Supply Voltage	20	Vdc
Power Dissipation @ Ta = 25°C	1.2	Watts
Derate above Ta = 25°C	10	mW/°C
Operating Ambient Temperature Range	0 to +75	°C



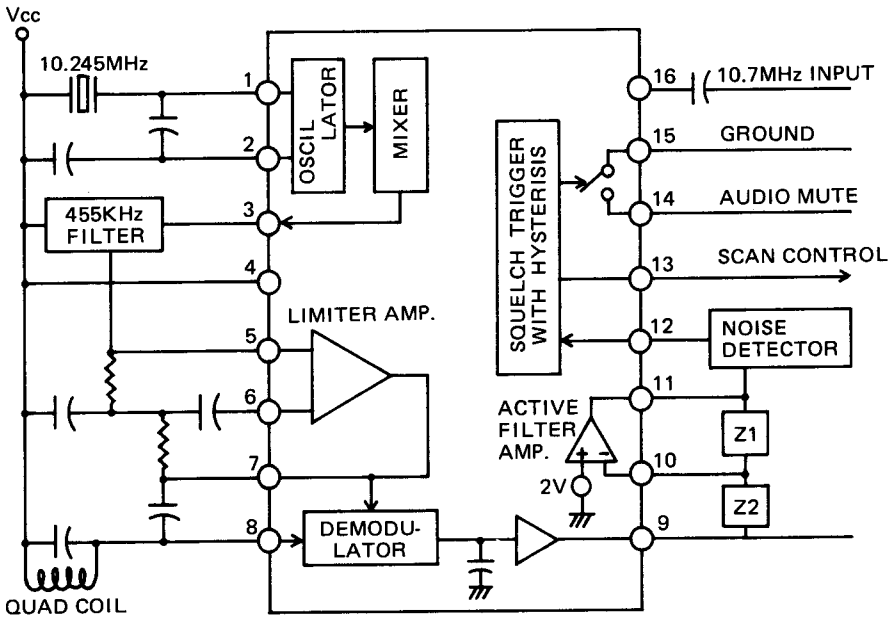
PLASTIC PACKAGE

MC-3357 (LOW POWER FM IF)

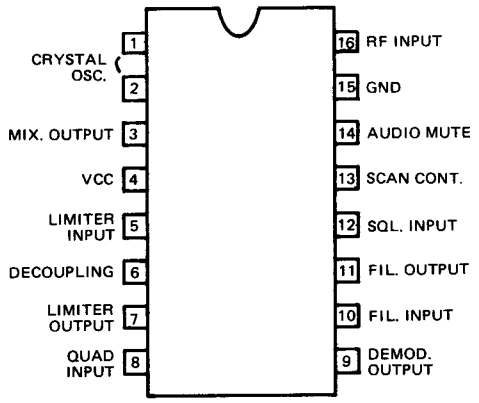
MAXIMUM RATINGS (Ta = 25°C)

SYMBOL	DESCRIPTION	RATINGS	UNIT
VCC	Supply Voltage (MAX)	12	VDC
VCC	Operating Supply Voltage	4 to 8	VDC
VIN	Input Voltage	1.0	VRMS
TOPR	Operating Temperature	−30 ~ +70	°C
TSTG	Storage Temperature	−65 ~ +150	°C

BLOCK DIAGRAM

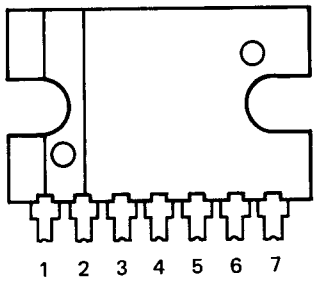


PIN CONNECTION



μPC1181H (AF POWER AMPLIFIER)

PIN CONNECTION



MAXIMUM RATING

DESCRIPTION	SYMBOL	RATING	UNIT
Peak Supply Voltage	VCC (SURGE)	40	V
Supply Voltage (No Signal)	VCC1	25	V
Operating Supply Voltage *1	VCC2	18	V
Circuit Current	ICC (PEAK)	4.5	A
Permissible Dissipation	PD	12	W
Operating Temperature *2	TOPR	−30 ~ +75	°C
Storage Temperature	TSTC	−55 ~ +150	°C

*1 *2 Aliminum Heatsink 100mm x 100mm x 1mm

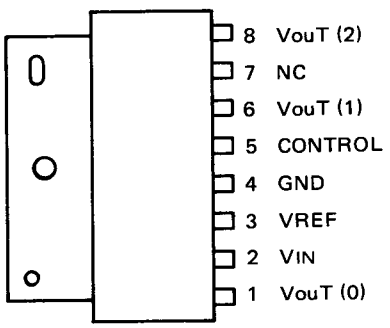
MB-3756 (Voltage Rugulator)

MAXIMUM RATING

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	VIN	18	V
Permissible Dissipation	PD	1*	W
		4**	W
Operating Temperature	TOP	−30 ~ +80	°C
Storage Temperature	TSTG	−55 ~ +150	°C

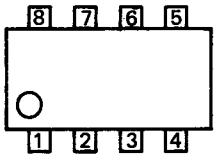
* No Heat Sink TA ≤ 70°C
** Infinite Heat Sink TA ≤ 70°C

PIN CONNECTION



NJM4558D (DUAL LOW NOISE AMP.)

PIN CONNECTION



MAXIMUM RATING

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	18	V
Input Voltage	V_{IN}	15	V
Operating Temperature	T_{OPT}	−20 ~ +75	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

SECTION 12 PARTS LIST

CONTROL UNIT [2ch. TYPE]

REF NO.	DESCRIPTION	PART NO.
IC1	IC	μA555TC
Q1	Transistor	2SC945 P
Q2	Transistor	2SC2458 GR
Q3	Transistor	2SC2458 GR
DS1	LED	GL-9PR4
DS2	LED	GL-9HY4
DS3	LED	GL-9PR4
DS4	7-SEG LED	TLR352
D1	Diode	1SS53
S1	Switch	PS-135A22S
S2	Switch	PS-135M2-A22S
S3	Switch	SDW1P
R1	Resistor	1K R25
R2	Resistor	680 R25
R3	Resistor	1K R25
R4	Resistor	10K R25
R5	Resistor	47K R25
R6	Resistor	47K R25
R7	Resistor	470 ELR10
R8	Resistor	470 R25
R9	Resistor	470 R25
R10	Resistor	470 ELR10
R11	Resistor	470 ELR10
R12	Resistor	470 R25
R13	Resistor	47K R25
R14	Resistor	1K R25
R15	Resistor	10K R25
R16	Resistor	1M R25
R17	Resistor	10K R25
R18	Resistor	1K R25
R19	Variable	20K C K16110
R20	Resistor	22K R25
R21	Trimmer	47K H0622A
R22	Resistor	18K R25
R23	Resistor	1K R25
R24	Resistor	47K R25
C1	Ceramic	0.001 50V B
C2	Ceramic	0.001 50V B
C3	Ceramic	0.001 50V B
C4	Electrolytic	10 16V
C5	Electrolytic	10 16V
C6	Ceramic	0.0022 50V B
J1	Connector	12B-SQ
J2	Connector	6B-SQ
J3	Connector	3022 04 A
J4	Connector	3022 04 A
P1	Connector	SQ-6
P2	Connector	SQ-6
P3	Connector	SQ-6
P4	Connector	PI32B20R-1
B1	PC. Board	B-751B
B2	PC. Board	B-753B

CONTROL UNIT [2ch. TYPE]

REF NO.	DESCRIPTION	PART NO.
W1	Jumper	JPW-02A
W2	Jumper	JPW-02A
W3	Jumper	JPW-02A

CONTROL UNIT [12ch. TYPE]

REF NO.	DESCRIPTION	PART NO.
IC1	IC	TC4516BP
IC2	IC	TC5002BP
IC3	IC	μA555TC
IC4	IC	TC4013BP
IC5	IC	TC4081BP
IC6	IC	TC4069BP
IC7	IC	TC4028BP
Q1	Transistor	2SC3399
Q2	Transistor	2SC2458 GR
Q3	Transistor	2SC3399
Q4	Transistor	2SC2458 GR
Q5	Transistor	2SC2458 GR
Q6	Transistor	2SA1348
Q7	Transistor	2SC2458 GR
Q8	Transistor	2SC3399
Q9	Transistor	2SC2458 Y/GR
Q10	Transistor	2SC3399
DS1	7-SEG LED	TLR324
DS2	LED	GL-9PR4
DS3	LED	GL-9HY4
DS4	LED	GL-9PR4
D1	Diode	1SS133
D2	Diode	1SS133
D3	Diode	1S953
D4	Diode	1SS133
D5	Diode	1SS133
D6	Diode	1SS133
D7	Diode	1SS133
D8	Diode	1SS133
D9	Diode	1SS133
D10	Diode	1SS133
D11	Diode	1SS133
D12	Diode	1SS133
D13	Diode	1SS133
D14	Diode	1SS133
D15	Diode	1SS133
D20	Diode	1S953
D21	Diode	1SS133
D22	Diode	1SS133
D23	Diode	1SS133
S1	Switch	SDW1P L = 2.5
S2	Switch	PS-135M2-A22S
S3	Switch	PS-135M-A22N
S4	Switch	PS-135M-A22N
R1	Resistor	47K R10
R2	Resistor	560 ELR10
R3	Resistor	47K ELR10
R4	Resistor	680 R25

CONTROL UNIT [12ch. TYPE]

REF NO.	DESCRIPTION	PART NO.		
R5	Resistor	10K	R10	
R6	Resistor	47K	ELR10	
R7	Resistor	1M	ELR10	
R8	Resistor	560	ELR10	
R9	Resistor	560	ELR10	
R10	Resistor	560	ELR10	
R11	Resistor	560	ELR10	
R12	Resistor	560	ELR10	
R13	Resistor	560	ELR10	
R14	Resistor	560	ELR10	
R15	Resistor	47K	ELR10	
R16	Resistor	220K	R10	
R17	Resistor	100K	R10	
R18	Resistor	10K	ELR10	
R19	Resistor	100K	ELR10	
R20	Resistor	47K	ELR10	
R21	Resistor	100K	R10	
R22	Resistor	220K	R10	
R23	Resistor	47K	ELR10	
R24	Resistor	10K	ELR10	
R25	Resistor	1M	ELR10	
R26	Resistor	470K	ELR10	
R27	Resistor	10K	ELR10	
R29	Resistor	270K	R10	
R30	Resistor	10K	ELR10	
R31	Resistor	2.2K	ELR10	
R32	Resistor	470K	ELR20	
R33	Resistor	470K	R10	
R34	Resistor	47K	R10	
R35	Resistor	10K	R10	
R36	Resistor	6.8K	R10	
R37	Resistor	1K	ELR10	
R38	Trimmer	47K	H0622A	
R39	Resistor	22K	R10	
R40	Variable	20K	C.K16110	
R41	Resistor	18K	R10	
R42	Resistor	1K	R10	
R43	Resistor	680	R10	
R45	Resistor	47K	R10	
R47	Resistor	22K	ELR10	
R48	Resistor	1.5K	R10	
R49	Resistor	470K	ELR10	
R50	Resistor	47K	R10	
R51	Resistor	22K	ELR10	
R52	Resistor	47K	R10	
R53	Resistor	1K	R10	
R54	Resistor	100K	R10	
R55	Resistor	22K	R10	
C1	Barrier Lay	0.047	25V	
C2	Electrolytic	22	16V	MS7
C3	Ceramic	0.001	50V	B
C4	Electrolytic	10	16V	MS7
C5	Ceramic	0.001	50V	B
C6	Electrolytic	10	16V	MS7
C7	Barrier Lay	0.047	25V	
C8	Ceramic	0.001	50V	B
C9	Barrier Lay	0.1	16V	
C10	Ceramic	470P	50V	B
C11	Barrier Lay	0.047	25V	
C13	Ceramic	100P	50V	SL
C14	Electrolytic	10	16V	RC2
C15	Barrier Lay	0.1	16V	
C16	Ceramic	0.001	50V	B

CONTROL UNIT [12ch. TYPE]

REF NO.	DESCRIPTION	PART NO.		
C17	Ceramic	0.001	50V	B
C18	Electrolytic	3.3	16V	MS7
C19	Barrier Lay	0.1	16V	
C20	Barrier Lay	0.1	16V	
C21	Barrier Lay	0.047	25V	
C22	Ceramic	0.001	50V	
C23	Ceramic	0.001	50V	
C24	Ceramic	0.001	50V	
C25	Ceramic	0.001	50V	
C26	Ceramic	0.001	50V	
C27	Ceramic	0.001	50V	
C28	Ceramic	0.001	50V	
C29	Ceramic	0.001	50V	
C31	Barrier Lay	0.047	25V	
C32	Barrier Lay	0.1	16V	
C33	Barrier Lay	0.1	16V	
C34	Electrolytic	0.22	50V	MS7
C35	Ceramic	0.0047	50V	B
C36	Ceramic	0.001	50V	B
C37	Ceramic	0.001	50V	B
P1	Connector	SQ-7		
P2	Connector	SQ-7		
P3	Connector	PI32B20R-1		
P5	Connector	SQ-9		
P6	Connector	SQ-9		
P7	Connector	SQ-8		
J1	Connector	7B-SQ		
J2	Connector	7B-SQ		
J3	Connector	5B-5P-HVQ-CA		
J4	Connector	5B-5P-HVQ-CA		
J5	Connector	9B-SQ		
J6	Connector	9B-SQ		
J7	Connector	8B-SQ		
B1	PC. Board	B-830B		
B2	PC. Board	B-831B		
W1	Jumper	JPW-02A		
W2	Jumper	JPW-02A		
W4	Jumper	JPW-02A		
W6	Jumper	JPW-02A		
W7	Jumper	JPW-02A		
W8	Jumper	JPW-02A		
W9	Jumper	JPW-02A		
W10	Jumper	JPW-02A		

MATRIX UNIT [2ch. TYPE]

REF NO.	DESCRIPTION	PART NO.	
Q1	Transistor	2SC3399	
Q2	Transistor	2SC3399	
Q3	Transistor	2SC3399	
Q4	Transistor	2SC3399	
C1	Ceramic	0.001	50V B
C2	Ceramic	0.001	50V B
C3	Ceramic	0.001	50V B
C4	Ceramic	0.001	50V B
R1	Resistor	1.5K	R25

MATRIX UNIT [2ch. TYPE]

REF NO.	DESCRIPTION	PART NO.
R2	Resistor	1.5K R25
R3	Resistor	1.5K R25
R4	Resistor	1.5K R25
J1	Connector	TL-25P-05-V1
J2	Connector	TL-25P-02-V1
J3	Connector	TL-25P-08-V1
J4	Connector	TL-25P-06-V1
D	Diodes	*450 ~ 460MHz BAND 1SS133 x 39
	Diodes	*460 ~ 470MHz BAND 1SS133 x 38
B1	PC. Board	B-870

MATRIX UNIT [12ch. TYPE]

REF NO.	DESCRIPTION	PART NO.
J7	Connector	B (10)-EH
J8	Connector	B (04)-EH
J9	Connector	B (10)-EH
J10	Connector	TLB-P13H-B1
J11	Connector	TLB-P10H-B1
J12	Connector	TLB-P04H-B1
P1	Connector	EHR-(03)
P2	Connector	EHR-(04)
P3	Connector	EHR-(10)
P4	Connector	EHR-(04)
P5	Connector	EHR-(10)
B1	PC Board	B-872B
B2	PC Board	B-873B

MATRIX UNIT [12ch. TYPE]

REF NO.	DESCRIPTION	PART NO.
IC1	IC	TC4051BP
IC2	IC	TC4051BP
IC3	IC	TC4051BP
IC4	IC	TC4051BP
Q1	Transistor	2SC3399
Q2	Transistor	2SC3399
D1	Diode	1SS133
D2	Diode	1SS133
D3	Diode	1SS133
D4	Diode	1SS133
D5	Diode	1SS133
D6	Diode	1SS133
D7	Diode	1SS133
D8	Diode	1SS133
D	Diodes	*1SS133 x 8
R1	Resistor	100K ELR10
R2	Resistor	100K ELR10
R3	Resistor	100K ELR10
R4	Resistor	10K R10
R5	Resistor	1.5K ELR10
R7	Resistor	10K R10
R8	Resistor	1.5K R10
C1	Ceramic	470p 50V B
C2	Ceramic	470p 50V B
C3	Ceramic	470p 50V B
C4	Ceramic	470p 50V B
C5	Barrier Lay	0.01 25V
C6	Barrier Lay	0.01 25V
C7	Barrier Lay	0.01 25V
C8	Barrier Lay	0.01 25V
C9	Barrier Lay	0.047 25V
J1	Connector	TL-25P-05-V1
J2	Connector	B (04)-EH
J3	Connector	B (08)-EH
J4	Connector	B (06)-EH
J5	Connector	B (03)-EH
J6	Connector	B (04)-EH

RF UNIT

REF NO.	DESCRIPTION	PART NO.
Q1	FET	3SK48-2
Q2	FET	3SK48-2
L1	Coil	LB-155
L2	Coil	LB-156
L3	Coil	LB-157
L4	Coil	LB-158
L5	Coil	LB-159
L6	Coil	LS-116
L7	Coil	LA-38
C1	Ceramic	47P 50V SL
C2	Ceramic	0.001 50V B
C3	Ceramic	47P 50V SL
C4	Ceramic	0.001 50V B
C5	Ceramic	0.001 50V B
C6	Trimmer	ALL 3P
C7	Trimmer	ALL 3P
C8	Trimmer	ALL 3P
C9	Trimmer	ALL 3P
C10	Trimmer	ALL 3P
C11	Ceramic	47P 50V SL
C12	Trimmer	CV05A060
C13	Ceramic	0.001 50V B
C14	Ceramic	47P 50V SL
C15	Ceramic	0.001 50V B
C16	Ceramic	10pF 50V SL
R1	Resistor	4.7K R25
R2	Resistor	100K R25
R3	Resistor	100K ELR25
R4	Resistor	47 ELR25
J1	Connector	TL-25-02-V1
J2	Connector	TMP-J01X-A1
J3	Connector	TMP-J01X-A1
J4	Connector	TMP-J01X-A1
B1	PC. Board	B-694C

MAIN UNIT

REF NO.	DESCRIPTION	PART NO.		
IC1	IC	MC3357P		
IC2	IC	MB3756		
IC3	IC	4558D		
IC4	IC	4558D		
IC5	IC	MC3340P		
IC6	IC	μPC1181H		
IC7	IC	AFL24F3500A10		
Q2	FET	2SK192A Y		
Q3	Transistor	2SC2458GR		
Q4	Transistor	2SC2458GR		
Q5	Transistor	2SC2458GR		
Q6	Transistor	2SC2458GR		
Q7	Transistor	2SA1348		
Q8	Transistor	2SC3402		
Q9	Transistor	2SC945P		
D1	Zenner	RD6.2EB2		
D2	Diode	1S953		
D3	Diode	1S953		
D4	Diode	1SS53		
D5	Diode	1SS53		
D6	Diode	1SS53		
D7	Diode	1SS133		
D8	Diode	1SS133		
D9	Diode	1SS133		
FI1	Crystal Filter	21M15B		
FI2	Ceramic Filter	CFW455E		
X1	Crystal	20.945MHz RW-18/T		
X2	Ceramic Unit	CDB455C		
L2	Coil	LS-233		
L3	Choke	LW-15		
C1	Barrier Lay	0.1	16V	
C2	Ceramic	7P	50V	SL
C3	Ceramic	100P	50V	SL
C4	Barrier Lay	0.047	25V	
C5	Ceramic	0.001	50V	B
C6	Ceramic	100P	50V	SL
C7	Ceramic	68P	50V	SL
C8	Ceramic	120P	50V	SL
C9	Barrier Lay	0.1	16V	
C10	Barrier Lay	0.1	16V	
C11	Electrolytic	10	16V	
C12	Barrier Lay	0.1	16V	
C13	Ceramic	82P	50V	SL
C14	Tantalum	1	35V	
C16	Mylar	0.001	50V	
c17	Ceramic	33P	50V	SL
C18	Electrolytic	47	10V	
C19	Electrolytic	10	16V	
C20	Ceramic	0.0047	50V	B
C21	Mylar	0.01	50V	
C22	Mylar	0.0033	50V	
C23	Mylar	0.039	50V	
C24	Mylar	0.039	50V	
C25	Ceramic	0.0047	50V	B
C28	Electrolytic	2.2	50V	MS7
C29	Ceramic	0.001	50V	B
C30	Electrolytic	10	16V	
C31	Electrolytic	47	10V	

MAIN UNIT

REF NO.	DESCRIPTION	PART NO.		
C32	Electrolytic	220	10V	
C34	Ceramic	0.001	50V	B
C35	Electrolytic	47	16V	
C36	Electrolytic	470	16V	
C37	Barrier Lay	0.1	16V	
C38	Electrolytic	4.7	25V	
C39	Electrolytic	2.2	35V	
C40	Mylar	0.01	50V	
C41	Electrolytic	10	16V	
C42	Electrolytic	10	16V	MS7
C43	Electrolytic	0.22	50V	MS7
C44	Ceramic	0.001	50V	B
C45	Ceramic	0.001	50V	B
C46	Electrolytic	1	50V	MS7
C47	Electrolytic	10	16V	
C48	Electrolytic	10	16V	MS7
C49	Electrolytic	4.7	25V	
C50	Electrolytic	10	16V	MS7
C52	Ceramic	0.001	50V	B
C53	Electrolytic	1	50V	MS7
C54	Electrolytic	0.47	50V	
C55	Electrolytic	0.1	50V	MS7
C56	Ceramic	47P	50V	SL
C57	Electrolytic	470	16V	
C58	Ceramic	0.001	50V	B
C59	Barrier Lay	0.1	16V	
C60	Mylar	0.033	50V	
C61	Mylar	0.001	50V	
C62	Mylar	0.001	50V	
C64	Ceramic	0.001	50V	B
C66	Ceramic	0.0047	50V	B
C67	Ceramic	0.001	50V	B
C69	Barrier Lay	0.0047	50V	
C70	Ceramic	0.0047	50V	B
C71	Ceramic	0.0047	50V	
C72	Electrolytic	1	50V	B.P.
C73	Electrolytic	33	16V	
R2	Resistor	680	ELR10	
R3	Resistor	1K	ELR25	
R5	Resistor	3.3K	ELR25	
R6	Resistor	5.6K	ELR25	
R7	Resistor	22K	ELR25	
R8	Resistor	3.3K	ELR25	
R9	Resistor	1K	ELR25	
R10	Resistor	4.7K	ELR25	
R11	Resistor	150	ELR25	
R12	Resistor	22K	ELR25	
R13	Resistor	1.5K	ELR25	
R14	Resistor	1.5K	ELR10	
R15	Resistor	47K	ELR25	
R16	Resistor	1.5K	ELR25	
R17	Resistor	22K	ELR25	
R18	Resistor	10K	ELR25	
R19	Resistor	330K	ELR25	
R20	Resistor	2.2K	ELR25	
R21	Resistor	100K	ELR25	
R22	Resistor	10K	ELR25	
R23	Resistor	10K	ELR25	
R24	Resistor	10K	ELR25	
R25	Resistor	10K	ELR25	
R26	Resistor	10K	ELR25	
R27	Resistor	10K	ELR10	
R28	Resistor	47	ELR25	

MAIN UNIT

REF NO.	DESCRIPTION	PART NO.
R29	Resistor	22K ELR10
R33	Resistor	4.7K ELR25
R34	Resistor	470 R25
R36	Resistor	2.2 ELR25
R38	Resistor	1.5K ELR25
R39	Resistor	2.2K ELR25
R40	Resistor	4.7K ELR10
R41	Resistor	3.3K H0651
R42	Resistor	8.2K ELR25
R43	Resistor	100 ELR10
R44	Resistor	1.8M ELR25
R45	Resistor	10K ELR10
R46	Resistor	4.7K ELR10
R47	Resistor	470K ELR10
R48	Trimmer	4.7K H0651
R49	Resistor	100 ELR25
R50	Resistor	2.2K ELR25
R51	Resistor	10K ELR25
R52	Resistor	82K ELR25
R53	Resistor	100 ELR25
R54	Resistor	1K ELR25
R55	Thermistor	33D28
R57	Resistor	4.7 ELR25
R59	Resistor	10K ELR25
R60	Resistor	47 ELR25
R61	Resistor	5.6K ELR25
R62	Resistor	2.2K ELR10
R67	Resistor	10K ELR25
R68	Resistor	22K ELR25
R69	Resistor	4.7K ELR25
R70	Resistor	47K ELR10
R71	Resistor	8.2K ELR10
R72	Resistor	8.2K ELR10
R73	Resistor	1K R10
J1	Connector	PI32B20P-1
J2	Connector	16B-SQ
J3	Connector	TL-25P-06-V1
P1	Connector	TMP-P01X-A1
P2	Connector	TL-25H-07-B1
P3	Connector	TL-25H-02-B1
P4	Connector	TL-25H-05-B1
P5	Connector	TL-25H-02-B1
P6	Connector	TL-25H-02-B1
	PC. Board	B-695D
W13	Jumper	JPW-02A
W16	Coax	K99X090J-h-W
W17	Coax	08 Y-D
W18	Jumper	JPW-02H

CONDENSER UNIT

REF NO.	DESCRIPTION	PART NO.
C1	Electrolytic	10 16V
J1	Connector	TL-25P-02-V1
B1	PC Board	B-849

PLL-Y.G.R UNIT

REF NO.	DESCRIPTION	PART NO.
IC1	IC	TC9122P
IC2	IC	TC5081AP
IC3	IC	TC5082P-GL
Q1	FET	2SK192A GR
Q2	FET	2SK192A GR
Q3	Transistor	2SC2026
Q4	Transistor	2SC2026
Q5	Transistor	2SC763 C
Q6	FET	3SK102 GR
Q7	Transistor	2SC763 C
Q8	Transistor	2SC763 C
Q9	Transistor	2SC383 TM
Q10	Transistor	2SC2026
Q11	Transistor	2SC2026
Q12	Transistor	2SA1015Y
Q14	Transistor	2SC2026
Q15	Transistor	2SC2026
Q16	Transistor	2SC2026
Q17	Transistor	2SC2407
D1	Varactor Diode	1SV50 (1) E
D2	Varactor Diode	1SV50 (1) E
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Zenner	RD6.8EB3
D10	Varactor Diode	1SV50E
L1	Choke	LAL 03NA 100K
L2	Choke	LAL 03NA 100K
L3	Coil	MC 111 2½t
L4	Coil	MC 111 2½t
L5	Choke	LW-19
L6	Choke	LW-19
L7	Choke	LW-19
L8	Coil	LS-229
L9	Choke	LAL 03NA 5R6K
L10	Coil	LS-124A
L11	Coil	LS-124A
L12	Coil	LS-127
L13	Coil	LS-127
L14	Coil	LS-230A
L15	Coil	LS-230A
L16	Coil	LA-153
L17	Coil	LA-153
L18	Coil	LA-159
L19	Coil	LA-158
L20	Coil	LA-159
L21	Coil	LA-158
L22	Coil	LA-159
L23	Coil	LA-232
L24	Coil	LA-232
L25	Coil	LA-232
L26	Coil	LA-232
X1	Crystal	*
X2	Crystal	*
X3	Crystal	*

PLL-Y.G.R UNIT

REF NO.	DESCRIPTION	PART NO.	
*450 ~ 460MHz BAND			
X1	Crystal	CR38 (2.56MHz)	
X2	Crystal	CR35 (52.794MHz)	
X3	Crystal	CR36 (55.46875MHz)	
*460 ~ 470MHz BAND			
X1	Crystal	CR38 (2.56MHz)	
X2	Crystal	CR53 (54.044MHz)	
X3	Crystal	CR54 (51.71875MHz)	
FI1	Filter	LP470A1	
C1	Tantalum	0.1	50V
C2	Tantalum	2.2	16V
C3	Mylar	0.022	50V
C4	Ceramic	*	
C5	Cylinder	UP125 CH 100J-NA	
C6	Ceramic	*	
C7	Trimmer	CV05A0601	
C8	Ceramic	3P	50V CH
C9	Ceramic	5P	50V CH
C10	Ceramic	1P	50V CH
C11	Mylar	0.022	50V
C12	Ceramic	*	
C13	Cylinder	UP125 CH 100J-NA	
C14	Ceramic	*	
C15	Trimmer	CV05A0601	
C16	Ceramic	*	
C17	Ceramic	*	
C18	Ceramic	3P	50V CH
C19	Ceramic	5P	50V CH
C20	Ceramic	1P	50V CH
C21	Ceramic	0.001	50V B
C22	Ceramic	0.001	50V B
C23	Ceramic	0.001	50V B
C24	Ceramic	47P	50V SL
C25	Ceramic	0.001	50V B
C26	Ceramic	5P	50V CH
C27	Ceramic	0.001	50V B
C28	Ceramic	0.001	50V B
C29	Barrier Lay	0.047	25V
C30	Electrolytic	1000	6.3V
C31	Ceramic	0.001	50V B
C32	Barrier Lay	0.047	25V
C33	Ceramic	0.001	50V B
C34	Electrolytic	100	10V
C35	Ceramic	0.001	50V B
C36	Barrier Lay	0.047	25V
C37	Electrolytic	10	16V
C38	Ceramic	0.001	50V B
C40	Ceramic	0.001	50V B
C41	Ceramic	20P	50V SL
C42	Ceramic	5P	50V SL
C43	Ceramic	0.001	50V B
C44	Ceramic	6P	50V SL
C45	Trimmer	CTZ-31A	
C46	Ceramic	0.5P	50V SL
C47	Trimmer	CTZ-31A	
C48	Ceramic	0.001	50V B
C49	Ceramic	0.001	50V B
C50	Ceramic	0.001	50V B
C51	Ceramic	0.001	50V B
C52	Ceramic	0.001	50V B
C53	Ceramic	0.001	50V B

PLL-Y.G.R UNIT

REF NO.	DESCRIPTION	PART NO.	
C55	Trimmer	CTZ-31A	
C56	Ceramic	1P	50V CH
C57	Trimmer	CTZ-31A	
C58	Ceramic	10P	50V CH
C59	Ceramic	0.001	50V B
C60	Ceramic	0.001	50V B
C61	Trimmer	CTZ-31A	
C62	Ceramic	1P	50V CH
C63	Trimmer	CTZ-31A	
C64	Ceramic	10P	50V CH
C65	Ceramic	0.001	50V B
C66	Ceramic	0.001	50V B
C67	Trimmer	CTZ-31A	
C68	Ceramic	8P	50V CH
C69	Trimmer	CTZ-31A	
C70	Ceramic	7P	50V CH
C71	Ceramic	0.001	50V B
C72	Ceramic	0.001	50V B
C73	Ceramic	0.001	50V B
C74	Ceramic	0.001	50V B
C75	Ceramic	0.001	50V B
C77	Ceramic	0.001	50V B
C78	Ceramic	0.001	50V B
C79	Ceramic	0.001	50V B
C80	Tantalum	1	16V
C81	Electrolytic	22	16V
C82	Ceramic	30P	50V CH
C83	Ceramic	30P	50V CH
C84	Trimmer	CTZ-31C	
C85	Ceramic	15P	50V SL
C86	Barrier Lay	0.1	16V
C88	Electrolytic	100	10V
C89	Barrier Lay	0.047	25V
C90	Barrier Lay	0.1	16V
C91	Ceramic	0.0047	50V B
C92	Ceramic	0.0047	50V B
C93	Ceramic	33P	50V SL
C94	Ceramic	33P	50V SL
C95	Ceramic	0.001	50V B
C96	Ceramic	10P	50V SL
C97	Ceramic	0.001	50V B
C98	Ceramic	10P	50V SL
C99	Ceramic	5P	50V SL
C100	Ceramic	0.0047	50V B
C101	Ceramic	0.0047	50V B
C102	Ceramic	0.001	50V B
C103	Ceramic	8P	50V SL
C104	Ceramic	2P	50V SL
C105	Ceramic	5P	50V SL
C106	Ceramic	0.001	50V B
C107	Ceramic	0.001	50V B
C108	Ceramic	68P	50V SL
C109	Ceramic	12P	50V SL
C110	Ceramic	0.5P	50V SL
C111	Ceramic	22P	50V SL
C112	Ceramic	100P	50V SL
C113	Ceramic	100P	50V SL
C114	Ceramic	33P	50V SL
C115	Ceramic	33P	50V SL
C116	Ceramic	0.001	50V B
C117	Ceramic	0.001	50V B
C118	Barrier Lay	0.1	16V
C119	Ceramic	0.001	30V B
C120	Ceramic	0.001	50V B

PLL-Y.G.R UNIT

REF NO.	DESCRIPTION	PART NO.	
C121	Ceramic	0.001	50V B
C122	Ceramic	0.001	50V B
C123	Ceramic	0.001	50V B
C124	Ceramic	0.001	50V B
C125	Ceramic	0.001	50V B
C126	Ceramic	0.001	50V B
C127	Ceramic	0.001	50V B
C128	Ceramic	0.001	50V B
C129	Ceramic	0.001	50V B
C131	Ceramic	0.001	50V B
C132	Ceramic	0.001	50V B
C133	Ceramic	0.001	50V B
C134	Ceramic	0.001	50V B
C135	Ceramic	0.001	50V B
C136	Ceramic	0.001	50V B
C137	Ceramic	0.001	50V B
C138	Barrier Lay	0.047	25V
C139	Ceramic	0.001	50V B
C140	Ceramic	0.001	50V B
C141	Ceramic	470P	50V B
C142	Ceramic	2P	50V CH
C143	Ceramic	*	
C144	Barrier Lay	0.047	25V
C145	Barrier Lay	0.047	25V
*450 ~ 460MHz BAND			
C4	Ceramic	7P	50V UJ
C6	Ceramic	3P	50V UJ
C12	Ceramic	8P	50V UJ
C14	Ceramic	3P	50V UJ
C16	Ceramic	3P	50V UJ
C17	Ceramic	3P	50V UJ
C143	Ceramic	1P	50V CH
*460 ~ 470MHz BAND			
C4	Ceramic	7P	50V UJ
C6	Ceramic	3P	50V UJ
C12	Ceramic	8P	50V UJ
C14	Ceramic	3P	50V UJ
C16	Ceramic	1P	50V CH
C17	Ceramic	3P	50V UJ
C143	N.C		
R1	Resistor	12K	R25
R2	Resistor	470	ELR25
R3	Resistor	5.6K	ELR25
R4	Resistor	5.6K	ELR25
R5	Resistor	47	ELR25
R6	Resistor	470K	ELR10
R7	Resistor	470K	ELR10
R8	Resistor	220	ELR25
R9	Resistor	47	R25
R10	Resistor	470K	ELR10
R11	Resistor	470K	ELR10
R12	Resistor	220	ELR25
R13	Resistor	5.6K	ELR25
R14	Resistor	1.2K	ELR25
R15	Resistor	100	ELR25
R16	Resistor	5.6K	ELR25
R17	Resistor	1.2K	ELR25
R18	Resistor	100	ELR25
R19	Resistor	100	R10
R20	Resistor	100	ELR25
R21	Resistor	220	R10

PLL-Y.G.R UNIT

REF NO.	DESCRIPTION	PART NO.	
R22	Resistor	1K	ELR25
R23	Resistor	220	ELR25
R24	Resistor	220	R25
R25	Resistor	2.7K	ELR25
R26	Resistor	470	ELR25
R27	Resistor	100	ELR25
R28	Resistor	2.2K	ELR25
R29	Resistor	470	ELR25
R30	Resistor	100	ELR25
R31	Resistor	47	ELR25
R33	Resistor	33K	ELR25
R34	Resistor	4.7K	ELR25
R35	Resistor	47	ELR25
R36	Resistor	2.2K	ELR25
R37	Resistor	1K	ELR25
R38	Resistor	47	ELR25
R39	Resistor	47	ELR25
R40	Resistor	470	ELR25
R41	Resistor	220	ELR25
R42	Resistor	47	ELR25
R43	Resistor	47	ELR25
R44	Resistor	1K	ELR25
R45	Resistor	100	ELR25
R46	Resistor	22	ELR25
R47	Resistor	100	R25
R48	Resistor	10K	ELR10
R49	Resistor	47K	ELR25
R52	Resistor	100	ELR25
R53	Resistor	470	ELR25
R54	Resistor	47	ELR25
R55	Resistor	68K	ELR25
R56	Resistor	100	ELR25
R57	Resistor	470	ELR25
R58	Resistor	220	ELR25
R59	Resistor	1K	ELR25
R60	Resistor	1K	ELR25
R61	Resistor	100	ELR25
R62	Resistor	22K	ELR25
R63	Resistor	470	ELR25
R64	Resistor	5.6K	ELR25
R65	Resistor	220	ELR25
R66	Resistor	100	ELR25
R67	Resistor	470	ELR25
R68	Resistor	10K	ELR25
R69	Resistor	1.2K	ELR25
R70	Resistor	1.8K	ELR25
R71	Resistor	470	ELR25
R72	Resistor	4.7K	ELR25
R73	Resistor	680	ELR25
R74	Resistor	10K	ELR25
R75	Resistor	680	ELR25
R76	Resistor	10K	ELR25
R77	Resistor	100	R25
R78	Resistor	10K	R10
R79	Resistor	33K	R10
R80	Resistor	22K	R10
J1	Connector	TLB-P13H-B1	
J2	Connector	TL-25P-07-V1	
J3	Connector	TMP-J01X-A1	
P1	Connector	TMP-P01X-A1	
P2	Connector	EHR-(06)	
P3	Connector	EHR-(08)	

PLL-Y.G.R UNIT

REF NO.	DESCRIPTION	PART NO.
P5	Connector	EHR-(04)
B1	PC. Board	B-714 B
W1	Jumper	JPW-02A
W2	Jumper	JPW-02A
W3	Jumper	JPW-02A
W4	Jumper	JPW-02A
W5	Jumper	JPW-02A
W6	Jumper	JPW-02A
W7	Jumper	JPW-02A
W8	Jumper	JPW-02A
W9	Jumper	JPW-02A
W10	Jumper	JPW-02A
W12	Jumper	JPW-02H
W13	Jumper	JPW-02H
W25	Coax	K99X155J-h-W
W26	Coax	08 D
W37	Jumper	JPW-02A

PA UNIT

REF NO.	DESCRIPTION	PART NO.
IC1	IC	M57704H
Q1	Transistor	2SC2905
Q2	Transistor	2SC945P
Q3	Transistor	2SC945P
Q4	Transistor	2SC945P
Q5	Transistor	2SC945P
Q6	Transistor	2SA1015Y
Q7	Transistor	2SB596Y
D1	Diode	1SS97
D2	Diode	1SS97
D3	Diode	1SS97
D4	Diode	1SS97
D5	Diode	1SS53
D6	Diode	15CD11
C1	Electrolytic	10 16V
C2	Ceramic	47P 50V SL
C3	Ceramic	0.001 50V B
C4	Ceramic	0.001 50V B
C5	Ceramic	47P 50V SL
C6	Ceramic	0.001 50V B
C7	Ceramic	47P 50V B
C8	Ceramic	0.001 50V B
C10	Ceramic	0.0047 50V B
C11	Trimmer	CTZ51C
C12	Monolithic	UC23H 0320F
C13	Monolithic	UC23H 0320F
C14	Monolithic	UC23H 0470F
C15	Monolithic	UC23H 0270F
C16	Trimmer	TMC210 SLD 15P
C17	Trimmer	CTZ81C
C18	Monolithic	221M 100 GR710CK
C19	Ceramic	6P 500V SL
C20	Ceramic	0.5P 500V SL
C21	Ceramic	5P 500V SL
C22	Ceramic	3P 500V SL
C23	Monolithic	0.5P 500V SL

PA UNIT

REF NO.	DESCRIPTION	PART NO.
C24	Ceramic	5P 500V SL
C25	Ceramic	0.001 50V B
C26	Ceramic	0.001 50V B
C27	Ceramic	0.001 50V B
C28	Ceramic	0.001 50V B
C29	Ceramic	0.001 50V B
C30	Ceramic	0.001 50V B
C31	Ceramic	0.001 50V B
C32	Ceramic	0.001 50V B
C33	Ceramic	0.001 50V B
C34	Ceramic	5P 500V SL
C35	Ceramic	10P 500V SL
C36	Ceramic	5P 500V SL
C37	Ceramic	1P 500V SL
C38	Ceramic	0.5P 500V SL
C39	Ceramic	47P 50V SL
C40	Ceramic	0.001 50V B
C41	Ceramic	0.001 50V B
C42	Electrolytic	22 16V
C43	Barrier Lay	0.047 25V
C44	Ceramic	0.001 50V B
RL1	Relay	CX-1051
L1	Choke	LW-17
L2	Choke	LW-9
L3	Choke	LA-169
L4	Choke	LA-122
L5	Choke	LA-38
L6	Choke	LA-98
L7	Choke	LW-19
L8	Choke	LW-27
R1	Resistor	4.7 ELR25
R2	Resistor	120K ELR25
R3	Resistor	47 R25
R4	Trimmer	H0651A 10K
R5	Resistor	5.6K R25
R6	Resistor	1.5K ELR25
R7	Resistor	10K ELR25
R8	Resistor	10K ELR25
R9	Resistor	1K ELR25
R10	Resistor	1K ELR25
R11	Resistor	1K ELR25
R12	Resistor	1.2K ELR25
R13	Resistor	47 ELR25
EP1	Bead Core	DL20P 2.6-3-1.2H
EP2	Bead Core	DL20P 2.6-3-1.2H
EP3	Bead Core	DL20P 2.6-3-1.2H
EP4	Bead Core	2D1 1.4
EP5	Bead Core	2D1 1.4
EP6	Bead Core	2D1 1.4
EP7	Bead Core	DL20P 2.6-3-1.2H
J1	Connector	LR02-2
J2	Connector	FM-MDFM
J3	Connector	SJ-296
J4	Connector	SMP-04V-B
P1	Connector	TMP-P01X-A1
P2	Connector	TMP-P01X-A1
P3	Connector	TL-25H-06-A1
P4	Connector	TSL-P04H-A1
B1	PC Board	B-755C

SECTION 13 DESCRIPTION OF IC-435 OPTIONAL ACCESSORIES

UT-10

The UT-10 provides CTCSS interface for the IC-435 2 channel unit and utilizes the Communications Specialist TS-32 CTCSS encoder/decoder. The UT-10 interface provides diode matrix programming for 2 channels of tone allowing a different tone for each channel. ICOM has available the UT-10 interface or the UT-10/TS32 complete assembly.

UT-11

The UT-11 provides a 2805Hz decoder interface for the IC-435 2 or 12 channel units and utilizes the Midian CS-101B decoder with or without the high power switching circuit. If horn honk utilizing the relay on the UT-11, the CS-101B with the high power switch must be used.

UT-12

The UT-12 provides MTSD and touch tone decoder interface for the IC-435 2 or 12 channel units. For 2-tone decode, the UT-12 interfaces with the Midian MTSD-1. For DTMF decode, the UT-12 interfaces with the Midian TTD-2. Programming is accomplished on the Midian units. Horn honk option is standard on the UT-12.

UT-14

The UT-14 provides CTCSS interface for the 12 (or 16) channel version of the IC-435. The UT-14 interface has available independent CTCSS programming for each channel (12 or 16) utilizing diode matrix programming. Like the UT-10, the UT-14 uses the Com-Spec TS-32 CTCSS encoder/decoder. The UT-14 can be ordered with or without the TS-32 installed.

Remote Cable CK-11

The Remote Cable provides remote mounting capability for the IC-435 2 or 12 channel units and provides the necessary cable and interface boxes to fit between the removable control head and the main unit allowing up to 17' of separation.

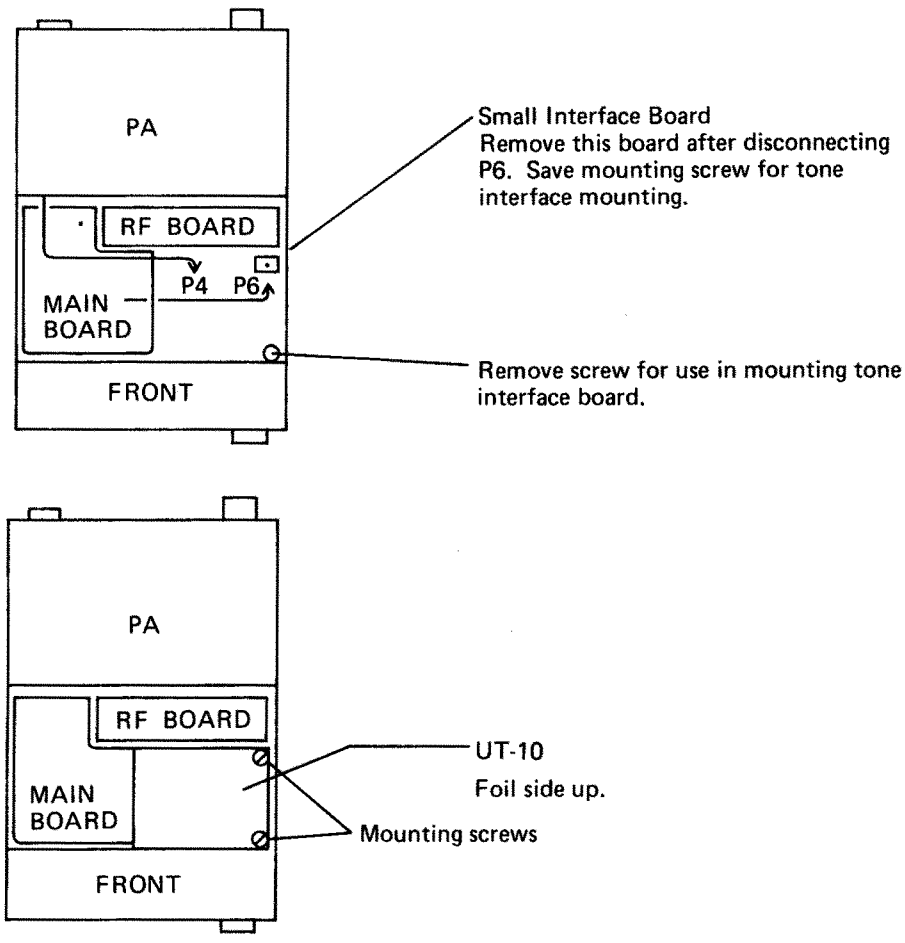
SECTION 14 UT-10 CTCSS UNIT (For 2ch Version)

14 - 1 INSTALLATION OF UT-10 IN IC-435

The UT-10 interface board is for use with the TS-32 CTCSS unit and can be used only with the IC-435 2 channel configuration. When used in the 2 channel configuration, tone may be programmed for both channels independently.

1. When installing the UT-10, first unplug P-6 from the small interface board and remove the interface board (see Fig 1). Remove the mounting screw from the blank standoff of the front right and save also. The two screws will be used to secure the tone interface board.

Fig. 1



2. Before intalling the UT-10, make sure that each tone is properly programmed using the appropriate diode matrix (see Fig 2). Programming is shown in Fig. 3. Boards are supplied fully programmed so remove diodes to program.

3. If installing your own TS-32 rather than buying assembled board, remove the programming dip switch or place all switches to the off or open position. Interface wires are soldered to the holes left by removing the switch (see Fig 4).

4. Before inserting the programmed UT-10/TS-32 into the radio, make sure P-6 is plugged into the connection on the UT-10. P4 is only used with tone boards with the horn honk option and provides connection to the horn honk accessory connector on the rear of the radio.

5. Insert the UT-10 making sure that the in-line connector properly mates to the pin row on the main board. Care must be used to make sure that interface is not offset one way or the other.

6. Secure UT-10 using the two screws removed earlier. Adjustment of tone level can be made through the hole in the UT-10 board.

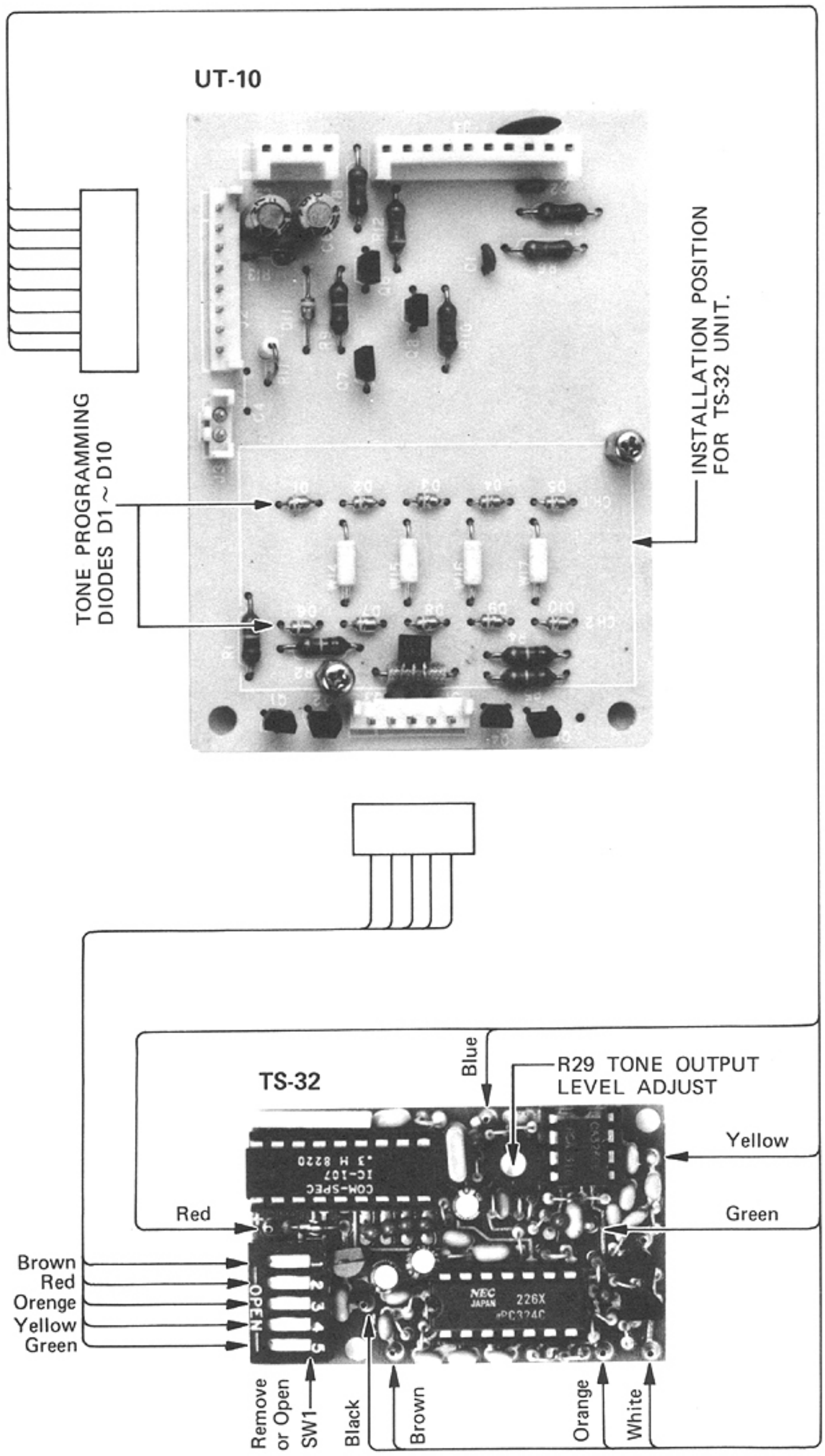

UT-10
TONE PROGRAMMING
DIODES D1 ~ D10
INSTALLATION POSITION
FOR TS-32 UNIT.
TS-32
Blue
R29 TONE OUTPUT
LEVEL ADJUST
Yellow
Green
Red
Brown
Red
Orenge
Yellow
Green
Remove
or Open
SW1
Black
Brown
Orange
White

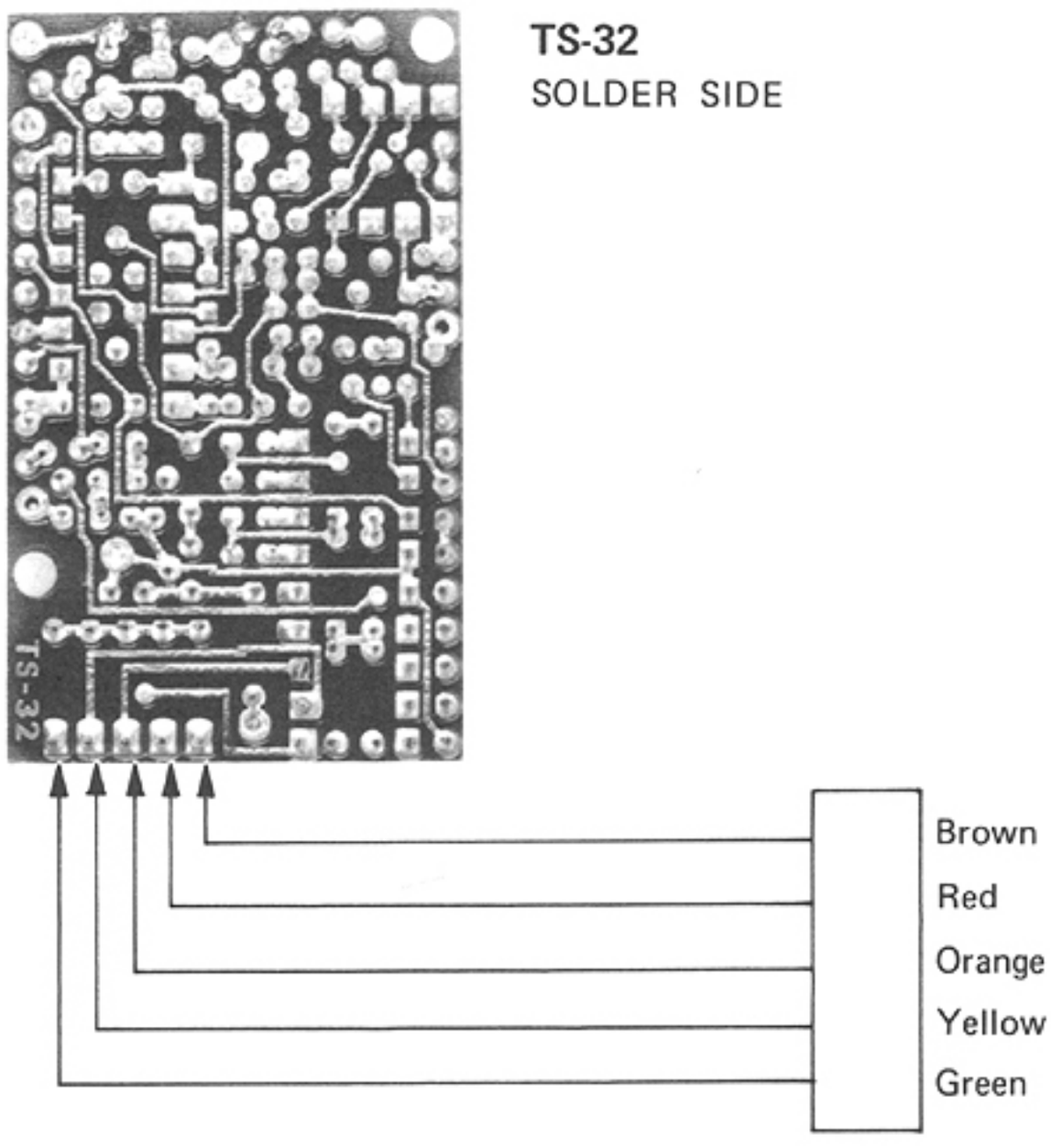
Fig. 3

TONE PROGRAMMING ON UT-10

#	FREQ	CODE	CH1 PROGRAM					CH2 PROGRAM				
			D5	D4	D3	D2	D1	D10	D9	D8	D7	D6
1	67.0	XZ	O	O	O	O	O	O	O	O	O	O
2	71.9	XA	O	O	O	O	X	O	O	O	O	X
3	74.4	WA	O	O	O	X	O	O	O	O	X	O
4	77.0	XB	O	O	O	X	X	O	O	O	X	X
5	79.7	SP	O	O	X	O	O	O	O	X	O	O
6	82.5	YZ	O	O	X	O	X	O	O	X	O	X
7	85.4	YA	O	O	X	X	O	O	O	X	X	O
8	88.5	YB	O	O	X	X	X	O	O	X	X	X
9	91.5	ZZ	O	X	O	O	O	O	X	O	O	O
10	94.8	ZA	O	X	O	O	X	O	X	O	O	X
11	97.4	ZB	O	X	O	X	O	O	X	O	X	O
12	100.0	1Z	O	X	O	X	X	O	X	O	X	X
13	103.5	1A	O	X	X	O	O	O	X	X	O	O
14	107.2	1B	O	X	X	O	X	O	X	X	O	X
15	110.9	2Z	O	X	X	X	O	O	X	X	X	O
16	114.8	2A	O	X	X	X	X	O	X	X	X	X
17	118.8	2B	X	O	O	O	O	X	O	O	O	O
18	123.0	3Z	X	O	O	O	X	X	O	O	O	X
19	127.3	3A	X	O	O	X	O	X	O	O	X	O
20	131.8	3B	X	O	O	X	X	X	O	O	X	X
21	136.5	4Z	X	O	X	O	O	X	O	X	O	O
22	141.3	4A	X	O	X	O	X	X	O	X	O	X
23	146.2	4B	X	O	X	X	O	X	O	X	X	O
24	151.4	5Z	X	O	X	X	X	X	O	X	X	X
25	156.7	5A	X	X	O	O	O	X	X	O	O	O
26	162.2	5B	X	X	O	O	X	X	X	O	O	X
27	167.9	6Z	X	X	O	X	O	X	X	O	X	O
28	173.8	6A	X	X	O	X	X	X	X	O	X	X
29	179.9	6B	X	X	X	O	O	X	X	X	O	O
30	186.2	7Z	X	X	X	O	X	X	X	X	O	X
31	192.8	7A	X	X	X	X	O	X	X	X	X	O
32	203.5	M1	X	X	X	X	X	X	X	X	X	X

O : DIODE INSTALLED X : NO DIODE

Fig. 4



14 - 2 PARTS LIST

UT-10

REF NO.	DESCRIPTION	PART NO.	
Q1	Transistor	2SC2458 GR	
Q2	Transistor	2SC2458 GR	
Q3	Transistor	2SC2458 GR	
Q4	Transistor	2SC2458 GR	
Q5	Transistor	2SC2458 GR	
Q6	Transistor	2SC2458 GR	
Q7	Transistor	2SC2458 GR	
Q8	Transistor	2SC2458 GR	
D1	Diode	1SS133	
D2	Diode	1SS133	
D3	Diode	1SS133	
D4	Diode	1SS133	
D5	Diode	1SS133	
D6	Diode	1SS133	
D7	Diode	1SS133	
D8	Diode	1SS133	
D9	Diode	1SS133	
D10	Diode	1SS133	
D11	Diode	1SS133	
D12	Zenner	RD8.2EB1	
R1	Resistor	100K	R25
R2	Resistor	100K	R25
R3	Resistor	100K	R25
R4	Resistor	100K	R25
R5	Resistor	100K	R25
R6	Resistor	22K	R25
R7	Resistor	22K	R25
R8	Resistor	22K	R25
R9	Resistor	100K	R25
R10	Resistor	2.2K	R25
R12	Resistor	47K	R25
R13	Resistor	27K	ELR25
C1	Ceramic	0.001	50V B
C2	Ceramic	0.001	50V B
C3	Barrier Lay	0.047	25V
C5	Electrolytic	10	16V
C6	Electrolytic	10	16V
P1	Connector	TSL-P05H-A1	
P2	Connector	TSL-P08H-A1	
J1	Connector	TSL-P05P-B1	
J2	Connector	TSL-P08P-B1	
J3	Connector	TL-25P-02-V1	
J4	Connector	SQ-10	
J5	Connector	SQ-4	
	P.C. Board	B-783C	
W14	Jumper	JPW-02A	
W15	Jumper	JPW-02A	
W16	Jumper	JPW-02A	
W17	Jumper	JPW-02A	
W19	Jumper	JPW-02H	
W20	Jumper	JPW-02A	

SECTION 15 UT-11 2805Hz DECODER UNIT

15 - 1 INSTALLATION OF UT-11 IN IC-435

The UT-11 interface board is for use with the CS101B 2805Hz decode unit and can be used with all IC-435 radios. Programming is accomplished on the Midian CS-101B unit directly.

1. Before installation can commence, some minor changes are required to the UT-11 and the CS-101B. Proceed as follows (only if UT-11 and CS-101B are purchased separately).

   Modification required on Interface Boards:

   A. UT-11 and CS-101B 2805 decoder: See Figure 1 attached. Make sure all wires are connected to the CS-101B decoder as shown in Fig 1. Make changes to the CS-101B as below:

      1. Short R14 (18K)
      2. Remove RX (10K)
      3. Cut the wire (yellow) at 4cm from the board.
      4. Connect the 4cm wire (yellow) between Q2 base (INV. IN) and squelch input tab (see Fig 2). Another yellow wire is connected between INV, OUT and Squelch (PIN 5 of UT-11).
      5. R20 (10K pot) its turned full CW.

   B. Modification required to UT-11 board.

      1. See Fig 1 ----- Short across the 2 tabs of C-7, CS-101B Notch Filter Relay driver
      2. See Fig 3 ----- Remove C1 (10μF) if using notch filter

      Note: Fig 1 shows CS-101B without hi power drive. To make relay of UT-11 work requires CS-101B with hi power driver.

2. After modification is completed, the CS-101 must be programmed. Proceed as follows:

   A. In order to strap the assigned telephone number on the decoder, connect A to the first number, B to the second number, etc. To program the number 0388, for example, the following connections must be made:

      Jumper from A to 0
      Jumper from B to 3
      Jumper from C to 8
      Jumper from D to 8

   B. If using a code length other than 4 or 7 digits, the unused program parts, E through H for example, must be grounded.

   C. In addition to programming the number, the length of the number must be programmed. The programming is a binary format as follows:

No of digits	D7	D8	D9
1	diode	no diode	no diode
2	no diode	diode	no diode
3	diode	diode	no diode
4	no diode	no diode	diode
5	diode	no diode	diode
6	no diode	diode	diode
7	diode	diode	diode
8	no diode	no diode	no diode

   For example, with a 4 digit number, only one diode is installed at D9. For an 8 digit number, a jumper wire must be added to the bottom side of the CS-101B between pin 6 of IC5 and the junction of R34 and R33.

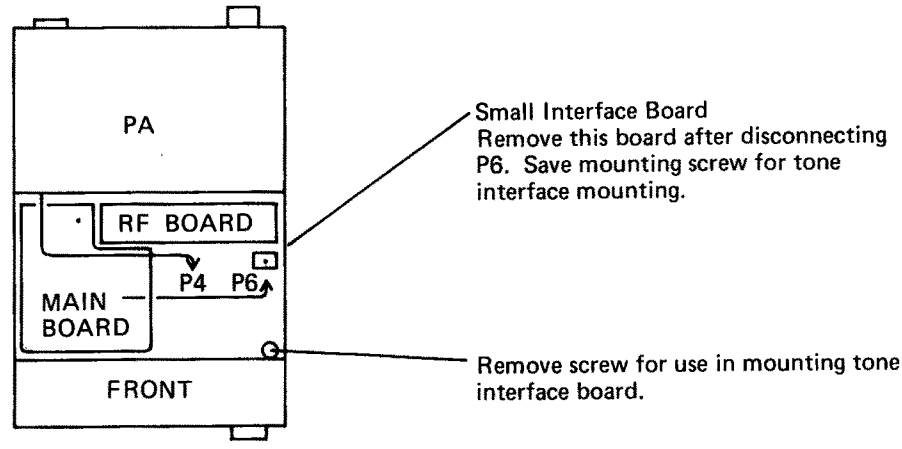
   D. Potentiometer R20 is used to adjust the audio input level to the decoder. This can best be set by connecting a signal just strong enough to produce full quieting and measuring the voltage on Pin 8 of the

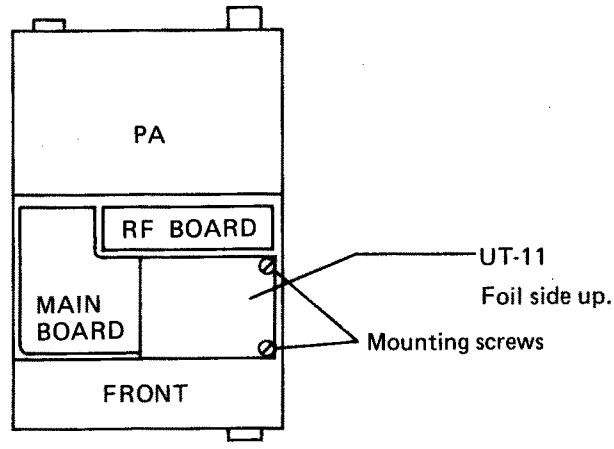
Phase Locked Loop, with a voltmeter. It should read about 6 volts. Modulate the input signal with a 2805Hz signal and adjust R20 so that the voltage on Pin 8 drops low when the 2805Hz tone deviation on the input signal exceeds 1.5KHz.

E. If you procure the UT-11 only and choose to install your own CS-101B, make sure the modifications outlined in paragraph 1 are followed. Interface of the CS-101B to the UT-11 is shown in figures 1, 2, and 3.

F. To install the UT-11 in the IC-435, proceed as follows:

1. When installing the UT-11 first unplug P-6 from the small interface board and remove the interface board (see Fig 1). Remove the mounting screw from the blank standoff of the front right and save also. The two screws will be used to secure the tone interface board.





2. Before installing the UT-11, make sure that the CS-101B is properly programmed using the appropriate diode matrix as described in paragraph 2C.

3. If installing your own rather than buying assembled board, remove the programming dip switch or place all switches to the off or open position. Interface wires are soldered to the holes left by removing the switch (see Fig 4).

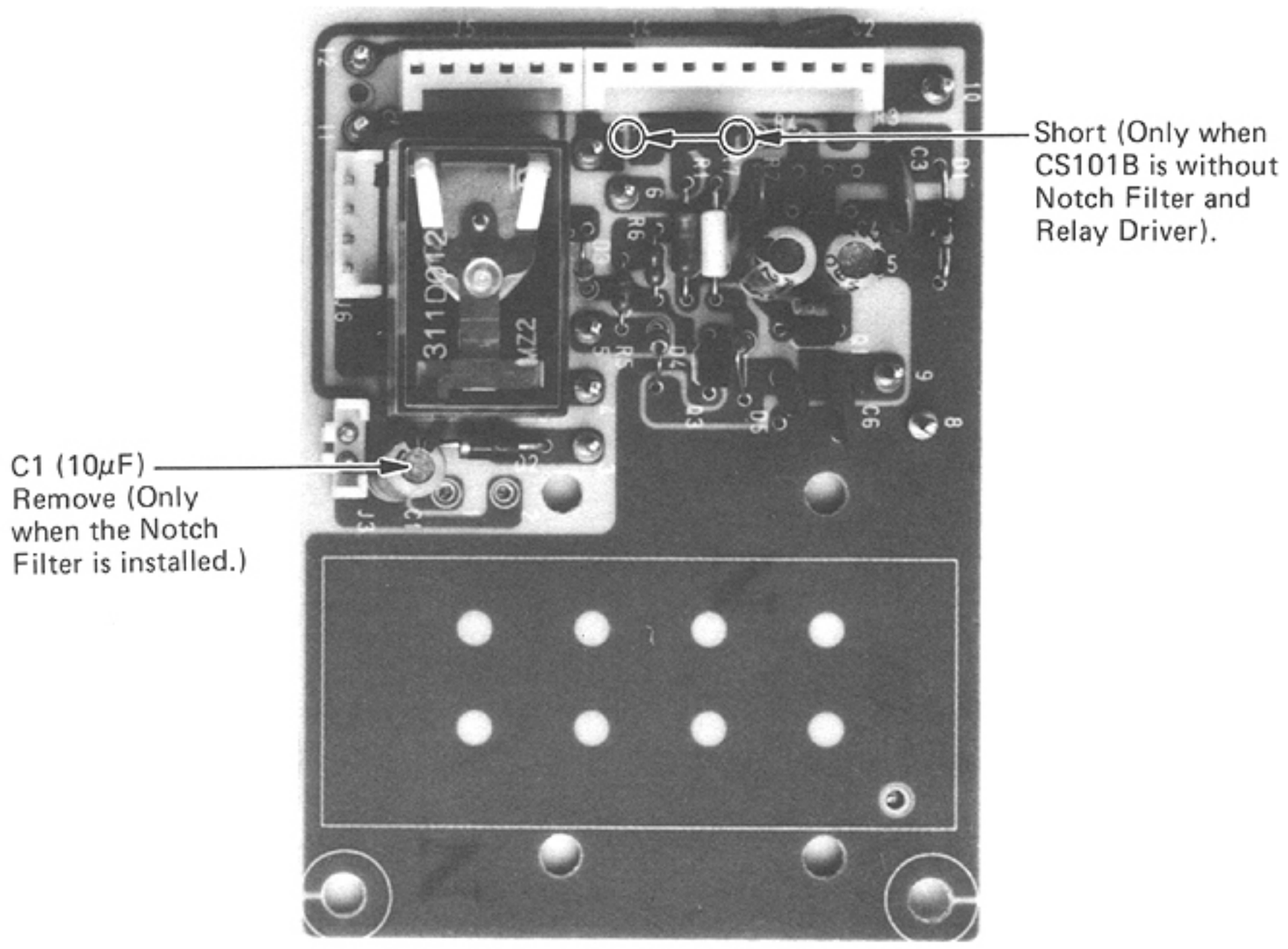
4. Before inserting the UT-11/CS-101B into the radio, make sure P-6 is plugged into the connection on the UT-11. P4 is only used with the horn honk option and provides connection to the horn honk accessory connector on the rear of the radio. If horn honk is to be used, insert P4 into the connection on the UT-11.

5. Insert the UT-11 making sure that the in-line connector properly mates to the pin row on the main board. Care must be used to make sure that interface is not offset one way or the other.

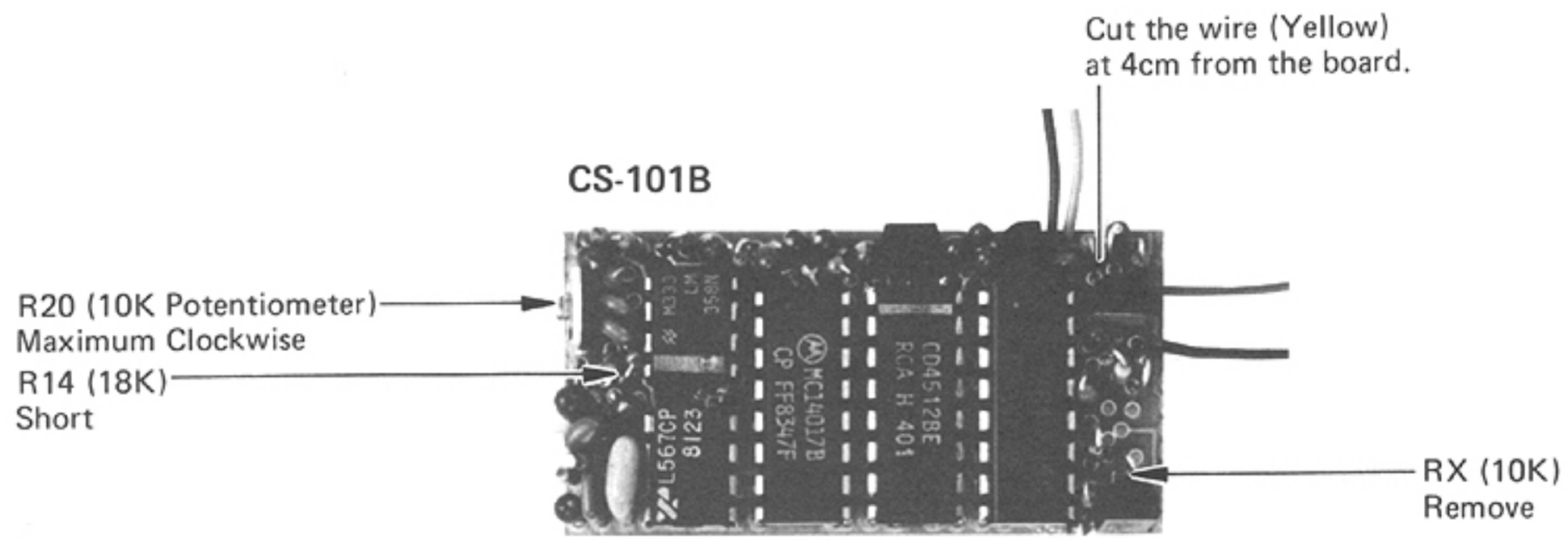
6. Secure UT-11 using the two screws removed earlier.

Fig. 1

UT-11



CS-101B



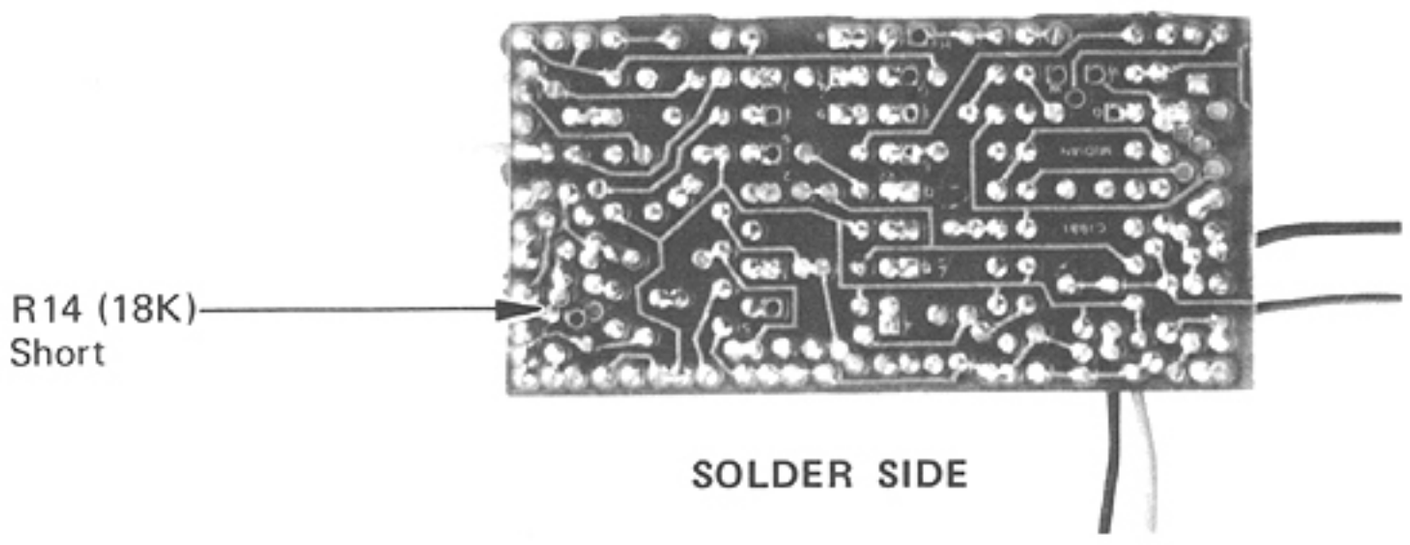
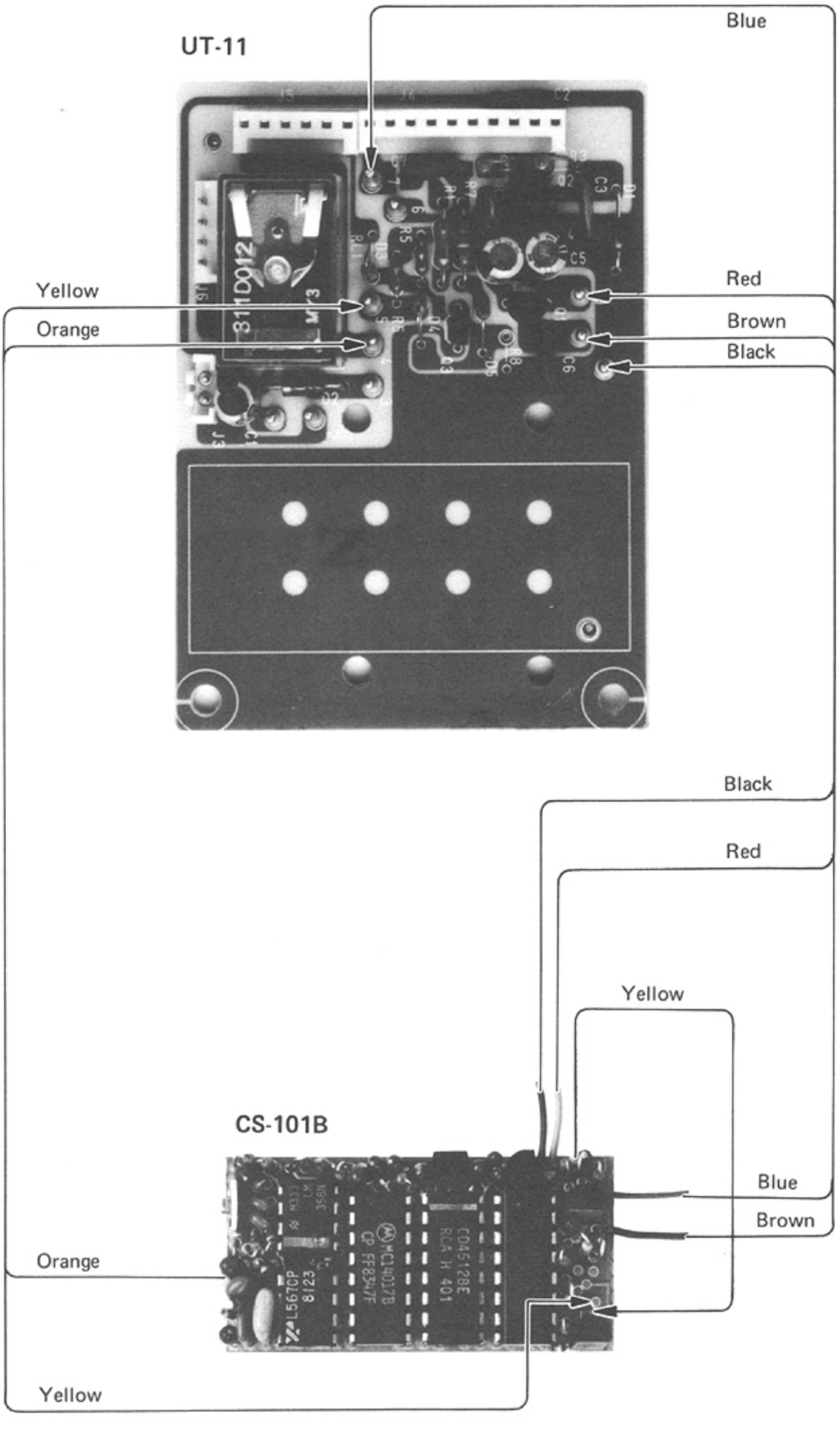
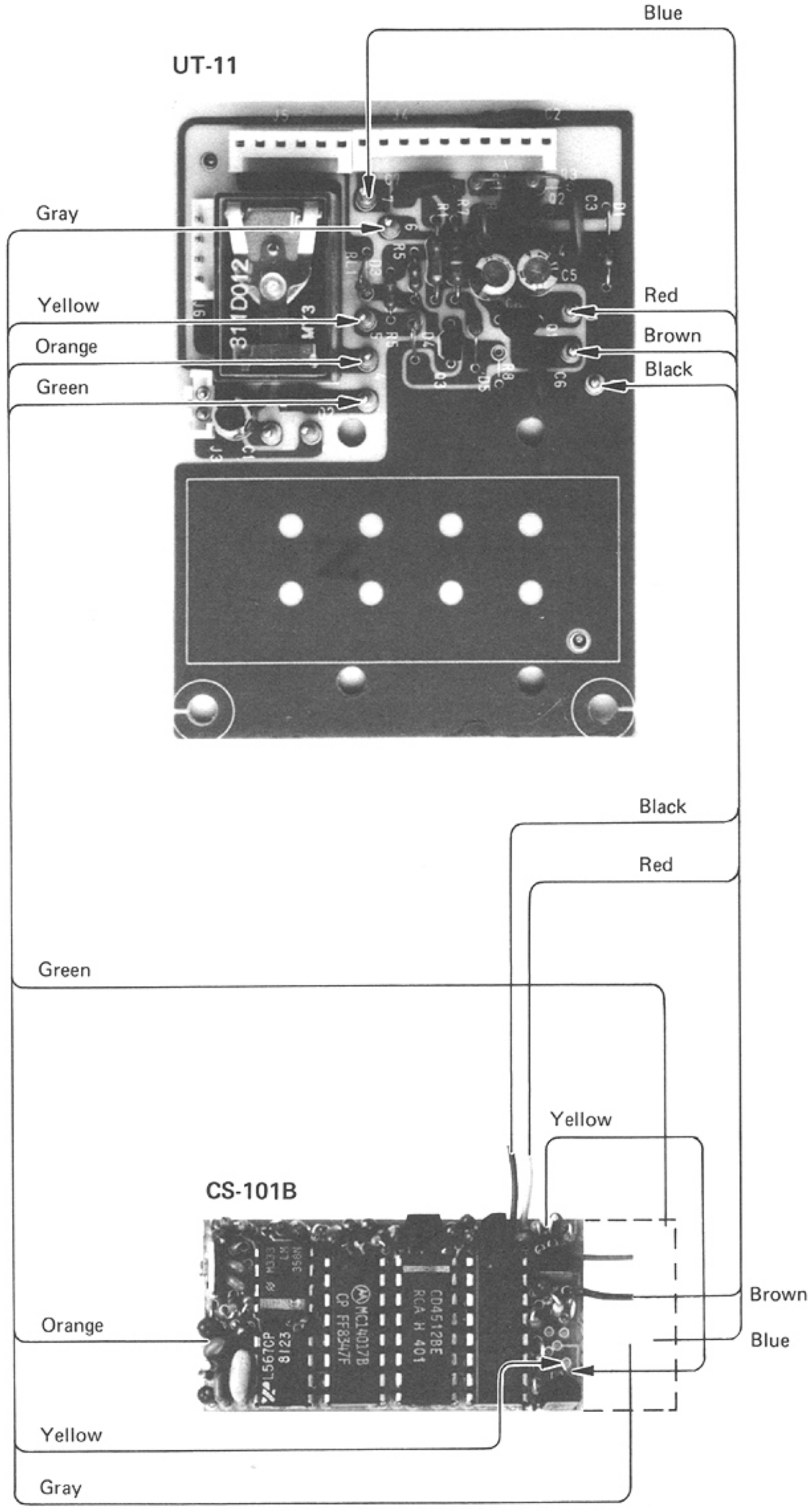


Fig. 2



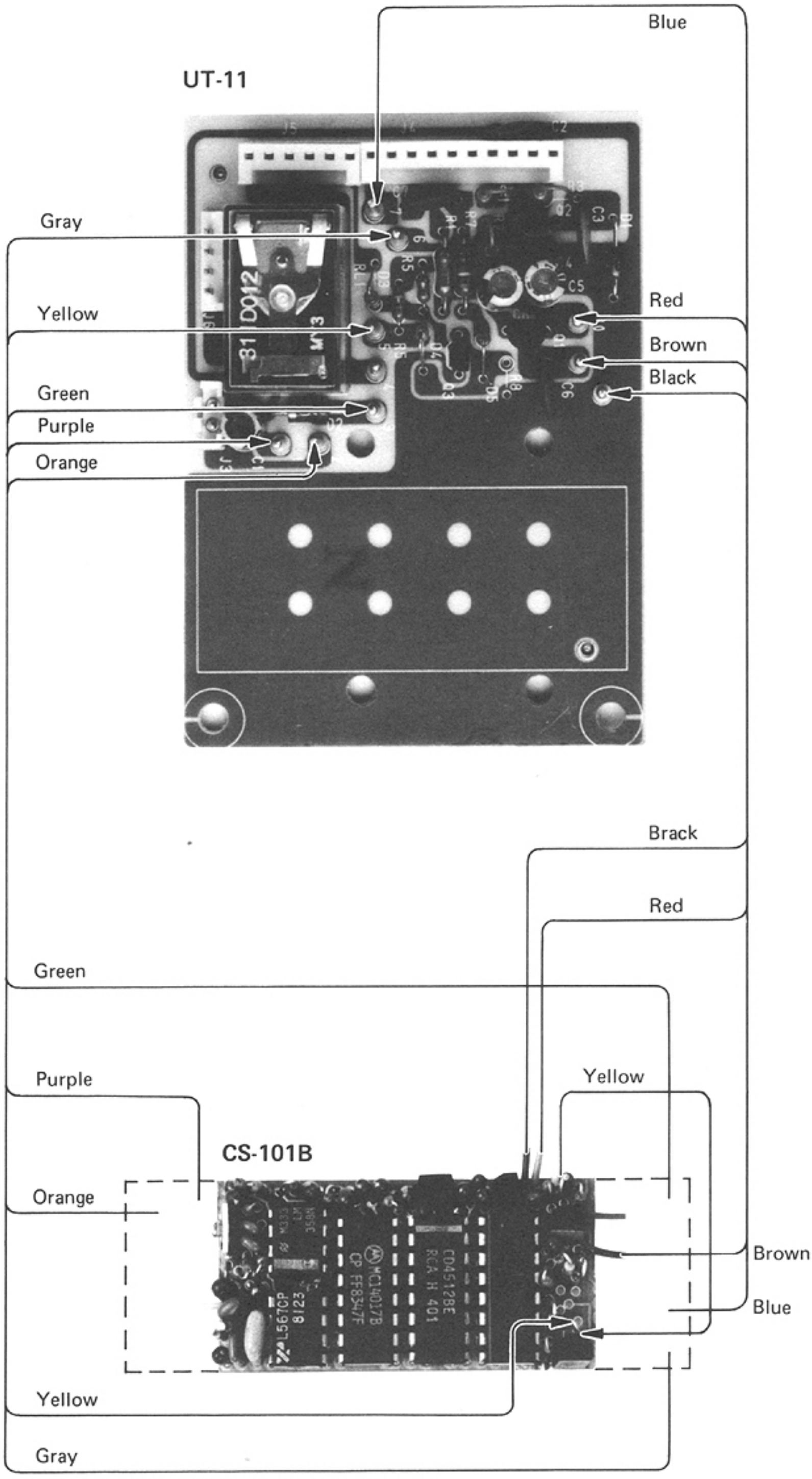
CS-101B (Without Notch Filter and Relay Driver)

Fig. 3



CS-101B (With Relay Driver)

Fig. 4



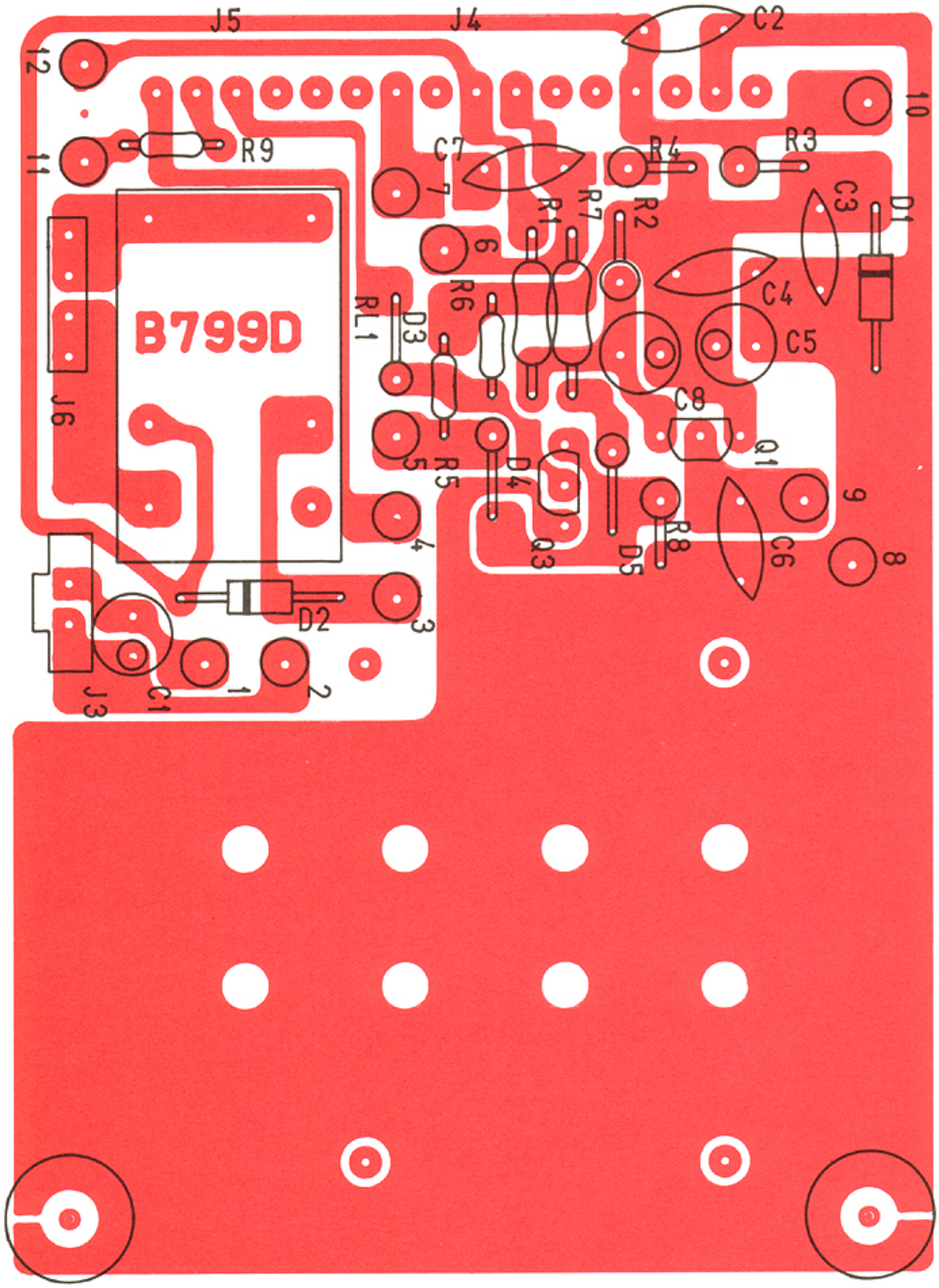
CS-101B (With Notch Filter and Relay Driver)

15 - 2 PARTS LIST

UT-11

REF NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SA1015Y
Q3	Transistor	2SC2458 GR
D1	Zenner	RD9.1EB1
D2	Diode	1N4002
D3	Diode	1SS133
D4	Diode	1SS133
D5	Diode	1SS133
R1	Resistor	22K R25
R2	Resistor	10K ELR25
R3	Resistor	470 ELR25
R4	Resistor	10K ELR25
R5	Resistor	470K R10
R6	Resistor	560 R10
R7	Resistor	100K R25
C1	Electrolytic	10 16V
C2	Barrier Lay	0.047 25V
C3	Ceramic	0.0047 50V B
C4	Barrier Lay	0.047 25V
C5	Electrolytic	4.7 25V
C6	Barrier Lay	0.1 16V
C7	Barrier Lay	0.1 16V
C8	Electrolytic	4.7 25V
RL1	Relay	FBR31D012
J3	Connector	TL-25P-02-V1
J4	Connector	SQ-10
J5	Connector	SQ-6
J6	Connector	TSL-P04P-B1
B1	P.C. Board	B-799D
1～10	Pins	RT-01T-1.3B

UT-11/UT-12 Option Board



SECTION 16 UT-12 2/5 TONE DECODER/DTMF DECODER UNIT

16 - 1 INSTALLATION OF UT-12 IN IC-435

The UT-12 interface board is for use with the Midian MTSD-1 and 2, 2 tone and 5 tone sequential decoders, or the TTD-1 DTMF decoder or other similar decoders. The UT-12 may be used with either the 2 or 12 channel versions of the IC-435. The UT-12 may be provided without the tone option for installation by the servicing dealer.

1. To install the tone decoder on the UT-12, the following UT-12 pin out information is necessary.

Pin 1	Use pin 1 & 2 when using the 2805Hz notch filter. Connect Pin 1 to filter output and Pin 2 to filter input. When using the notch filter, remove C1 which interconnects Pin 1 and 2.
Pin 2	
Pin 3	Connect to horn driver. This input controls the horn relay on the UT-12.
Pin 4	Connect to audio input to decoder.
Pin 5	Squelch control for radio.
Pin 6	Decoder reset line. Reset is engaged by moving mic to on-hook or off hook.
Pin 7	Call light driver output. Connect to all light circuit.
Pin 8	Ground
Pin 9	This line causes decoder to cut off when PTT is momentarily depressed to allow monitoring the channel prior to transmitting.
Pin10	+13.8V DC controlled by on/off switch.
Pin11	If multitone decoder with transpond feature is used, this pin is the transpond output line.
Pin12	Transponder PTT. Causes radio to go to TX mode for transpond.

2. Modify the both units before installing the MTSD unit onto the UT-12 according to the following procedure.

   A. Modification of the MTSD unit.
      1. Remove R25 (47K ohm).
      2. Cut yellow wire at 4cm from the board, and solder its end to the base of Q4.

   B. Modification of the UT-12.
      1. Jumper the foil lands between C7 and R4, and C7 and Pin 7.

Note that the relay (RL1) on UT-12 does not work when using MTSD unit without Hi Power Relay Driver. To use the relay, use MTSD unit with the High Power Relay Driver and follow the description in the Fig. 2.

3. Modify the both units before installing the TTD-2 unit onto the UT-12 according to the following procedure.

   A. Modification of the TTD-2 unit.
      1. Remove the yellow wire from the soldered point on the unit and solder it to pin 3 of IC5.

   B. Modification of the UT-12.
      1. Remove R5 (100K ohm).
      2. Jumper the foil lands between C7 and R4.

4. After modification and programming, final installation in the IC-435 is accomplished as follows:

   A. When installing the UT-12 first unplug P6 from the small interface board and remove the interface board (see Fig 7). Remove the mounting screw from the blank standoff of the front right and save also. The two screws will be used to secure the tone interface board.

   B. Before installing the UT-12 make sure that tones are properly programmed using the information supplied above.

   C. Before inserting the programmed UT-12/assembly into the radio, make sure P6 is plugged into the proper connection on the UT-12. P4 is used for the horn honk option and provides connections to the horn honk accessary connector on the rear of the radio. Plug into the UT-12 as appropriate.

   D. Insert the UT-12 making sure that the in-line connector properly mates to the pin row on the main board. Care must be used to make sure that interface is not offset one way or the other.

   E. Secure UT-12 using the two screws removed earlier.

16 - 2 OPERATION AND PROGRAMMING OF THE MULTI-TONE SEQUENTIAL DECODER

The MTSD employs a state variable active filter (comprised of IC3 ABC) to select the proper tones in a paging sequence.

IC3 D generates a low impedance pseudo ground reference for all of the op-amp circuits. IC4 C is an audio input amplifier and limiter that provides a constant input level to the filter circuit.

Once the active filter passes the correct tone, it is detected and timed by schmitt trigger IC4 A and its associated input circuitry. If IC4 A's output remains high for 5 seconds or more, (group call) Pin 10 of IC4 B will charge up via R18 and C9 and activate the alert tone generator IC4 D, horn output transistor and the SCR circuit. For normal 2 tone or 5 tone sequential calls, the schmitt trigger will advance binary counter IC2 A after each tone disappears. When IC2 A is advanced to its binary two state, a voltage will be fed through jumper J through D8 instantly charging Pin 10 of IC4 B again activating all of the outputs. Similar action occurs on the 5 tone sequence. IC2 A will be advanced to its binary 5 state removing the ground at the junction of R13, D5, and D6 allowing IC4 B to again activate all the output features. Q3, R20 and C7 form an interdigit timer between tones. These components vary depending on the tone formats.

When the radio is initially turned on, the SCR in the decoder is reset. This allows a positive voltage to be felt at the yellow lead (via R28 and D3 and R27). This voltage is applied to the squelch circuit keeping the receiver muted.

After the logic decodes the proper sequence, a voltage is applied from IC4 B to the gate of the SCR. This triggers the SCR which pulls the bottom of R27 to ground. This action back biases D3 which removes the voltage from the squelch circuit allowing the receiver to unmute. The user will then hear the alert tone from IC4 D.

After completion of the call the user can reset the unit by simply turning the radio off and back on, or by hanging up the microphone when using the board extension.

A tap on the PTT switch provides a positive pulse on the brown lead triggering the SCR which again unmutes the radio. The user can then monitor the channel prior to making a call.

16 - 3 MTSD - FREQUENCY SETTING

A. Jumper square pad E (see solder side layout).

B. On MTSD 1, two tone sequential decoder, apply the first sequential tone to the orange wire and then monitor square pad T (Pin 15 of IC3) with oscilloscope. Adjust potentiometer 1 for maximum amplitude of 1 + volts peak to peak making sure that the waveform is the same frequency as the input waveform on the orange wire. Turning the pot clockwise lowers the frequency. When the pot is correctly adjusted, the waveform will peak in amplitude and decrease when the pot is adjusted CW or CCW from the correct setting. A False setting will occur if the pot is radically misadjusted to the third harmonic of the input frequency. The scope waveform will display a frequency 3 times the input frequency. Be sure this does not occur or the decoder will not decode.

C. To set the second sequential tone, it will be necessary to advance the multiplexer circuit to retune the state variable filter. This is done by placing a jumper between the square pad D and square pad A (see solder side layout). Repeat step two for the second sequential tone frequency by adjusting potentiometer 2.

D. Remove the jumper from D to E and D to A and remove oscilloscope from Pad T.

E. Now apply the proper sequency and time of the two tones. The unit should decode the tone pairs and produce an alert tone, a momentary horn output and a latched call light. The unit should now be operational.

F. On MTSD 2, Five tone sequential decoder, jumper pad D to E (see solder side layout).

G. On the MTSD 2, the procedure for setting the frequency for the first and second tone is identical to steps 2 and 3 above.

H. To see the third tone, it will again be necessary to advance the multiplexer to retune the filter. Place a jumper from pad D to pad B and adjust the potentiometer 3 for a peak on the oscilloscope.

I. To set the fourth tone, jump pad D to pad A and B and adjust potentiometer 4 for a peak on the oscilloscope.

J. To set the fifth tone, jump pad D to pad C and adjust potentiometer 5 for a peak on the oscilloscope.

K. Remove the jumper D to E and jumper D to C and remove the oscilloscope from pad T. Unit should now be operational.

L. Remember in the 5 tone format that the repeat tone is substituted each time there are two identical successive digits appearing in the address code. For example, an address code of 35549 would be converted to 35R49.

16 - 4 TOUCH-TONE DECODER OPERATION AND PROGRAMMING

When power is first applied to the circuit, counter 4518B is reset and Q3 is off. This provides a positive voltage at the yellow lead to squelch the receiver. 324A amplifies the incoming audio by approximately 5 times. The 8865 filter requires an input level of 0.1 to 2.5 volts P-P. The filter separates the tone pairs into separate high and low tones for the 8860 decoder. The 8860 translates the 2 tones to their binary equivalent and latches this on pins 8, 7, 6, and 5. Pin 15 (StD) provides a logic 1 signal as long as the 2 tones are present. The 4028 provides a 1 of 10 output of the binary digit received. These digits are strapped to the 74C151 sequencing decoder inputs A through H. The 4518A counter, steps the sequencer through its steps. When a correct digit is received, StD Goes high and 74C151 Pin 6 goes low. Capacitor C1 discharges through D13 and removes the reset signal to 4518A. When the digit is released StD falls and advances the counter. C1 begins to charge via R1 and will reset the counter if the next digit is not received within approximately 2 seconds. When an incorrect digit is received, 74C151 Pin 6 does not go low and C1 charges rapidly via D14 and R11 and will reset the counter to provide falsing protection.

Diodes D1 through D4 detect the telephone number length and trigger one shot 324B through D5. The group call capacitor C2 charges via R2 when a correct digit is held and will also trigger the one shot through D15. C4, R30 and R13 determines the one shot pulse time. When the one shot goes high: the 4518B latch is triggered via D17, the horn output Q1 is turned on, alert tone oscillator 324C is enabled (D18), "*" reset of the latch is enabled (D21), and D19 back biases permitting C3 to charge via R3. After approximately 3 seconds the voltage on C3 is sufficient to turn on Q2 for the acknowledge signal. When the one shot times out: the transmitter is released, alert tone disabled, and the horn output released. The latch will remain set or reset if the "*" has been received.

16 - 5 TELEPHONE NUMBER PROGRAMMING

In order to strap the assigned telephone number on these decoders, the letter A must be connected to the first number, B must be connected to the second number and so on. Take the telephone number 0388 for example:

Install a jumper from A to 0
Install a jumper from B to 3
Install a jumper from C to 8
Install a jumper from D to 8

These jumpers are installed on the solder side of the board. Use a 28 guage solid wire with 26 guage teflon spaghetti.

In addition to programming the telephone number, the length of the number must also be programmed. This process follows a binary code.

Digit length	X Jumper	Y Jumper	Z Jumper	W Jumper
1	add	omit	omit	omit
2	omit	add	omit	omit
3	add	add	omit	omit
4	omit	omit	add	omit
5	add	omit	add	omit
6	omit	add	add	omit
7	add	add	add	omit
8	omit	omit	omit	add

As can be observed from the above chart, the 4 digit number 0388 would need Z jumper installed and W, X, and Y jumpers omitted.

Caution: The "0" is not decoded by the 4028 IC. It is decoded by diodes D6 and D7. As a result of this the "0" can be falsed by a "*". In the example, if the sequences *388 were received, the unit would ring. This is the only case of falsing with the standard 12 touch tone pairs.

OPTIONS

Option 1: To decode * in the Dialing Sequence, make the cut ✕ and install the jumper at "M" (See Solder Side Layout.) Jumper the * pad to a letter pad to set the * as that digit. NOTE: If this option is used, the call light reset feature will no longer work on *.

Option 2: To use # instead of * for call light reset, make the 2 cuts ✕ and install jumper at "N" (See Solder Side Layout). This disconnects D8 and D9 from Pins 10 and 13 of the 4028 and connects D9 to Pin 12. This will reset the call light on # (not *).

Option 3: To decode # as part of the dialing sequence, modify the board as in both options 1 and 2. **NOTE:** Using Option 3 will eliminate the call light reset feature.

Option 4: To eliminate all and group call, remove D15.

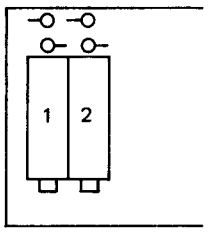
16 - 6 TONE FREQUENCY TABLES

5 TONE TABLE

TONE	FREQUENCY (Hz)
R	459
0	600
1	741
2	882
3	1023
4	1164
5	1305
6	1446
7	1587
8	1728
9	1869
x	2010

FREQUENCY ADJUSTMENT POTS

2 TONE



5 TONE

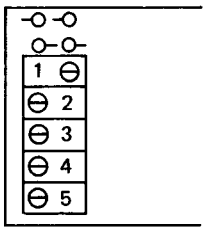


TABLE 1

POT	JUMP "D" to:
1	E
2	A
3	B
4	A & B
5	C

MOTOROLA

TABLE 1

GENERAL ENCODING PLAN		
FURST DIGIT OF PACER CODE	GROUP FROM WHICH TONE A IS SELECTED	GROUP FROM WHICH TONE B IS SELECTED
1	1	1
2	2	2
3	1	2
4	4	4
5	5	5
6	2	1
7	4	5
8	5	4
9	2	4
0	4	2
A	3	3

TABLE 2A

CODE TYPE "Y" REED GROUPS

TONE NO.	A SERIES		B SERIES		Z SERIES	
	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz
1	DA	398.1	DB	412.1	DZ	384.6
2	EA	441.6	EB	457.1	EZ	426.6
3	FA	489.8	FB	507.0	FZ	473.2
4	GA	543.3	GB	562.3	GZ	524.8
5	HA	602.6	NB	623.7	HZ	582.1
6	JA	668.3	JB	691.8	JZ	654.7
7	KA	741.3	KB	767.4	KZ	716.7
8	LA	822.2	LB	851.1	LZ	794.3
9	MA	912.0	MB	944.1	MZ	881.0
0	CA	358.9	CB	371.5	CZ	346.7

2ND OR 3RD DIGIT OF PAGER CODE

TABLE 2

REED GROUPS

TONE NUMBER	REED GROUP 1		REED GROUP 2		REED GROUP 3 (OR A)		REED GROUP 4		REED GROUP 5		REED GROUP 6	
	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz	REED CODE	FREQ. Hz
1	111	346.0	121	600.9	138	288.5	141	339.6	151	584.3	191	1153.4
2	112	368.5	122	634.5	108	296.5	142	358.6	152	617.4	192	1185.2
3	113	389.0	123	669.9	139	304.7	143	378.6	153	651.9	193	1217.8
4	114	410.8	124	707.3	109	313.0	144	399.8	154	688.3	194	1251.4
5	115	433.7	125	746.8	160	953.7	145	422.1	155	726.8	195	1285.6
6	116	457.9	126	788.5	130	979.9	146	445.7	156	767.4	196	1321.2
7	117	483.5	127	832.5	161	1006.9	147	470.5	157	810.2	197	1357.6
8	118	510.5	128	879.0	131	1034.7	148	496.8	158	855.5	198	1395.0
9	119	539.0	129	928.1	162	1063.2	149	524.6	159	903.2	199	1433.4
0	110	330.5	120	360.1	189	1092.4	140	321.7	150	553.9	190	1122.5

2ND OR 3RD DIGIT OF PAGER CODE

TABLE 3

CODE PLAY TABLE

FIRST DIGIT	CODE TYPE																		
	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V
1	11	11	11	11	11	11	11	11	11	11	23	23	23	24	24	25	34	34	35
2	22	22	22	22	13	13	13	14	14	15	22	22	22	22	22	22	43	43	43
3	33	12	12	12	33	33	33	41	41	51	33	33	33	42	42	52	33	33	33
4	12	44	15	21	44	31	31	44	44	16	44	32	32	44	44	26	44	44	36
5	13	14	55	16	31	55	16	55	16	55	32	55	26	55	26	55	55	36	55
6	21	21	21	66	14	15	66	15	66	66	24	25	66	25	66	66	35	66	66
7	31	41	51	61	41	51	61	45	61	61	42	52	62	45	62	62	45	63	63
8	23	24	25	26	34	35	36	54	46	46	34	35	36	54	46	56	54	46	56
9	32	42	52	62	43	53	63	51	64	65	43	53	63	52	64	65	53	64	65

GE TABLE 1

GENERAL ELECTRIC TYPE 99

GROUP	A	B	C
TONE NUMBER	FREQ Hz	FREQ Hz	FREQ Hz
1	592.5	607.5	712.5
2	757.5	787.5	772.5
3	802.5	832.5	817.5
4	847.5	877.5	862.5
5	892.5	922.5	9075.
6	937.5	967.5	952.5
7	547.5	517.5	532.5
8	727.5	562.5	577.5
9	637.5	697.5	622.5
0	682.5	652.5	667.5

DIA 742.5Hz

GE TABLE 2

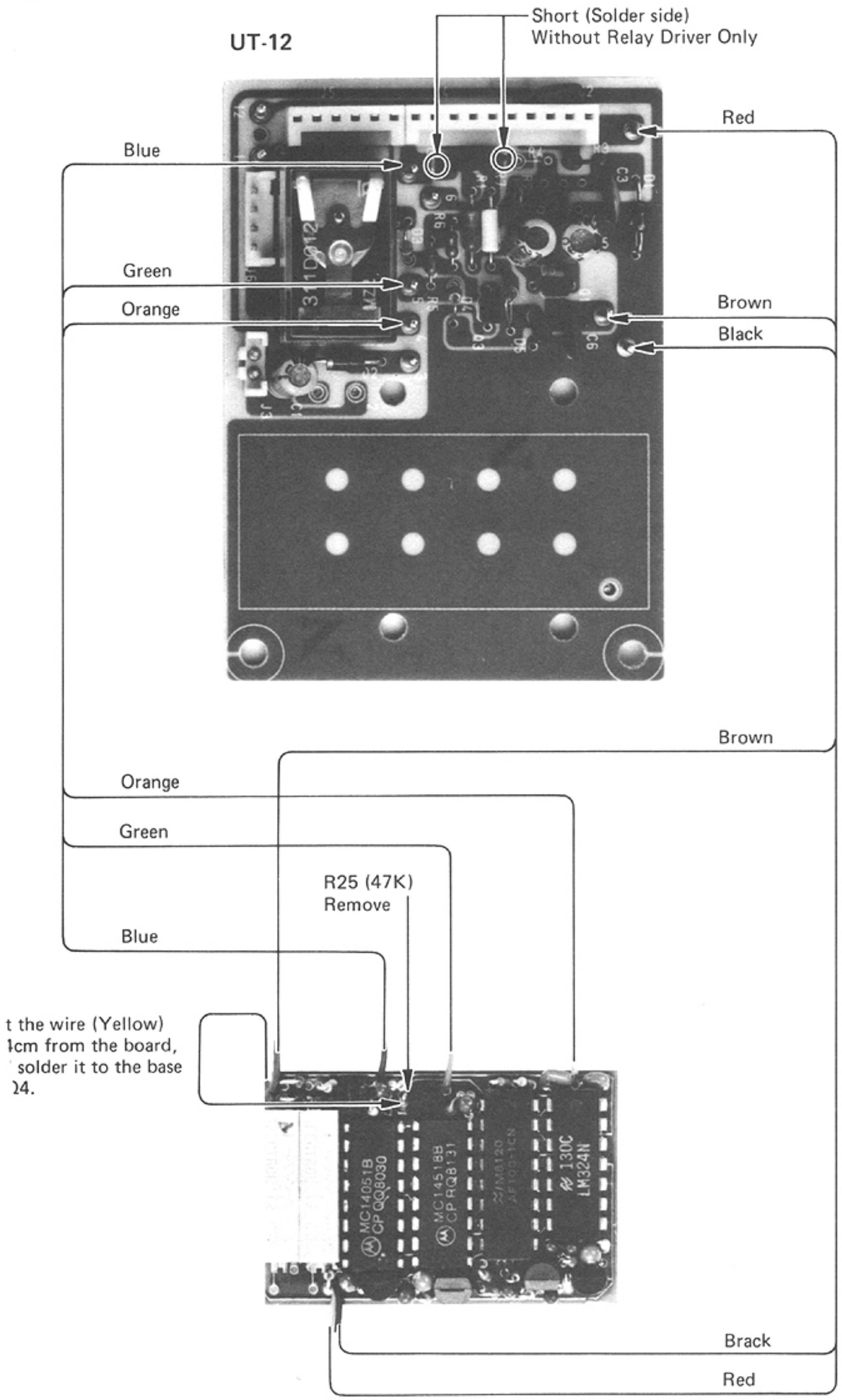
100'S	TONE REED GROUPS	
DIGIT	FOR 1st TONE	FOR 2nd TONE
0	A	A
1	B	A
2	B	B
3	A	B
4	C	C
5	C	A
6	C	B
7	A	C
8	B	C

REACH TWO TONE SEQUENTIAL - FAST OR SLOW

1st DIGIT OF CODE	GROUP FOR 1st TONE	GROUP FOR 2nd TONE
1	A	C
2	C	A
3	B	D
4	D	B
5	A	D
6	D	A
7	A	E
8	E	A
9	B	E
0	E	B

TONE #	GROUP A		GROUP B		GROUP C		GROUP D		GROUP E	
	CHNL.	FREQ.	CHNL.	FREQ.	CHNL.	FREQ.	CHNL.	FREQ.	CHNL.	FREQ.
1	11	2704	21	1912	26	1608	36	1137	46	804
2	12	2612	22	1847	27	1553	37	1098	47	776
3	13	2523	23	1784	28	1500	38	1061	48	750
4	14	2437	24	1723	29	1449	39	1025	49	725
5	15	2354	25	1664	30	1400	40	990	50	700
6	16	2274	26	1606	31	1352	41	956	51	676
7	17	2196	27	1553	32	1306	42	923	52	653
8	18	2121	28	1500	33	1261	43	892	53	631
9	19	2049	29	1449	32	1219	44	882	54	609
0	20	1980	30	1400	35	1177	45	832	55	588

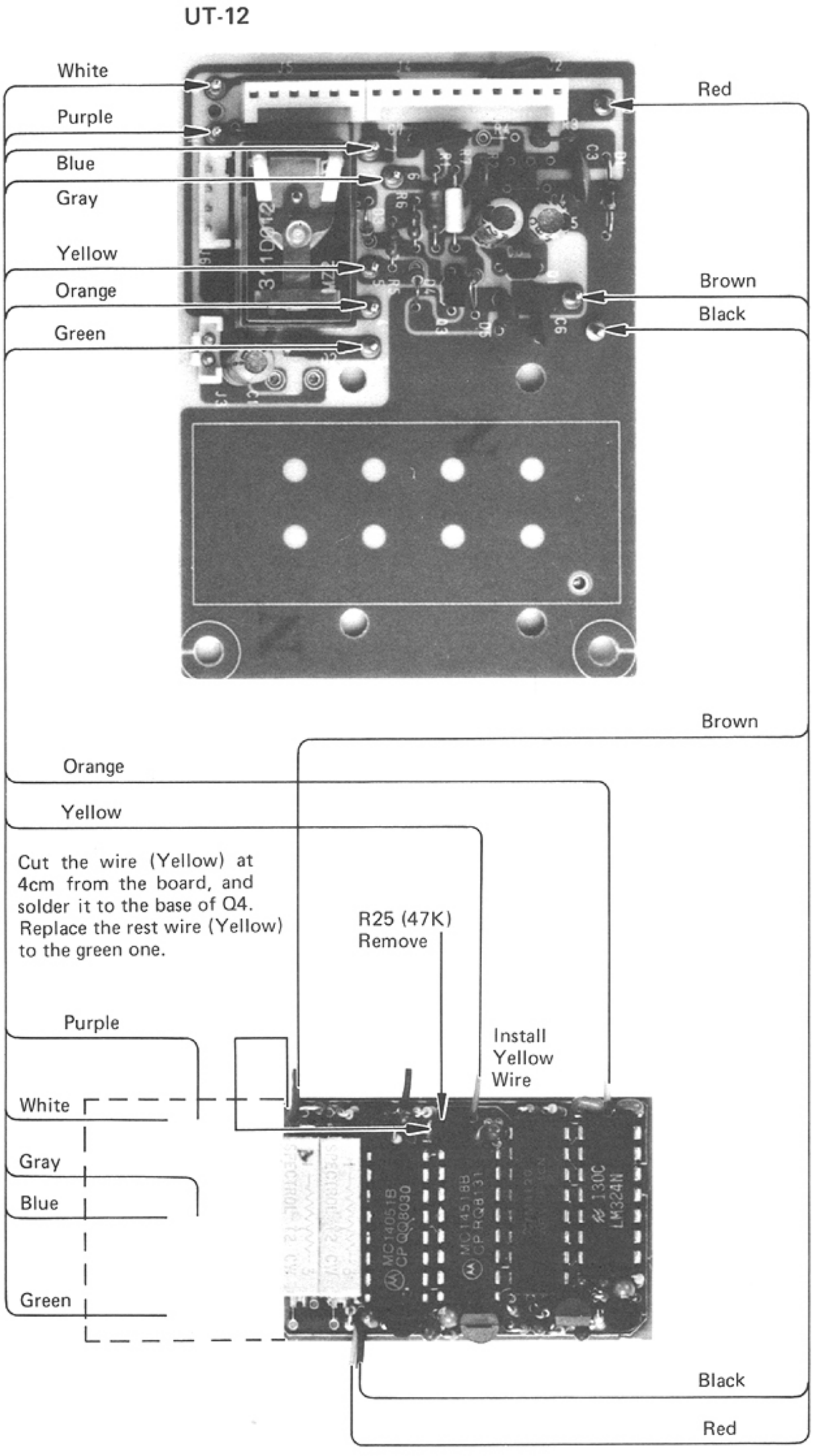
Fig. 1



MTSD (Without Relay Driver)

* The photo shows 2-Tone type. 5 Tone type has the same connections.

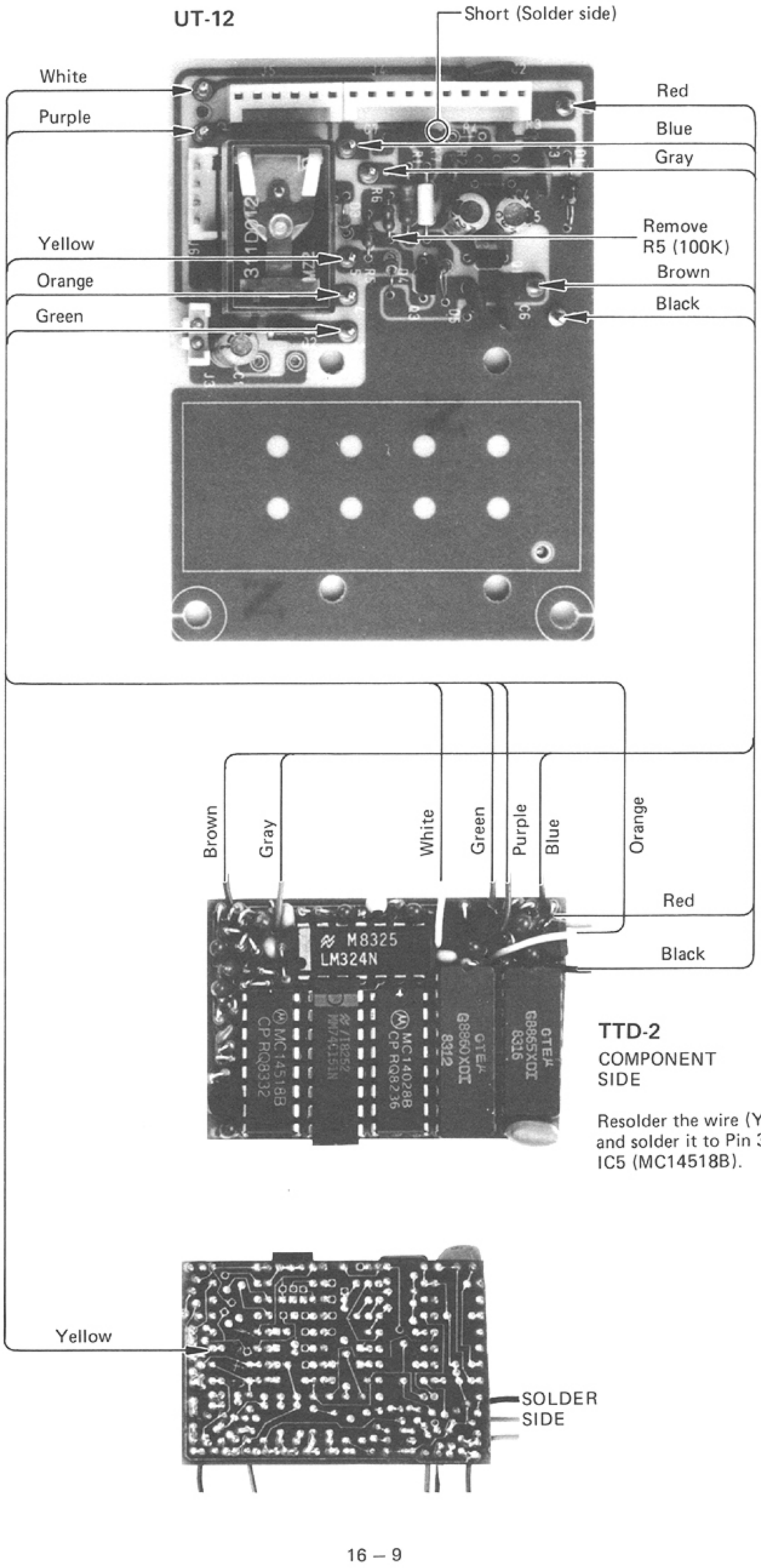
Fig. 2



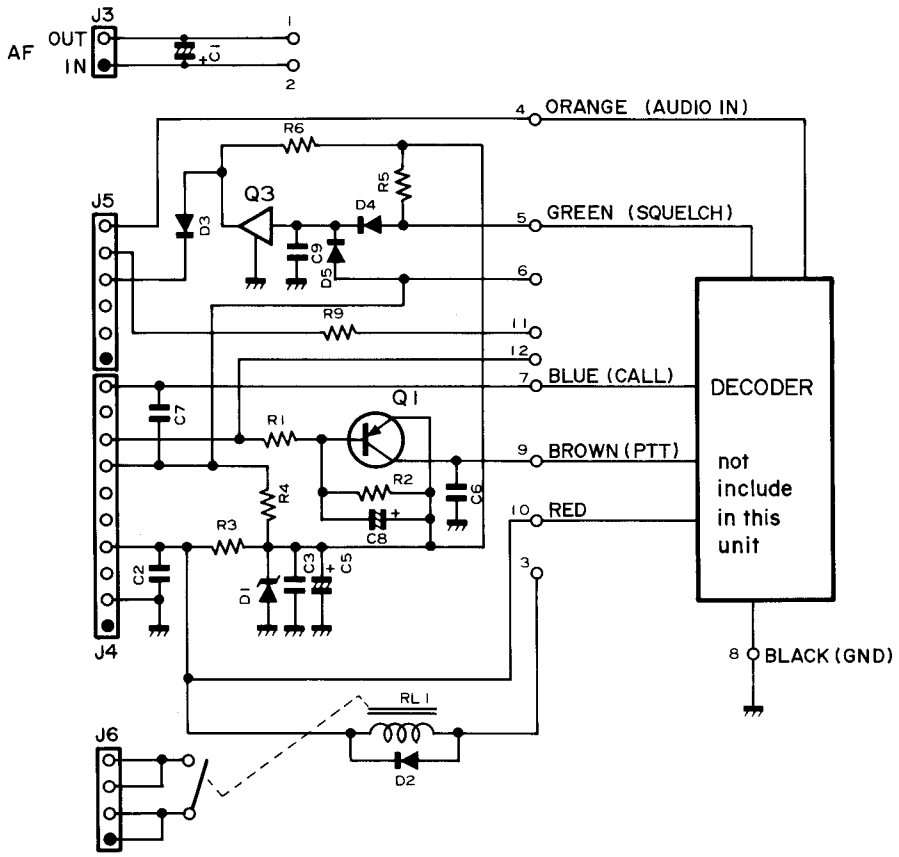
MTSD (With Relay Driver)

* The photo shows the 2-Tone type. The 5-Tone type has the same connections.

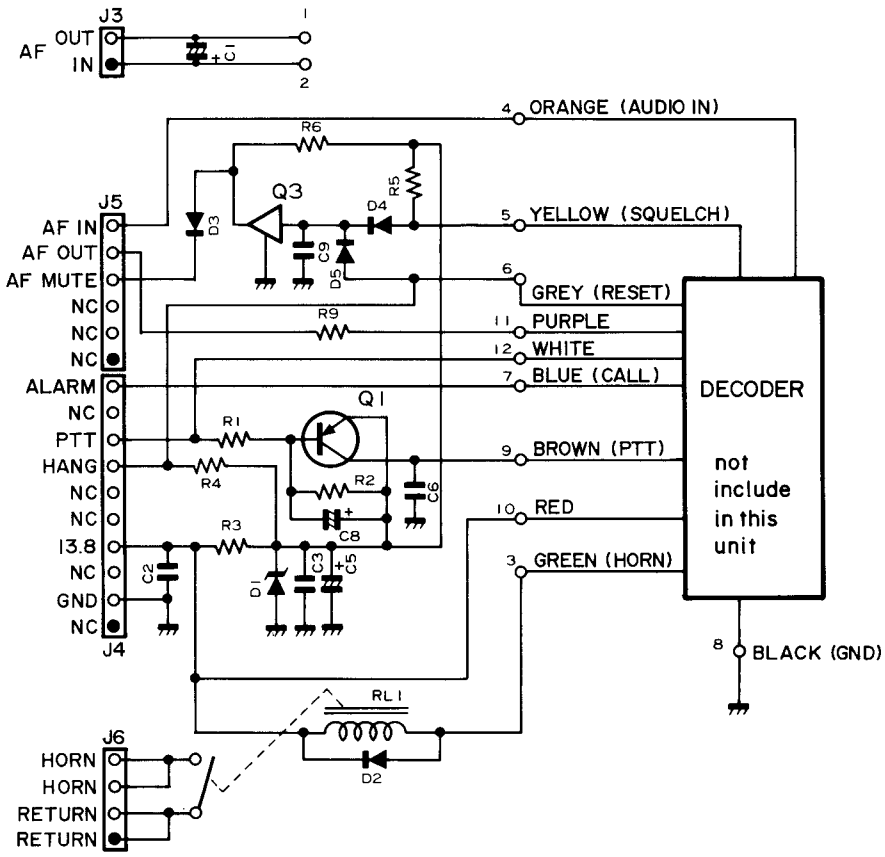
Fig. 3


UT-12
Short (Solder side)
White
Purple
Yellow
Orange
Green
Red
Blue
Gray
Remove
R5 (100K)
Brown
Black
Brown
Gray
White
Green
Purple
Blue
Orange
Red
Black
M8325
LM324N
MC14518B
CP RQ8332
MC14028B
CP RQ8236
GTE
G8865XDI
8316
GTE
G8860XDI
8312
TTD-2
COMPONENT
SIDE
Resolder the wire (Yellow), and solder it to Pin 3 of IC5 (MC14518B).
Yellow
SOLDER
SIDE

Hook-on→(Hook-off→Tx)



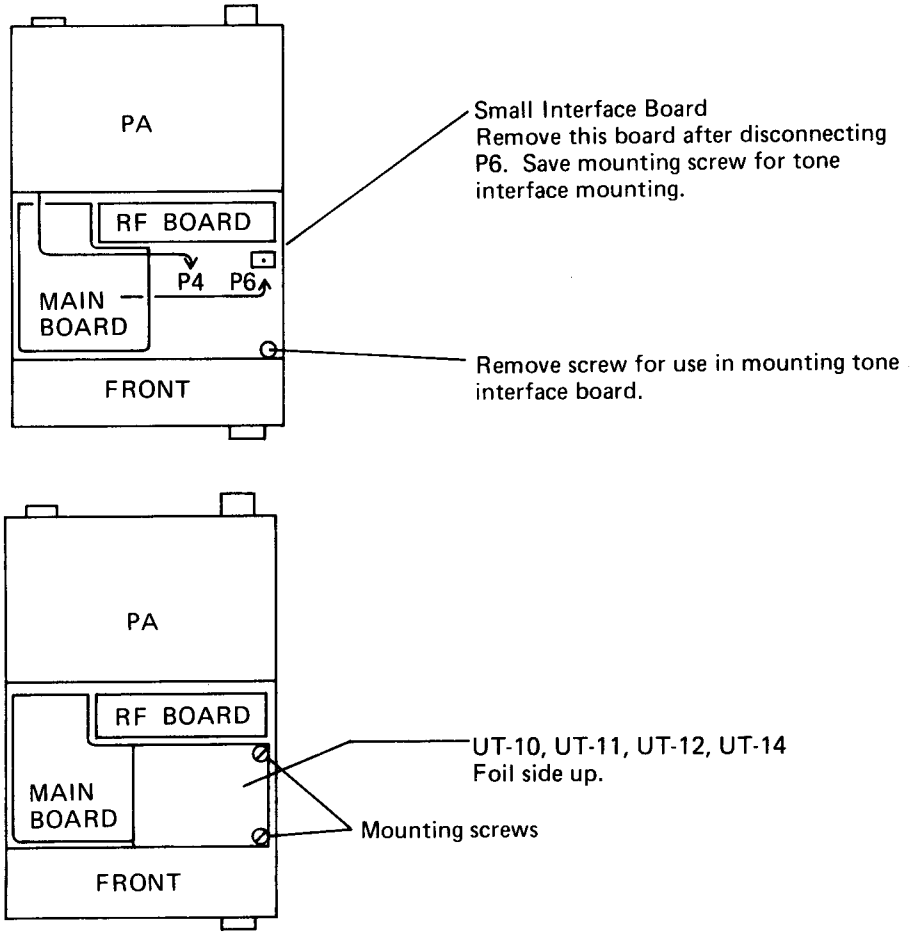
Hook-on→(Hook-off→Tx)



R4 : TTD-2 used only

UT-11, UT-12

IC-435 INSTALLATION OF UT-10, UT-11, UT-12, UT-14



16 - 7 PARTS LIST

UT-12

REF. NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SA1048 Y
Q3	Transistor	2SC3399
D1	Zenner	RD9.1EB1
D2	Diode	1N4002
D3	Diode	1SS133
D4	Diode	1SS133
D5	Diode	1SS133
R1	Resistor	22K R25
R2	Resistor	10K ELR25
R3	Resistor	470 ELR25
R5	Resistor	100K R10
R6	Resistor	560 R10
R9	Resistor	22K R10
C1	Electrolytic	10 16V
C2	Barrier Lay	0.047 25V
C3	Ceramic	0.0047 50V B

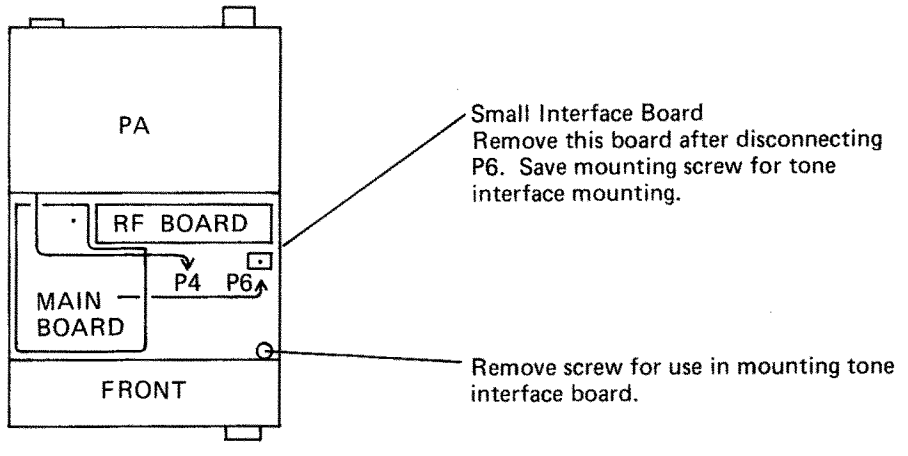
REF. NO.	DESCRIPTION	PART NO.
C5	Electrolytic	4.7 25V
C6	Barrier Lay	0.1 16V
C7	Barrier Lay	0.1 16V
C8	Electrolytic	4.7 25V
C9	Barrier Lay	0.01 25V
RL1	Relay	FBR311 D012
J3	Connector	TL-25P-02-V1
J4	Connector	SQ-10
J5	Connector	SQ-6
J6	Connector	TSL-P04P-B1
B1	PC. Board	B-799D
	Pins	RT-01T-1.3B
W1	Jumper	JPW-02A

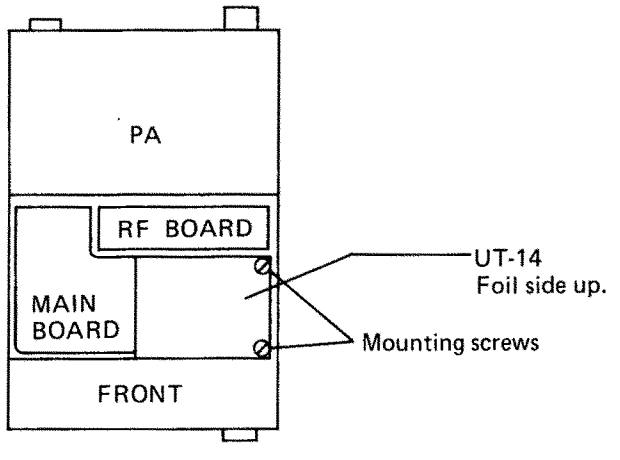
SECTION 17 UT-14 CTCSS UNIT (For 12ch Version)

17 - 1 INSTALLATION OF UT-14 IN IC-435

The UT-14 interface board is for use with the TS-32 CTCSS unit and can be used only with the IC-435 12 channel configuration. When used in the 12 channel configuration, tone may be programmed for both channels independently.

1. When installing the UT-14, first unplug P-6 from the small interface board and remove the interface board (see Fig 1). Remove the mounting screw from the blank standoff of the front right and save also. The two screws will be used to secure the tone interface board.





2. Before installing the UT-14, make sure that each tone is properly programmed using the appropriate diode matrix (see Fig 2). Programming is shown in Fig 3. Boards are supplied fully programmed so remove diodes to program.

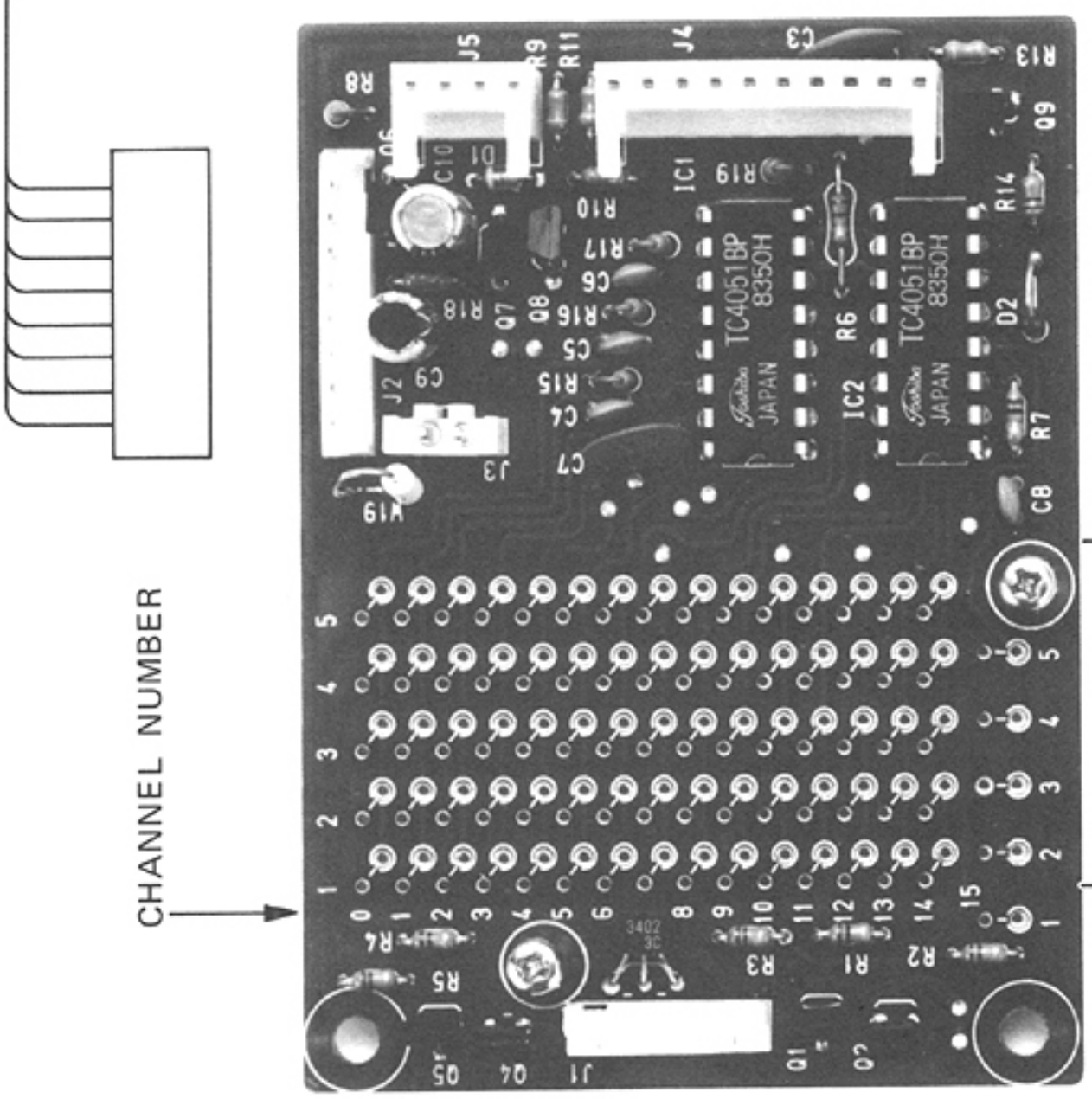
3. If installing your own TS-32 rather than buying assembled board, remove the programming dip switch or place all switches to the off or open position. Interface wires are soldered to the holes left by removing the switch (see Fig 4).

4. Before inserting the programmed UT-14/TS-32 into the radio, make sure P-6 is plugged into the connector on the UT-14. P4 is only used with tone boards with the horn honk option and provides connection to the horn honk accessory connector on the rear of the radio.

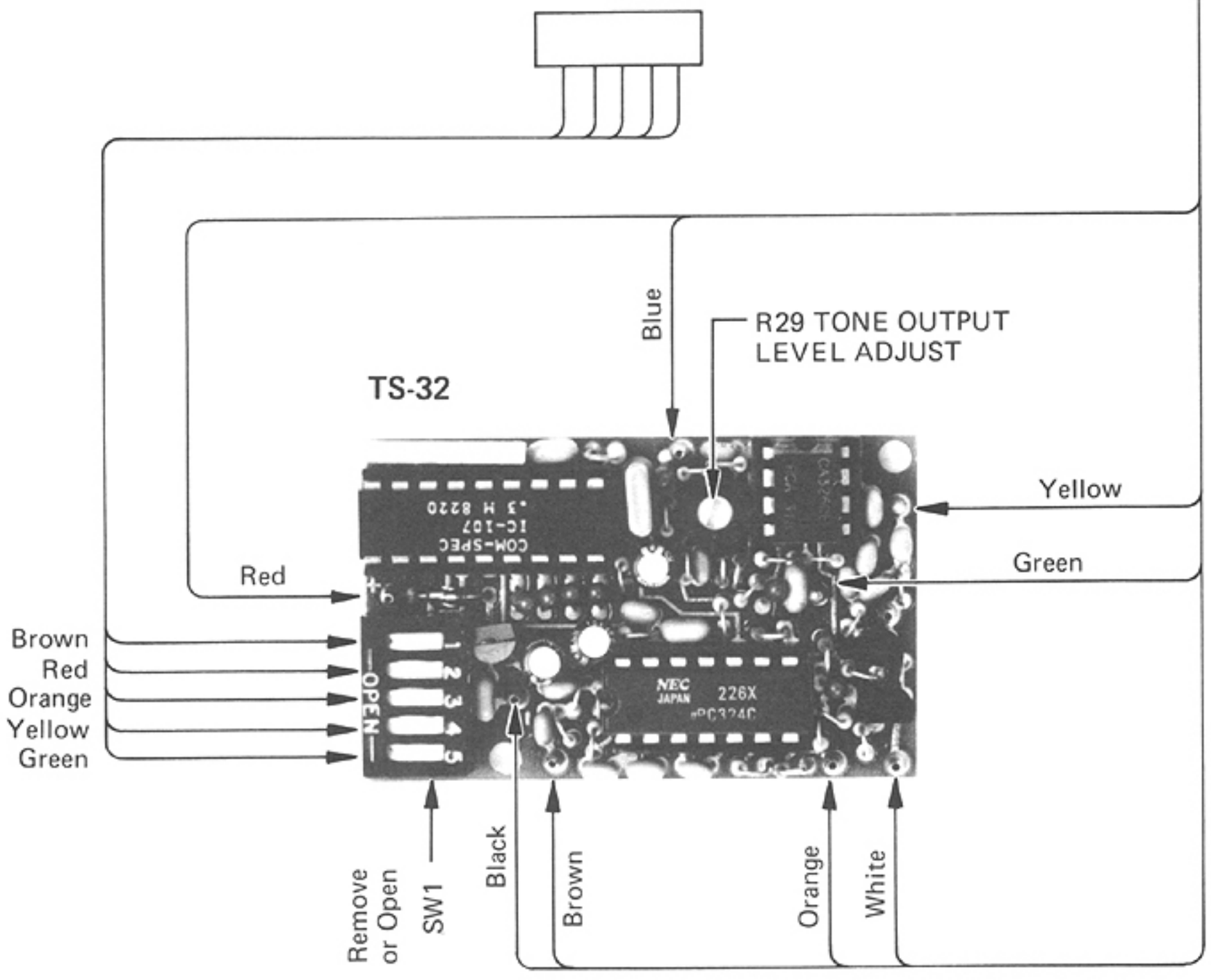
5. Insert the UT-14 making sure that the in-line connector properly mates to the pin row on the main board. Care must be used to make sure that interface is not offset one way or the other.

6. Secure UT-14 using the two screws removed earlier. Adjustment of tone level can be made through the hole in the UT-14 board.

UT-14


CHANNEL NUMBER
TONE PROGRAMMING DIODES SPACE

TS-32


Blue
R29 TONE OUTPUT LEVEL ADJUST
Yellow
Green
Red
Brown
Red
Orange
Yellow
Green
Remove or Open SW1
Black
Brown
Orange
White

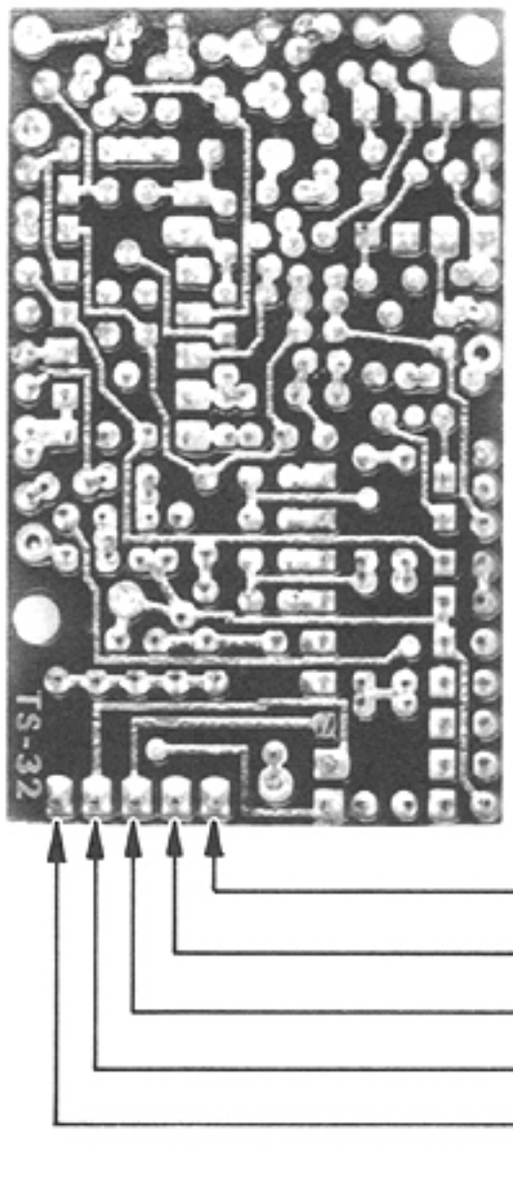
17 - 2 TONE PROGRAMMING (Fig. 3)

TONE PROGRAMMING – TS32/UT-14

#	FREQ	CODE	5	4	3	2	1
1	67.0	XZ	O	O	O	O	O
2	71.9	XA	O	O	O	O	X
3	74.4	WA	O	O	O	X	O
4	77.0	XB	O	O	O	X	X
5	79.7	SP	O	O	X	O	O
6	82.5	YZ	O	O	X	O	X
7	85.4	YA	O	O	X	X	O
8	88.5	YB	O	O	X	X	X
9	91.5	ZZ	O	X	O	O	O
10	94.8	ZA	O	X	O	O	X
11	97.4	ZB	O	X	O	X	O
12	100.0	1Z	O	X	O	X	X
13	103.5	1A	O	X	X	O	O
14	107.2	1B	O	X	X	O	X
15	110.9	2Z	O	X	X	X	O
16	114.8	2A	O	X	X	X	X
17	118.8	2B	X	O	O	O	O
18	123.0	3Z	X	O	O	O	X
19	127.3	3A	X	O	O	X	O
20	131.8	3B	X	O	O	X	X
21	136.5	4Z	X	O	X	O	O
22	141.3	4A	X	O	X	O	X
23	146.2	4B	X	O	X	X	O
24	151.4	5Z	X	O	X	X	X
25	156.7	5A	X	X	O	O	O
26	162.2	5B	X	X	O	O	X
27	167.9	6Z	X	X	O	X	O
28	173.8	6A	X	X	O	X	X
29	179.9	6B	X	X	X	O	O
30	186.2	7Z	X	X	X	O	X
31	192.8	7A	X	X	X	X	O
32	203.5	M1	X	X	X	X	X

O: DIODE IN PLACE X: OPEN

(Fig. 4)

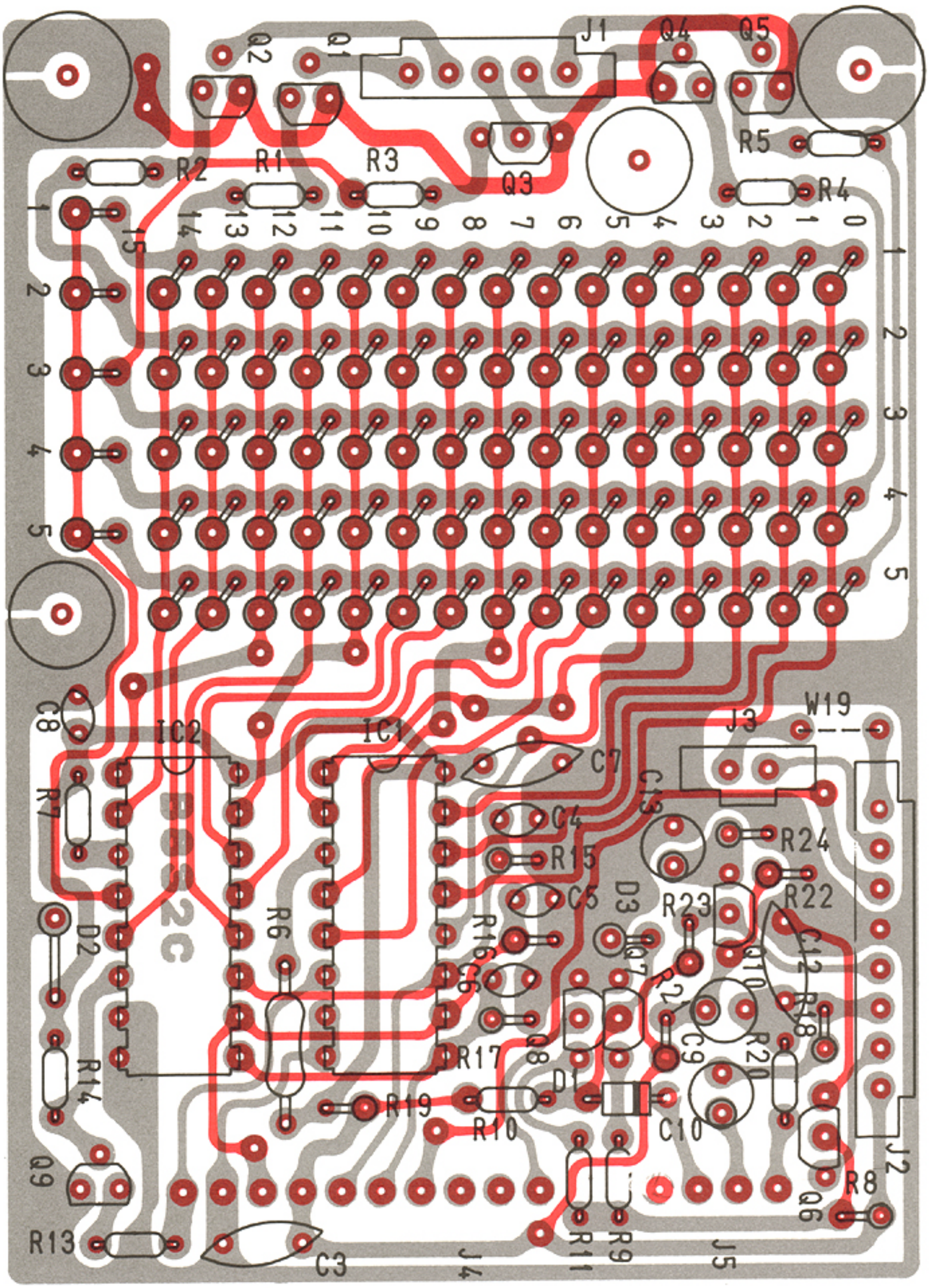


17 - 3 PARTS LIST

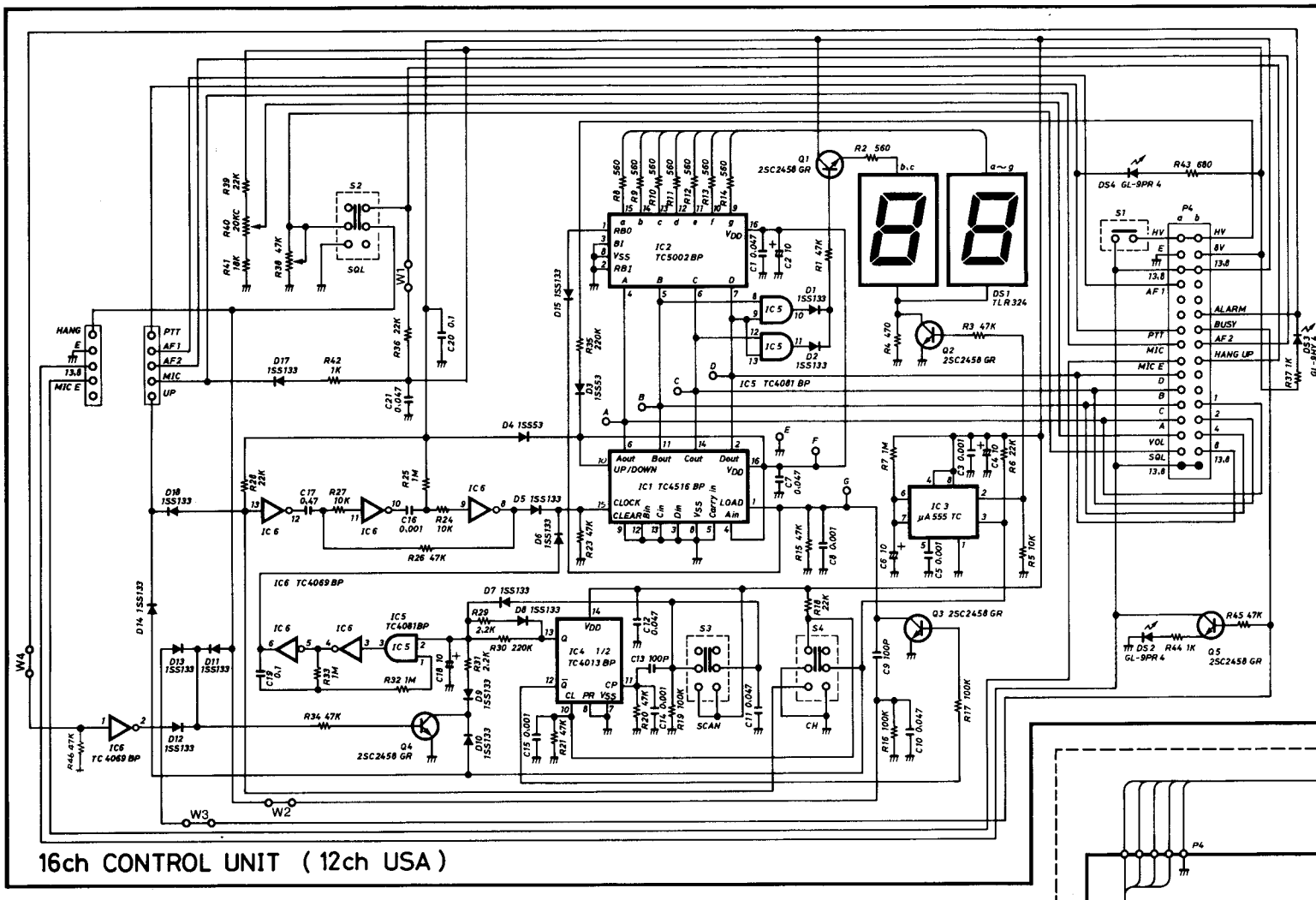
REF NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SC3402
Q2	Transistor	2SC3402
Q3	Transistor	2SC3402
Q4	Transistor	2SC3402
Q5	Transistor	2SC3402
Q6	Transistor	2SC2458 GR
Q7	Transistor	2SC2458 GR
Q8	Transistor	2SC2458 GR
Q9	Transistor	2SC2458 GR
IC1	IC	TC4051BP
IC2	IC	TC4051BP
D1	Diode	1SS133
D2	Zenner	RD9.1EB1
D3	Zenner	RD8.2EB1
R1	Resistor	100K R10
R2	Resistor	10K R10
R3	Resistor	10K R10
R4	Resistor	10K R10
R5	Resistor	10K R10
R6	Resistor	1K R10
R7	Resistor	1K R10
R8	Resistor	22K ELR10
R9	Resistor	47K R10
R10	Resistor	2.2K R10
R11	Resistor	47K R10

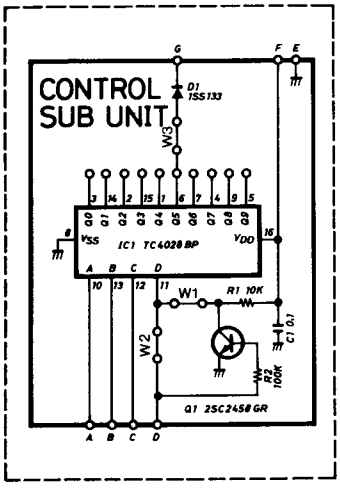
REF NO.	DESCRIPTION	PART NO.
R13	Resistor	47K R10
R14	Resistor	10K R10
R15	Resistor	100K ELR10
R16	Resistor	100K ELR10
R17	Resistor	100K ELR10
R18	Resistor	27K R10
R19	Resistor	560 ELR10
C3	Barrier Lay	0.1 16V
C4	Ceramic	47P 50V SL
C5	Ceramic	47P 50V SL
C6	Ceramic	47P 50V SL
C7	Ceramic	0.1 16V B
C8	Ceramic	0.001 50V B
C9	Electrolytic	4.7 25V
C10	Electrolytic	4.7 25V
J1	Connector	TSL-P05P-B1
J2	Connector	TSL-P08P-B1
J3	Connector	TL-25P-02-V1
J4	Connector	SQ-10
J5	Connector	SQ-4
B1	PC Board	B-832 A
W19	Jumper	JPW-02H
W20	Jumper	JPW-02A

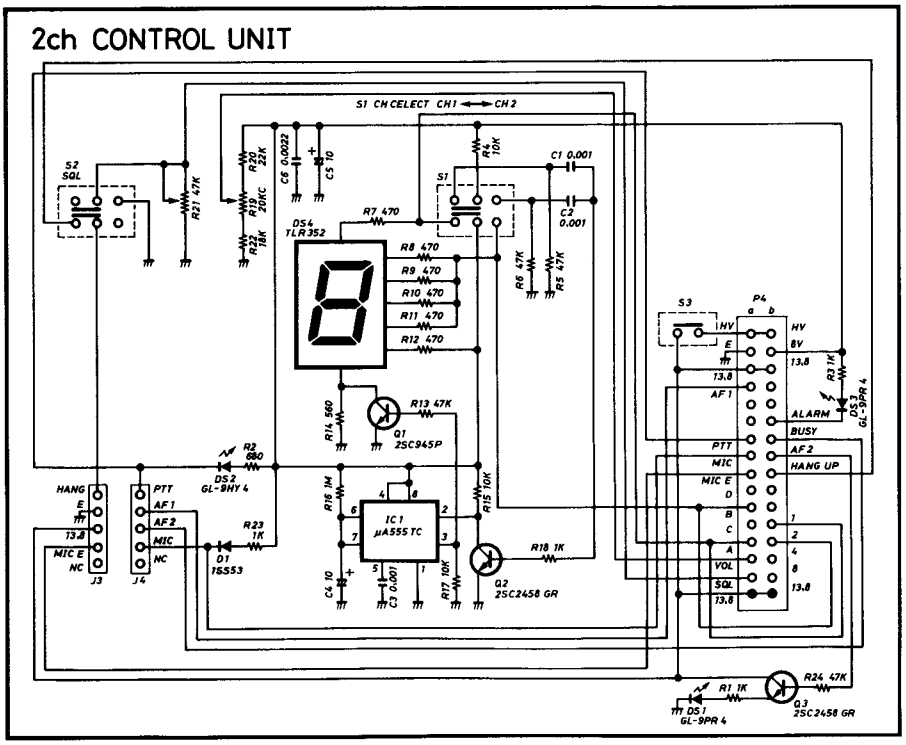
UT-14 Option Board

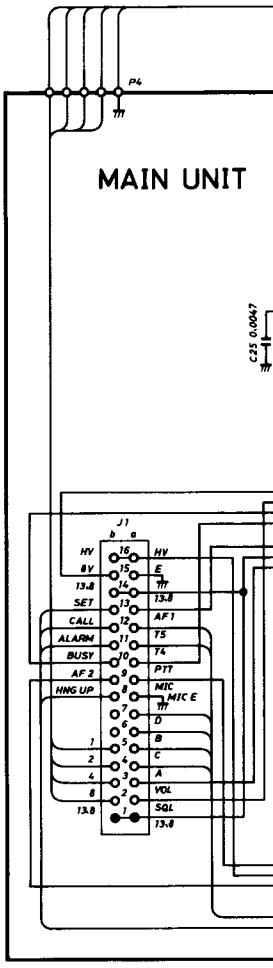


IC-435 SCHEMATIC DIAGRA

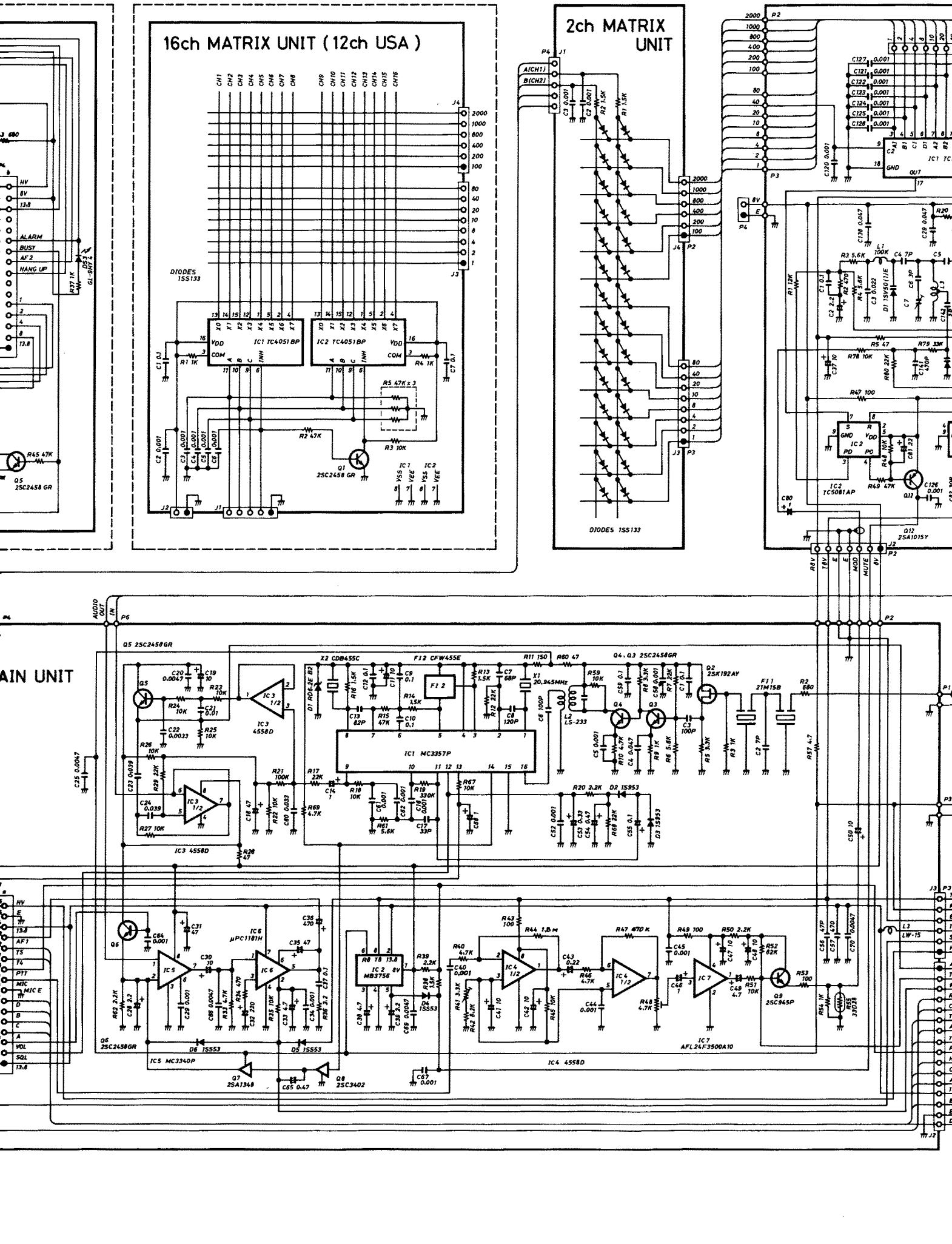


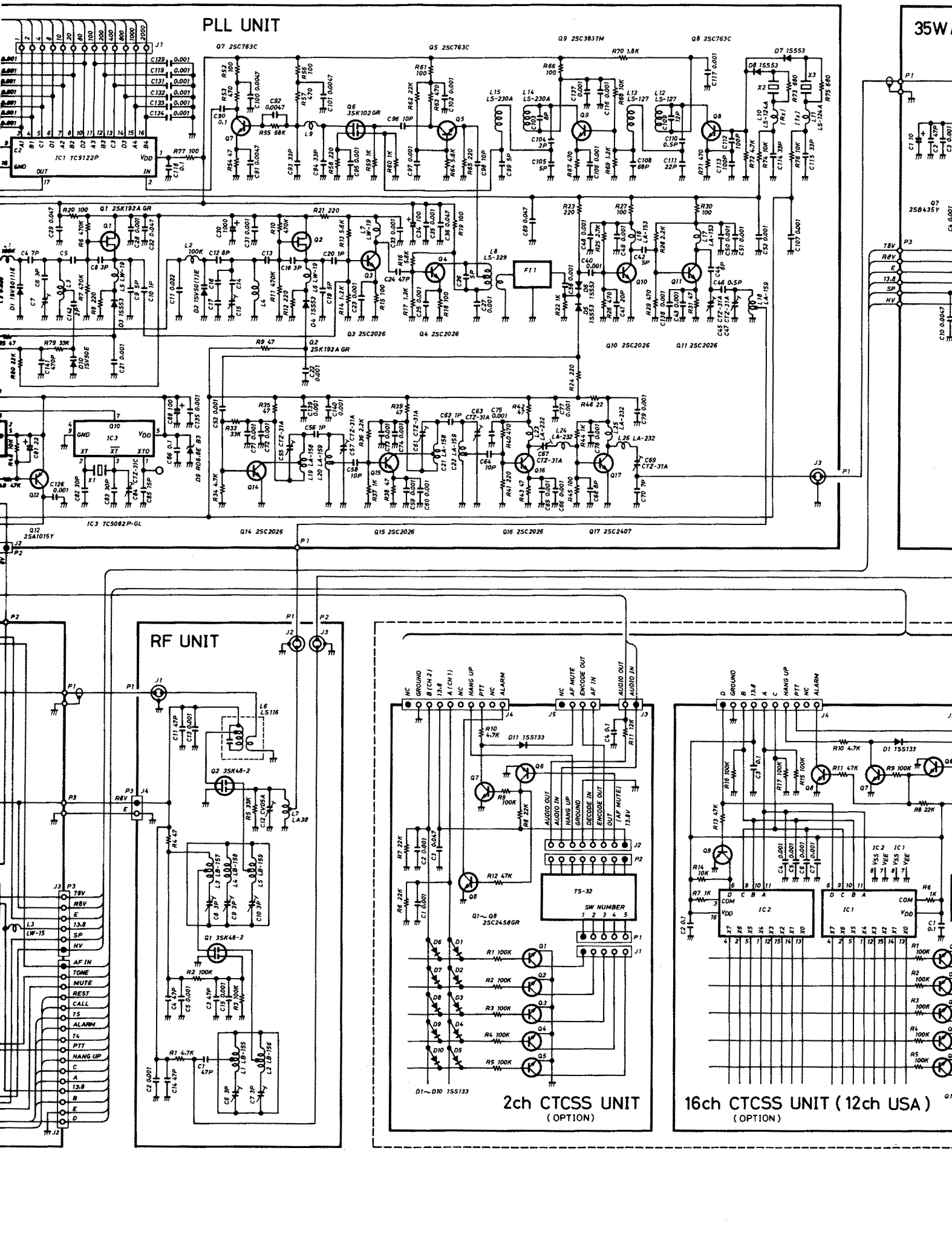


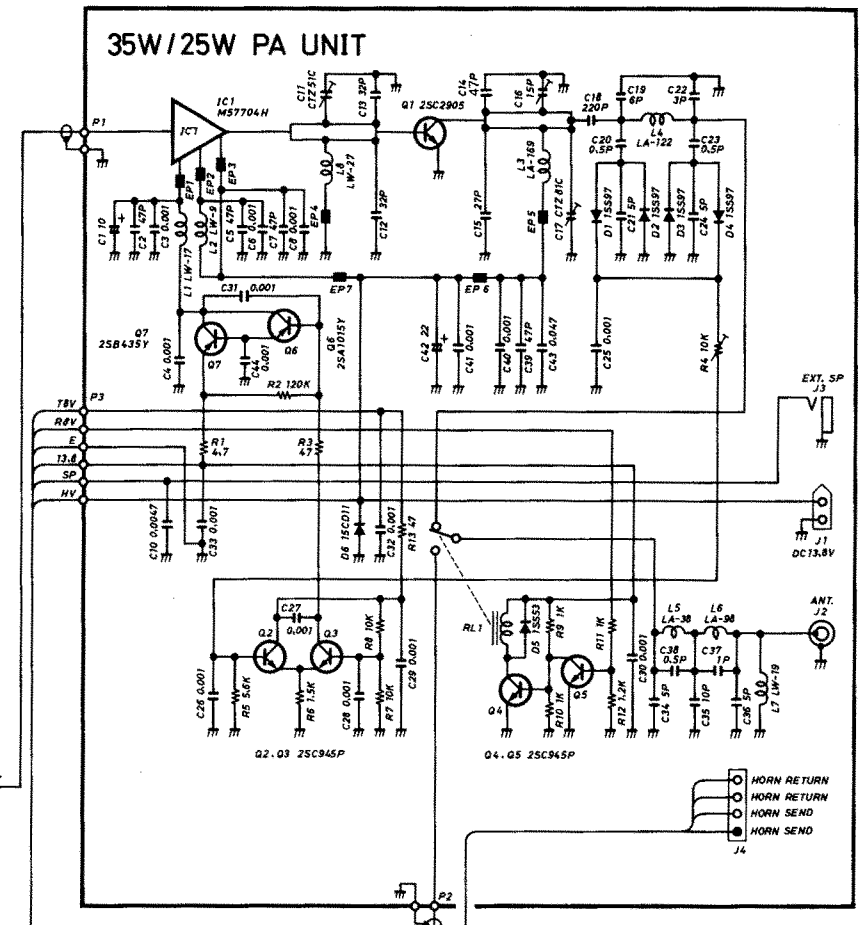


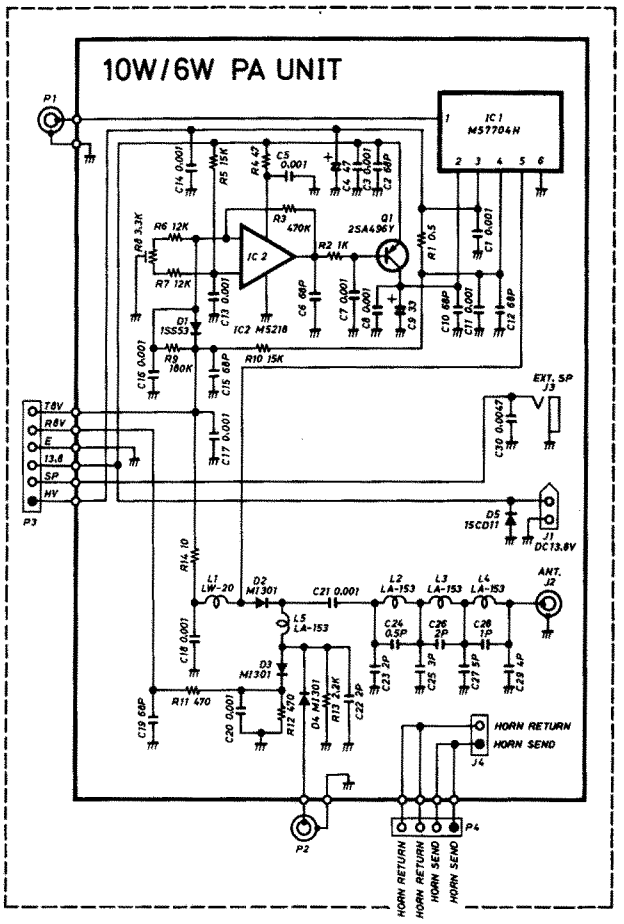


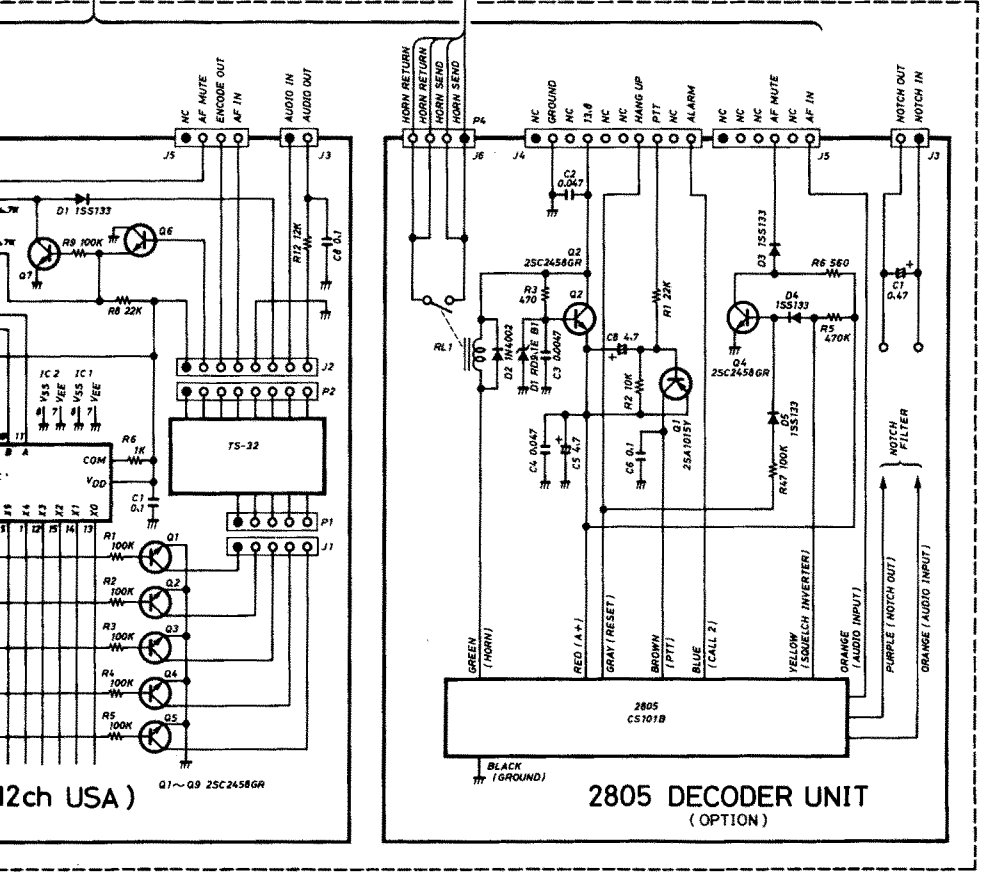
AGRAM


16ch MATRIX UNIT (12ch USA)
2ch MATRIX UNIT
DIODES 1SS133
IC1 TC4051BP
IC2 TC4051BP
IC2 TC5081AP
IC3 4558D
IC4 4558D
IC5 MC3340P
IC6 μPC1181H
IC7 AFL24F3500A10
IC1 MC3357P
IC2 MB3756
X2 CDB455C
F12 CFW455E
F11 21M15B
X1 20.945MHz
L2 LS-233
Q1 2SC2458 GR
Q5 2SC2458 GR
Q6 2SC2458GR
Q7 2SA1360
Q8 2SC3402
Q9 2SC965P
Q12 2SA1015Y
Q2 2SK192AY
Q4,Q3 2SC2458GR
D1 RD5.2E B2
D2 1S953
D3 1S953
D5 1SS53
D6 1SS53
AUDIO OUT
IN
P6
P2
P3
P4
J1
J2
J3
J4
ALARM
BUSY
AF 2
HANG UP
HV
8V
13.8
AF1
T5
T4
PTT
MIC
MIC E
D
B
C
A
VOL
SQL


PLL UNIT
RF UNIT
2ch CTCSS UNIT
(OPTION)
16ch CTCSS UNIT (12ch USA)
(OPTION)
35W







PLL UNIT

	USA	West Germany	Australia
X1	2.56 MHz	5.12 MHz	6.4 MHz

	450~460	460~470	470~480	480~490	490~500	500~510	510~530 (MHz)
X2	52.794	54.044	55.294	56.544	57.794	59.044	60.294 (MHz)
X3 simplex	55.469	56.719	57.969	59.219	60.469	61.719	62.969 (MHz)
C4	7 pF		7 pF		6 pF		
C6	3 pF		2 pF		1 pF		
C12	8 pF		8 pF		7 pF		
C14	4 pF		3 pF		2 pF		
C16	4 pF		3 pF		2 pF		
C17	4 pF		3 pF		2 pF		