430MHz FM TRANSCEIVER

IC-47A/E

MAINTENANCE MANUAL

ICOM INCORPORATED
1-6-19, Kamikuratsukuri, Hirano-ku, Osaka 547, Japan
Phone: (06) 793-5301
Telex: ICOM TR J63649

ICOM EUROPE G.M.B.H.
Himmelgeister Strasse 100
4000 Duesseldorf 1
West Germany
Phone: 0211-346047
Telex: 41-8588082

ICOM AMERICA, INC.
2380 116th Avenue N.E.
Bellevue, WA 98004
Phone: (206) 454-8155
Telex: 230-152210 ICOM AMER BVUE

3331 Towerwood Dr., Suite 307
Dallas, Texas 75234
Phone: (214) 620-2781

ICOM CANADA LTD.
810 S.W. Marine Drive
Vancouver, B.C., Canada
Phone: (604) 321-1833
Telex: 21-454315

ICOM AUSTRALIA, PTY., Ltd.
7 Duke Street, Windsor 3181
Victoria, Australia
Phone: (03) 529-7582
Telex: 71-35521 ICOMAS AA35521

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SECTION 1 SPECIFICATIONS

GENERAL

Numbers of semiconductors	:	Transistors 60 FETs 7 ICs 23 Diodes 99
Frequency coverage	:	430 ~ 439.9875MHz (IC-47E #04) 440 ~ 449.9950MHz (IC-47A #05) 430 ~ 439.9950MHz (IC-47A #07)
Frequency resolution	:	12.5kHz/25kHz steps (IC-47E) 5kHz/25kHz steps (IC-47A)
Frequency control	:	Microcomputer-based PLL synthesizer with 5kHz steps. Independent Dual VFO capability.
Frequency stability	:	Within ±0.001%
Memory channels	:	9 channels with any inband frequency programmable
Usable conditions	:	Temperature: −10°C ~ 60°C (14°F ~ 140°F) Operational time: Continuous
Antenna impedance	:	50 ohms unbalanced
Power supply requirement	:	13.8V DC ±15% (negative ground) 7A Max.
Current drain (at 13.8V DC)	:	Transmitting: High (25W) Approx. 7.0A Low (5W) Approx. 3.5A Receiving: At max audio output Approx. 0.7A Squelched Approx. 0.5A
Dimensions	:	38(41)mm(H) × 140mm(W) × 226(238)mm(D) ( ): Shows the dimensions including projections.
Weight	:	Approx. 1.4kg

TRANSMITTER

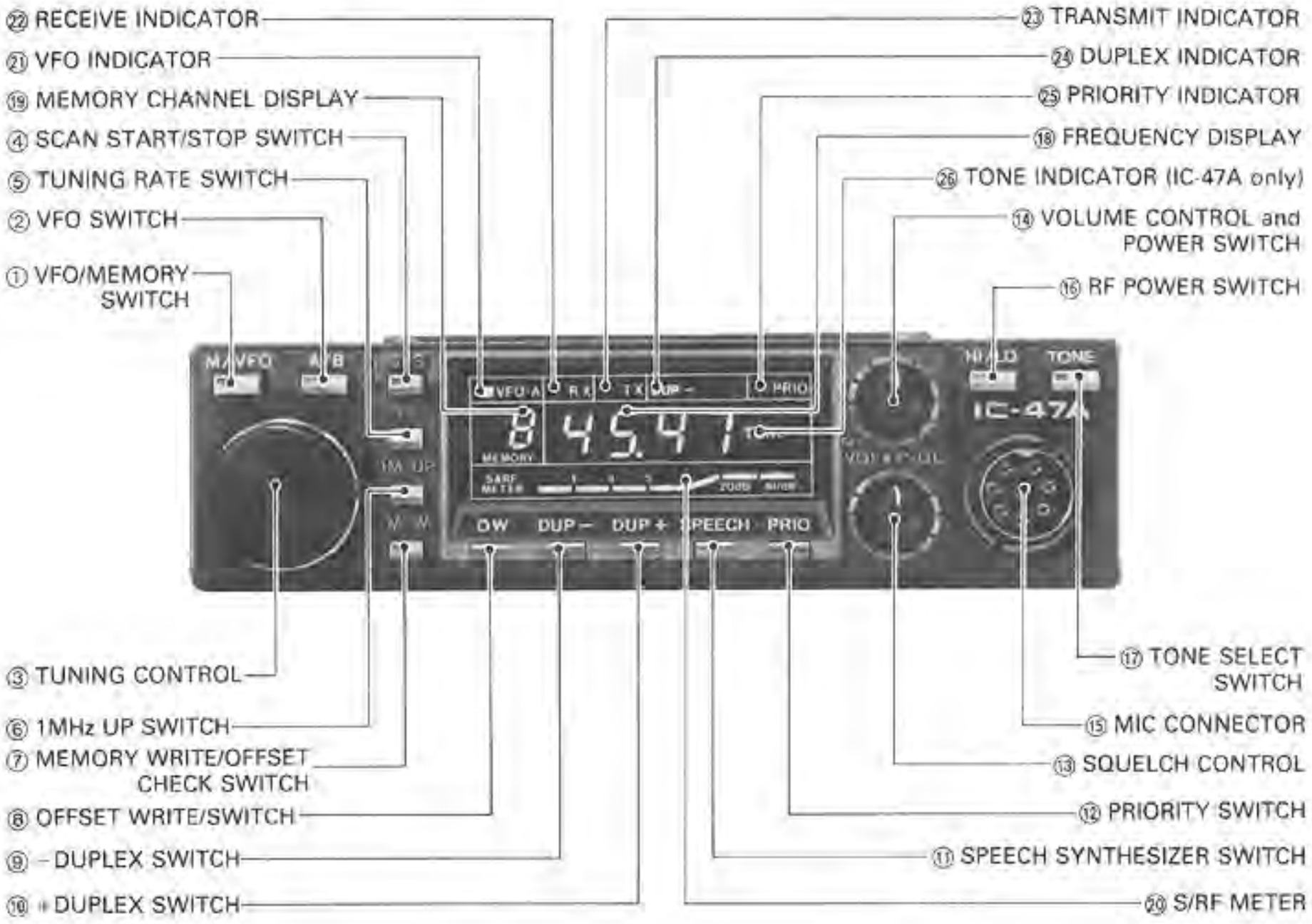
Output power	:	HIGH 25W LOW 5W
Emission mode	:	16F3 (F3E 16K0)
Modulation system	:	Variable reactance frequency modulation
Max. frequency deviation	:	±5kHz
Spurious emission	:	More than 60dB below carrier
Microphone	:	600 ohm electret condenser microphone with push-to-talk and frequency UP/DOWN switches. (with 1750Hz tone burst unit IC-47E) (with 16 key dual-tone pad IC-47A)
Operating mode	:	Simplex, Semi-Duplex (Any offset in-band in 100kHz increments programmable)

RECEIVER

Receiving system	:	Double-conversion superheterodyne
Modulation acceptance	:	16F3 (F3E 16K0)
Intermediate frequencies	:	1st: 21.8MHz 2nd: 455kHz
Sensitivity	:	Less than 0.2μV for 12dB SINAD Less than 0.4μV for 20dB Noise quieting
Squelch sensitivity	:	Less than 0.15μV
Spurious response rejection ratio	:	More than 60dB
Selectivity	:	More than 15kHz at −6dB point Less than 30kHz at −60dB point
Audio output power	:	More than 2.0W
Audio output impedance	:	4 ~ 8 ohms

SECTION 2 OPERATING CONTROLS

FRONT PANEL



1. VFO/MEMORY SWITCH

Each push switches from MEMORY CHANNEL operation to VFO operation alternately. When the set is in the MEMORY CHANNEL operation, the letter "M" is displayed at the MEMORY CHANNEL DISPLAY. The selected memory channel number is also displayed at the MEMORY CHANNEL DISPLAY, however this number remains even if the VFO operation is selected.

2. VFO SWITCH

Selects either VFO, "A" or "B", for tuning. When the switch is in the out position, VFO A is selected and the VFO INDICATOR is illuminated. When the switch is pushed in, VFO B is selected and the VFO INDICATOR goes off.

3. TUNING CONTROL

In the VFO operation mode, rotating the TUNING CONTROL clockwise increases the frequency, while rotating it counterclockwise decreases the frequency. The frequency is changed in 5kHz steps (IC-47E: 12.5kHz steps) when the TUNING RATE switch is pushed in, and in 25kHz steps when the TUNING RATE switch is in the out position.
When tuning up past the upper limit of the operation band, the frequency will automatically revert to the lower limit. Likewise, when tuning down past the lower limit, the frequency will automatically revert to the upper limit.

4. SCAN START/STOP SWITCH

Starts and stops any of the scan functions. When depressing it to restart the scan, it will start from the memory channel or frequency displayed.

5. TUNING RATE SWITCH

Selects the tuning frequency steps. When this switch is pushed in, the frequency changes in 5kHz steps (IC-47E: 12.5kHz steps) by turning the TUNING CONTROL. When the switch is in the out position, the frequency changes in 25kHz steps.

6. 1MHz UP SWITCH

Each push increases the frequency in 1MHz steps. The lower digits will not change.

7. MEMORY WRITE/OFFSET CHECK SWITCH

In the SIMPLEX mode (neither DUP− nor DUP+ is illuminated), by pushing this switch, the displayed VFO frequency is written into the selected memory channel (the memory channel number is displayed on the MEMORY CHANNEL DISPLAY). Each memory channel stores not only an operating frequency but also an offset frequency, offset direction and subaudible tone frequency (tone number).
In the DUPLEX mode, while holding this switch, the receive frequency changes to the offset transmit frequency. Thus the repeater input frequency may be checked.

8. OFFSET WRITE SWITCH

While holding this switch, the offset frequency is displayed on the FREQUENCY DISPLAY. This offset frequency can be changed by pushing the −DUPLEX SWITCH, +DUPLEX SWITCH or 1MHz UP SWITCH. Each push of the −DUPLEX SWITCH, decreases the offset frequency 100kHz, the +DUPLEX SWITCH increases 100kHz and the 1MHz UP SWITCH increases 1MHz.

9. −DUPLEX SWITCH

By pushing this switch, the set is in the duplex mode and the transmit frequency will be set 5.0MHz (IC-47E: 7.6MHz) below the receive frequency. This can be changed to any 100kHz step in-band frequency. To turn off the duplex, push this switch again.

10. +DUPLEX SWITCH

By pushing this switch, the set is in the duplex mode and the transmit frequency will be set 5.0MHz (IC-47E: 7.6MHz) above the receive frequency. This can be changed to any 100kHz step in-band frequency. To turn off the duplex, push this switch again.

11. SPEECH SYNTHESIZER SWITCH

Each push turns on the optional speech synthesizer which verbally announces the displayed frequency in English.

12. PRIORITY SWITCH

Turns the priority function ON and OFF.
During a QSO or when receiving on a frequency with a VFO, if you would like to monitor your favorite frequency or a calling frequency, select the memory channel number containing that frequency, and push the PRIORITY SWITCH. The receiving frequency will go to the channel for a moment every five seconds.
When receiving on a frequency with a memory channel, by pushing the PRIORITY SWITCH, the receiving frequency will go to the VFO frequency previously set for a moment every five seconds.

13. SQUELCH CONTROL

Turning this control clockwise sets the squelch threshold higher. To turn OFF the squelch function, turn this control completely counterclockwise.

14. VOLUME CONTROL and POWER SWITCH

When the control is turned completely counterclockwise, the power is OFF. By turning the control clockwise beyond the "click", the unit is turned ON and the audio level increases by further rotating it clockwise.

15. MIC CONNECTOR

Connect the supplied microphone to this jack.

16. RF POWER SWITCH

Selects the RF output power HIGH or LOW. When the switch is out, the output power is HIGH, 25 watts. When the switch is pushed in, the output power is LOW, 5 watts.

17. TONE SELECT SWITCH (IC-47A)

While holding this switch, the subaudible tone number is displayed on the FREQUENCY DISPLAY and the TONE INDICATOR is illuminated, and by turning the TUNING CONTROL, the tone number can be changed.

TONE SWITCH (IC-47E)

When the optional CTCSS unit is installed, by pushing this switch, the CTCSS unit will be activated, and a specified subaudible tone can be transmitted in the duplex mode.

18. FREQUENCY DISPLAY

The four large 7 segment LED's represent the digits between 10MHz and 10kHz and small "50" for 5kHz of the operating frequency. (IC-47E also shows "25" for 2.5kHz and "75" for 7.5kHz.) The frequency indicated is the carrier frequency.

19. MEMORY CHANNEL DISPLAY

Shows that the set is in the memory channel mode or not, and the selected memory channel number. When the set is in the memory channel mode, the letter "M" is displayed here.

20. S/RF METER

Indicates S-unit and RF output level with seven LED's in line. The numbers on the S-meter represent S1 through S9 and 60dB over S9. The RF output level meter functions only as a relative output meter and does not indicate the wattage. These functions are switched automatically when T/R switching is made.

21. VFO INDICATOR

When the VFO A is selected, this indicator illuminates.

22. RECEIVE INDICATOR

Illuminates when the squelch is opened in the receive mode.

23. TRANSMIT INDICATOR

Illuminates in the transmit mode.

24. DUPLEX INDICATOR

Illuminates when the set is in the duplex mode. "DUP−" shows the transmit frequency will be below the receive frequency, and "DUP+" shows the transmit frequency will be above the receive frequency.

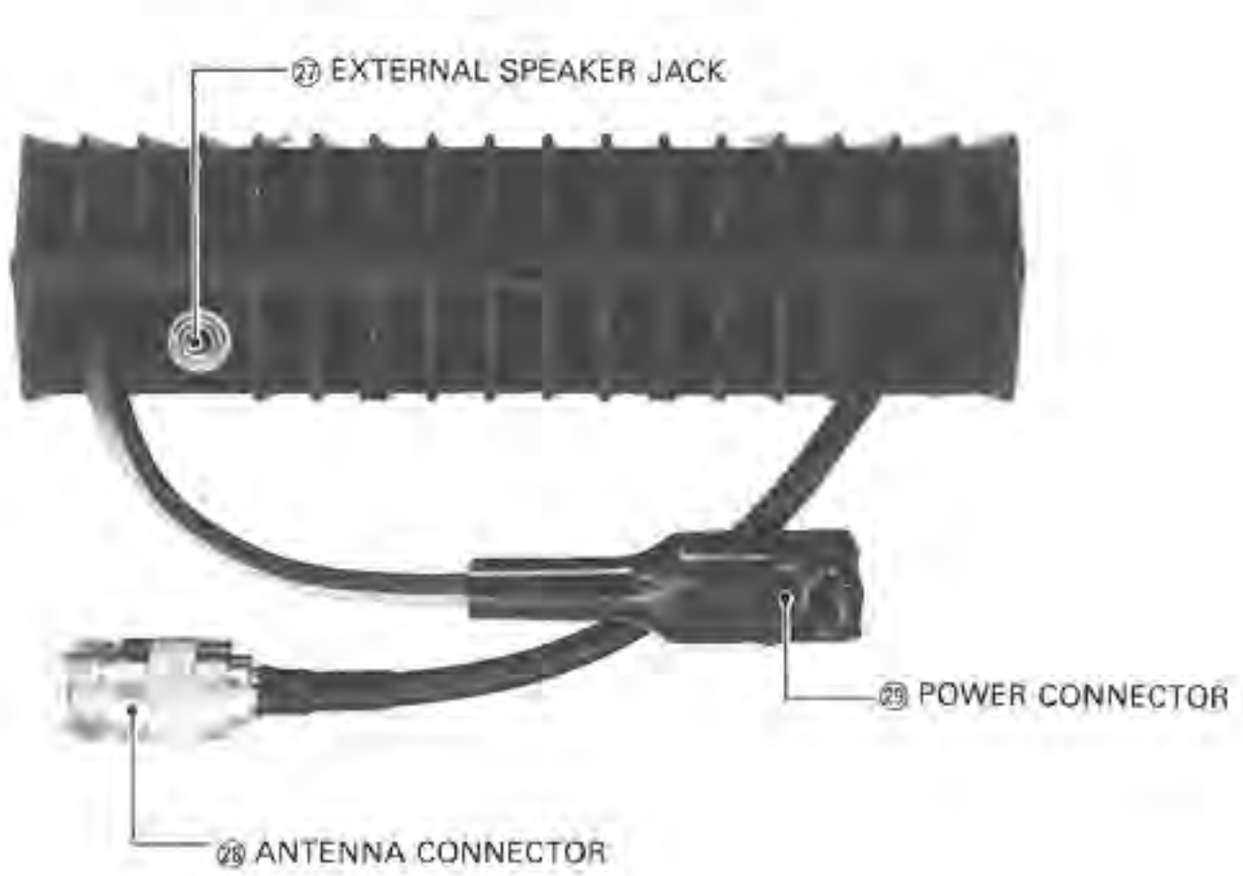
25. PRIORITY INDICATOR

The indicator lights when the function is activated.

26. TONE INDICATOR (IC-47A only)

Illuminates when the subaudible tone encoder is activated. When the selected tone number is "00", the tone encoder is turned off and this indicator does not illuminate.

REAR PANEL



27. EXTERNAL SPEAKER JACK

When an external speaker is used, connect it to this jack. Use a speaker with an impedance of 4 ~ 8 ohms. When the external speaker is connected, the built-in speaker does not function.

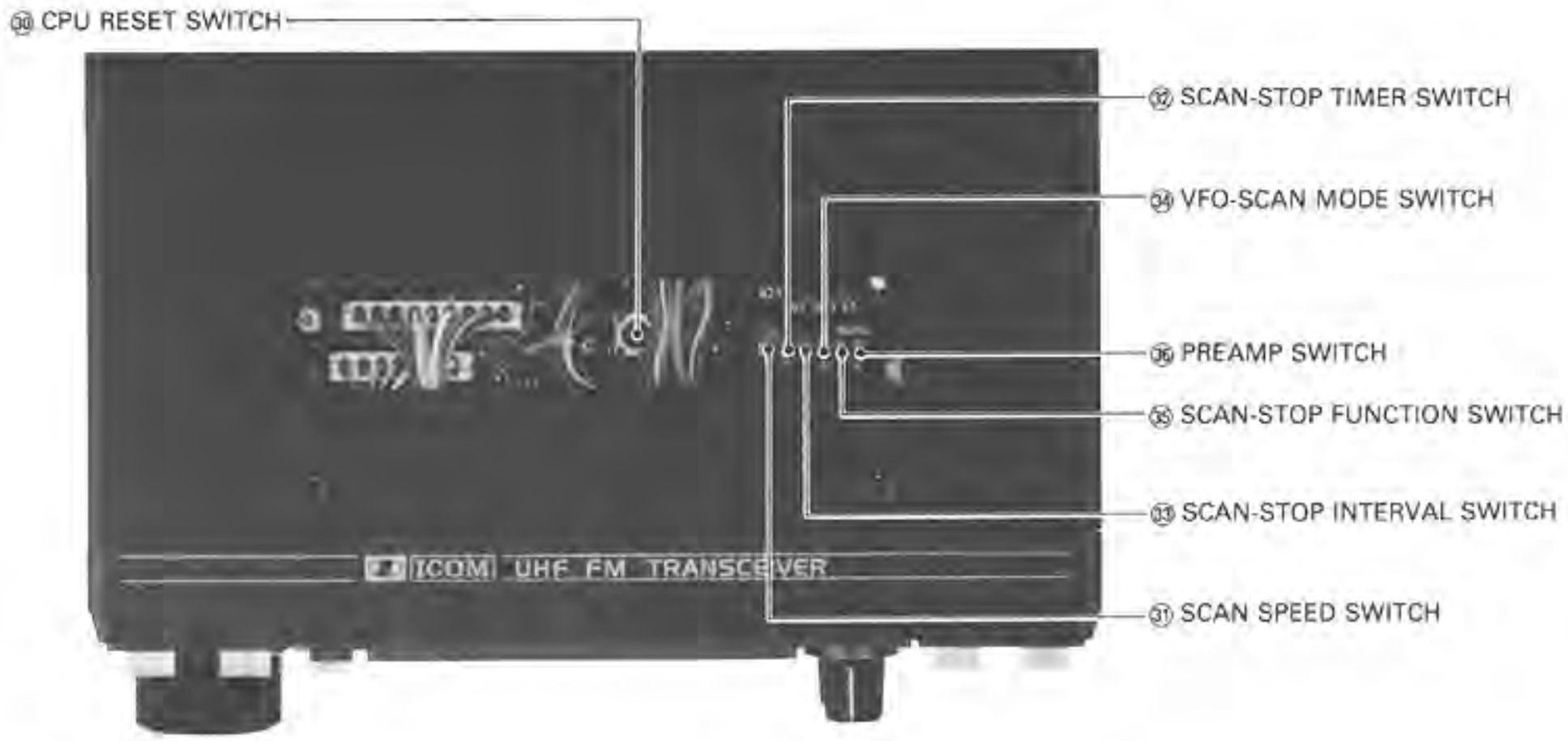
28. ANTENNA CONNECTOR

This is used to connect an antenna to the set. The connector's impedance is 50 ohms and it mates with an N (UG-21/U) connector.

29. POWER CONNECTOR

Connect the supplied power cord to this connector.

UNDER THE ACCESS COVER



30. CPU RESET SWITCH

Resets the CPU into the initial condition. If the CPU seems to malfunction, push this switch while the power is ON, and the CPU will be reset.

31. SCAN SPEED SWITCH

Switches the scanning speed in any scan mode. Place the switch to the desired speed; "FAST" or "SLOW".

32. SCAN-STOP TIMER SWITCH

Switches the scan-stop interval function ON and OFF.

33. SCAN-STOP INTERVAL SWITCH

Switches the interval of the scan auto-stopping time. Place the switch to the desired interval; "LONG" for about 9 seconds or "SHORT" for about 3 seconds.

34. VFO-SCAN MODE SWITCH

Switches the VFO-scan function to either the programmed scan (PS) or the full range scan (FS).

35. SCAN-STOP FUNCTION SWITCH

Switches the scan-stop function to either stop on a busy channel or stop on an empty channel.

36. PREAMP SWITCH

Switches an external preamplifier such as optional mast-mounting preamplifier, IC-AG1, ON and OFF.

SECTION 3 CIRCUIT DESCRIPTION

3-1 RECEIVER CIRCUITS

3-1-1 LOW-PASS FILTER AND ANTENNA SWITCHING CIRCUIT

An incoming signal from the antenna connector is first fed to the Low-pass Filter consisting of C19 ~ C21, L4 and L5, and the high-pass filter consisting of C16 ~ C18 and L3 in the PA unit (RF Power Amplifier unit), and applied to the Antenna Switching Circuit consisting of D1 and D3. Switching diodes D1 and D2 turn OFF when in the receive mode and provide isolation from the transmitter. The incoming signal passes to the RF amplifier on the RF board.

3-1-2 RF AMPLIFIER AND FIRST MIXER

The signal from the switching circuit is fed to the RF amplifier Q1 and Q2 via the antenna tuning coil L1. The amplified signal passes to gate 1 of the first Mixer Q3 through the tuning circuits L2 ~ L5. Those circuits reduce interference and intermodulation from out-of-band signals.
The PLL (Phase Locked Loop) circuit supplies a local oscillator signal to gate 2 of Q3 to convert the RF signal into the first IF (21.8MHz). This produced signal passes to the IF circuit from the drain of Q3.

3-1-3 IF CIRCUIT

The first IF signal from Q3 is fed into the matched-pair crystal filter FI1. The filtered signal passes to IF amplifier Q4. After, IC1 receives the amplified IF signal.
IC1 consists of a local oscillator, mixer, limiter amplifier, FM-demodulator, active filter and Squelch circuit. IC1 generates the 21.345MHz second local oscillator frequency. This signal and the first IF signal are mixed to produce the 455kHz second IF. The second IF exits from IC1 pin 3 and passes to a highly selective external ceramic filter FI2. The filtered signal feeds back to IC1 pin 5 to be amplified and demodulated. The signal from the limiter amplifier passes internally to the demodulator, as well as to pin 7 which loops to pin 8 through the resonator crystal X2. The demodulated signal exits from IC1 pin 9.

3-1-4 AF AMPLIFIER, SQUELCH CIRCUIT AND RF METER CIRCUIT

The demodulated signal from IC1 pin 9 is fed to an integrating circuit (R29 and C80) to provide 6dB/octave de-emphasis. The de-emphasized signal is fed to the pre-amplifiers Q10 and Q11, and the AF amplifier IC4 via the VOLUME control. IC4 supplies sufficient drive for the speaker. Noise components from IC1 pin 9 feed through C37 and the SQUELCH control, and back to the IC1 active filter. This circuit filters the 20kHz noise signal and outputs it to pin 11. D4 rectifies the noise signal. The rectified DC voltage is fed to Q5. When Q5 is turned ON by the noise signal, the audio pre-amplifier Q10 cuts OFF since the base bias drops to zero volts. IC2a and b prevents malfunction of the SQUELCH circuit from adjacent channel signals. A sample of the second IF signal is fed into the meter amplifier IC6 and rectified by D9. This DC voltage is decoded by IC1 to drive the LED meter circuit in the Display unit.

3-2 TRANSMITTER CIRCUITS

3-2-1 MIC AMPLIFIER CIRCUIT

The microphone signal is fed into the amplifier Q12 on the Main board. This amplifier has a 6dB/octave response between 300Hz and 3kHz due to C110 and R83. IC7a is a limiter amplifier with R88 for gain adjustment. The rectangular waveform at the limiter amplifier output contains many harmonics. The harmonics which are 3kHz or higher are eliminated by the active low-pass filter IC7b. This filtered audio signal modulates the frequency of the VCO (Voltage Controlled Oscillator) to produce an FM signal. R94 is a variable resistor for adjusting the deviation.

3-2-2 MULTIPLIER AND DRIVER CIRCUITS

The VCO oscillates at one-half of the transmit frequency. Multiplier Q214 doubles the VCO signal to obtain the transmit frequency. This signal feeds through band-pass filter L209 into the driver amplifier Q8, and Q7 and Q6 on the Main board. The driver amplifies it to a suitable level for the power amplifier.

3-2-3 POWER AMPLIFIER CIRCUIT

The signal from the driver on the Main board is amplified by IC1 on the PA board to obtain 25 watts RF output. IC1 is a hybrid IC consisting of a two-stage RF power amplifier. The output signal of IC1 is fed to the antenna terminal through the T/R switching diode D1, the high-pass filter and the low-pass filter.

3-2-4 ALC (Automatic Level Control) AND RF POWER METER CIRCUITS

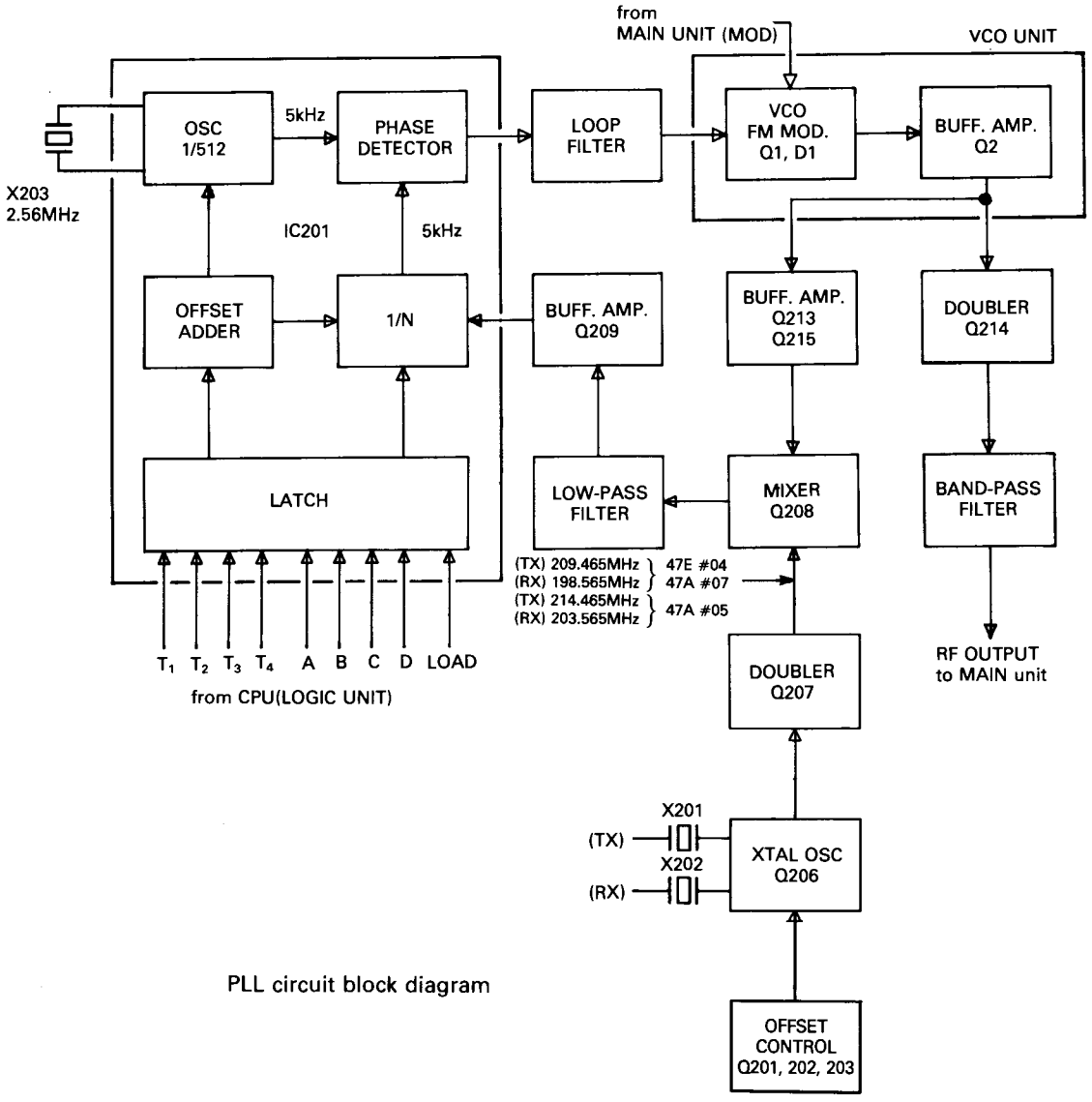
This circuit stabilizes the output power, even when the power supply voltage or the antenna load is fluctuating. The variation of the current of the power amplifier at R1 and R2 is amplified by the differential amplifier IC3 on the Main board. The output voltage is fed to Q1. Q1 controls the current to the module's driver stage to maintain constant RF power. The output power can be adjusted by R74 (High power position) and R71 (Low power position). A sample of the RF output power is fed to D2 and rectified, then fed to the indicator driver IC through the level adjust resistor R63.

3-3 VOLTAGE REGULATION AND RECEIVE-TRANSMIT SWITCH CIRCUITS

IC5 is a voltage regulator which has three regulators and a receive-transmit control terminal. A high level voltage applied to the control terminal pin 5 causes 8 volts to feed to the receive circuit from pin 6. In the transmit mode, the voltage at the control terminal is changed to zero volts, in which case, 8 volts feeds to the transmit circuit from pin 8. Pin 1 is the common output of the 8 volt regulator. Simultaneously, Q9 turns ON which supplies +8 volts to the driver amplifier circuit.

3-4 PLL (Phase Locked Loop) CIRCUIT

The PLL of this transceiver is a down-mixed loop that generates a frequency which is one-half of the required frequency, and it is shifted in 5kHz steps.



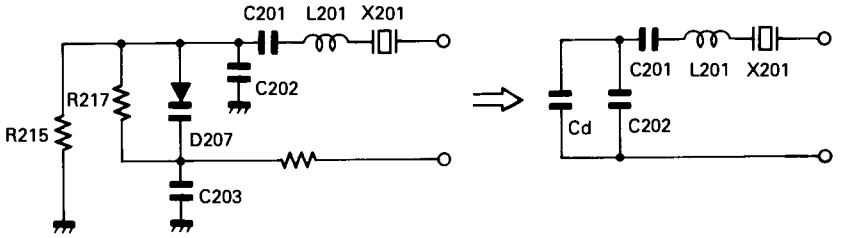
PLL circuit block diagram

3-4-1 LOCAL OSCILLATOR CIRCUIT

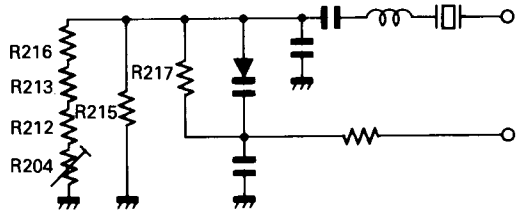
The local oscillator contains two crystal units for receive and transmit. In the transmit mode, D209 receives a high level voltage from the logic circuit. This voltage turns Q204 OFF then Q205 ON. Q205 forward biases D211 which reverse biases D212. The frequency of this oscillator is determined by L201, C201, C202 and the capacitance of the varactor diode D207. The offset frequency is determined by the capacitance of D207. The relation is shown in Fig 1. In the receive mode, X202 is selected by the same method. Q206 oscillates with crystal X201 or X202 and the tripled frequency feeds through the resonant circuits L203 ~ L205 into the PLL mixer (Q208).

(EXAMPLE)

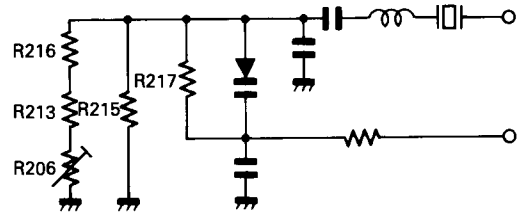
Transmit frequency 435.0000MHz (offset 0kHz)



Transmit frequency 435.0125MHz (offset 2.5kHz)



Transmit frequency 435.0250MHz (offset 5.0kHz)



Transmit frequency 435.0375MHz (offset 7.5kHz)

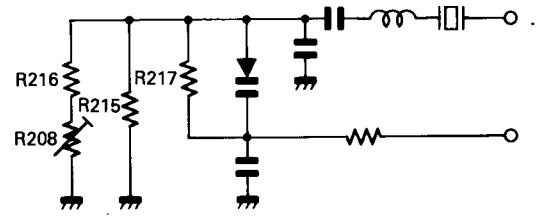


Fig. 1 PLL local oscillator

3-4-2 MIXER, LOW-PASS FILTER AND AMPLIFIER CIRCUITS

The output signal from the local oscillator circuit and the VCO signal from buffer amplifier Q213 combine in mixer Q208. The low-pass circuit of L206, C219 and C220 filters the output signal from Q208, and passes only the difference frequency produced by the mixer to Q209 for amplification to the correct drive level for the programmable divider.

3-4-3 REFERENCE FREQUENCY GENERATOR, PROGRAMMABLE DIVIDER, PHASE DETECTOR AND LOOP FILTER CIRCUITS

IC1 consists of the reference frequency generator, programmable divider and phase detector. The reference frequency generator oscillates at 2.56MHz, which is divided by 512. The resulting 5kHz reference frequency passes to the phase detector. The input signal at pin 12 of IC1 from the PLL mixer is divided by the "N" number. The programmable divider is also called the 1/N counter.
The relation between the "N" and the display frequency is as follows;

Display frequency F (MHz)	Input frequency to Pin 12 Fin=F/2−Flocal	CPU Output data	"N" (NOTE 1)	Fin/"N"
430.00	5.535	1000	1107	5kHz
430.01	5.540	1001	1108	
⋮	⋮	⋮	⋮	
434.99	8.030	1499	1606	
435.00	8.035	1500	1607	
435.01	8.040	1501	1608	
⋮	⋮	⋮	⋮	
439.00	10.035	1900	2007	
⋮	⋮	⋮	⋮	

IC-47E #04
IC-47A #07
(F_{LO}: 209.465MHz)

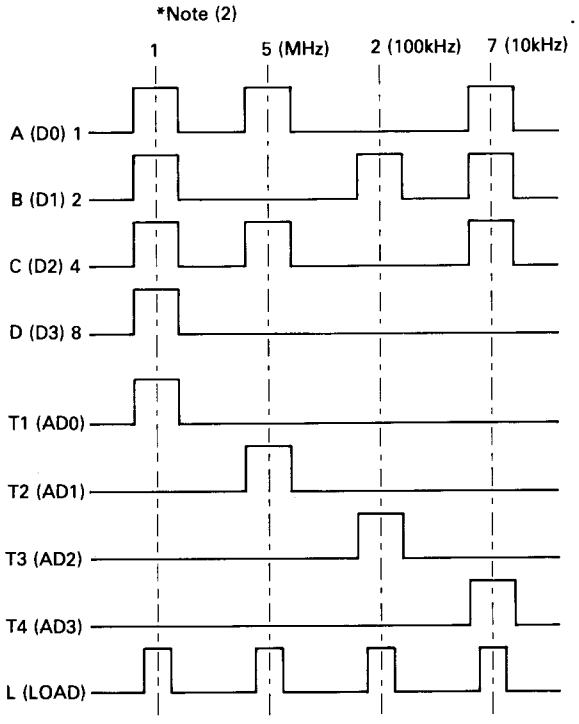
Display frequency F (MHz)	Input frequency to Pin 12 Fin=F/2−Flocal	CPU Output data	"N" (NOTE 1)	Fin/"N"
440.00	5.535	1000	1107	5kHz
440.01	5.540	1001	1108	
⋮	⋮	⋮	⋮	
444.99	8.030	1499	1606	
445.00	8.035	1500	1607	
445.01	8.040	1501	1608	
⋮	⋮	⋮	⋮	
449.00	10.035	1900	2007	
⋮	⋮	⋮	⋮	

IC-47A #05
(F_{LO}: 214.465MHz)

NOTE 1) IC201 has a +107 offset number, therefore, this number is bigger than the "N" by 107.

The frequency data is output from D0 ~ D3 of the CPU to IC201 (terminals A ~ D) of the PLL. At the same time, the digital data to the PLL is output from AD0 ~ AD3 of the CPU and input to T1 ~ T4 of PLL IC. Load pulses are consecutively sent from PL2 of the CPU, and data is selected according to its timing as shown in the chart below:

EXAMPLE: Display frequency: 435.27MHz (IC-47E #04, IC-47A #07)
445.27MHz (IC-47A #05)
CPU data: 1527



Note (2). All High data (A ~ D) means exceptionally 1 and initialization.

The digital phase detector in IC201 detects the phase difference of the programmable divider output and the reference frequency, and proportionately puts out a positive/negative pulse stream at pin 16. If there is a phase difference between the two input signals, pin 18 changes to ground level. The loop filter, consisting of R253, R256, R257, C244 and C245, converts the pulse stream from pin 16 into a DC voltage and determines the response time of the whole loop. When the frequency deviation of the VCO is very large, R256 is shunted to increase the response time of Q211 and Q212. The output signal is fed to varactor diode D1 of the VCO circuit as the control for the VCO frequency.

3-4-4 VCO AND FM MODULATION CIRCUITS

The VCO is a Clapp oscillator circuit, and oscillates in the 200 ~ 220MHz range. The frequency is controlled by the DC voltage from the loop filter. The D2 anode receives a positive voltage via R3 when the radio is in the receive mode. Then, D2 turns ON and inserts C7. Thus, the free-run frequency of the VCO decreases. In the transmit mode, D3 turns OFF. Thus, the free-run frequency of the VCO increases. The audio signal from the microphone is fed to the gate of Q1 to produce an FM signal. The VCO signal is amplified and doubled by Q214 and fed to the driver amplifier.

3-5 LOGIC CIRCUITS

This unit controls the frequency display, the operating mode display, etc., and is designed for high speed operation using a CMOS 4-bit CPU.

3-5-1 CPU

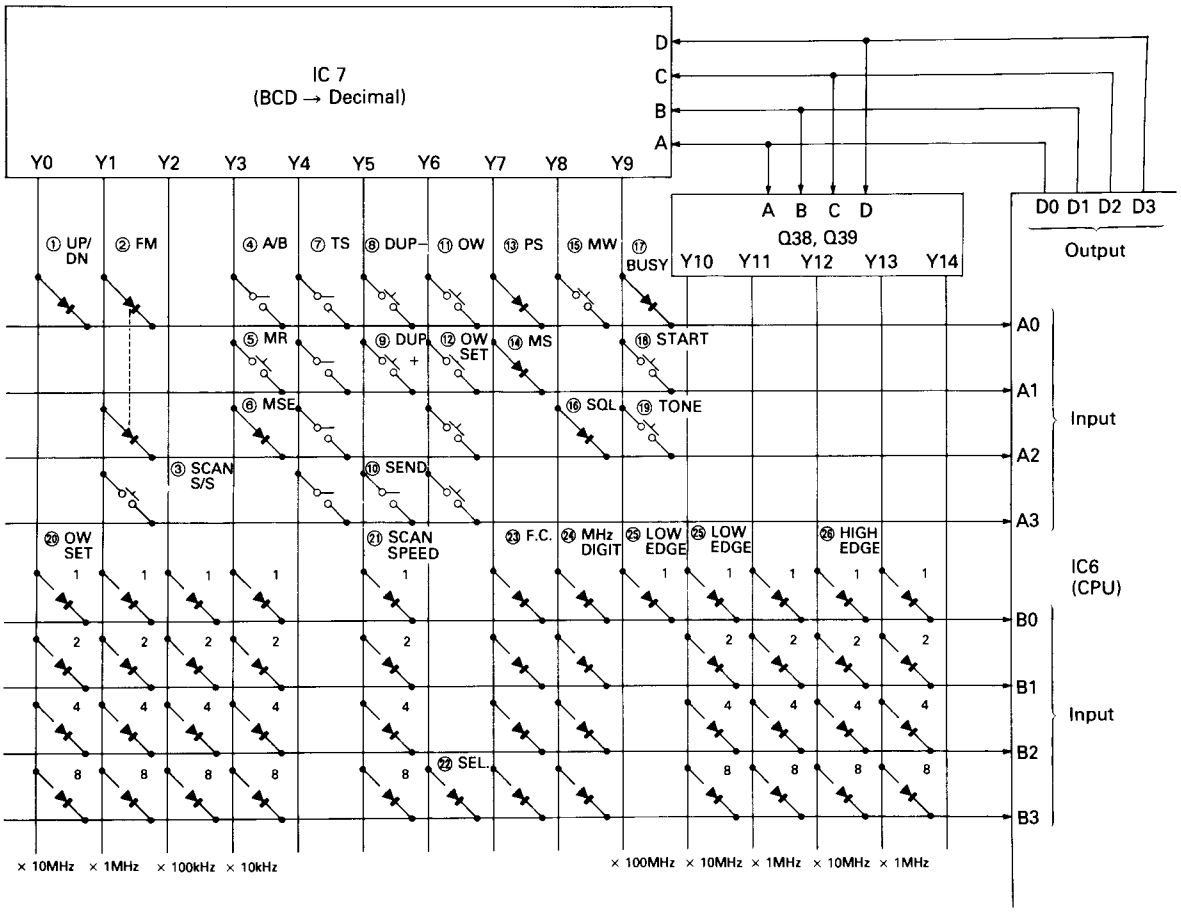
IC6 is the CPU. X IN and X OUT are the clock terminals for this CPU; input and output respectively for the 5MHz ceramic crystal oscillator. The CPU has other input and output ports with each having a specific function:

MICROPROCESSOR (IC6) EXPLANATION

Pin No.	Item	Function	Pin No.	Item	Function
1	K1	Not connected	22	MR	Memory/VFO output
2	K2	Not connected	23	MT	Mute signal output
3	K3	Not connected	24	RE1	Reset signal output
4	K4	Digit data output (10kHz)	25	CEN	Not connected
5	K5	Digit data output (100kHz)	26	A0	Data input (BCD 1)
6	K6	Digit data output (1MHz)	27	A1	Data input (BCD 2)
7	K7	Digit data output (10MHz)	28	A2	Data input (BCD 4)
8	K8	Digit data output (Memo. ch.)	29	A3	Data input (BCD 8)
9	D0	Data output (BCD 1)	30	Vss	GND
10	D1	Data output (BCD 2)	31	X IN	Clock
11	D2	Data output (BCD 4)	32	X OUT	Clock
12	D3	Data output (BCD 8)	33	$\overline{\text{RESET}}$	Reset signal input
13	B0	Initial data input (BCD 1)	34	$\overline{\text{HOLD}}$	Hold signal input
14	B1	Initial data input (BCD 2)	35	SCAN	Scan S/S output
15	B2	Initial data input (BCD 4)	36	$\overline{\text{DC}}$	Display latch output
16	B3	Initial data input (BCD 8)	37	$\overline{\text{INT1}}$	Rotary encoder signal input
17	AD0	Address data output (BCD 1)	38	DL	Data latch output
18	AD1	Address data output (BCD 2)	39	PL1	Not connected
19	AD2	Address data output (BCD 4)	40	PL2	PLL load output
20	AD3	Address data output (BCD 8)	41	PL3	Not connected
21	Vss	GND	42	V_{DD}	+5V input

3-5-2 CPU CONTROL CIRCUIT

A0 ~ A3 are the CPU data input terminals. To increase the number of available functions from the CPU, the outputs D0 ~ D3 pass to IC7 where Y0 ~ Y9 are generated and fed back to A0 ~ A3 through the matrix circuit consisting of transistors and diodes.



① Y0 → A0 (Up/Down) (IC4a, D3)

When this flow occurs, the operating frequency is increased by the pulse stream from the rotary encoder. When this flow does not occur the operating frequency is decreased.

② Y1 → A0 and A2 (Mode FM) (D33, D34)

This flow occurs when the mode is set to FM. The display shows the carrier frequency.

③ Y1 → A3 (Scan Start/Stop) (S/S Switch)

In the VFO mode, when the S/S switch is pressed, the operating frequency scans between frequencies written into memory channels 0 and 1. In the memory mode, the operating frequency scans through the memory channels.

④ Y3 →A1 (VFO A/B) (A/B Switch)

This flow occurs when the A/B switch is set to "B"position, and the unit operates at the frequency stored by "B" VFO. When the A/B switch is set to "A" position, the Y3 signal is not fed to A0, and the unit operates at the frequency stored by "A" VFO.

⑤ Y3 → A1 (Memory Read) (Q8, Q9)

This flow occurs when the VFO/MEMORY switch is pushed, and the operating mode is changed alternately between VFO and MEMORY CHANNEL operation.

⑥ Y3 → A2 (Mode Selector) (Q6, D7)

In the VFO mode, the data from the rotary encoder (tuning control) is fed into the "INT1" terminal of the CPU as frequency data. When the Y3 signal is not fed to A2, the data fed into "INT1" becomes memory channel data.

⑦ Y4 → A0 ~ A3 (Tuning Rate (TS) Switch)

This flow occurs when terminals A0 ~ A3 are programmed as in the table shown below, and the operating frequency shifts upwards or downwards at the indicated rate when the tuning control is rotated.

Stepping frequency	A0	A1	A2	A3
1kHz	0	0	0	0
10Hz	1	0	0	0
100Hz	0	1	0	0
20Hz	1	1	0	0
5kHz	0	0	1	0
15kHz	1	0	1	0
20kHz	0	1	1	0
12.5kHz	1	1	1	0
10kHz	0	0	0	1
25kHz	1	0	0	1
40kHz	0	1	0	1
150kHz	1	1	0	1
75kHz	0	0	1	1
1MHz	1	0	1	1

When the switch is pushed, Y4 is connected to A2 (IC-47E: to A0, A1 and A2), and the frequency changes in 5kHz (12.5kHz) steps when turning the tuning control. When the switch is set to the out position, Y4 is connected to A0 and A3, and the frequency changes in 25kHz steps.

⑧ Y5 → A0 (−Duplex) (Q22, Q25, D27)

This flow occurs when the OFFSET switch is set at DUP−, and the transmit frequency becomes lower than the receive frequency by an amount equal to the programmed offset frequency.

⑨ Y5 → A1 (+Duplex) (Q21, Q25, D26)

This flow occurs when the OFFSET switch is set at DUP+, and the transmit frequency becomes higher than the receive frequency by an amount equal to the programmed offset frequency.

⑩ Y1 → A3 (SEND) (Q14, D14)

This flow occurs when the PTT switch is pushed, and the CPU is in transmit mode.

⑪ Y6 → A0 (Offset Write) (Q23, D28)

This flow occurs when the OW switch is pushed, and the CPU is in the Offset Write mode.

⑫ Y6 → A1 ~ A3 (Offset Frequency Set) (Q19, Q20, Q24)

While the OW function is activated, pushing the DUP−, DUP+ or 1M UP switch programs the offset frequency as shown in the table below.

Offset Frequency	A1	A2	A3
+ 1MHz	1	0	0
+ 10MHz	0	1	0
+ 100kHz	1	1	0
− 1MHz	0	0	1
− 10MHz	1	0	1
− 100kHz	0	1	1

⑬ Y7 → A0 (Program Scan) (D36, R61)

This flow occurs when the S/S switch is pressed, and the operating frequency scans between frequencies written into memory channels 1 and 2. When the VFO-SCAN mode switch on the logic board is turned off, the operating frequency scans the entire band after the S/S switch is pressed.

⑭ Y7 → A1 (Memory Scan) (D35, R62)

When this flow occurs, the operating frequency scans through the memory channels.

⑮ Y8 → A0 (Memory Write) (Q15, D15)

This flow occurs when the MW switch is pushed. The operating frequency, duplex/simplex mode, offset frequency and subaudible tone frequency are stored in the CPU memory.

⑯ Y8 → A2 (Scan stop by SQL) (Q26, D30)

This flow occurs when scanning is halted by a signal opening the squelch. The flow stops when the scan resumes.

⑰ Y9 → A0 (Busy) (Q28, D32)

This flow occurs when the speech synthesizer (optional unit) functions, indicating the CPU is busy. The CPU does not accept any data at this time.

⑱ Y9 → A1 (Start) (Speech Switch)

This flow occurs when the SPEECH switch is pushed, and the speech synthesizer starts to function.

⑲ Y9 → A2 (Tone) (Tone switch)

This flow occurs when the TONE switch is pushed, and the tone generator starts to function.

⑳ Y0 ~ Y3 → B0 ~ B3 (Duplex Offset Frequency)

The initial offset frequency is determined by the location of diodes on the Matrix board. This programmed offset frequency is used when the power supply is first applied to the transceiver, or after the CPU is reset. The factory programming is 600kHz.

㉑ Y5 → B0 ~ B3 (Scanning Speed)

Diodes placed on the Matrix board determine the scanning speed as shown below.

Scanning speed	B0	B1	B2	B3
40m sec.	1	0	0	0
60m sec.	0	1	0	0
80m sec.	1	1	0	0
100m sec.	0	0	1	0
200m sec.	1	0	1	0
300m sec.	0	1	1	0
400m sec.	1	1	1	0
500m sec.	0	0	0	1
600m sec.	1	0	0	1
700m sec.	0	1	0	1
800m sec.	1	1	0	1
900m sec.	0	0	1	1
1.0sec.	1	0	1	1
1.2sec.	0	1	1	1
1.6sec.	1	1	1	1

㉒ Y6 → B3 (Selector)

This signal's purpose is to select the information as described in ㉓ or the information in ㉔ and ㉕ below.

㉓ Y7 → B0 ~ B3 (Frequency Coverage)

This is a matrix used to determine the frequency coverage.

Range (MHz)	B0	B1	B2	B3
430.000 ~ 439.999	0	1	1	0
432.000 ~ 433.499	1	1	1	0
430.000 ~ 449.999	0	0	0	1
432.000 ~ 437.999	1	0	0	1
NOTE	0	0	1	1

NOTE) This is to select the information as described in ㉒ or the information in ㉔ and ㉕ below.

㉔ Y8 → B0 ~ B3 (MHz Digit)

This matrix is to determine the value of the MHz digit on the display.

Display number	B0	B1	B2	B3
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

㉕ Y9 → B0, Y10, Y11 → B0 ~ B3 (Low Edge Frequency)

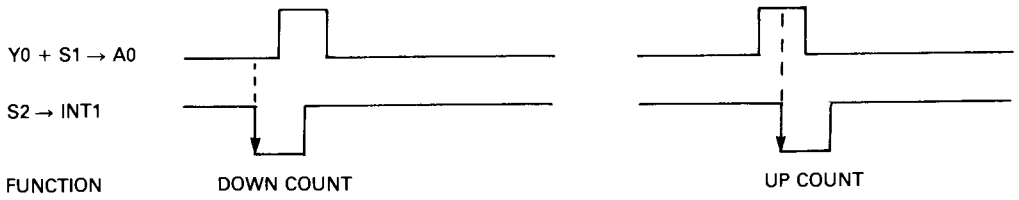
This matrix is to determine the low edge of the coverage.

㉖ Y13, Y14 → B0 ~ B3 (High Edge Frequency)

This matrix is to determine the high edge of the coverage.

3-5-3 CLOCK PULSE GENERATOR CIRCUIT

The clock pulses for changing the frequency are generated by a rotary encoder which is connected directly to the shaft of the tuning control. The rotary encoder supplies two signals which are 90 degrees out of phase. The relation between these two signals, Y0, A0 and INT1 are shown below;



The CPU counts the leading edge of S2 and, at the same time, determines the tuning direction with the A0 level. In the memory mode, the MSE matrix switch is closed by Q6 and D7, and the memory channels are scanned by these two pulse streams.

3-5-4 MIC UP/DOWN (MUD) CONTROL CIRCUIT

When the UP switch on the microphone is pressed, the MUD terminal is grounded (0V) and the multivibrator, consisting of IC2c and IC2d, starts oscillating. This signal is fed to "INT1". The ground voltage is applied to R43, Q18 is turned OFF and Pin ⑨ of IC4 is "H" level. Thus, Y0 is connected to A0. The CPU counts the multivibrator pulses while shifting the operating frequency upwards. When the DOWN switch is pressed, the MUD terminal is grounded through a 470 ohm resistor installed inside the microphone.
The voltage divided by R40 and the 470 ohm resistor, about 1.9V, is applied to R43. Q18 turns ON, and the CPU counts the multivibrator pulses while shifting the operating frequency downwards.

3-5-5 SCANNING CONTROL CIRCUIT

The squelch signal from the Main unit is fed to the Schmitt trigger circuit consisting of IC3b and IC3c. This circuit controls Q26, which turns the SQL (Y8 → A2) circuit ON or OFF. Thus, the scanning is stopped (or started).

3-5-6 SCAN CIRCUIT

In the memory scan mode, the flow (Y7 → A1) occurs through R62 and D36. At the same time, Q29 is turned ON by the "H" level at the MR terminal, and the flow (Y7 → A0) does not occur. Thus, the program scan does not function. In the program scan mode, MR is "L" level, so the flow (Y7 → A1) does not occur, but the flow (Y7 → A0) does.

3-5-7 PRIORITY CIRCUIT

IC1b is latched by the priority switch, which controls the oscillator consisting of IC2a, and IC2b. The output signal from the oscillator is shaped by IC3a, and is fed to the CPU INPUT MATRIX circuit (Y3 → A1). The memory and VFO frequencies are changed alternately by the signal.

3-5-8 PTT CIRCUIT

Q12 turns ON when the PTT switch is pressed. The voltage at the collector is ground level. This voltage is fed to the Main and PLL boards to select the transmit mode. At the same time, Q14 connects the SEND (Y5 → A3) circuit to the CPU to place it in the transmit mode.

3-5-9 TONE GENERATOR CIRCUIT

IC13 is the tone generator which has its frequency controlled by crystal X2. Pushing the TONE switch, causes the frequency display to show a tone number instead of the operating frequency. While holding the TONE switch, rotating the tuning control changes the tone number. The required subaudible tone frequencies can be set by selecting the correct tone numbers.

Tone No.	Frequency	Tone No.	Frequency	Tone No.	Frequency
1	67.0Hz	22	141.3Hz	43	900.0Hz
2	71.9	23	146.2	44	1000.0
3	74.4	24	151.4	45	1600.0
4	77.0	25	156.7	46	1700.0
5	79.7	26	162.2	47	1750.0
6	82.5	27	167.9	48	1800.0
7	85.4	28	173.8	49	1300.0
8	88.5	29	179.9	50	2000.0
9	91.5	30	186.2	51	2200.0
10	94.8	31	192.8	52	2975.0
11	97.4	32	203.5	53	2550.0
12	100.0	33	210.7	54	2295.0
13	103.5	34	218.1	55	2125.0
14	107.2	35	225.7	56	—
15	110.9	36	233.6	57	—
16	114.8	37	241.8	58	—
17	118.8	38	250.3	59	—
18	123.0	39	500.0	60	—
19	127.3	40	600.0	61	—
20	131.8	41	700.0	62	—
21	136.5	42	800.0	63	—

3-5-10 VOLTAGE REGULATOR AND MEMORY BACKUP CIRCUITS

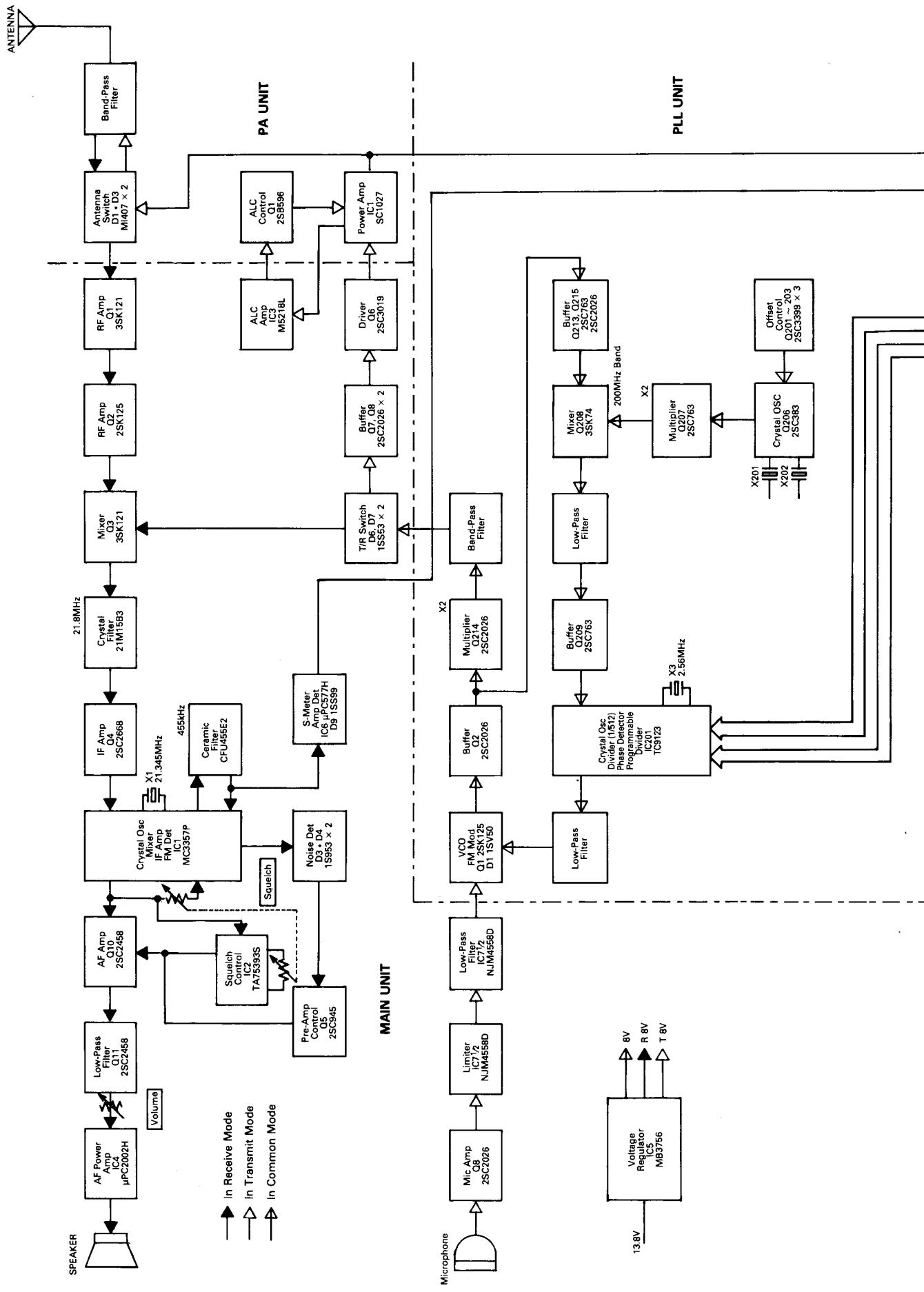
The supply voltage is regulated to 6.2V by IC5, and is divided into three parts designated M, S and D supplies. These supplies and the backup battery are distributed to the necessary circuits.

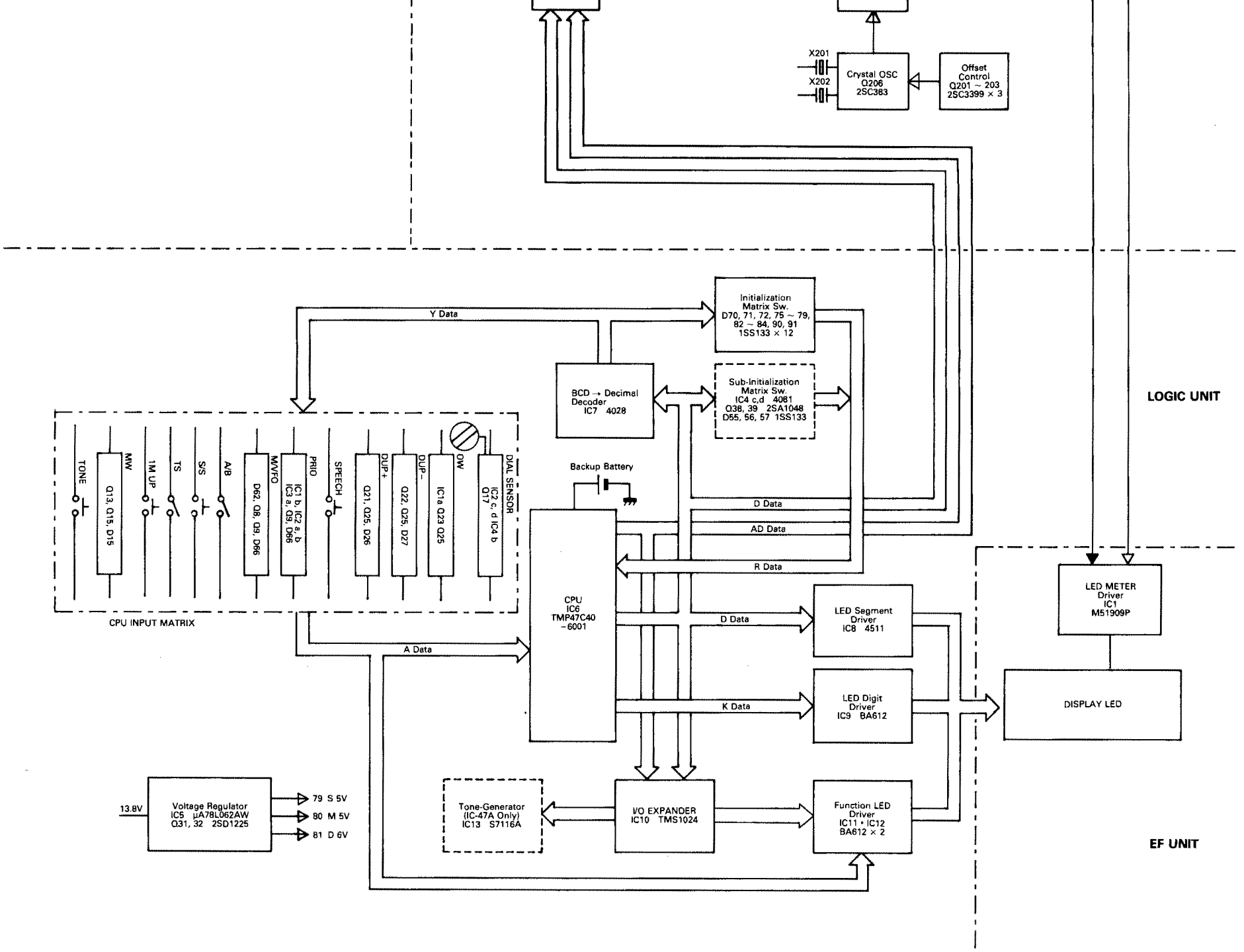
Conditions		M	S	D	BT1
Power supply code	Connected	○	—	—	—
	Not Connected	—	—	—	○
Power switch	ON	○	○	○	—
	OFF	○	—	—	—

NOTE) ○: State of function

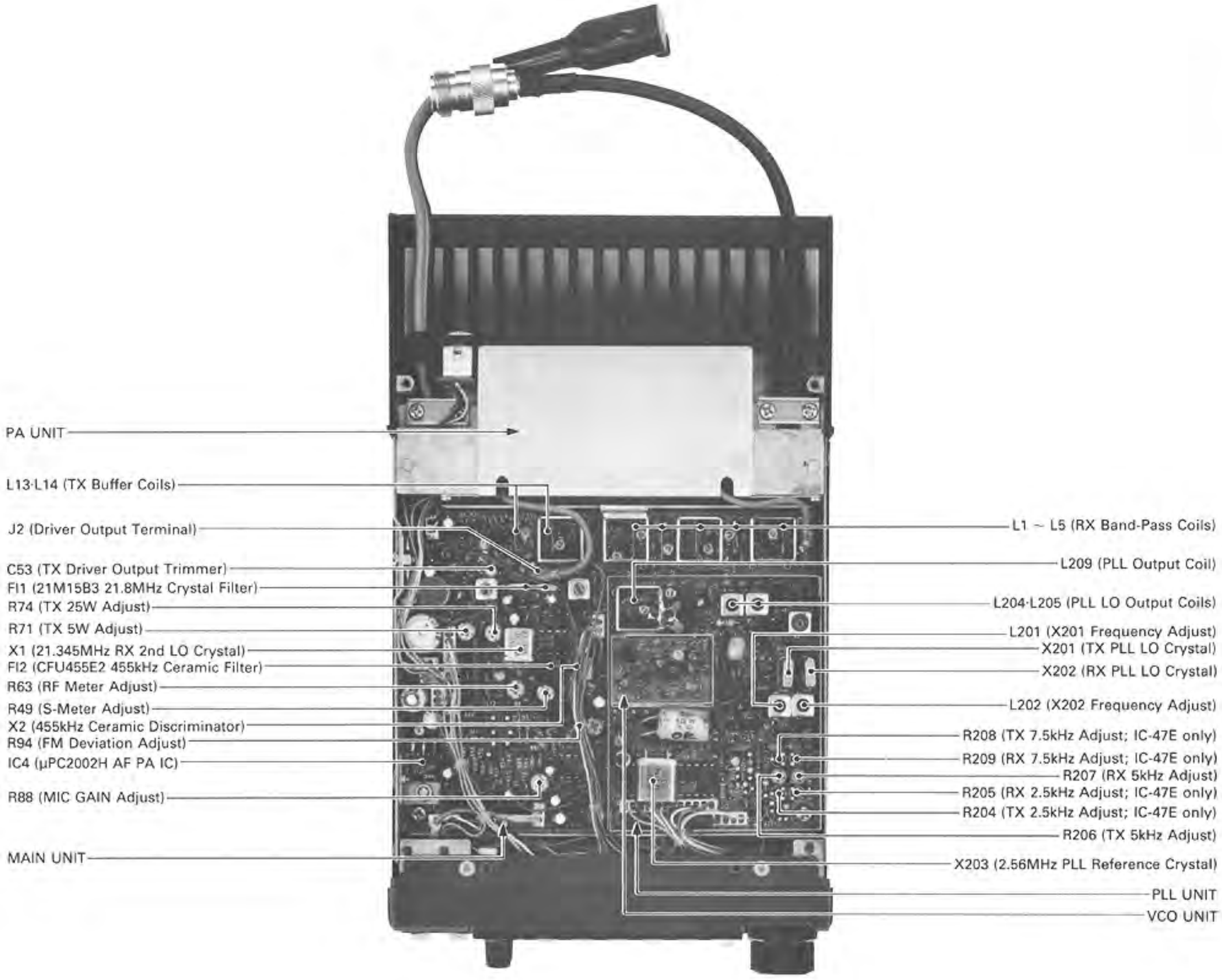
While the power switch is turned on, a 6.2V regulated voltage is applied to the CPU. Thus the CPU works normally. When this regulated voltage drops or the power switch is turned off, the CPU enters the HALT condition. At this time, the CPU stops its clock oscillation and all functions. However, a 3V memory backup voltage from the backup battery BT1 is applied to the CPU through D41, and the CPU stores all current data such as the operating frequency and all memorized channels. Under normal conditions, the backup battery has a life of more than 5 years.

SECTION 4 BLOCK DIAGRAM

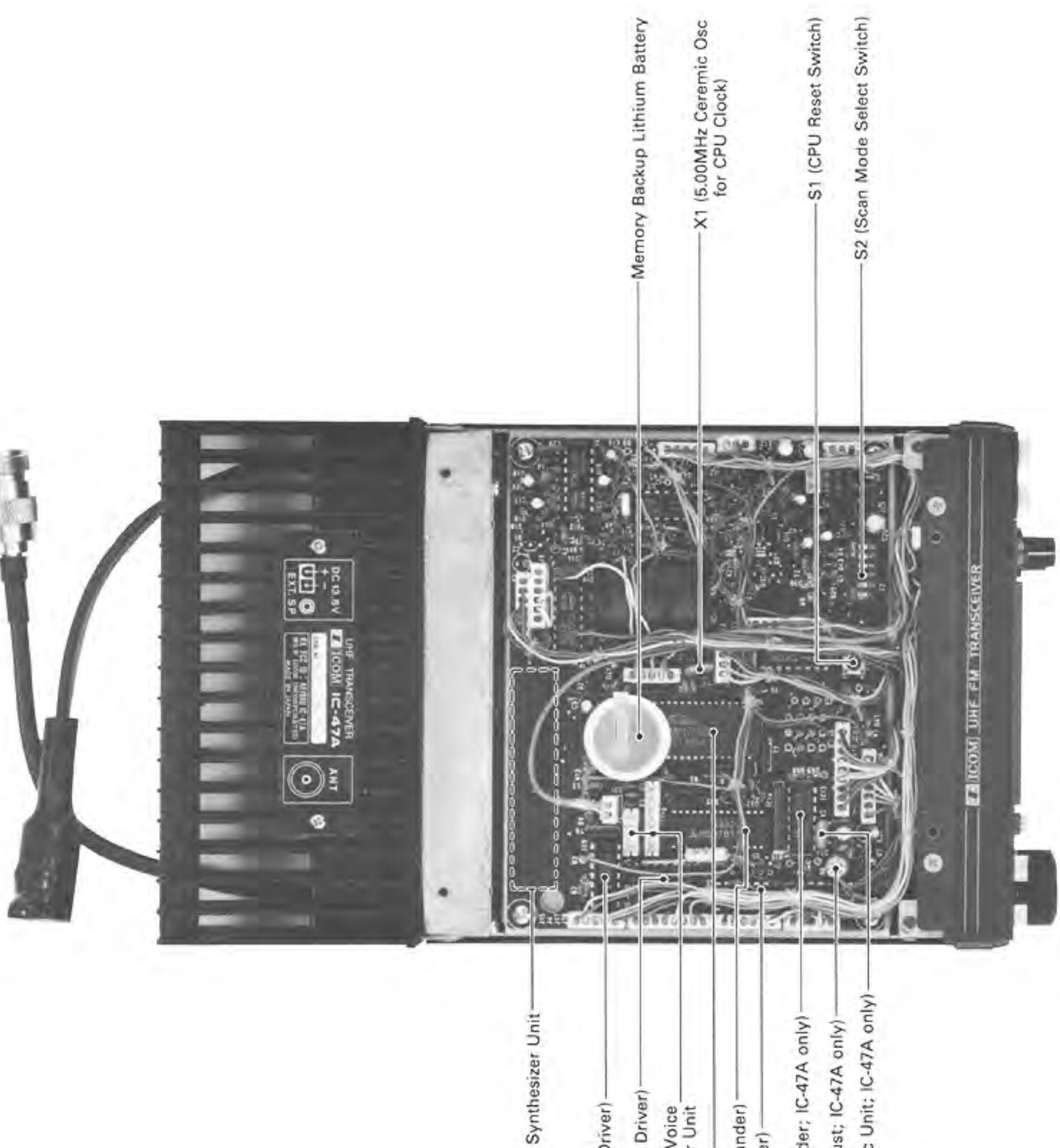



X201
X202
Crystal OSC
Q206
2SC383
Offset
Control
Q201 ~ 203
2SC3399 × 3
LOGIC UNIT
Y Data
Initialization
Matrix Sw.
D70, 71, 72, 75 ~ 79,
82 ~ 84, 90, 91
1SS133 × 12
BCD → Decimal
Decoder
IC7 4028
Sub-Initialization
Matrix Sw.
IC4 c,d 4081
Q38, 39 2SA1048
D55, 56, 57 1SS133
TONE
MW
Q13, Q15, D15
1M UP
TS
S/S
A/B
M/VFO
D62, Q8, Q9, D66
PRIO
IC1 b, IC2 a, b
IC3 a, Q9, D66
SPEECH
DUP+
Q21, Q25, D26
DUP−
Q22, Q25, D27
OW
IC1a Q23 Q25
DIAL SENSOR
IC2 c, d IC4 b
Q17
CPU INPUT MATRIX
Backup Battery
D Data
AD Data
R Data
CPU
IC6
TMP47C40
−6001
A Data
LED Segment
Driver
IC8 4511
D Data
LED Digit
Driver
IC9 BA612
K Data
LED METER
Driver
IC1
M51909P
DISPLAY LED
13.8V
Voltage Regulator
IC5 μA78L062AW
Q31, 32 2SD1225
79 S 5V
80 M 5V
81 D 6V
Tone-Generator
(IC-47A Only)
IC13 S7116A
I/O EXPANDER
IC10 TMS1024
Function LED
Driver
IC11 • IC12
BA612 × 2
EF UNIT

MAIN UNIT SIDE



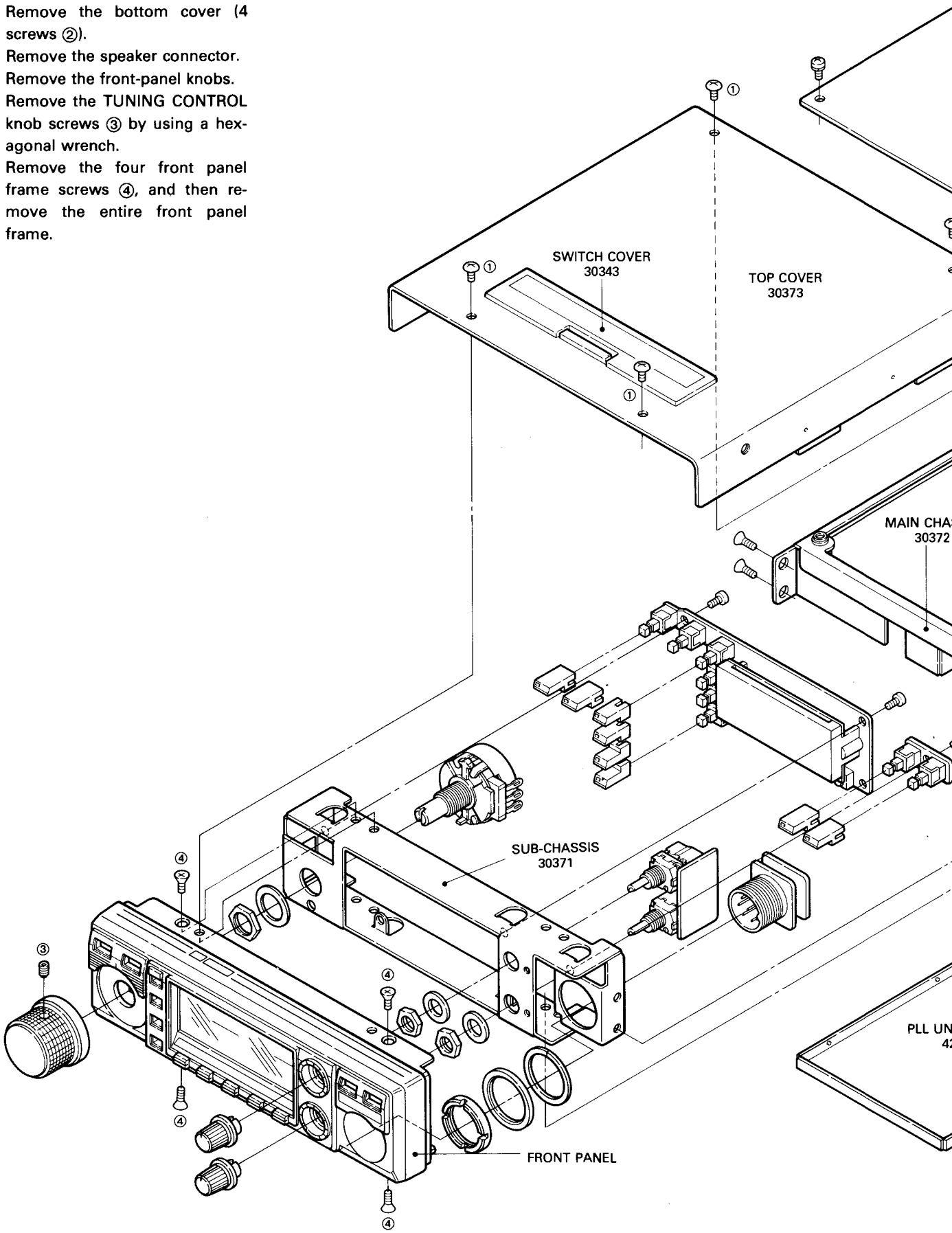
LOGIC UNIT SIDE

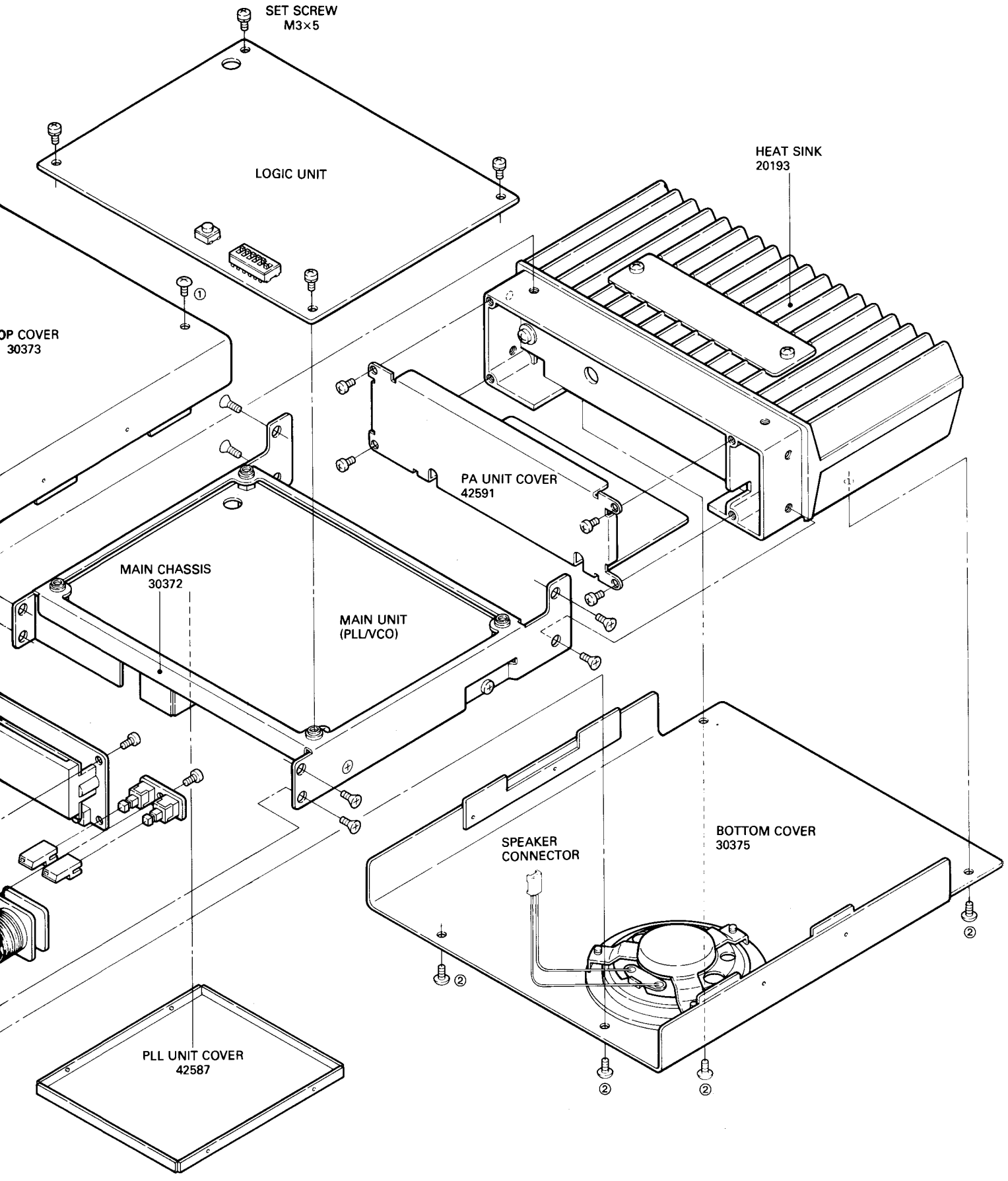


SECTION 6 MECHANICAL PARTS AND DISASSEMBLY

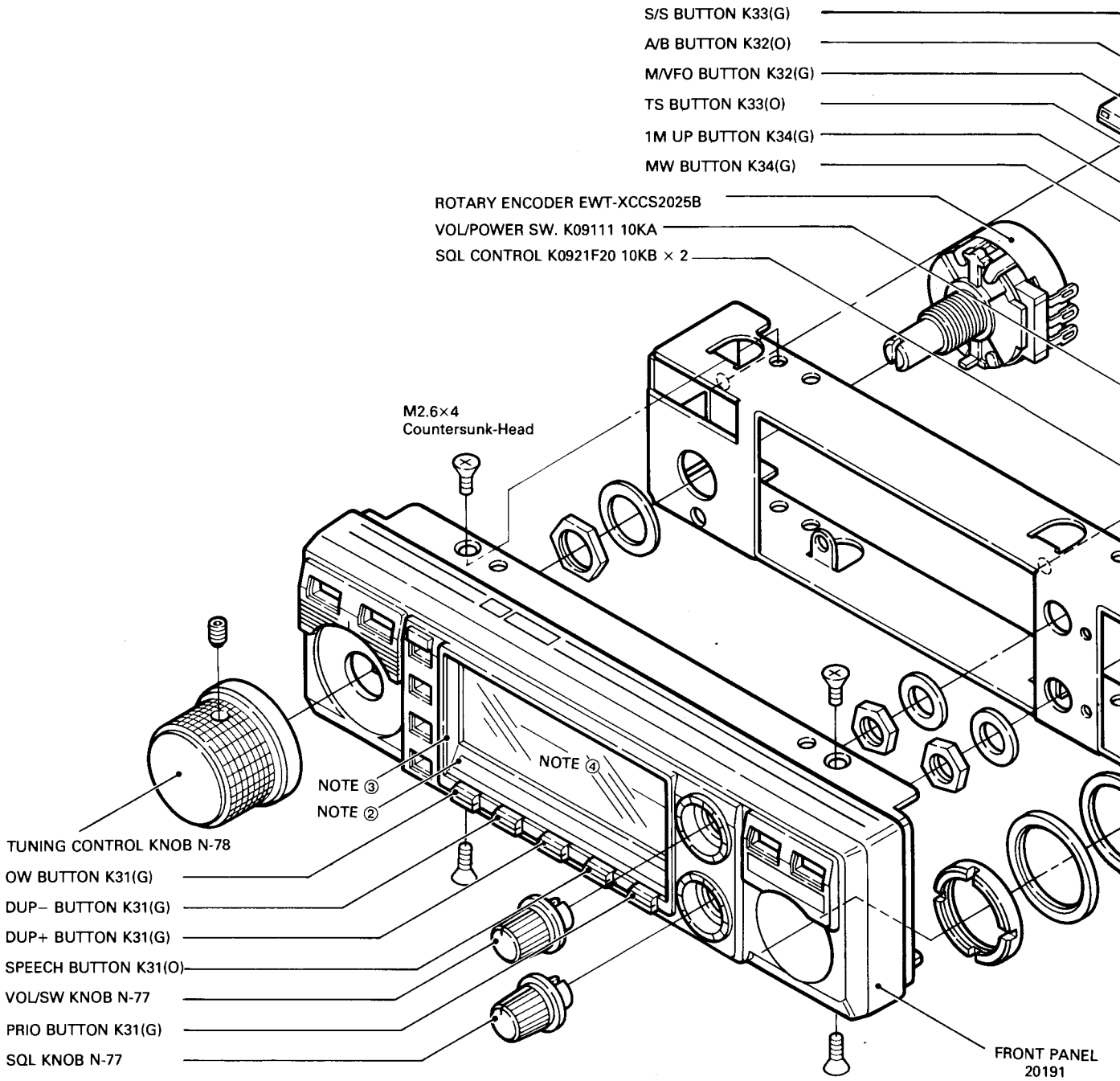
6 - 1 FRAME DISASSEMBLY

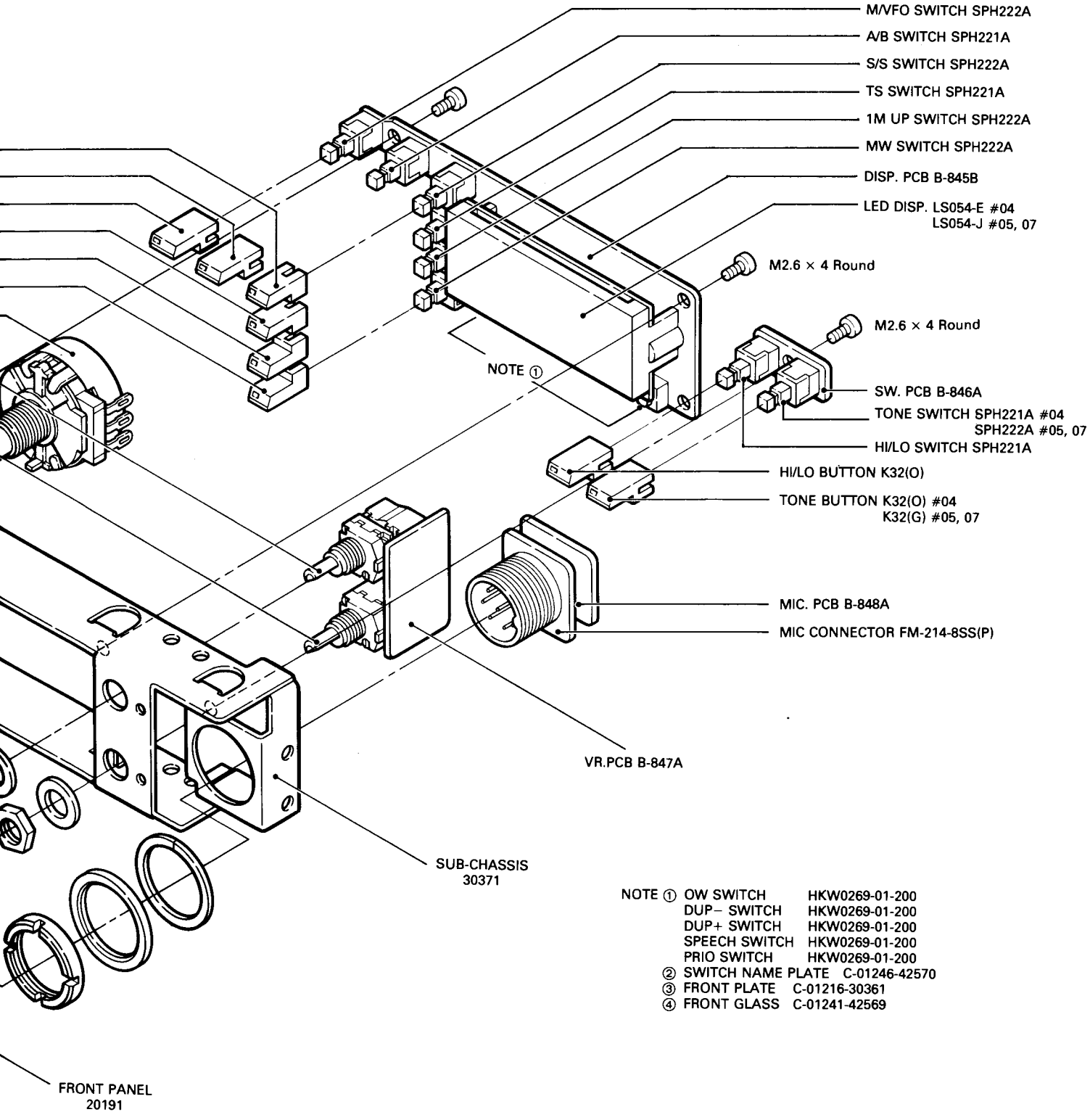
1. Remove the top cover (4 screws ①).
2. Remove the bottom cover (4 screws ②).
3. Remove the speaker connector.
4. Remove the front-panel knobs. Remove the TUNING CONTROL knob screws ③ by using a hexagonal wrench.
5. Remove the four front panel frame screws ④, and then remove the entire front panel frame.




SET SCREW
M3×5
LOGIC UNIT
HEAT SINK
20193
OP COVER
30373
PA UNIT COVER
42591
MAIN CHASSIS
30372
MAIN UNIT
(PLL/VCO)
SPEAKER
CONNECTOR
BOTTOM COVER
30375
PLL UNIT COVER
42587
①
②
②
②

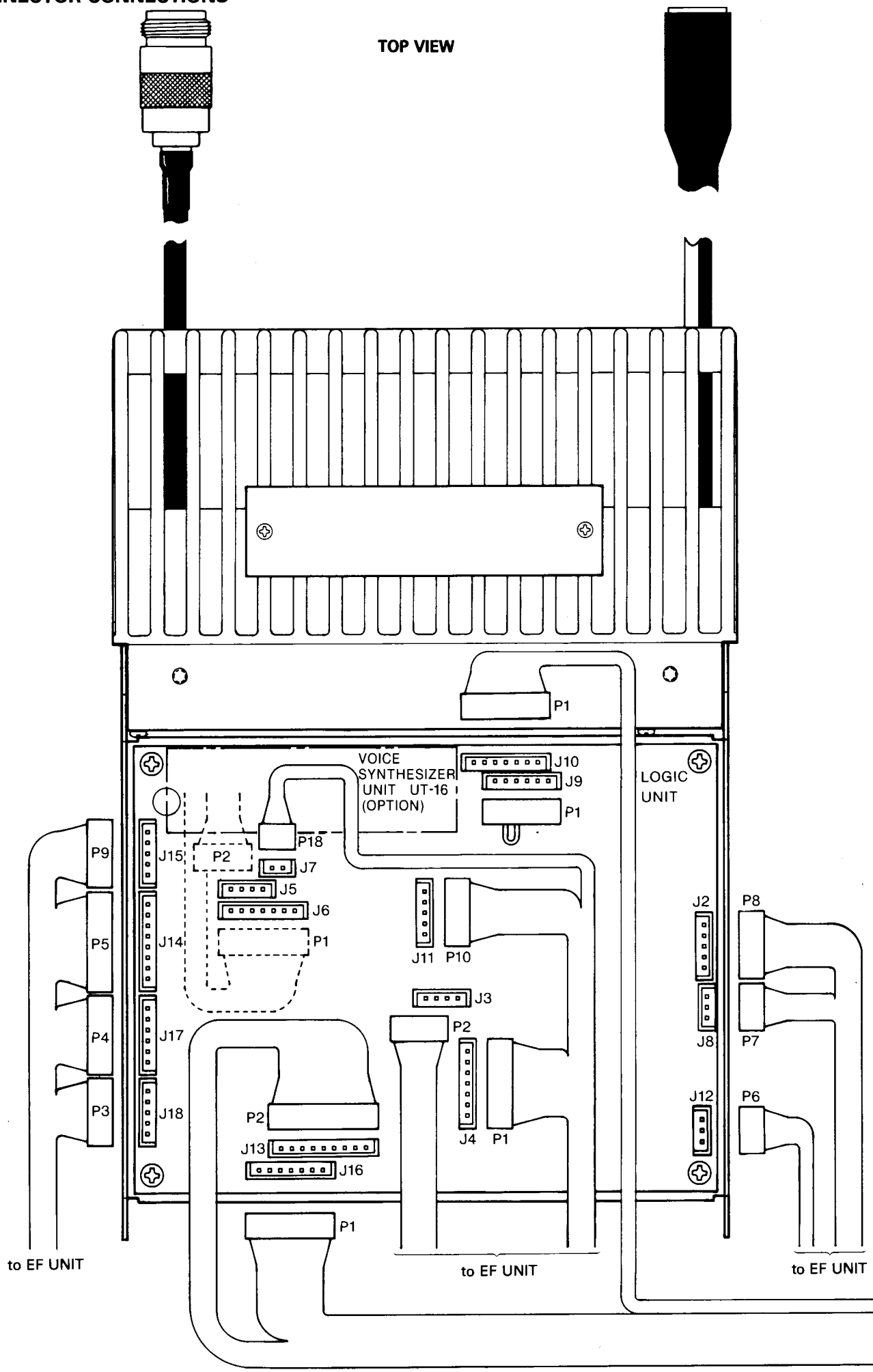
6 - 2 FRONT PANEL DISASSEMBLY

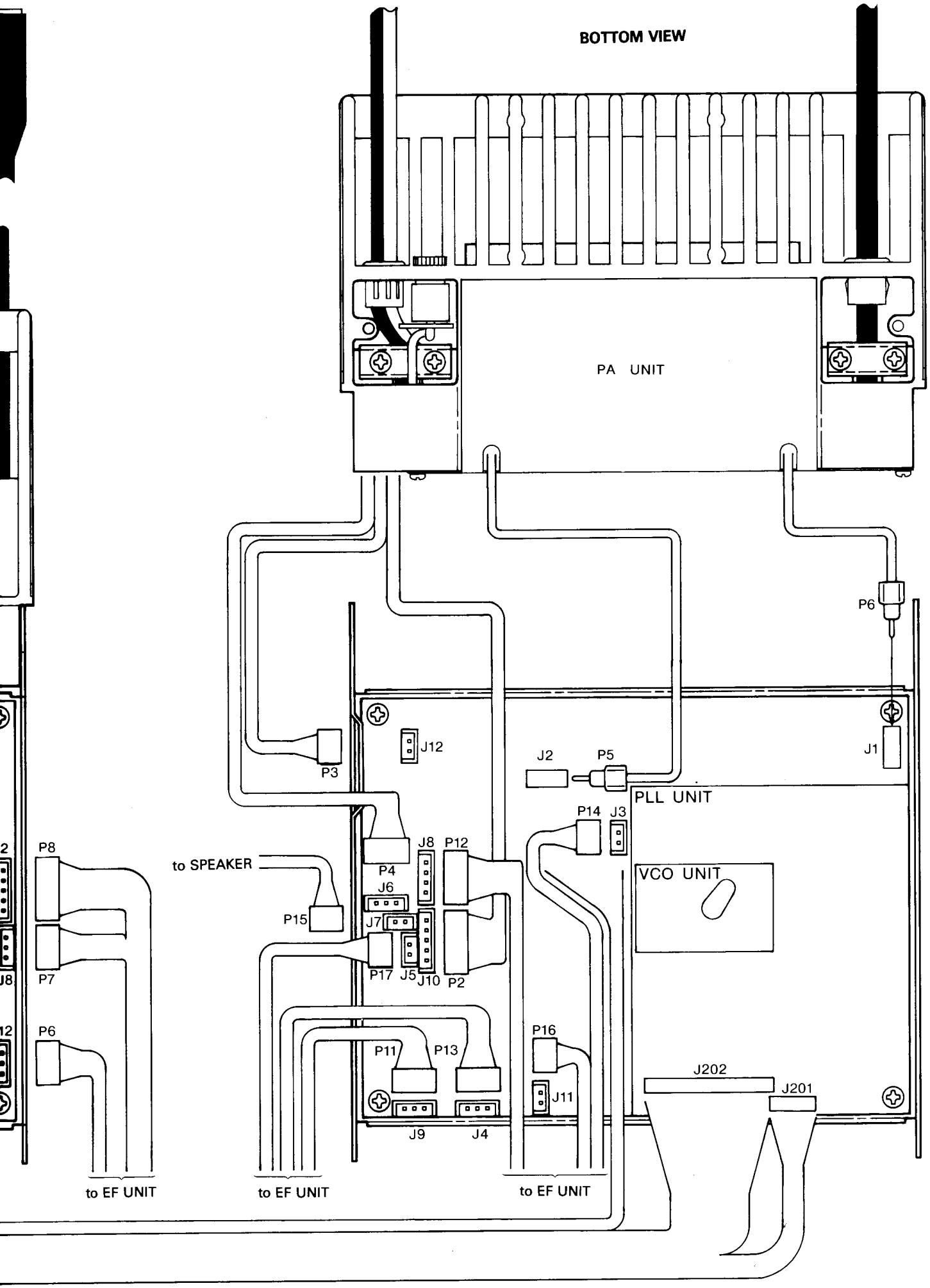




NOTE ① OW SWITCH HKW0269-01-200
DUP− SWITCH HKW0269-01-200
DUP+ SWITCH HKW0269-01-200
SPEECH SWITCH HKW0269-01-200
PRIO SWITCH HKW0269-01-200
② SWITCH NAME PLATE C-01246-42570
③ FRONT PLATE C-01216-30361
④ FRONT GLASS C-01241-42569

6 - 3 CONNECTOR CONNECTIONS



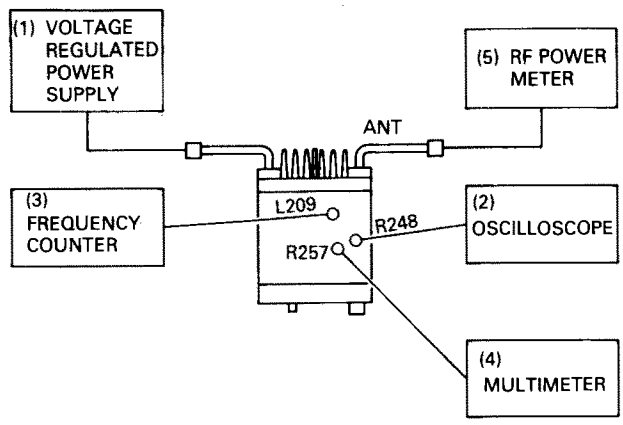

BOTTOM VIEW
PA UNIT
P6
J12
P3
J2
P5
J1
PLL UNIT
P14
J3
P8
J8
P12
to SPEAKER
P4
VCO UNIT
J6
P15
J7
P17
J5
J10
P2
P7
P6
P16
P11
P13
J202
J11
J201
J9
J4
to EF UNIT
to EF UNIT
to EF UNIT

SECTION 7 MAINTENANCE AND ADJUSTMENT

7 - 1 PREPARATION BEFORE SERVICING

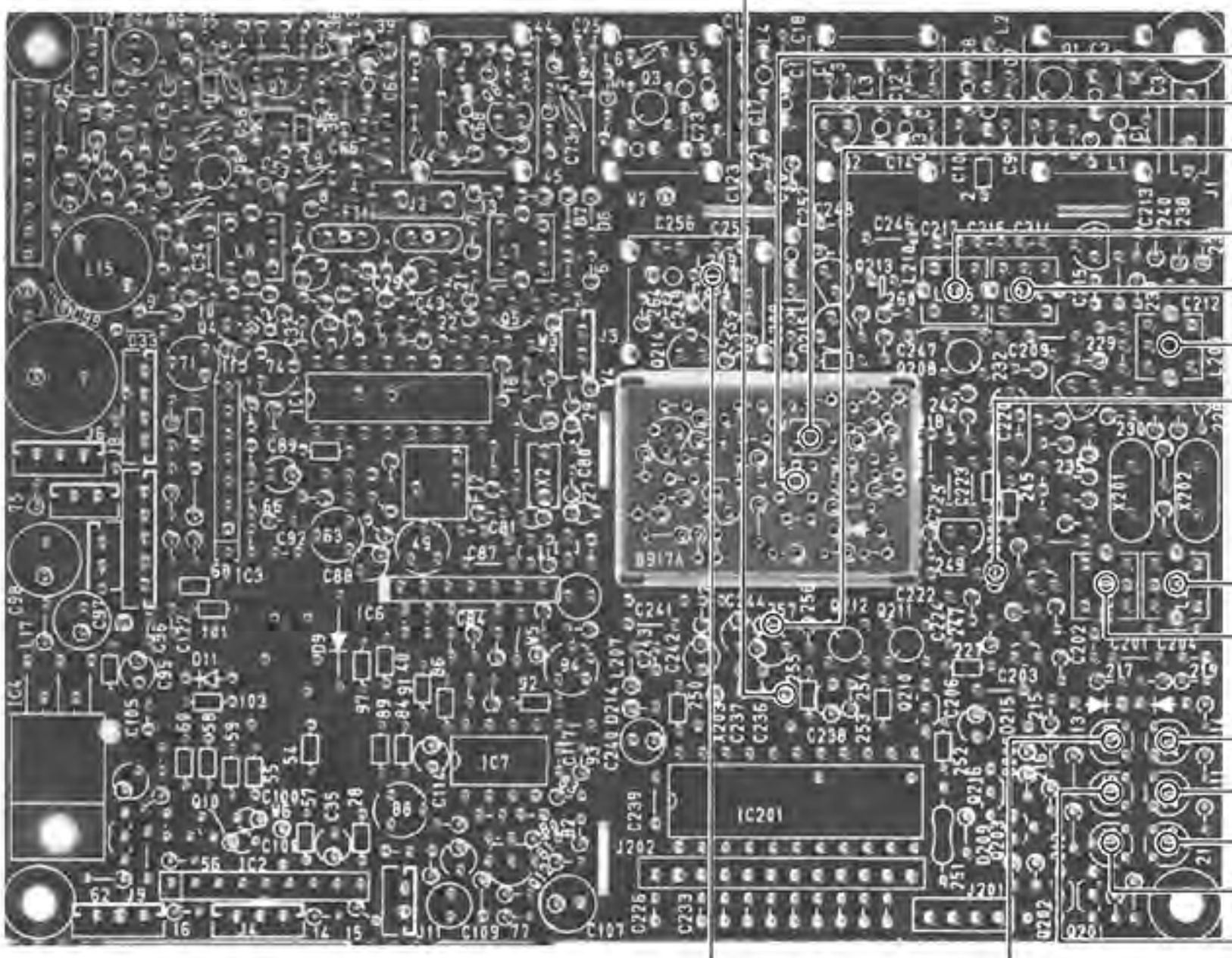
1. Detach the power cord and turn off the power switch before performing any work on the radio.
2. Do not short circuit components while making adjustments.
3. Use an insulated tuning tool for all adjustments.
4. Do not force any of the variable components. Tune them slowly and smoothly.
5. Follow the instructions exactly. If an indicated result is not obtained, repeat the instruction until the correct result is obtained.
6. Check the condition of connectors, solder joints and screws when adjustments are complete. Confirm that components do not touch each other.
7. There are several versions of this radio. Adjustment procedures and results may differ for each version. Be certain to follow the correct procedure for the radio you have.
8. Confirm defective operation of the radio first when checking an out-of-service unit. Verify that external sources do not cause the problem.
9. Use the correct tools and test equipment.
10. Remove the transceiver case as shown on Page 6–1 and Page 6–2.
11. Attach a 13.8 volt DC external power source to the power cord. Be sure to check the polarity.
12. For transmission problems, attach a dummy load to the antenna connector. For reception problems, attach an antenna or a signal generator to the antenna connector. Do not transmit into the signal generator.
13. Recheck for the suspected malfuntion with the power switch on.
14. Check the defective circuit. Measure the DC voltages of the collector, base and emitter of each transistor.

7 - 2 PLL ADJUSTMENT

INSTRUMENTS REQUIRED	CONNECTIONS
(1) VOLTAGE REGULATED POWER SUPPLY : OUTPUT VOLTAGE DC13.8V ± 15% : CURRENT CAPACITY MORE THAN 7A (2) OSCILLOSCOPE : FREQUENCY RANGE DC ~ 10MHz : MEASURING RANGE 0.01 ~ 10V (3) FREQUENCY COUNTER : FREQUENCY RANGE 0.1 ~ 470MHz : ACCURACY BETTER THAN ±1PPM (4) MULTIMETER : MEASURING RANGE 50kΩ/VOLT or BETTER (5) RF POWER METER (TERMINATED TYPE) : MEASURING RANGE 50 watts : FREQUENCY RANGE 400 ~ 470MHz : IMPEDANCE 50Ω : SWR LESS THAN 1.1	

Adjustment		Adjustment conditions	Unit	Adjustment location	Adjustment value	Unit	Adjustment Point
PRELIMINARY	1.	• Check the programmable divider input.	PLL	Connect the oscilloscope to R248.	Unstable or no waveform indicates PLL failure.		
	2.	• Check the master oscillator frequency.		Connect the oscilloscope to crystal (X203).	Check for a 2.56MHz signal.		
	3.	• Check IC and transistor voltages.	PLL/VCO	Connect the multimeter to IC201, Q206 ~ 209, Q213 ~ 215, Q1 ~ 2 (VCO).	See voltage information in section 8.		
PLL LOCK	1.	• Set operating frequency: 434.9850MHz (IC-47E#04), 444.9950MHz (IC-47A#05), 434.9950MHz (IC-47A#07). • Receive and transmit mode. Repeat this step several times.	PLL	Connect the oscilloscope (with a ×10 probe) to R248.	Maximum peak-to-peak value on the oscilloscope.	PLL	L203 L204 L205
	2.	• Set operating frequency: 439.9875MHz (IC-47E#04), 449.9950MHz (IC-47A#05), 439.9950MHz (IC-47A#07). • Receive and transmit mode. Repeat this step several times.		Connect the multimeter to R257.	1.5V.	VCO	L2 (TX mode) C6 (RX mode)
		This PLL is locked under normal conditions. The voltage range is 0.5 ~ 6V. After changing the operating frequency to 430.00MHz (IC-47E#04, IC-47A#07) or 440.00MHz (IC-47A#05), check that the voltage at R257 is less than 5.5V.					
PLL L.O. FREQUENCY	1.	• Set operating frequency as follows: IC-47E#04: 435.0000MHz in TX mode, 434.9875MHz in TX mode, 434.9750MHz in TX mode, 434.9625MHz in TX mode, 435.0000MHz in RX mode, 434.9875MHz in RX mode, 434.9750MHz in RX mode, 434.9625MHz in RX mode. IC-47A#05: 445.0000MHz in TX mode, 444.9950MHz in TX mode, 445.0000MHz in RX mode, 444.9950MHz in RX mode. IC-47A#07: 435.0000MHz in TX mode, 434.9950MHz in TX mode, 435.0000MHz in RX mode, 434.9950MHz in RX mode.	PLL	Connect the frequency counter to L209.	 435.0000MHz, 434.9875MHz, 434.9750MHz, 434.9625MHz, 413.2000MHz, 413.1875MHz, 413.1750MHz, 413.1625MHz. 445.0000MHz, 444.9950MHz, 423.2000MHz, 423.1950MHz. 435.0000MHz, 434.9950MHz, 413.2000MHz, 413.1950MHz.	 PLL	 L201 R208 R206 R204 L202 R209 R207 R205 L201 R206 L202 R207 L201 R206 L202 R207

PLL/VCO UNIT



X203, Master Oscillator Check point (to Oscilloscope)

L2, C6, PLL Lock (VCO Free-Run Frequency) Adjustment

R257, PLL Lock Check Point (to Multimeter)

L205, L204, L203, PLL Lock (LO Output) Adjustment

R248, PLL Lock Check point (to Oscilloscope)

L202, RX LO Frequency Adjustment

L201, TX LO Frequency Adjustment

R209, RX Offset Freq. Adj. (+7.5kHz)

R207, RX Offset Freq. Adj. (+5.0kHz)

R205, RX Offset Freq. Adj. (+2.5kHz)

R204, TX Offset Freq. Adj. (+7.5kHz)

R206, TX Offset Freq. Adj. (+5.0kHz)

R208, TX Offset Freq. Adj. (+2.5kHz)

L209, Frequency Check Point (to Frequency Counter)

7 - 3 RECEIVER ADJUSTMENT

INSTRUMENTS REQUIRED

(1) VOLTAGE REGULATED POWER SUPPLY
: OUTPUT VOLTAGE DC13.8V ± 15%
: CURRENT CAPACITY MORE THAN 7A

(2) STANDARD SIGNAL GENERATOR (SSG.)
: FREQUENCY RANGE 0.1 ~ 470MHz
: OUTPUT VOLTAGE −20 ~ +90dB μ (OdBμ = 1μV)

(3) AC MILLIVOLTMETER
: MEASURING RANGE 0.001 ~ 3V

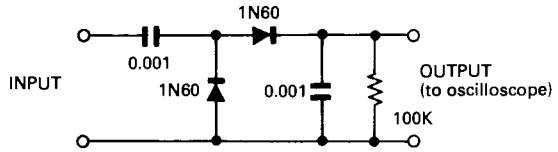
(4) EXTERNAL SPEAKER
: IMPEDANCE 8Ω

(5) MULTIMETER
: INPUT IMPEDANCE 50kΩ/VOLT OR BETTER

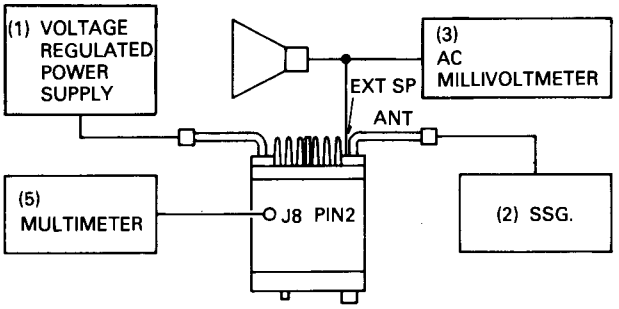
(6) SWEEP GENERATOR
: CENTER FREQUENCY 435MHz (IC-47E#04, 47A#07)
445MHz (IC-47A#05)
: SWEEP BANDWIDTH ± 15MHz
: OUTPUT IMPEDANCE 50Ω

(7) OSCILLOSCOPE (with external synchronization)
: MEASURING RANGE 0.01 ~ 10V

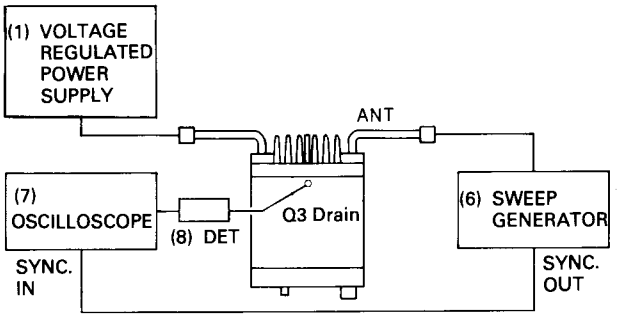
(8) DETECTOR (DET)



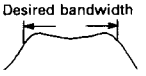
CONNECTIONS



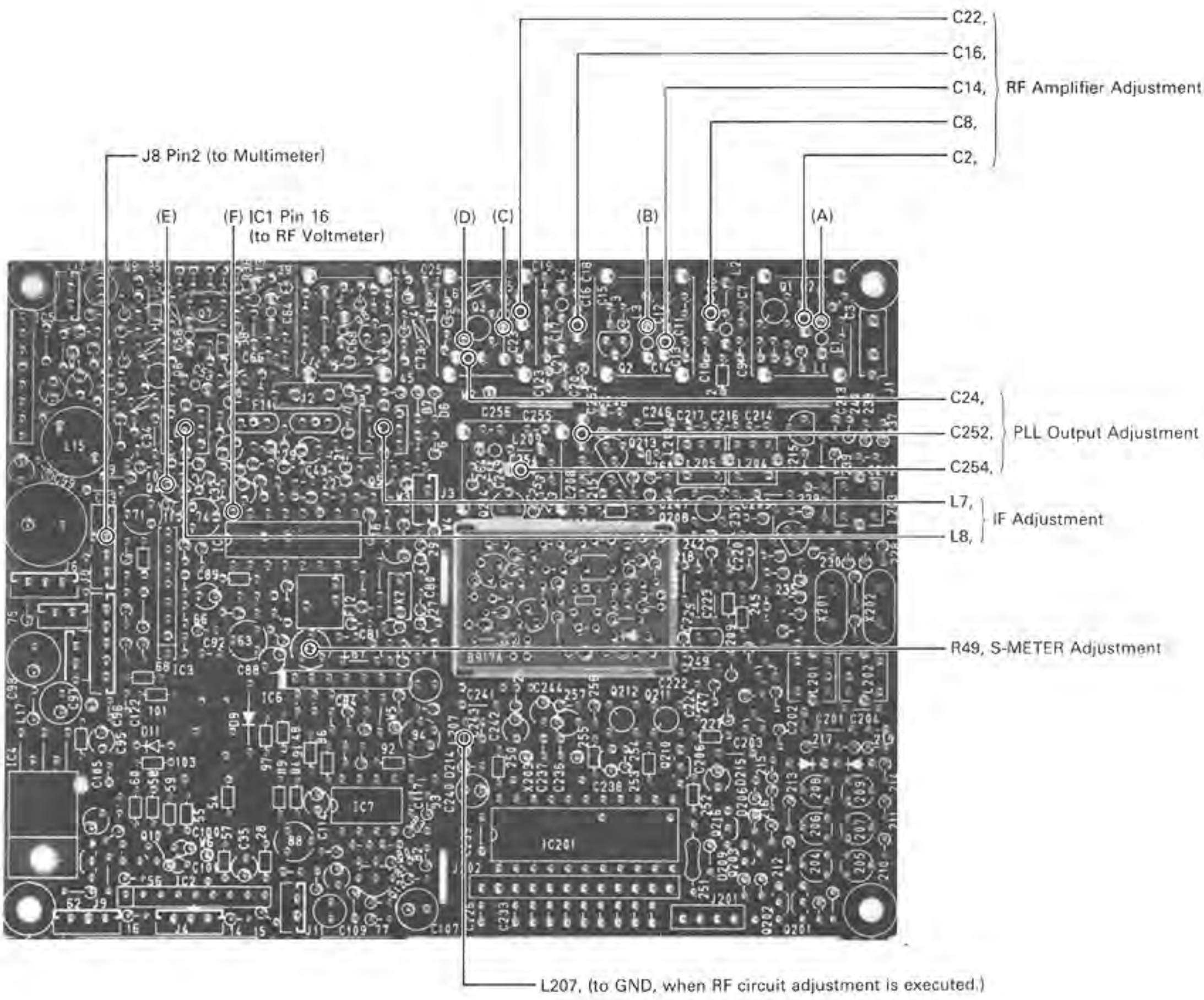
MAIN UNIT SIDE



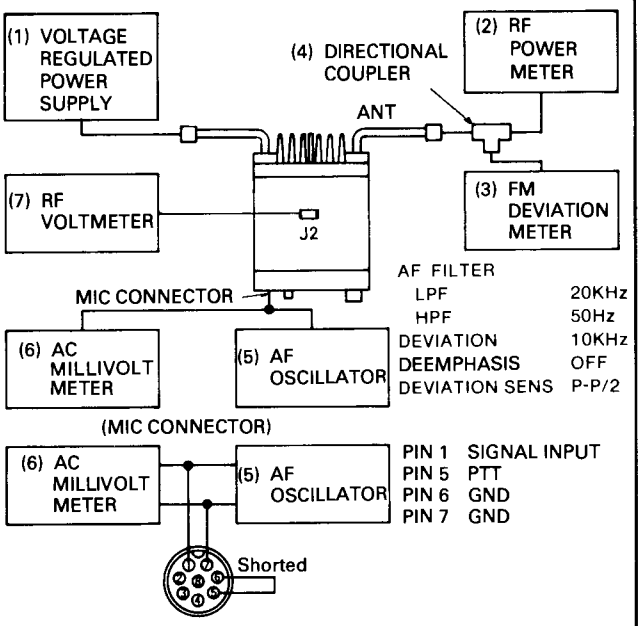
MAIN UNIT SIDE

Adjustment		Adjustment conditions	Unit	Adjustment location	Adjustment value	Unit	Adjustment Point
PRELIMINARY	1.	• Check the sensitivity. (20dB noise quieting) • SQUELCH: CCW • No input to the ANTENNA CONNECTOR from the SSG.		Bridge the AC millivoltmeter to the EXT SPEAKER jack. Connect the external speaker.	Full Scale.		VOLUME
		NOTE: Do not readjust the VOLUME after this step.					
	2.	• Set the SSG to receive frequency.		Connect the SSG to the ANTENNA CONNECTOR.	20dB decrease in level.		SSG level
		NOTE: The SSG output voltage is the 20dB quieting sensitivity.					
	3.	• Confirm the PLL works correctly.		See Section 7-2 PLL PRELIMINARY.			
	4.	• Check the receive path continuity. • Set the SSG for an FM test signal with 1kHz modulation. • Use a 0.01μF capacitor between the SSG and the test points. (A) L1 } Receive frequency. (B) L3 } (C) L5 } (D) Q3 Drain } (E) Q4 Base } 1st IF. (F) IC1 Pin 16 }	MAIN	Monitor the receiver speaker.			
RF/IF STAGES	1.	• Set the radio for the center raido's frequency range. 435MHz (IC-47E#04, IC-47A#07), 445MHz (IC-47A#05). • Set the SSG for the receive frequency. • Reduce the output level so the RF voltmeter reads just above the noise.	MAIN	Connect the RF voltmeter to IC1 pin 16. (Or connect the multimeter to J8 pin 2.)	Maximum RF voltmeter (or multimeter).	PLL MAIN	C252 C254 C24 L7 L8
		NOTE: Final setttings should produce 20dB quieting for a −8dBμ (0.4μV) signal. See PRELIMINARY section for method of measuring 20dB quieting level.					
RF AMPLIFIER		NOTE: Do not adjust C2, C8, C14, C16 and C22 without the instruments (6), (7) and (8). Contact your nearest ICOM service agency if you need adjustment.					
	1.	• Connect a short jumper wire between L207 and GND. • Inject a −30dBm sweep signal to the ANTENNA CONNECTOR.	MAIN	Connect the DET to Q3 Drain.	Wave of DET output: Desired bandwidth 	MAIN	C2 C8 C14 C16 C22
S-METER	1.	• Set the radio for the center raido's frequency range. • Set the SSG for the receive frequency and +0dBμ output.		S-METER	2 segments.	MAIN	R49
	2.	• Confirm linearity of S-METER. • Set the SSG for +30dBμ.			7 segments.		Verify

MAIN/PLL UNIT

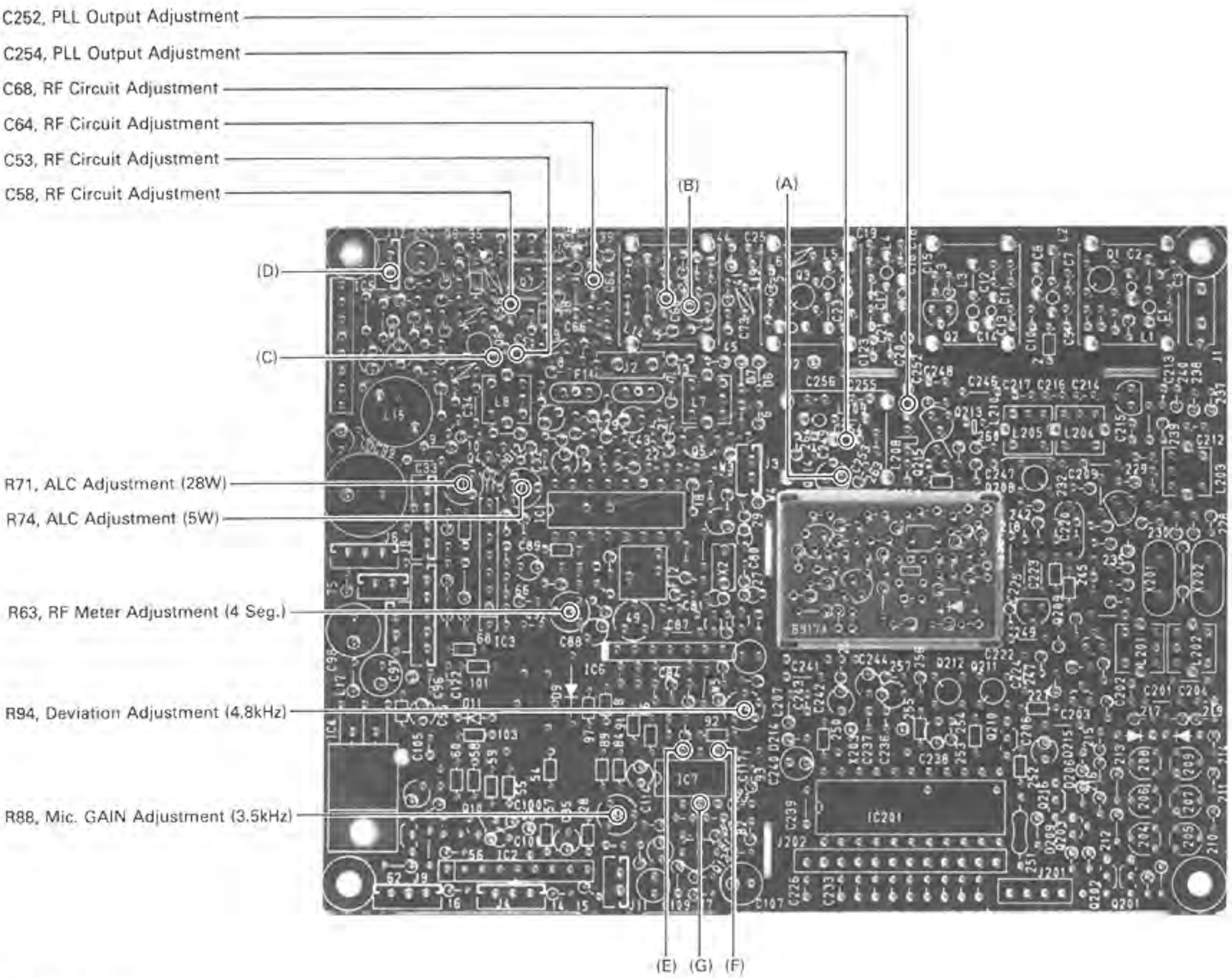


7 - 4 TRANSMITTER ADJUSTMENT

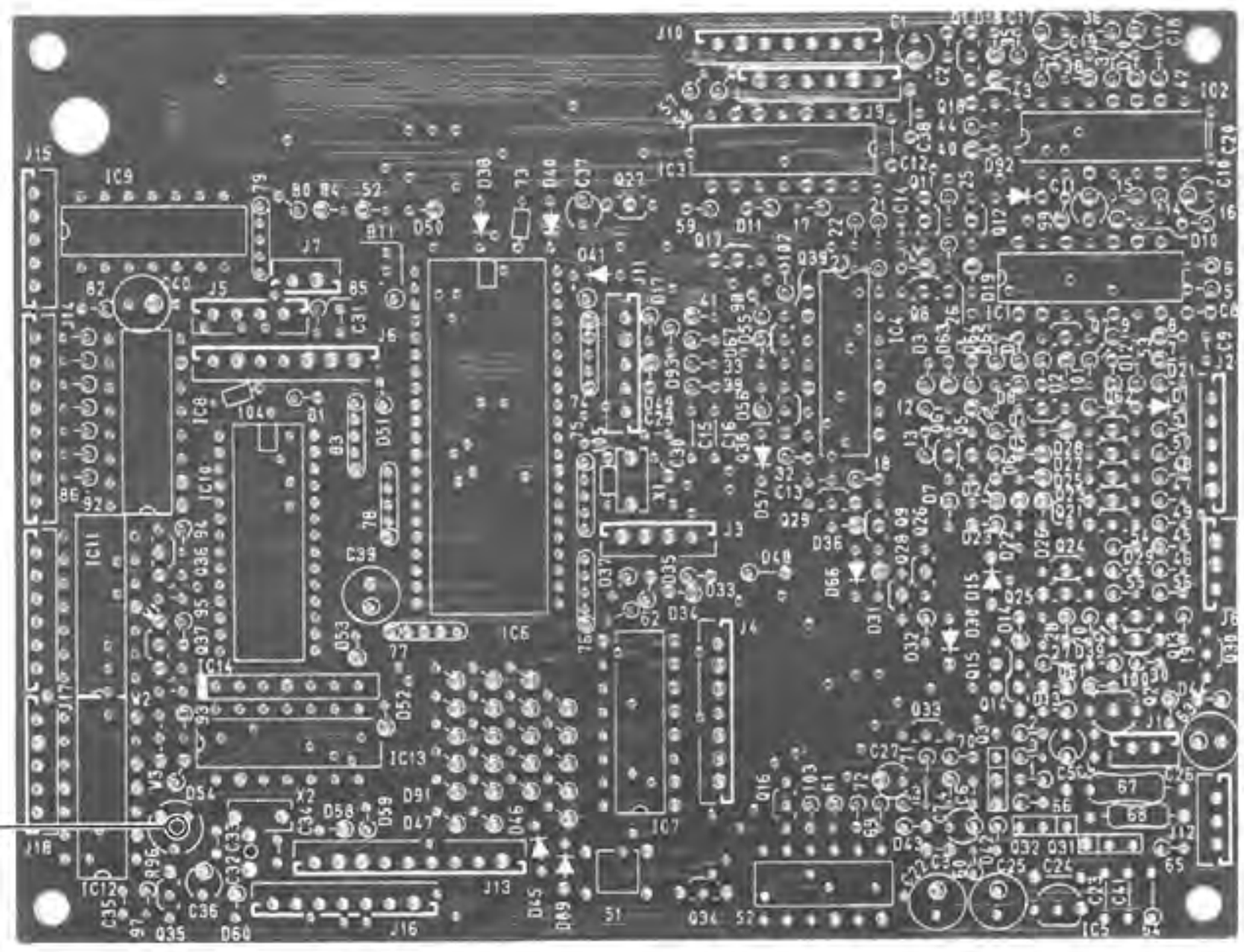
INSTRUMENTS REQUIRED	CONNECTIONS
(1) VOLTAGE REGULATED POWER SUPPLY : OUTPUT VOLTAGE DC 13.8V ± 15% : CURRENT CAPACITY MORE THAN 7A (2) RF POWER METER (TERMINATED TYPE) : MEASURING RANGE 30 watts : FREQUENCY RANGE 400 ~ 470MHz : IMPEDANCE 50Ω : SWR LESS THAN 1.1 (3) FM DEVIATION METER : FREQUENCY RANGE 400 ~ 470MHz : MEASURING RANGE 0 ~ ±10kHz (4) DIRECTIONAL COUPLER : FREQUENCY RANGE 400 ~ 470MHz : MEASURING RANGE 50Ω (5) AF OSCILLATOR : OUTPUT FREQUENCY RANGE 200 ~ 3000Hz : OUTPUT VOLTAGE 0 ~ 300mV (6) AC MILLIVOLTMETER : MEASURING RANGE 0.001 ~ 3V (7) RF VOLTMETER : FREQUENCY RANGE 0.1 ~ 470MHz : MEASURING RANGE 0.001 ~ 3V	

Adjustment		Adjustment conditions	Unit	Adjustment location	Adjustment value	Unit	Adjustment Point
PRELIMINARY	1.	• Check the RF output power with RF POWER switch in HIGH position. • Transmit mode.		Connect the RF power meter to the ANTENNA CONNECTOR.	25W.		
	2.	• Check the main points in the transmission path. • Transmit mode.	MAIN	Connect the RF voltmeter to: (A) Q214 collector, (PLL) (B) Q8 collector, (C) Q6 collector.	Verify RF is present.		
	3.	• If the output power is low, check the regulated power supply voltage. • Do not adjust the trimmers.		Connect the multimeter to: (D) J12 Pin2.	8.0 V.		
	4.	• Check the main audio voltages. • Transmit mode. Apply a 1kHz 65mV signal to MIC connector.		Connect the oscilloscope to: (E) IC7 pin 7, (F) IC7 pin 5, (G) IC7 pin 3.	Verify AF is present.		
OUTPUT POWER	1.	• Set operating frequency to the center of the frequency range: 435MHz (IC-47E#04) (IC-47A#07), 455MHz (IC-47A#05). • RF POWER SW.: HIGH • Turn R74 counterclockwise. • Transmit mode.		Connect the RF power meter to ANTENNA CONNECTOR.	Maximum power.	PLL MAIN	C252 C254 C53 C58 C64 C68
ALC	1.	• RF POWER SW.: HIGH • Transmit mode.		Connect the RF power meter to ANTENNA CONNECTOR.	28W.	MAIN	R74
	2.	• RF POWER SW.: LOW			5W.		R71
	3.	• Confirm correct power over radio's frequency range.					
RF POWER METER	1.	• RF POWER SW.: LOW • Transmit mode.		S/RF meter	4 segments.	MAIN	R63
DEVIATION, MODULATION SENSITIVITY, S/N RATIO	1.	• Deviation meter deemphasis: OFF • Transmit mode. • R88: center position. Apply a 1kHz 20mV RMS (IC-47E) (65mV RMS (IC-47A)) signal to the MIC connector.		Connect the RF power meter and the deviation meter to the ANTENNA CONNECTOR using a directional coupler.	±4.8kHz deviation.	MAIN	R94
	2.	Apply the AF oscillator to 1kHz 2.0mV RMS (IC-47E) (6.5mV RMS (IC-47A)).			±3.5kHz deviation.		R88
	3.	• Check the transmit signal-to-noise ratio. • No audio input. • Transmit mode. Remove the oscillator signal.		Connect the millivoltmeter to the deviation meter output.	S+N/N: more than 40dB		Verify
MODULATION (SUBAUDIBLE TONE)	1.	• Set the TONE number to 38. • DUPLEX mode. • Transmit mode.		deviation meter	±0.5kHz deviation.	LOGIC	R96

MAIN/PLL UNIT

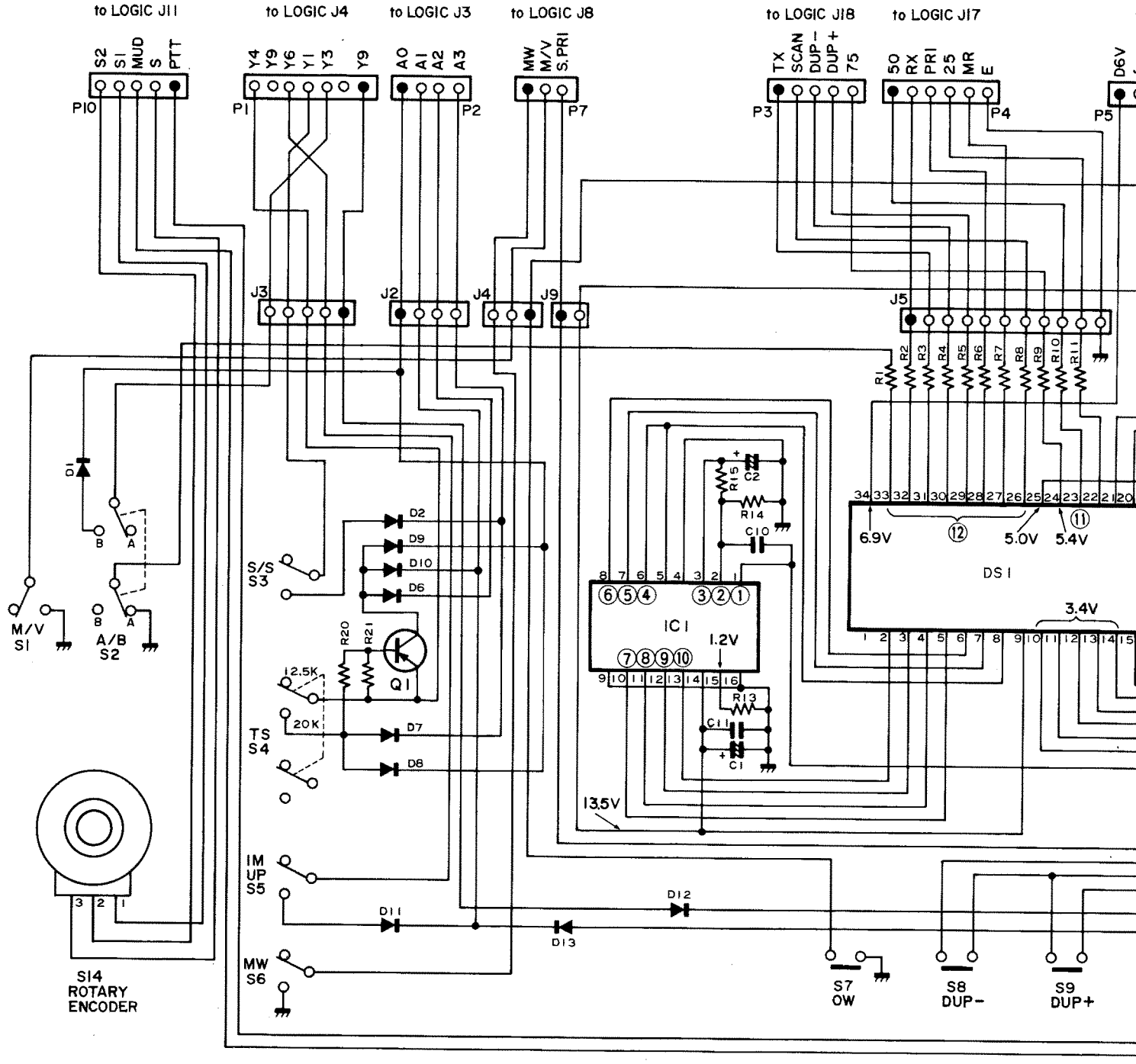


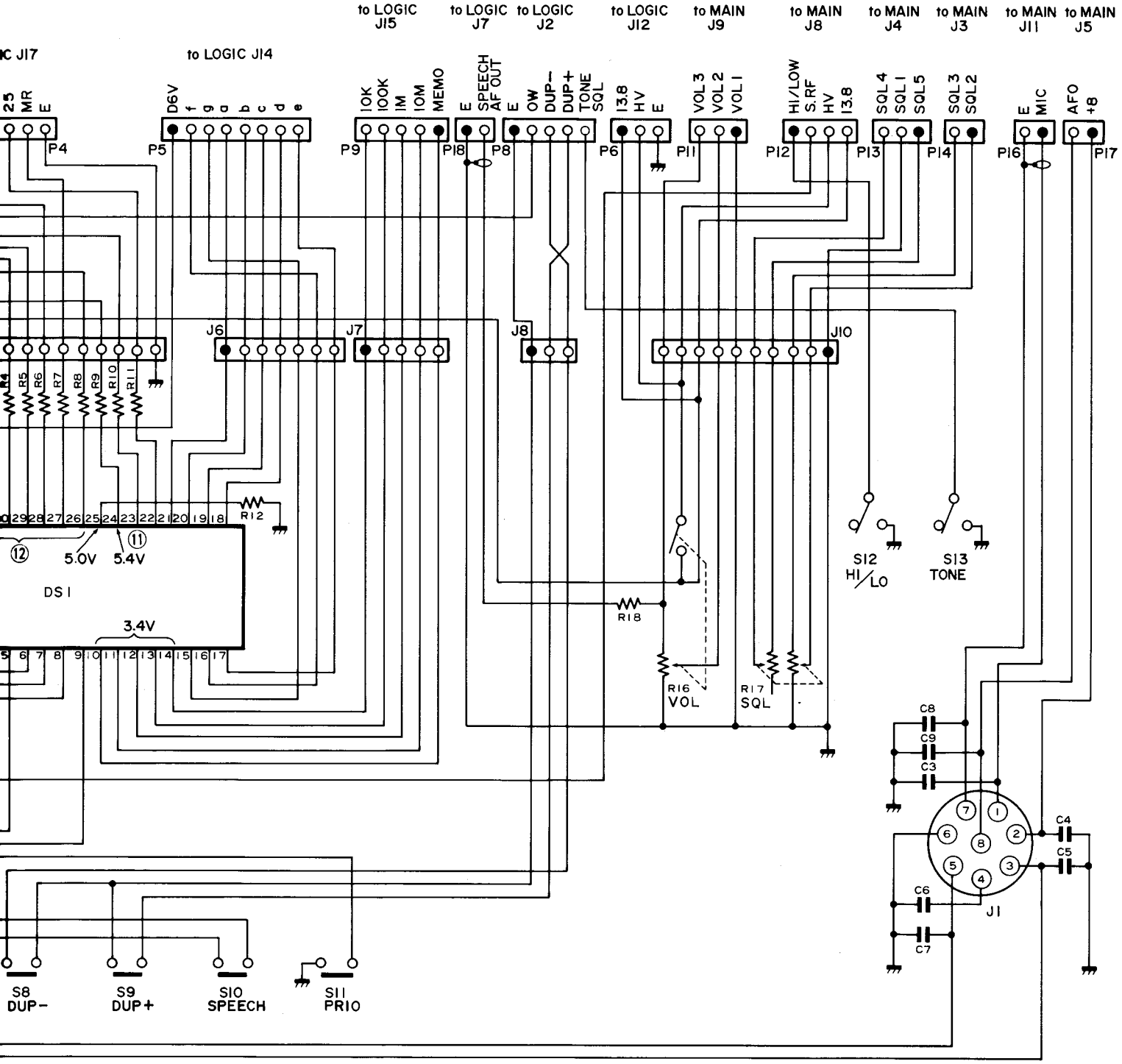
LOGIC UNIT



SECTION 8 VOLTAGE (CIRCUIT) DIAGRAMS

EF UNIT (#04)



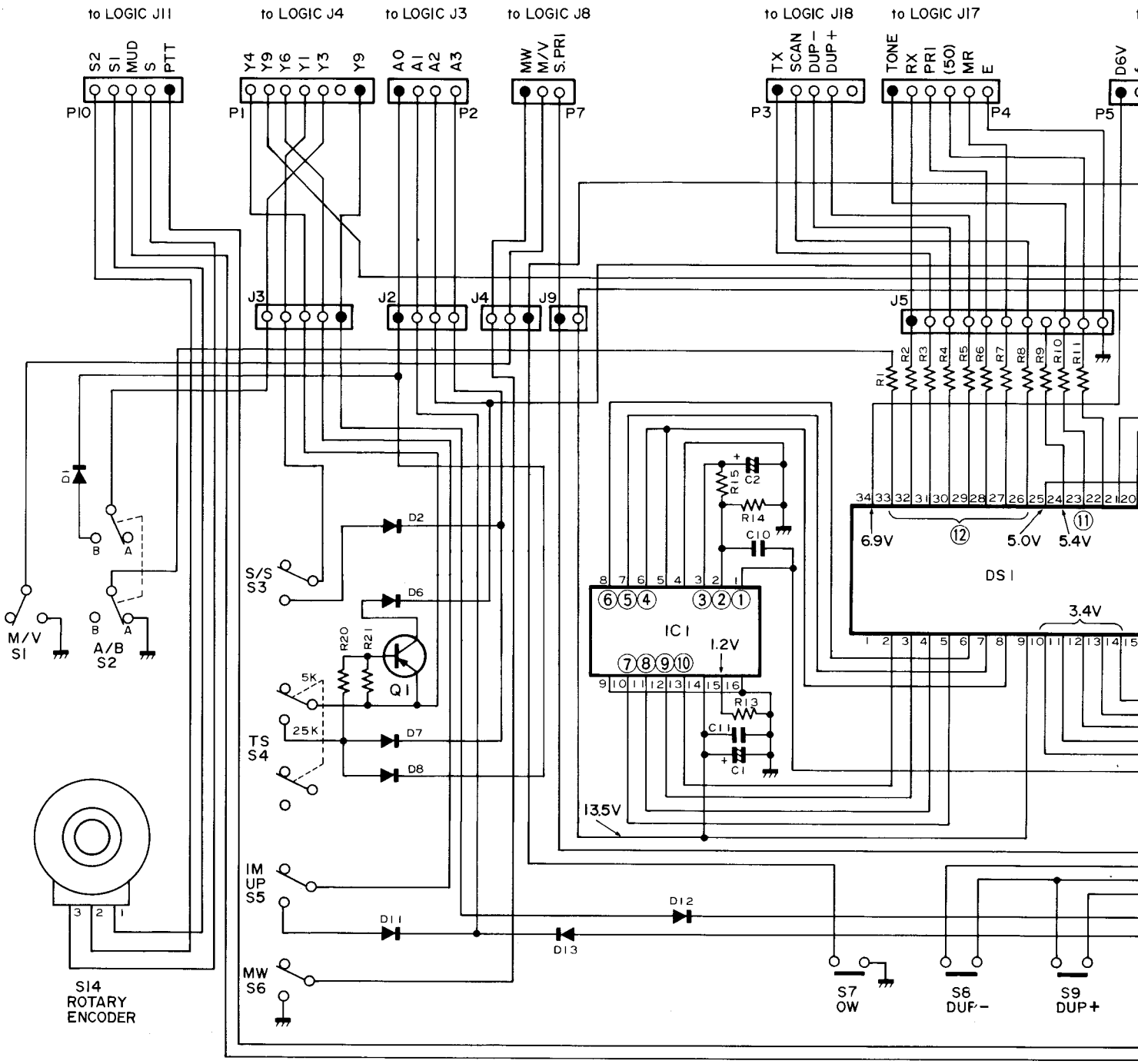


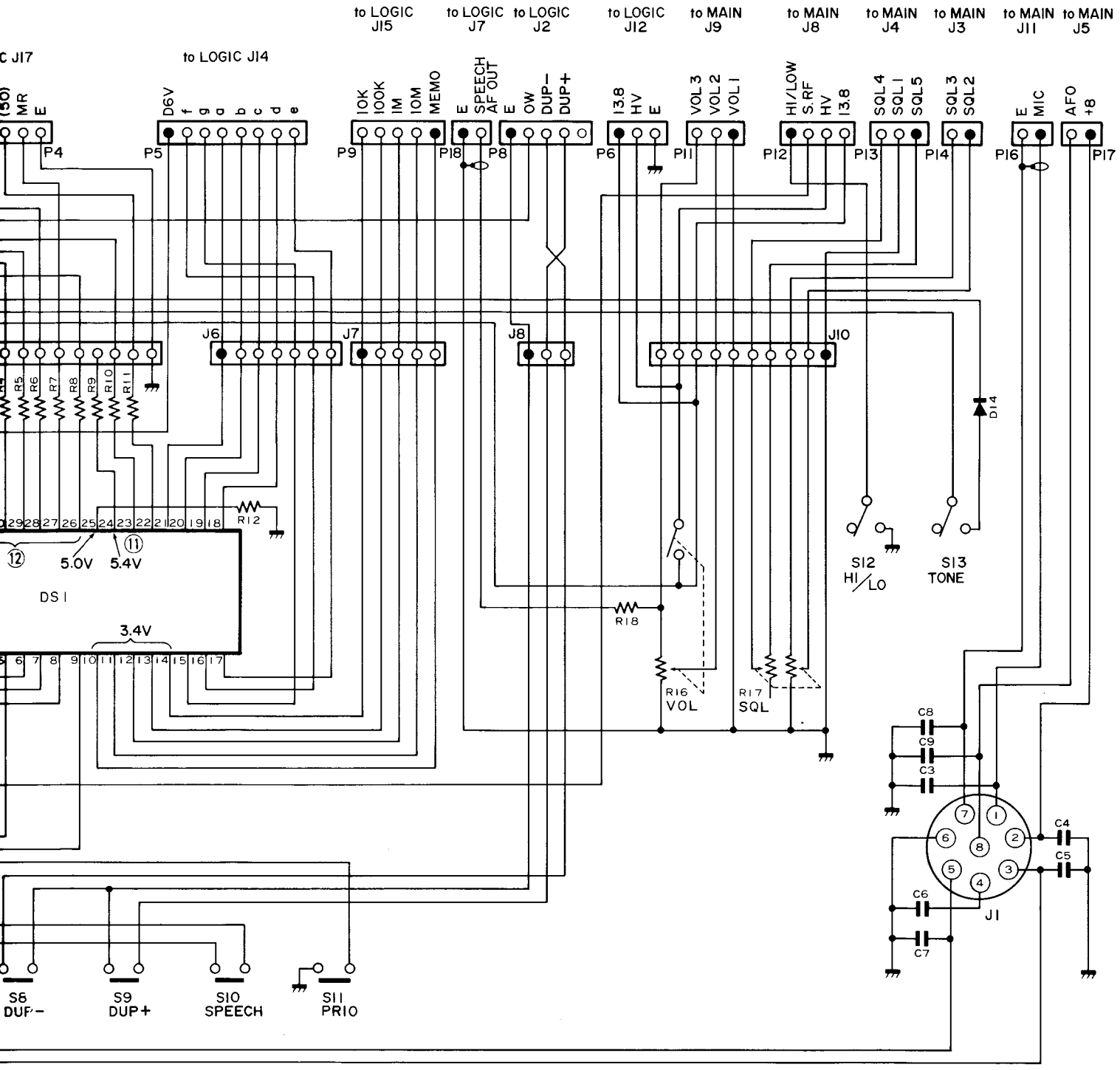
NO.		1	4	5	6	7	8	9	10	11	12
LED	OFF	0	11.9	10.3	11.8	10.1	11.7	10.1	11.7	5.4	5.4
	ON	0.7	11.1	9.0	10.8	8.7	10.9	8.7	10.8	4.8	4.8

NO.		2	3
RX		0	0
TX	LOW	0.1	0.5
	HI	0.7	4.5

DC Voltage 50KΩ-V multimeter

EF UNIT (#05, 07)


to LOGIC J11
to LOGIC J4
to LOGIC J3
to LOGIC J8
to LOGIC J18
to LOGIC J17
S2 S1 MUD S PTT
Y4 Y9 Y6 Y1 Y3 Y9
A0 A1 A2 A3
MW M/V S.PRI
TX SCAN DUP− DUP+
TONE RX PRI (50) MR E
D6V
P10
P1
P2
P7
P3
P4
P5
J3
J2
J4
J9
J5
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11
D1
B A
M/V S1
A/B S2
S/S S3
D2
D6
R20 R21
5K
25K
Q1
TS S4
D7
D8
R15 C2
R14
C10
IC1
1.2V
R13
C11
C1
13.5V
6.9V
5.0V
5.4V
DS1
3.4V
IM UP S5
D11
D12
D13
MW S6
S14 ROTARY ENCODER
S7 OW
S8 DUP−
S9 DUP+

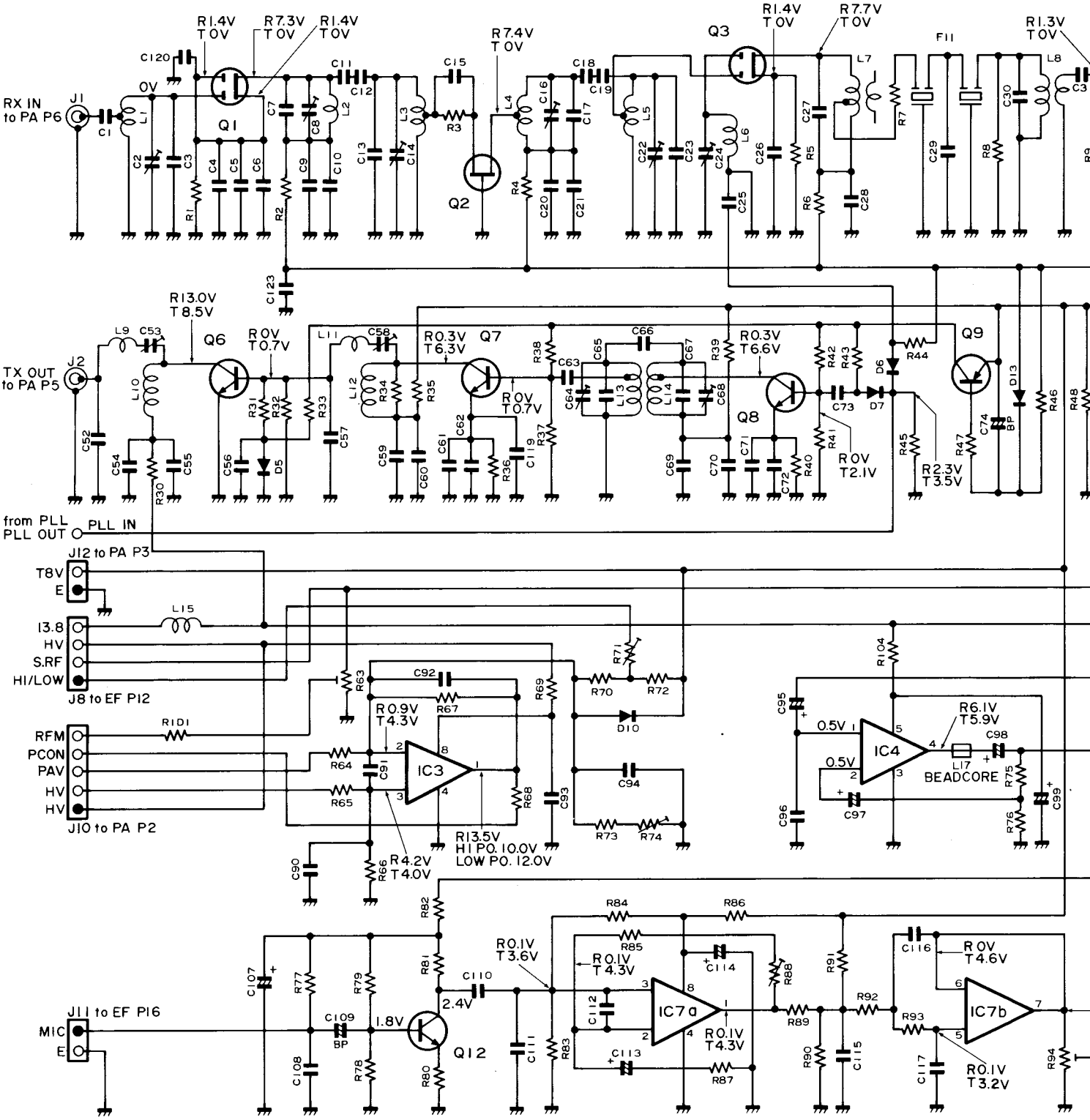


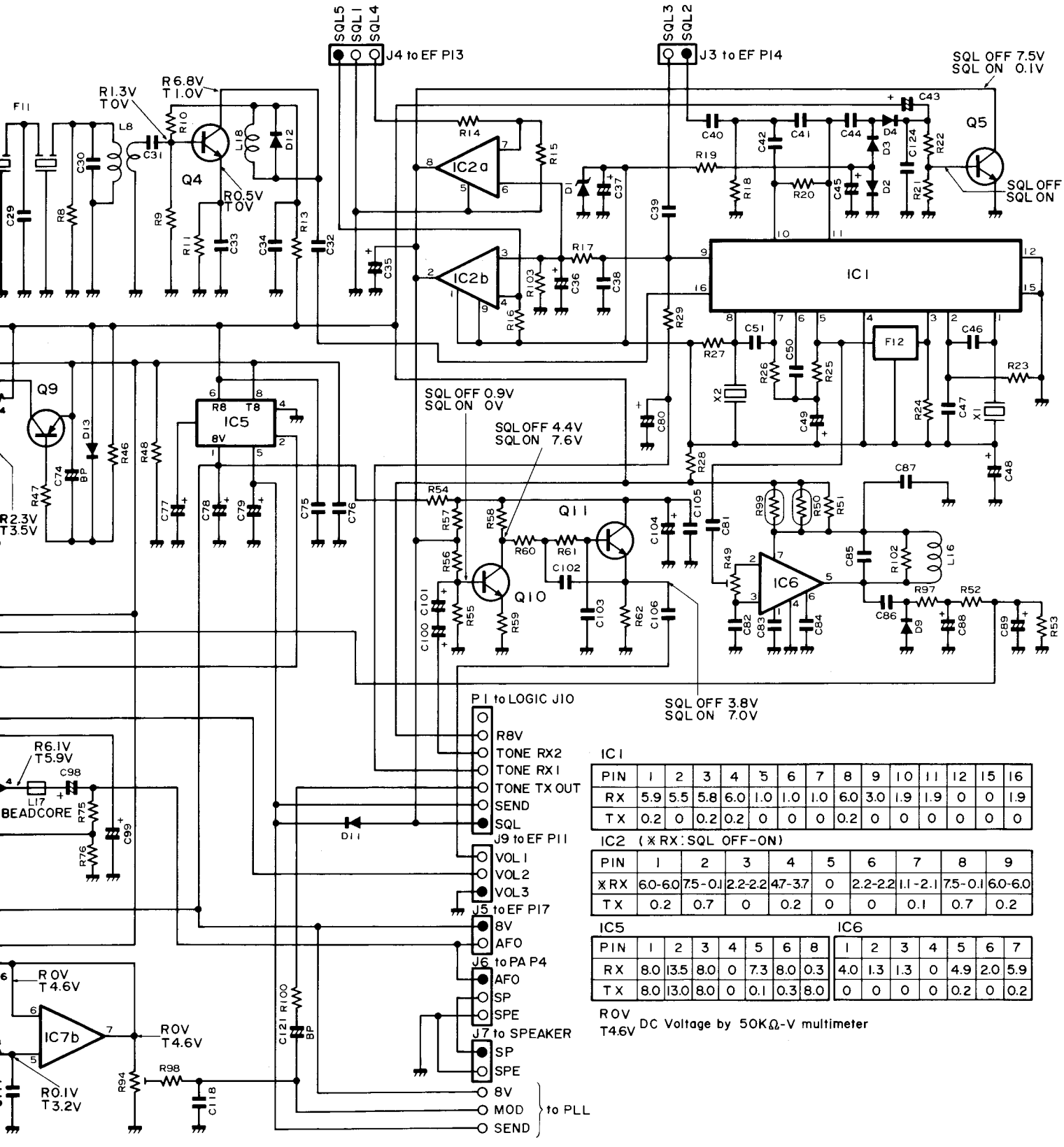
	NO.	1	4	5	6	7	8	9	10	11	12
LED	OFF	0	11.9	10.3	11.8	10.1	11.7	10.1	11.7	5.4	5.4
	ON	0.7	11.1	9.0	10.8	8.7	10.9	8.7	10.8	4.8	4.8

	NO.	2	3
	RX	0	0
TX	LOW	0.1	0.5
	HI	0.7	4.5

DC Voltage 50KΩ-V multimeter

MAIN UNIT


RX IN
to PA P6
J1
TX OUT
to PA P5
J2
from PLL
PLL OUT
PLL IN
J12 to PA P3
T8V
E
13.8
HV
S.RF
HI/LOW
J8 to EF P12
RFM
PCON
PAV
HV
HV
J10 to PA P2
J11 to EF P16
MIC
E
Q1
Q2
Q3
Q6
Q7
Q8
Q9
Q12
IC3
IC4
IC7a
IC7b
D5
D6
D7
D10
D13
F11
L7
L8
L15
L17
BEADCORE
R1.4V T0V
R7.3V T0V
R7.4V T0V
R13.0V T8.5V
R0V T0.7V
R0.3V T6.3V
R0.3V T6.6V
R0V T2.1V
R2.3V T3.5V
R1.3V T0V
R0.9V T4.3V
R13.5V HI P0.10.0V LOW P0.12.0V
R4.2V T4.0V
R6.1V T5.9V
0.5V
R0.1V T3.6V
R0.1V T4.3V
R0V T4.6V
R0.1V T3.2V
2.4V
1.8V



IC1

PIN	1	2	3	4	5	6	7	8	9	10	11	12	15	16
RX	5.9	5.5	5.8	6.0	1.0	1.0	1.0	6.0	3.0	1.9	1.9	0	0	1.9
TX	0.2	0	0.2	0.2	0	0	0	0.2	0	0	0	0	0	0

IC2 (※RX: SQL OFF-ON)

PIN	1	2	3	4	5	6	7	8	9
※RX	6.0-6.0	7.5-0.1	2.2-2.2	4.7-3.7	0	2.2-2.2	1.1-2.1	7.5-0.1	6.0-6.0
TX	0.2	0.7	0	0.2	0	0	0.1	0.7	0.2

IC5

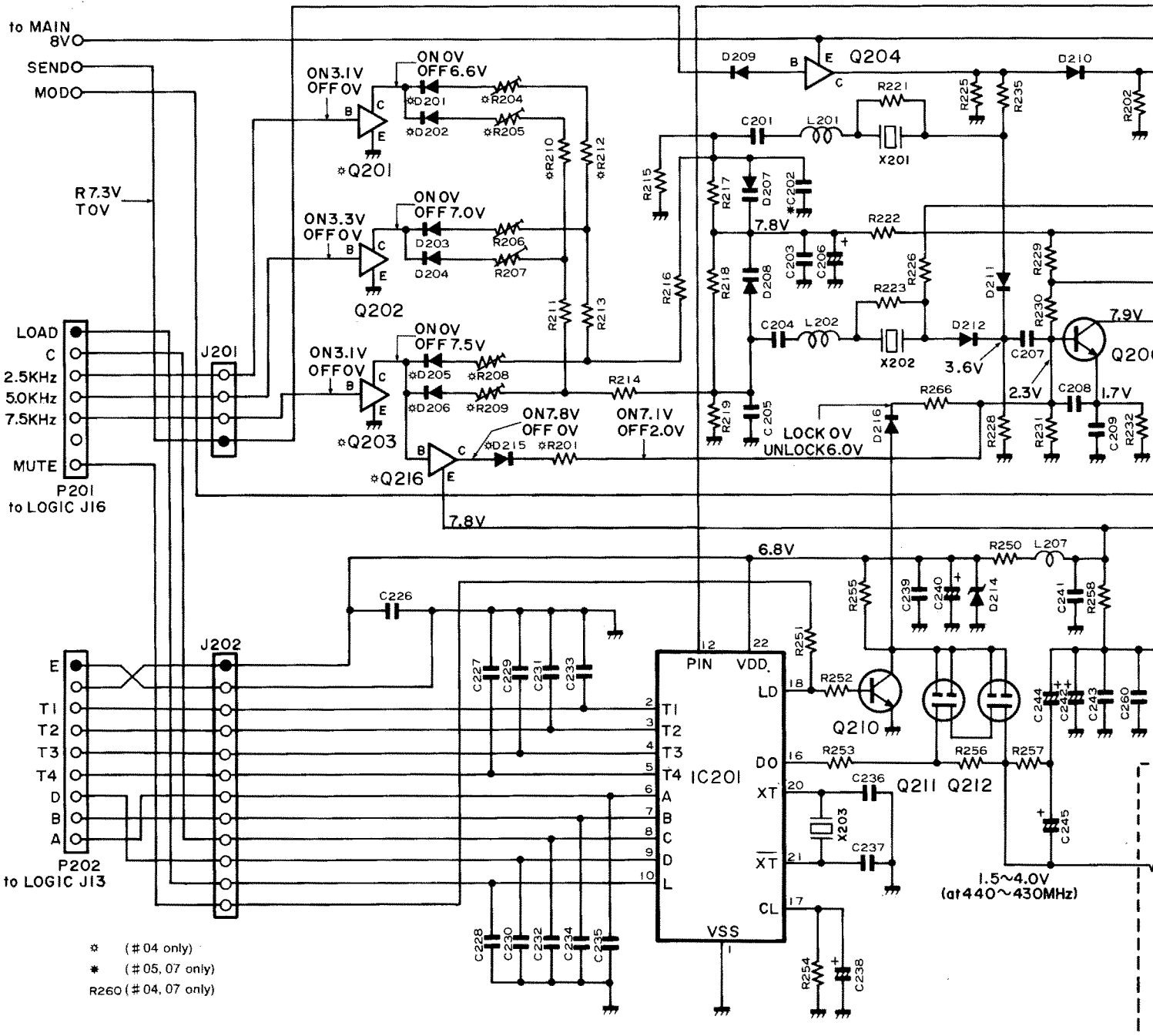
PIN	1	2	3	4	5	6	8
RX	8.0	13.5	8.0	0	7.3	8.0	0.3
TX	8.0	13.0	8.0	0	0.1	0.3	8.0

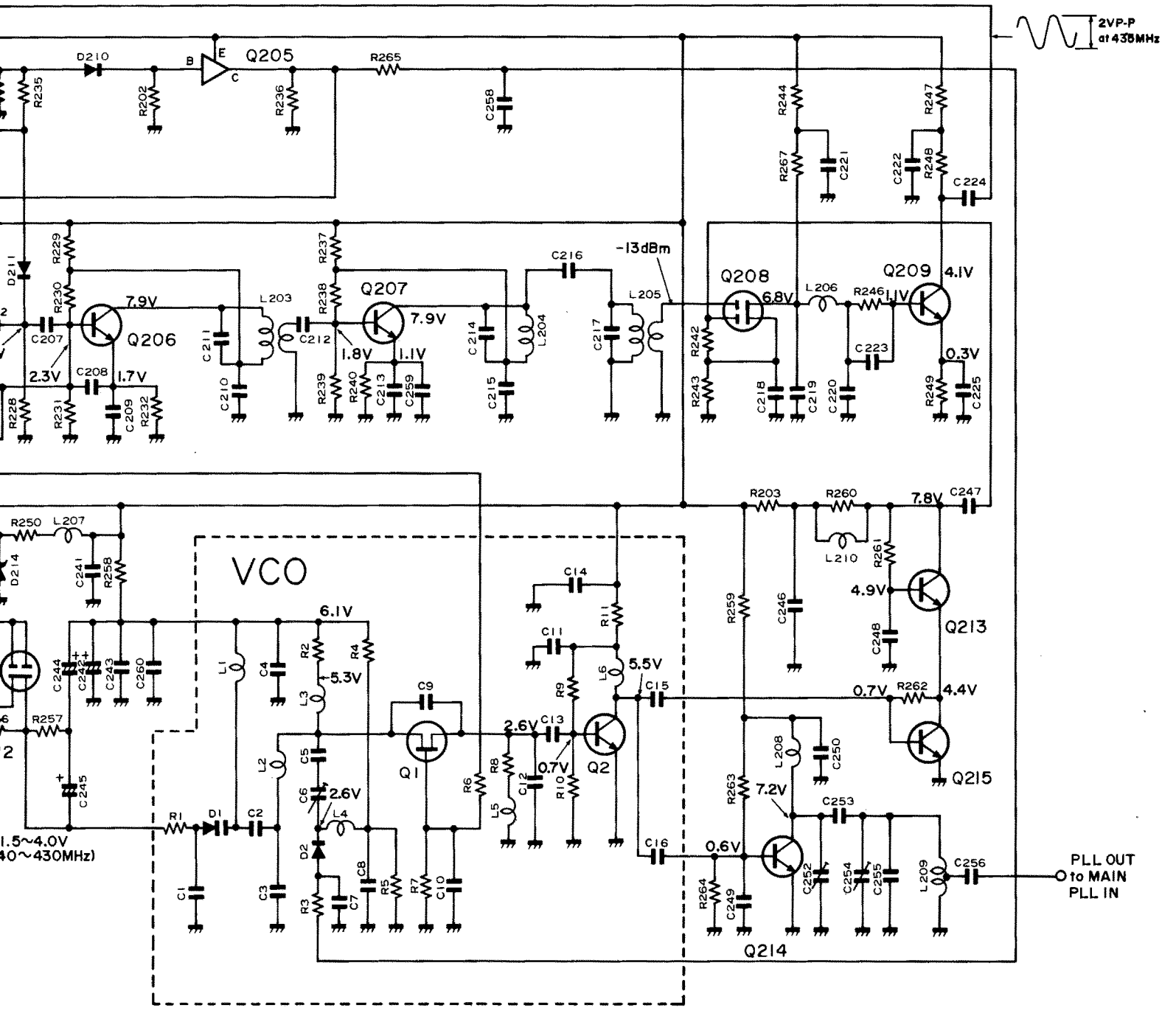
IC6

1	2	3	4	5	6	7
4.0	1.3	1.3	0	4.9	2.0	5.9
0	0	0	0	0.2	0	0.2

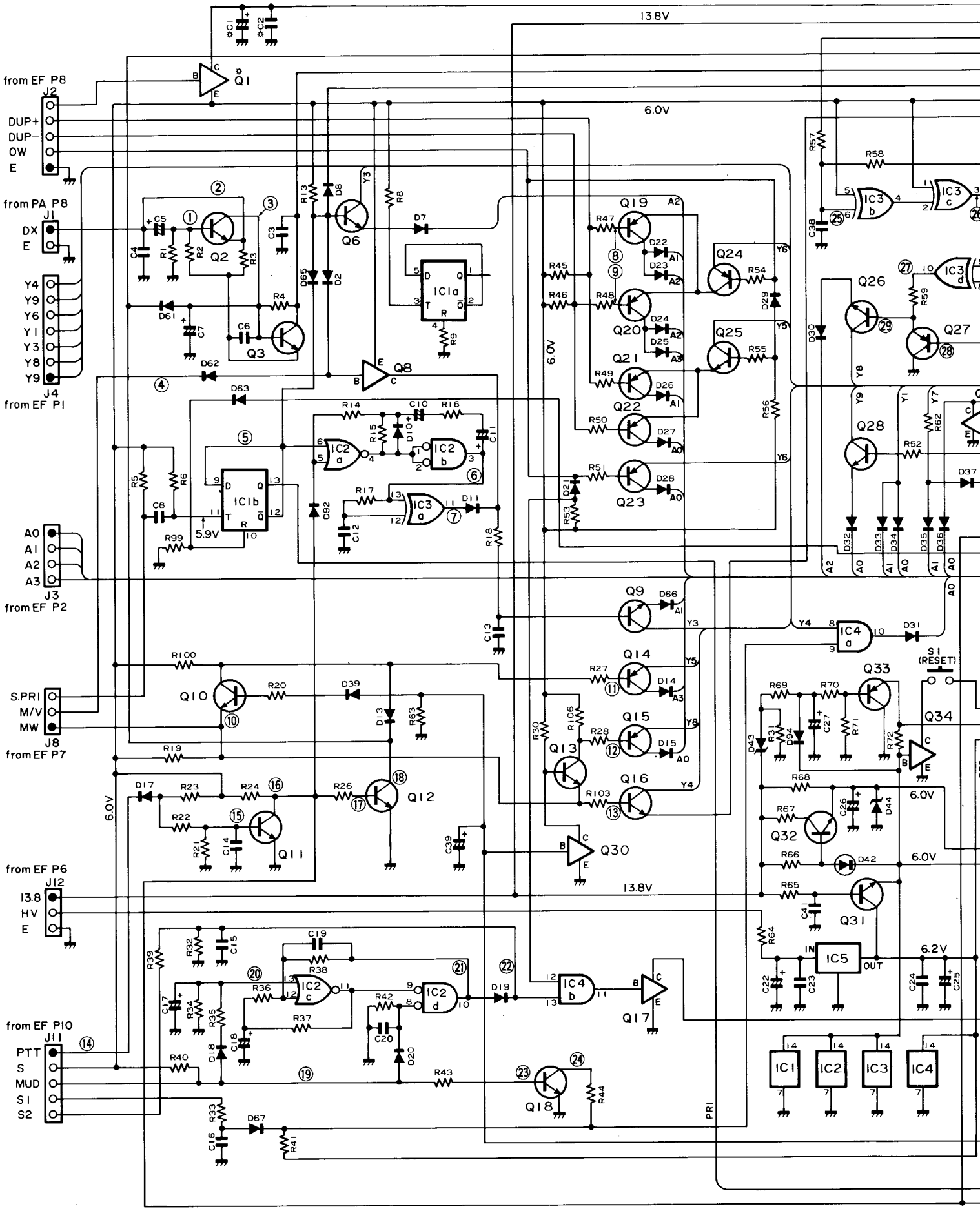
R0V
T4.6V DC Voltage by 50KΩ-V multimeter

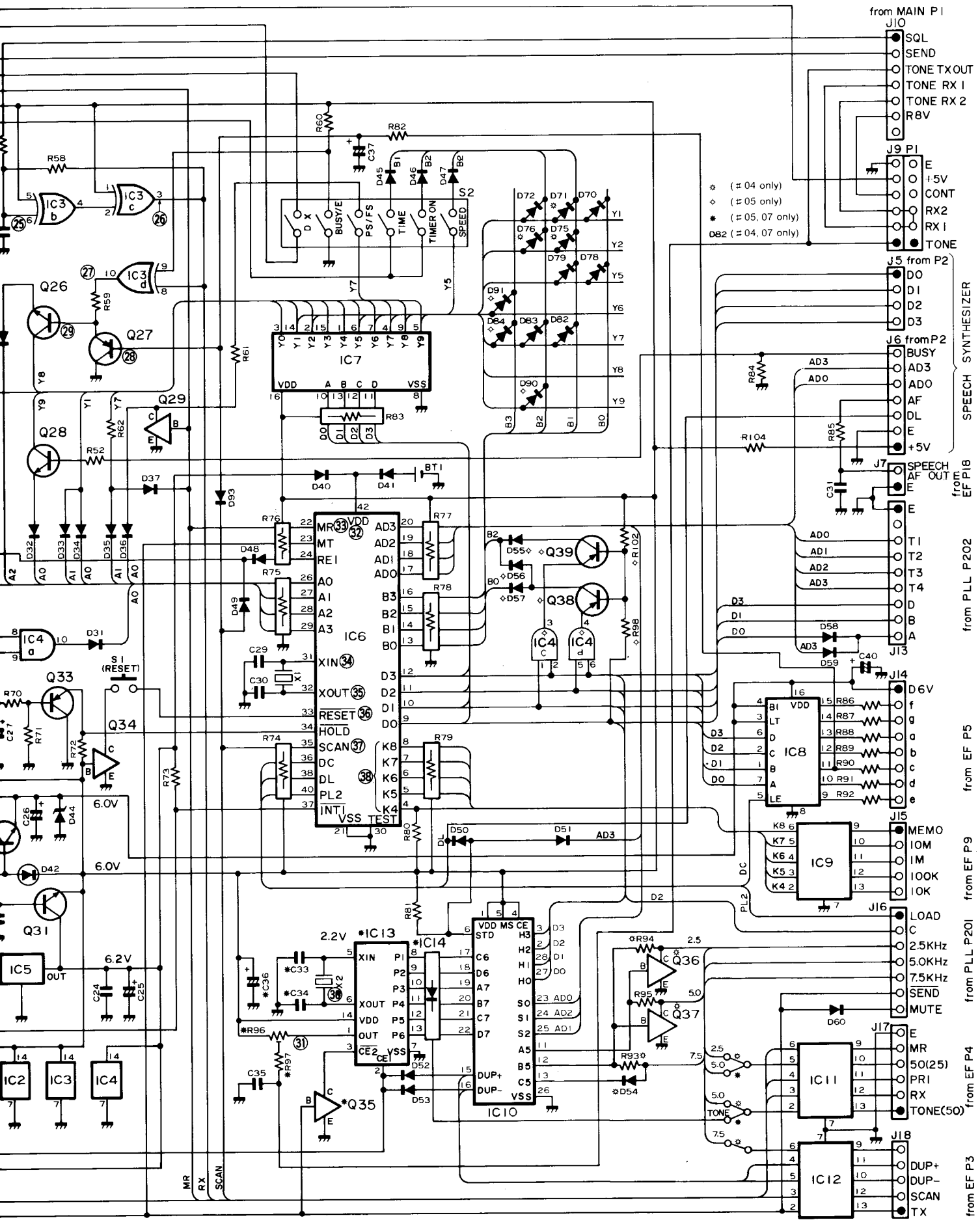
PLL/VCO UNIT


to MAIN 8V
SEND
MOD
R7.3V T0V
LOAD
C
2.5KHz
5.0KHz
7.5KHz
MUTE
P201 to LOGIC J16
J201
ON3.1V OFF0V
ON0V OFF6.6V
*Q201
ON3.3V OFF0V
ON0V OFF7.0V
Q202
ON3.1V OFF0V
ON0V OFF7.5V
*Q203
ON7.8V OFF0V
ON7.1V OFF2.0V
*Q216
Q204
LOCK0V UNLOCK6.0V
7.8V
6.8V
J202
E
T1
T2
T3
T4
D
B
A
P202 to LOGIC J13
IC201
PIN
VDD
LD
DO
XT
CL
VSS
Q210
Q211 Q212
1.5~4.0V (at440~430MHz)
* (#04 only)
* (#05, 07 only)
R260 (#04, 07 only)


2VP-P at 438MHz
D210
Q205
R265
R235
R202
R236
C258
R244
R247
R267
C221
C222
R248
C224
D211
R229
R230
7.9V
Q206
C207
2.3V
C208
1.7V
R228
R231
C209
R232
L203
C211
C210
R237
R238
Q207
7.9V
C212
1.8V
1.1V
R239
R240
C213
C259
C216
-13dBm
C214
L204
C215
L205
C217
Q208
6.8V
L206
R246
Q209
4.1V
1.1V
R242
R243
C218
C219
C220
C223
0.3V
R249
C225
R250
L207
D214
C241
R258
R257
C245
C244
C243
C260
VCO
6.1V
L1
C4
R2
R4
5.3V
L3
C5
L2
C6
2.6V
L4
R1
D1
C2
D2
C1
C3
C8
R5
R3
C7
C9
Q1
R7
C10
R6
R8
L5
C12
C14
R11
C11
R9
L6
5.5V
C15
2.6V
C13
0.7V
R10
Q2
C16
R203
R260
7.8V
C247
L210
R261
4.9V
Q213
R259
C246
C248
0.7V
R262
4.4V
Q215
L208
C250
R263
7.2V
C253
0.6V
R264
C249
C252
C254
C255
L209
C256
Q214
PLL OUT
to MAIN
PLL IN
1.5~4.0V
40~430MHz)

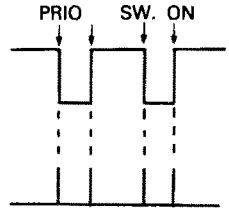
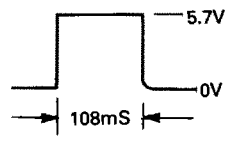
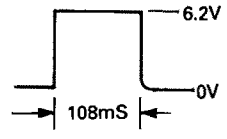
LOGIC UNIT

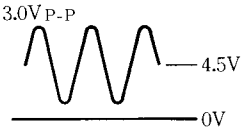
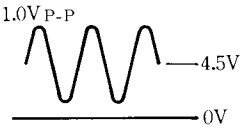
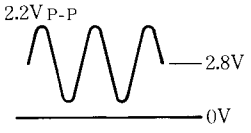
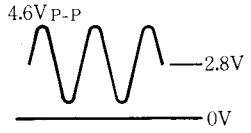
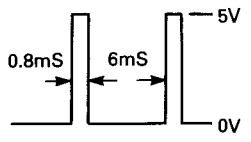

13.8V
6.0V
from EF P8
J2
DUP+
DUP−
OW
E
from PA P8
J1
DX
E
Y4
Y9
Y6
Y1
Y3
Y8
Y9
J4
from EF P1
A0
A1
A2
A3
J3
from EF P2
S.PRI
M/V
MW
J8
from EF P7
from EF P6
J12
13.8
HV
E
from EF P10
J11
PTT
S
MUD
S1
S2
Q1
Q2
Q3
Q6
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
Q26
Q27
Q28
Q30
Q31
Q32
Q33
Q34
IC1a
IC1b
IC1
IC2
IC3
IC4
IC5
5.9V
6.2V
S1 (RESET)
PRI


from MAIN P1
J10
SQL
SEND
TONE TX OUT
TONE RX 1
TONE RX 2
R8V
J9 P1
E
+5V
CONT
RX2
RX1
TONE
J5 from P2
D0
D1
D2
D3
J6 from P2
BUSY
AD3
AD0
AF
DL
E
+5V
SPEECH SYNTHESIZER
J7
SPEECH AF OUT
E
from EF P18
J13
E
T1
T2
T3
T4
D
B
A
from PLL P202
J14
D6V
f
g
a
b
c
d
e
from EF P5
J15
MEMO
10M
1M
100K
10K
from EF P9
J16
LOAD
C
2.5KHz
5.0KHz
7.5KHz
SEND
MUTE
from PLL P201
J17
E
MR
50(25)
PRI
RX
TONE(50)
from EF P4
J18
DUP+
DUP-
SCAN
TX
from EF P3
* (#04 only)
◇ (#05 only)
✱ (#05, 07 only)
D82 (#04, 07 only)
S2
D X
BUSY/E
PS/FS
TIME
TIMER ON
SPEED
IC7
IC6
IC8
IC9
IC10
IC11
IC12
IC13
IC14
Q26
Q27
Q28
Q29
Q31
Q33
Q34
Q35
Q36
Q37
Q38
Q39
S1 (RESET)
6.0V
6.2V
2.2V
AD3
AD0
AD1
AD2
MR
RX
SCAN

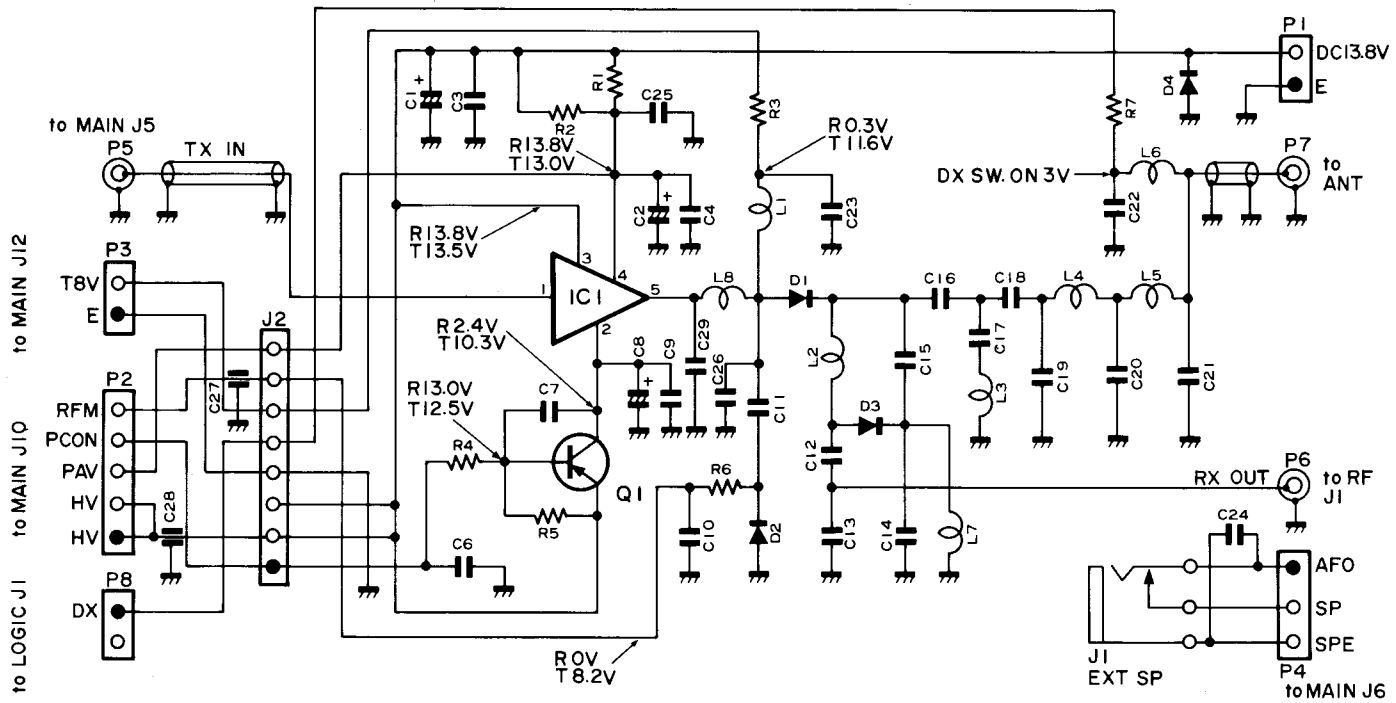
LOGIC UNIT

○ Test equipment: 10MHz oscilloscope
Multimeter 50kΩ/V
○ Test frequency: 435.00MHz

No.	Point	Conditions	Voltage
1	Q2 Base	DX SW. OFF DX SW. ON TX	0V 11.3V 0.5V
2	Q2 Emitter	DX SW. OFF DX SW. ON TX	0V 13.5V 1.0V
3	Q2 Collector	DX SW. OFF DX SW. ON TX	0.2V 13.8V 0.5V
4	D62 Cathode	M/V SW. OFF M/V SW. ON	5.0V 0V
5	IC1 PIN9 (PIN10)	PRIO SW. OFF PRIO SW. ON	6.1V 0V
6	IC2 PIN3	PRIO SW. ON	 * Voltage level changes state with each push of PRIO. SW.
7	IC3 PIN11	PRIO SW. ON	
8	Q19 Base	DUP SW. OFF DUP+ SW. ON	5.3V 0V
9	Q20 Base	DUP SW. OFF DUP− SW. ON	5.3V 0V
10	Q10 Emitter	MW SW. OFF MW SW. ON	5.8V 0V
11	Q14 Base	RX TX	5.3V 1.0V
12	Q15 Base	MW SW. OFF MW SW. ON	5.3V 0.2V
13	Q16 Base	MW SW. OFF MW SW. ON	5.7V 0.7V
14	J11 PIN1	RX TX	5.2V 0V
15	Q11 Base	RX TX	0.7V 0.2V
16	Q11 Collector	RX TX	0V 4.6V
17	Q12 Base	RX TX	0V 0.7V
18	Q12 Collector	RX TX	6.3V 0.1V
19	J11 PIN3	MUD(MIC UP/DN) SW. OFF MUD SW. UP MUD SW. DN	5.7V 0V 2.0V
20	IC2 PIN13	MUD SW. OFF MUD SW. UP MUD SW. DN	5.3V 0V 1.6V
21	IC2 PIN10	MUD SW. UP or DN ON	
22	IC4 PIN13	MUD SW. UP or DN ON	
23	Q18 Base	MUD SW. OFF MUD SW. UP MUD SW. DN	0.6V 0V 0.6V
24	Q18 Collector	MUD SW. OFF MUD SW. UP MUD SW. DN	0V 2.1V 0V
25	IC3 PIN6	SQL OFF SQL ON TX	5.9V 0V 0.4V
26	IC3 PIN3	SQL OFF SQL ON TX	6.0V 0V 0V
27	IC3 PIN10	SQL OFF SQL ON TX	6.0V 0V 0V
28	Q27 Base	SQL OFF SQL ON TX	0.5V 0.5V 0.5V
29	Q26 Base	SQL OFF SQL ON TX	0.7V 0V 0V

No.	Point	Conditions	Voltage
30	IC13 PIN16	TONE NO. 08	
31	IC13 PIN1	TONE NO. 08	
32	IC6 PIN42 (V_{DD})	POWER SW. OFF POWER SW. ON BACK UP	5.8V 5.5V 3.0V
33	IC6 PIN22 (MR)	M/VFO SW.OFF M/VFO SW. ON	0V 5.0V
34	IC6 PIN31 (X_{IN})		
35	IC6 PIN32 (X_{OUT})		
36	IC6 PIN33 (RESET)	S1 OFF S1 ON	3.9V 0V
37	IC6 PIN35 (SCAN)	S/S SW. OFF S/S SW. ON	0.1V 5.3V
38	IC6 PIN4~ PIN8 (K4~K8)		

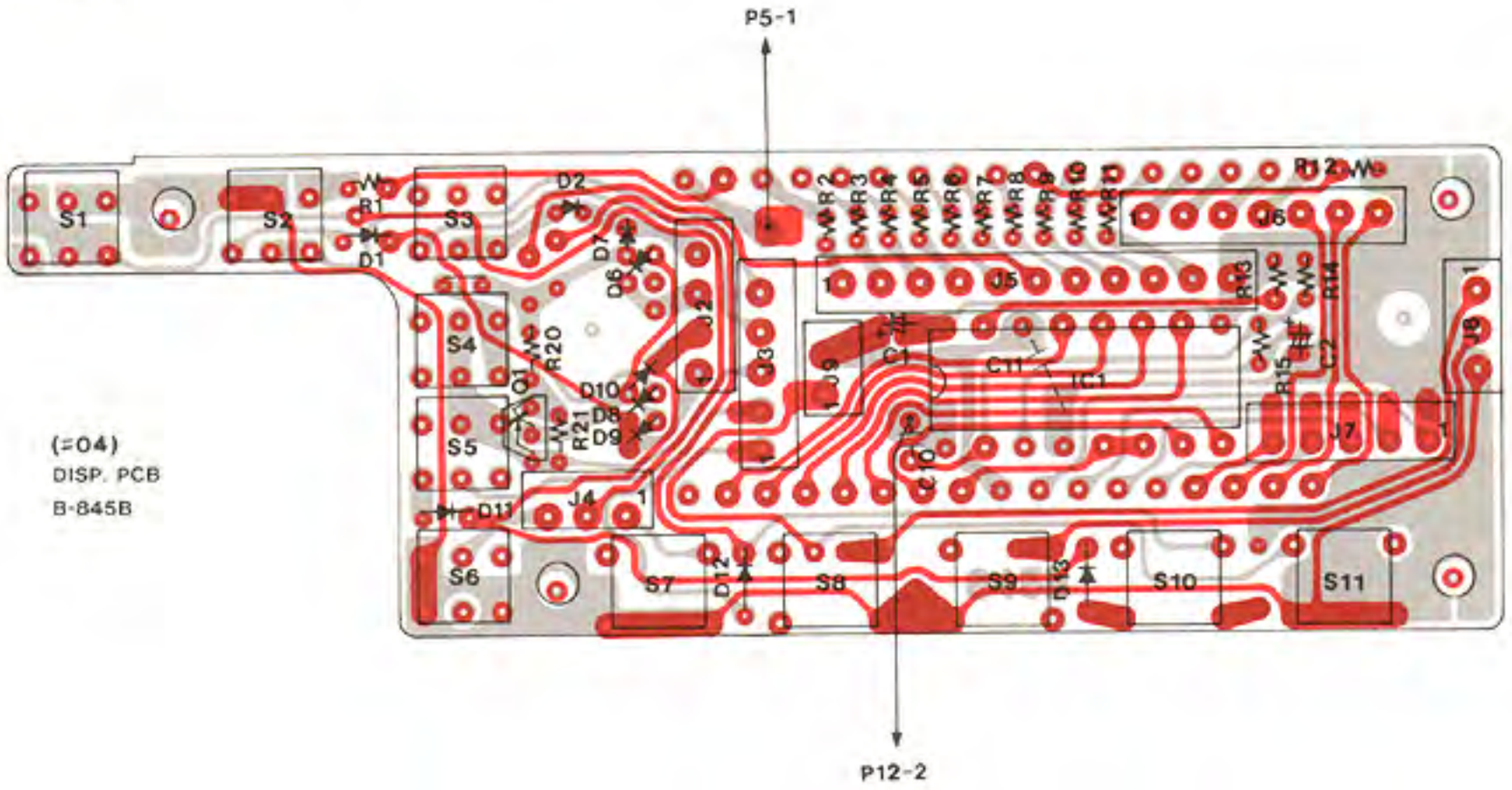
PA UNIT



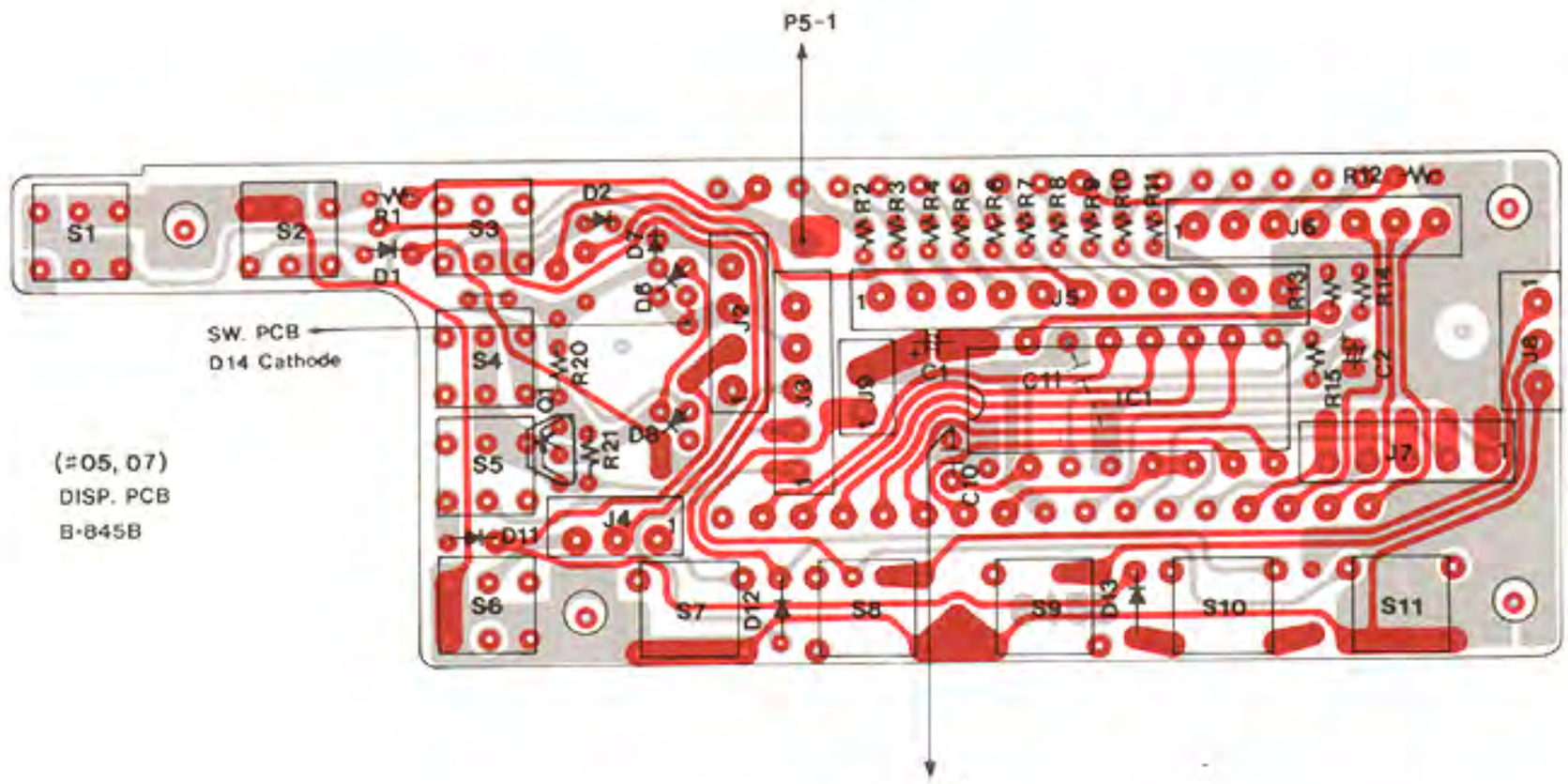
R0V
T8.2V DC Voltage by 50 KΩ-V multimeter

SECTION 9 BOARD LAYOUTS

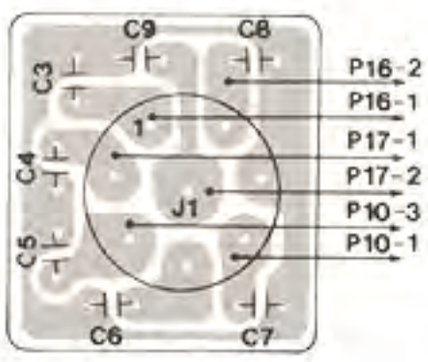
EF UNIT



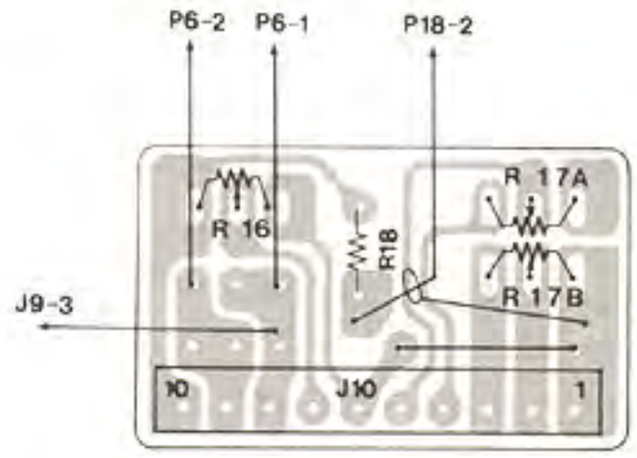
(=04)
DISP. PCB
B-845B



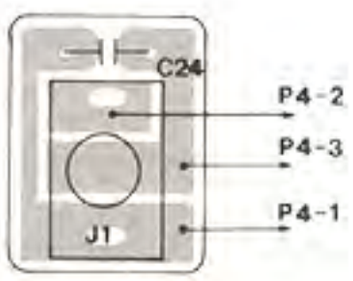
(=05, 07)
DISP. PCB
B-845B



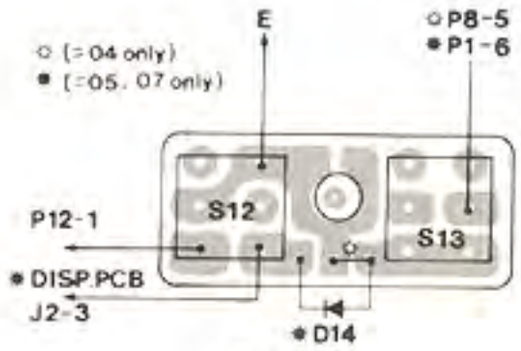
MIC. PCB
B-848A



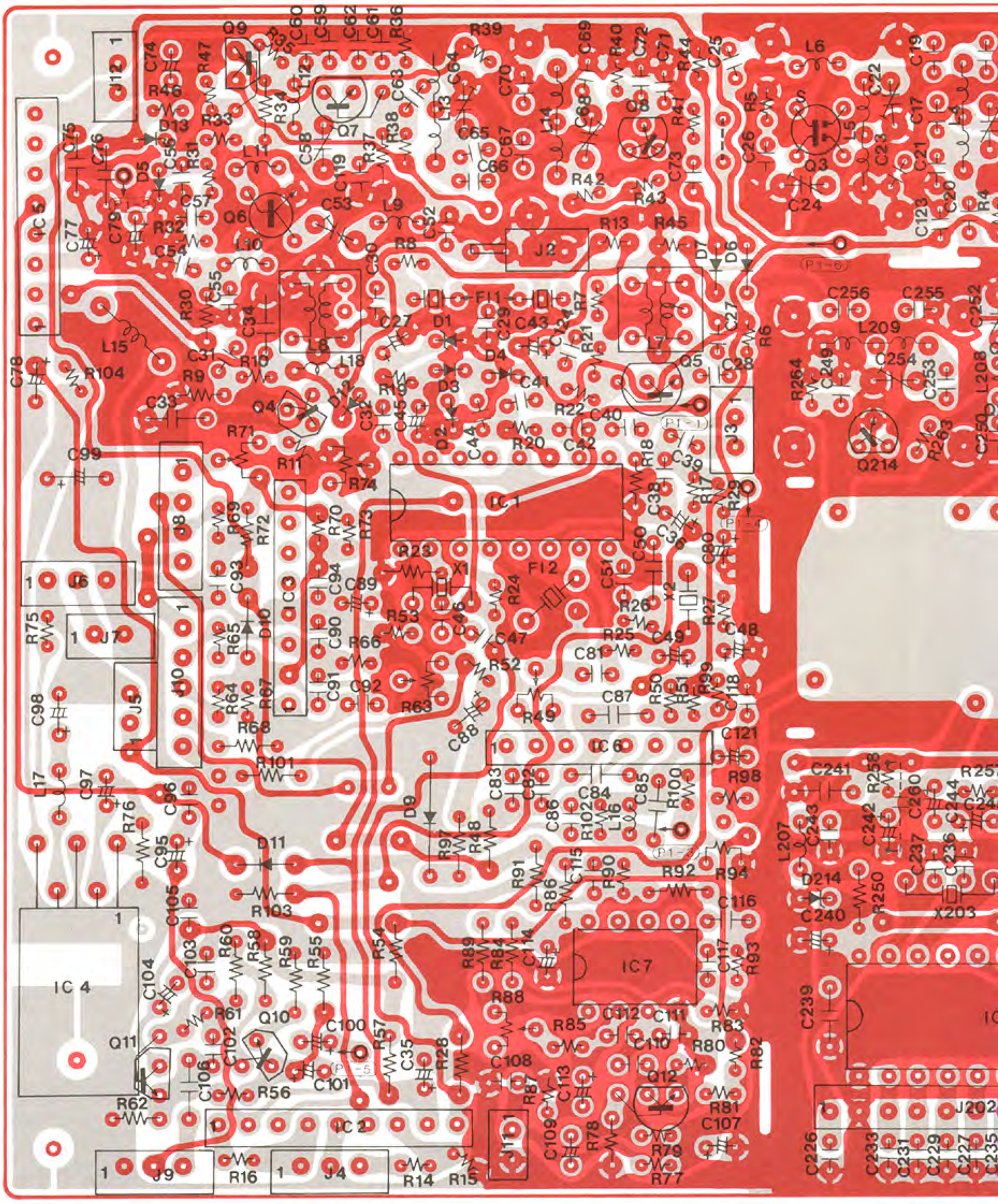
VR. PCB
B-847A



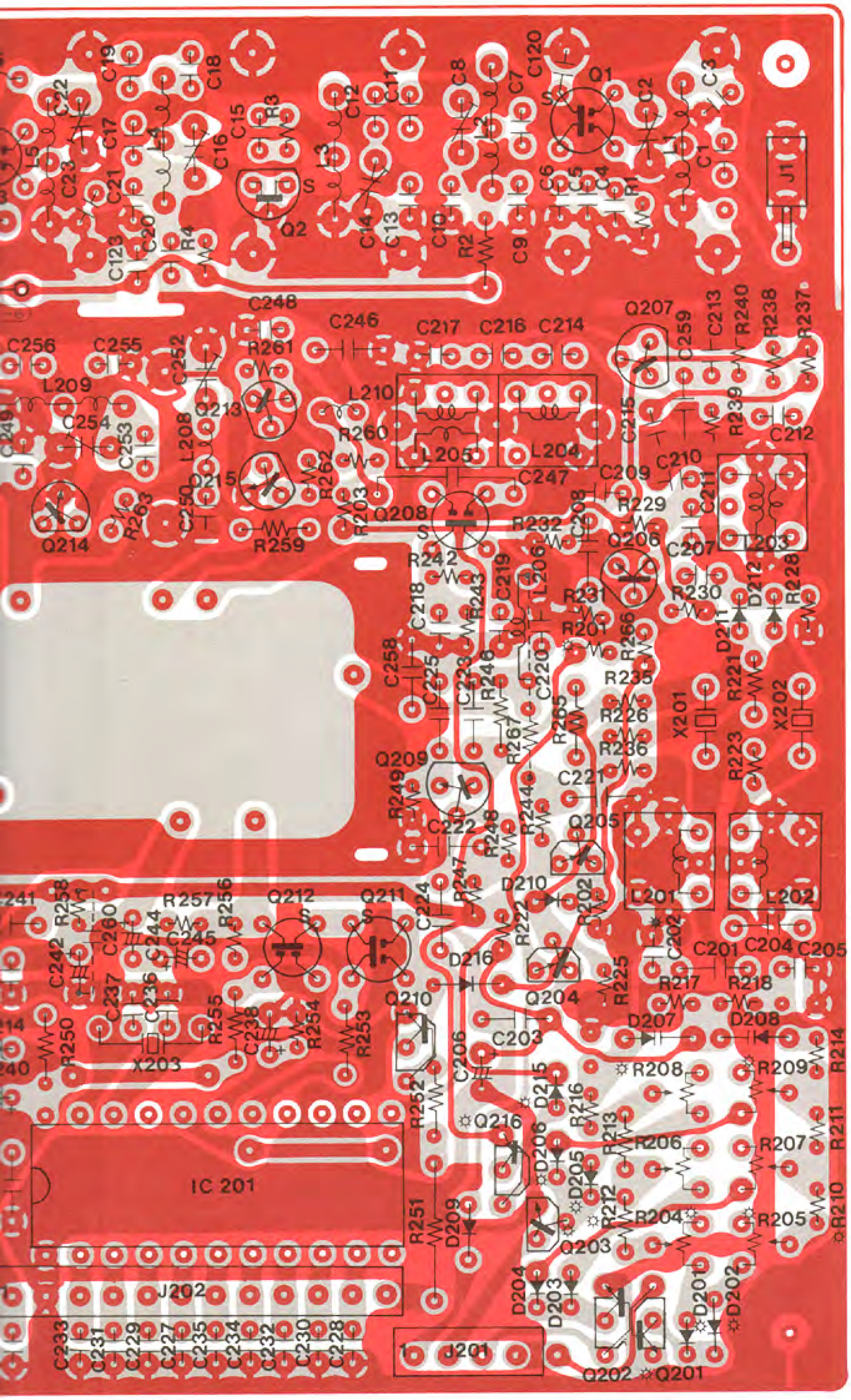
SPJ. PCB
B-855A



SW. PCB
B-846A



MAIN & PLL UNIT
B-916C



PLL UNIT
16C

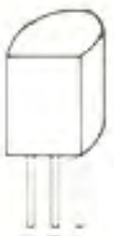
1
4 3SK 2
3
1. Drain
2. Source
3. Gate 1
4. Gate 2

Q1, 3, 208, 211, 212

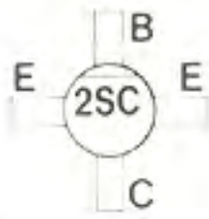
1. Source
2. Drain
3. Gate

Q2

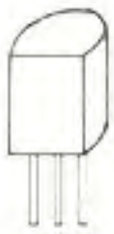
Q4



Q5, 12, 206



Q6

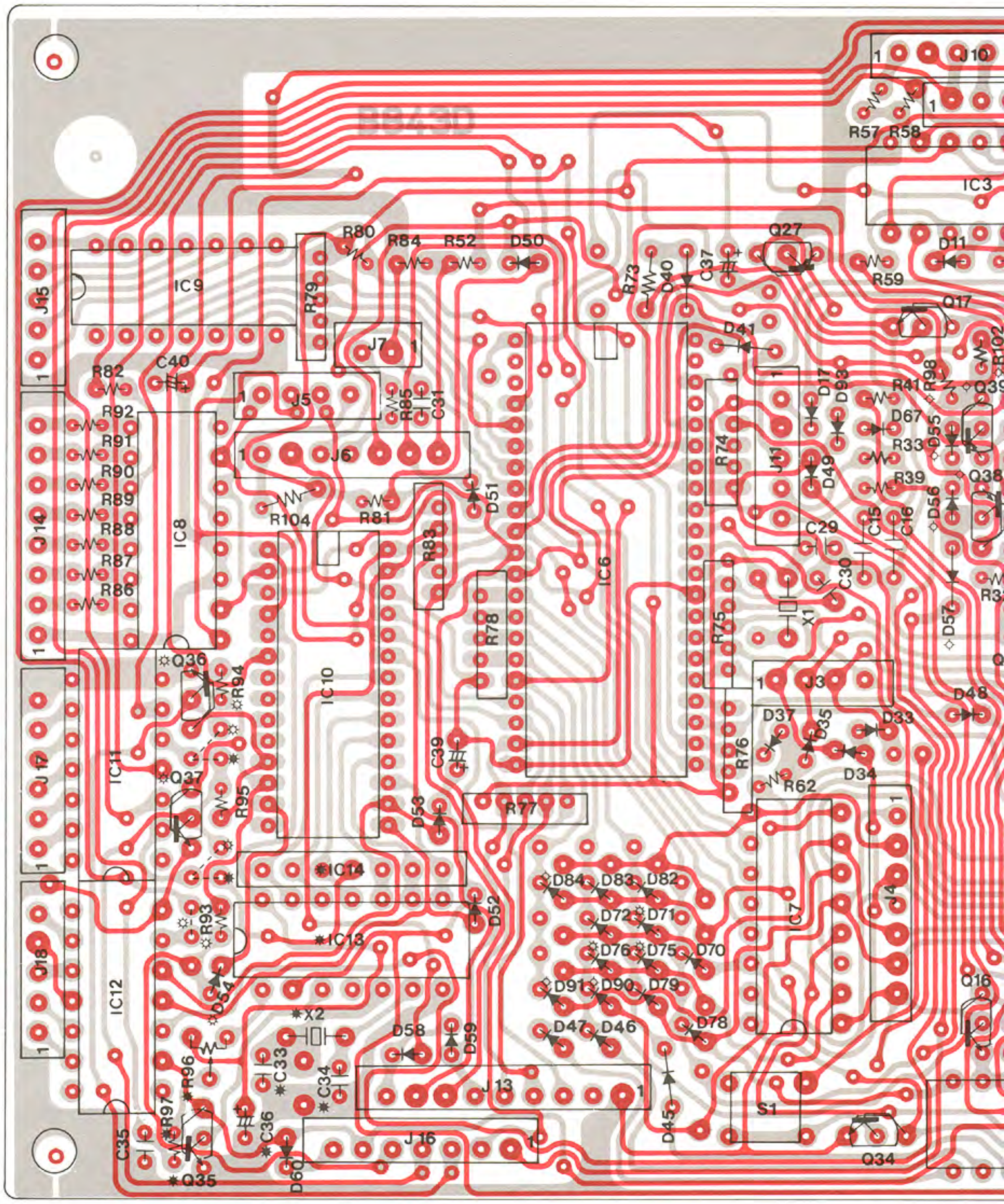


Q7, 8, 214, 215

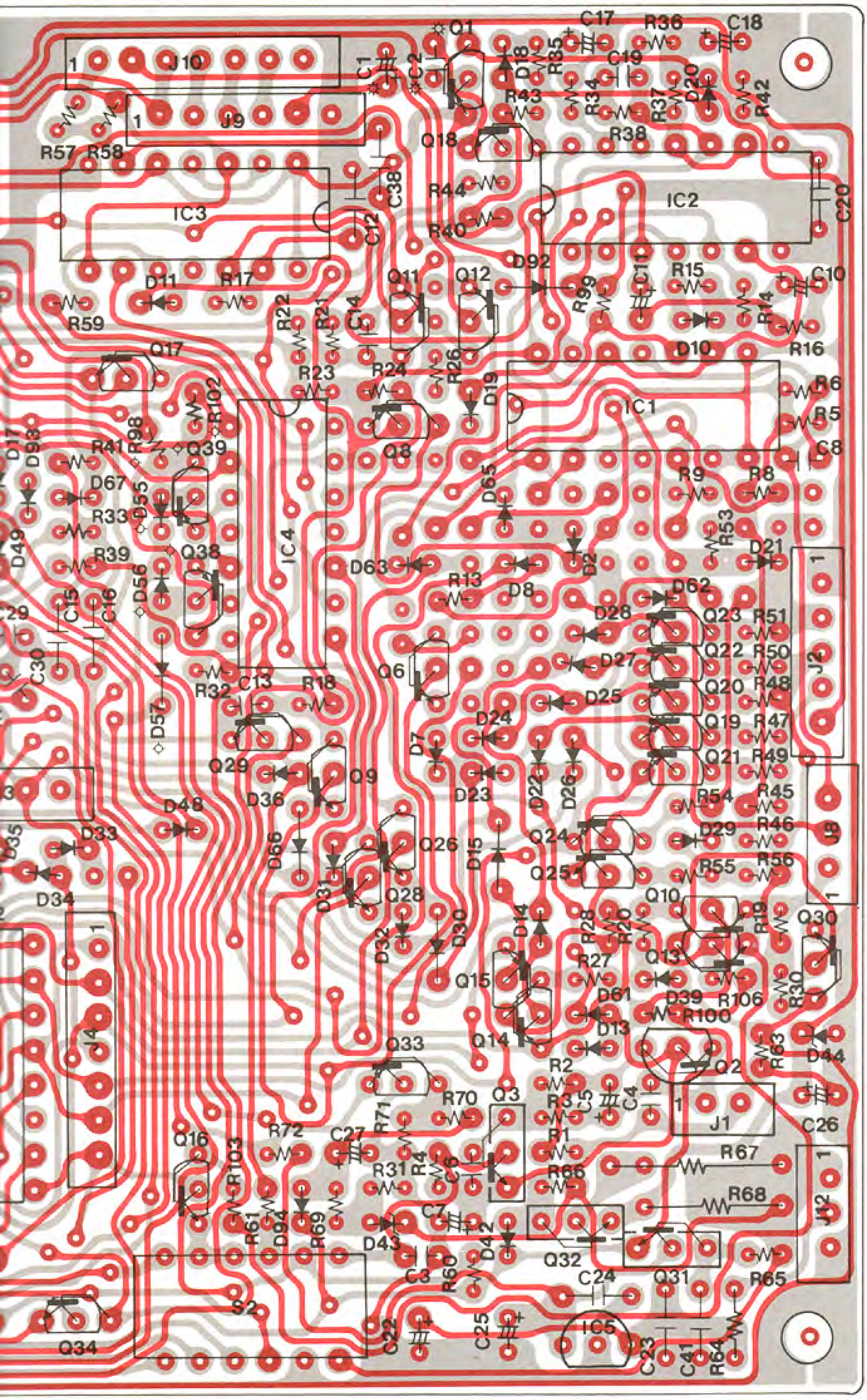
Q9, 10, 11, 201～205, 210, 216

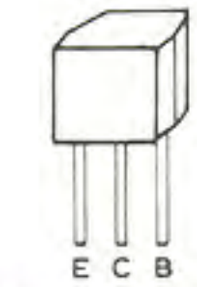
Q207, 209, 213

☼ (=04 only)
◇ (=05 only)
✱ (=05,07 only)
R260 (=04,07 only)

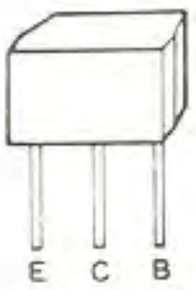


LOGIC UNIT
B-843D





Q 1 – Q30
Q 33 – Q 39

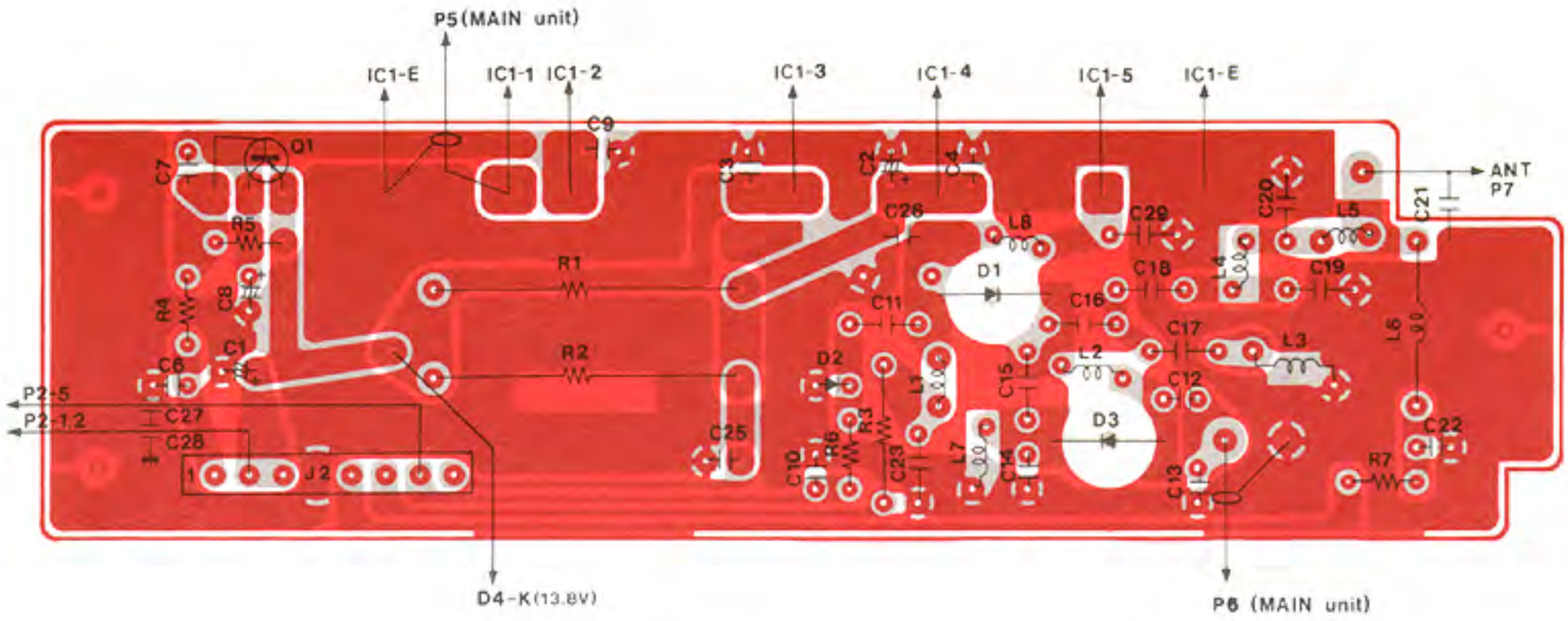


Q 3, Q 31, Q 32

☼ (= 04 only)
◇ (= 05 only)
✱ (= 05, 07 only)
D82 (= 04, 07 only)

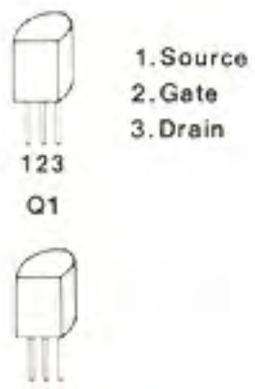
C UNIT
3D

PA UNIT



PA UNIT
B-875A

VCO UNIT



VCO UNIT
B-917

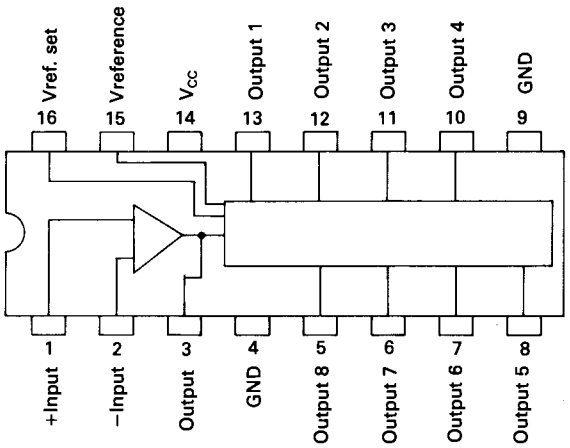
SECTION 10 IC SPECIFICATIONS

M51909P (LED LEVEL METER INDICATOR)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	16	V
Output current	I_O	25	mA
Input voltage	V_{IN}	$-3 \sim V_{CC}$	V
Operating free-air temperature range	T	$-20 \sim +75$	°C

PIN CONNECTION

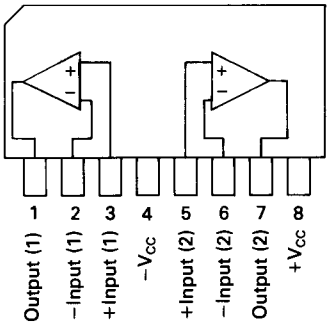


M5218L (DUAL AUDIO AMPLIFIER)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	$\pm V_{CC}$	±18	V
Operating free-air temperature range	T	$-20 \sim +75$	°C

PIN CONNECTION

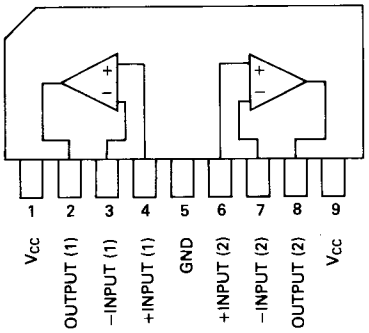


TA75393S (DUAL COMPARATOR)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	36	V
Operating free-air temperature range	T	−40 ~ 85	°C

PIN CONNECTION

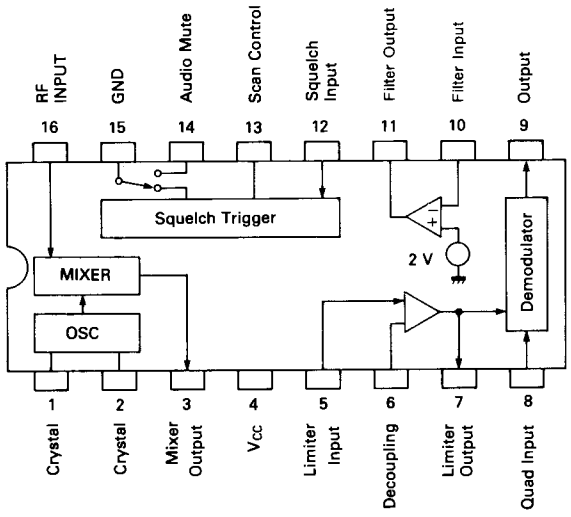


MC3357P (NARROW BAND FM IF)

Maximum Rating

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	12	V
Operating free-air temperature range	T	−30 ~ 70	°C

PIN CONNECTION

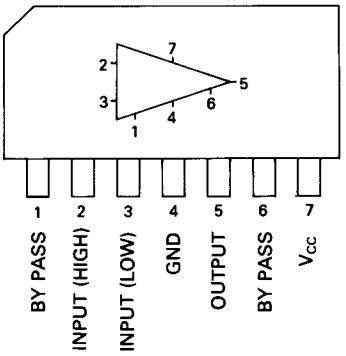


μPC577H (FM-IF AMPLIFIER)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	15	V
Input voltage	V_{IN}	±3.0	V
Operating free-air temperature range	T	−20 ~ 75	°C

PIN CONNECTION

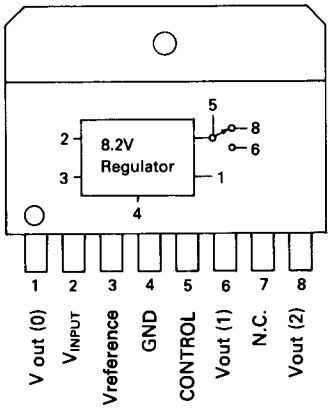


MB3756 (3-OUTPUT 8.2 V VOLTAGE REGULATOR)

Maximum Ratings

Item	Symbol	Rating	Unit
Input voltage	V_{IN}	18	V
Output current	Iout	100 (Vout (0), Vout (1)) 200 (Vout (2))	mA mA
Operating free-air temperature range	T	−20 ~ 75	°C

PIN CONNECTION

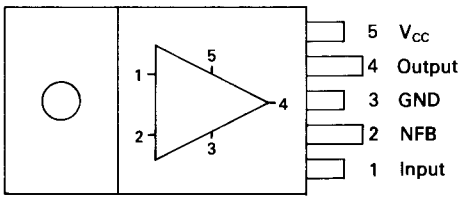


μPC2002H (5.4W AUDIO POWER AMPLIFIER)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	18	V
Output power	P_O	5.4 (4Ω Load)	W
Total dissipation	P_D	15	W
Audio distortion	T.H.D.	1.0	%
Operating free-air temperature range	T	−30 ~ 75	°C

PIN CONNECTION

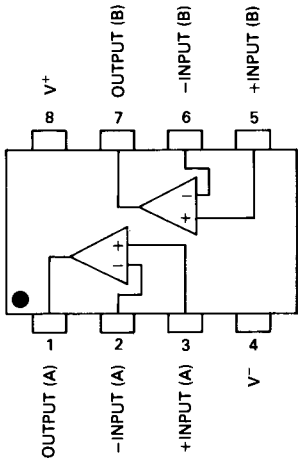


NJM 4558 D (DUAL OPERATIONAL AMPLIFIER)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	$V^{\pm}$	±18	V
Operating free-air temperature range	T	−20 ~ 75	°C

PIN CONNECTION

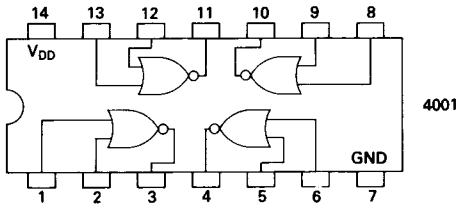


TC4001UBP (Quad 2-input positive NOR GATE)
TC4013BP (Dual D-type FLIP FLOP)
TC4028BP (BCD to Decimal DECODER)
TC4030BP (Quad Exclusive-OR GATE)
TC4081BP (Quad 2-input positive AND GATE)
TC4511BP (BCD to 7-SEGMENT DECODER and DRIVER)

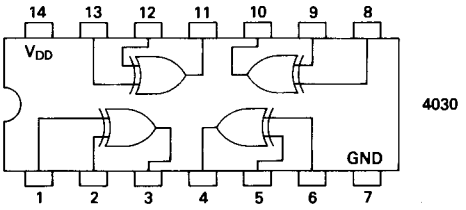
Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	3 ~ 18	V
Input voltage	V_{IN}	0 ~ V_{DD}	V
Operating free-air temperature range	T	−40 ~ 85	°C

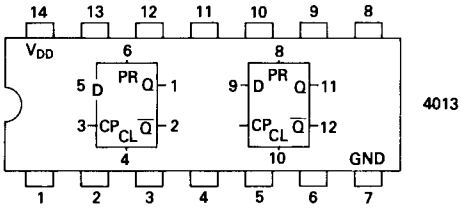
PIN CONNECTION



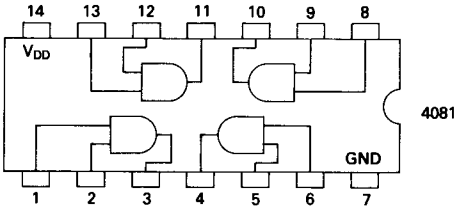
4001



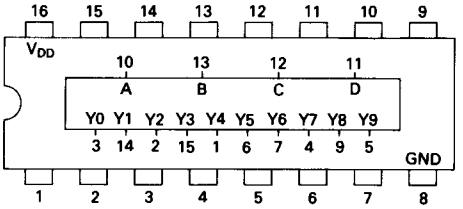
4030



4013



4081



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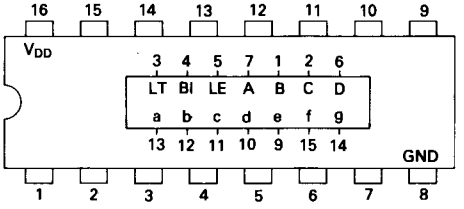


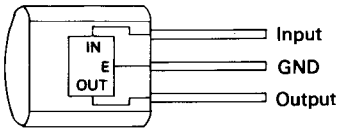
4511

μA78L062AW (6.2V VOLTAGE REGULATOR)

Maximum Ratings

Item	Symbol	Rating	Unit
Input Voltage	V_{IN}	30	V
Total dissipation at 25°C	P	0.8	W
Operating free-air temperature range	T	0 ~ 150	°C

PIN CONNECTION



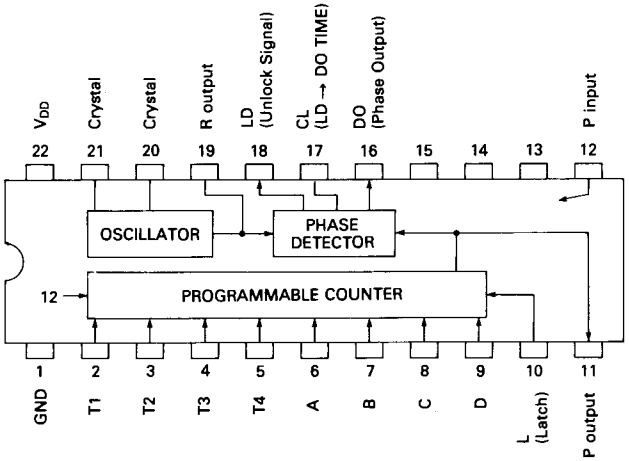
μA78L062AW

TC9123BP (PROGRAMMABLE PHASE-LOCKED LOOP)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	−0.3 ~ 9.5	V
Input voltage	V_{IN}	−0.3 ~ V_{DD} ±0.3	V
Operating free-air temperature range	T	−30 ~ 70	°C

PIN CONNECTION

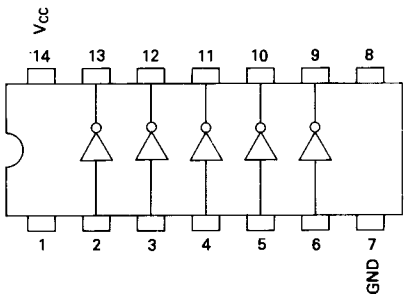


BA612 (5-UNIT 400 mA DARLINGTON TRANSISTOR ARRAY)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	30	V
Collector current	I_C	400	mA
Input voltage	V_{IN}	−0.5 ~ 30	V
Operating free-air temperature range	T	−25 ~ 75	°C

PIN CONNECTION

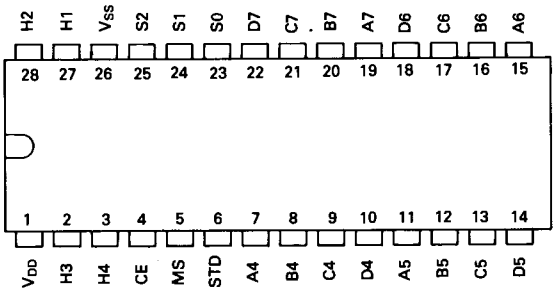


TMS1024NLC (I/O EXPANDER)

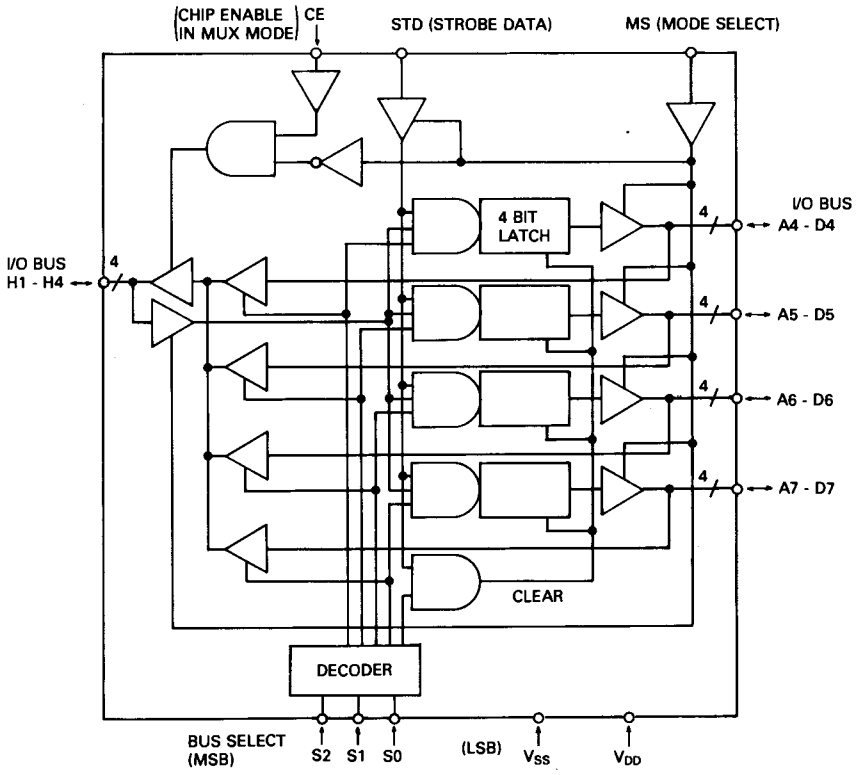
Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	7	V
Data input and output voltage	V_{IN}	$-0.3 \sim V_{DD} +0.3$	V
Operating free-air temperature range	T	$-10 \sim 70$	°C

PIN CONNECTIONS



BLOCK DIAGRAM

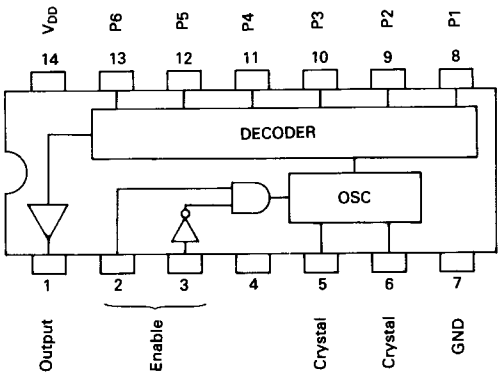


S-7116A (PROGRAMMABLE TONE GENERATOR)

Maximum Ratings

Item	Symbol	Rating	Unit
Power supply voltage	V_{DD}	12	V
Operating free-air temperature range	T	−25 ~ 70	°C

PIN CONNECTION



PROGRAMMING TABLE

Tone freq.	P1	P2	P3	P4	P5	P6	Tone freq.	P1	P2	P3	P4	P5	P6	Tone freq.	P1	P2	P3	P4	P5	P6
67.0	1						136.5	1		1		1		500	1	1	1			1
71.9		1					141.3		1	1		1		600				1		1
74.4	1	1					146.2	1	1	1		1		700	1			1		1
77.0			1				151.4				1	1		800		1		1		1
79.7	1		1				156.7	1			1	1		900	1	1		1		1
82.5		1	1				162.2		1		1	1		1000			1	1		1
85.4	1	1	1				167.9	1	1		1	1		1600	1		1	1		1
88.5				1			173.8			1	1	1		1700		1	1	1		1
91.5	1			1			179.9	1		1	1	1		1750	1	1	1	1		1
94.8		1		1			186.2		1	1	1	1		1800					1	1
97.4	1	1		1			192.8	1	1	1	1	1		1300	1				1	1
100.0			1	1			203.5						1	2000		1			1	1
103.5	1		1	1			210.7	1					1	2200	1	1			1	1
107.2		1	1	1			218.1		1				1	2975			1		1	1
110.9	1	1	1	1			225.7	1	1				1	2550	1		1		1	1
114.8					1		233.6			1			1	2295		1	1		1	1
118.8	1				1		241.8	1		1			1	2125	1	1	1		1	1
123.0		1			1		250.3		1	1			1	1275				1	1	1
127.3	1	1			1									1445	1			1	1	1
131.8			1		1															

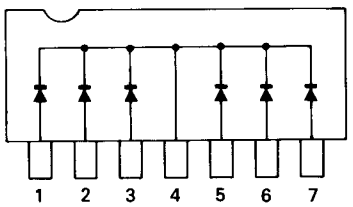
NOTE) 1 : V_{DD}
Blank : Ground or Open
Crystal frequency : 3.579545MHz

DAN601 (DIODE ARRAY)

Maximum Ratings

Item	Symbol	Rating	Unit
Reverse bias voltage	V_R	35	V
Forward current	I_F	25	mA
Operating free-air temperature range	T	−40 ~ 85	°C

PIN CONNECTION

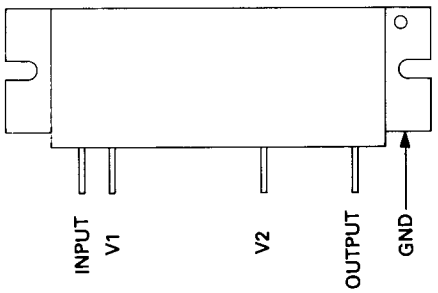


SC-1027 (25W UHF RF POWER AMPLIFIER)

Maximum Ratings (Tc = 25℃)

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	17	V
Input signal power	P_{IN}	0.5	W
Output signal power	Pout	40	W
Operating free-air temperature range	T	−30 ~ +110	℃

PIN CONNECTION



SECTION 11 PARTS LIST

[EF] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
IC1	IC	M51909P		
Q1	Transistor	2SA1048Y		
D1	Diode	1SS211		
D2	Diode	1SS211		
D6	Diode	1SS211		
D7	Diode	1SS211		
D8	Diode	1SS211		
D9	Diode	1SS211	(#04)	
D10	Diode	1SS211	(#04)	
D11	Diode	1SS211		
D12	Diode	1SS211		
D13	Diode	1SS211		
D14	Diode	1SS211	(#05, 07)	
R1	Resistor	470	ELR10	
R2	Resistor	220	ELR10	
R3	Resistor	1k	ELR10	
R4	Resistor	220	ELR10	
R5	Resistor	220	ELR10	
R6	Resistor	470	ELR10	
R7	Resistor	220	ELR10	
R8	Resistor	680	ELR10	
R9	Resistor	220	ELR10	
R10	Resistor	220	ELR10	
R11	Resistor	220	ELR10	
R12	Resistor	680	ELR10	
R13	Resistor	5.6k	EKR10	
R14	Resistor	10k	ELR10	
R15	Resistor	56k	ELR10	
R16	Variable	10kA	K09111	
R17	Variable	10kB×2	K0921F20	
R18	Resistor	10k	R20	
R20	Resistor	470k	ELR10	
R21	Resistor	100k	ELR10	
C1	Electrolytic	10	16V	MS7
C2	Electrolytic	2.2	50V	MS5 or RC3
C3	Ceramic	0.001	50V	
C4	Ceramic	0.001	50V	
C5	Ceramic	0.001	50V	
C6	Ceramic	0.001	50V	
C7	Ceramic	0.001	50V	
C8	Ceramic	0.001	50V	
C9	Ceramic	0.001	50V	
C10	Ceramic	0.001	50V	
C11	Ceramic	47p	50V	
J1	Connector	FM-214-8SS(P)		
J2	Connector	TLB-P04H-B1		
J3	Connector	TLB-P05H-B1		
J4	Connector	TLB-P03H-B1		
J5	Connector	TLB-P11H-B1		
J6	Connector	TLB-P07H-B1		
J7	Connector	TLB-P05H-B1		
J8	Connector	TLB-P03H-B1		
J9	Connector	TLB-P02H-B1		
J10	Connector	TLB-P10H-B1		

[EF] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)
P1	Connector	EHR-7
P2	Connector	EHR-4
P3	Connector	EHR-5
P4	Connector	EHR-6
P5	Connector	EHR-8
P6	Connector	EHR-3
P7	Connector	EHR-3
P8	Connector	EHR-5
P9	Connector	EHR-5
P10	Connector	EHR-5
P11	Connector	EHR-3
P12	Connector	EHR-4
P13	Connector	EHR-3
P14	Connector	EHR-2
P15	Connector	EHR-2
P16	Connector	EHR-2
P17	Connector	EHR-2
P18	Connector	EHR-2
DS1	LED Display	LS054-E (#04)
DS1	LED Display	LS054-J (#05, 07)
S1	Switch	SPH222A
S2	Switch	SPH221A
S3	Switch	SPH222A
S4	Switch	SPH221A
S5	Switch	SPH222A
S6	Switch	SPH222A
S7	Switch	HKW0269-01-200
S8	Switch	HKW0269-01-200
S9	Switch	HKW0269-01-200
S10	Switch	HKW0269-01-200
S11	Switch	HKW0269-01-200
S12	Switch	SPH221A
S13	Switch	SPH221A (#04)
S13	Switch	SPH222A (#05, 07)
S14	Rotary Encoder	EWT-XCCS2025B
SP1	Speaker	S05G29A
B1	DISP. PCB	B-845B
B2	SW. PCB	B-846A
B3	VR. PCB	B-847A
B4	MIC. PCB	B-848A
W1	Jumper	IPS-1041-4

[MAIN] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)
IC1	IC	MC3357P
IC2	IC	TA75393S
IC3	IC	M5218L
IC4	IC	μPC2002H
IC5	IC	MB3756
IC6	IC	μPC577H
IC7	IC	NJM4558D

[MAIN] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
Q1	FET	3SK121-Y	
Q2	FET	2SK125	
Q3	FET	3SK121-Y	
Q4	Transistor	2SC2668-0	
Q5	Transistor	2SC945-K	
Q6	Transistor	2SC3019	
Q7	Transistor	2SC2026	
Q8	Transistor	2SC2026	
Q9	Transistor	2SA1048-Y	
Q10	Transistor	2SC2458-GR	
Q11	Transistor	2SC2458-GR	
Q12	Transistor	2SC1571-G	
D1	Zener	RD6.2EB2	
D2	Diode	1SS53	
D3	Diode	1S953	
D4	Diode	1S953	
D5	Diode	1SS53	
D6	Diode	1SS53	
D7	Diode	1SS53	
D9	Diode	1SS99	
D10	Diode	1SS53	
D11	Diode	1SS133	
D12	Diode	LTZ-MR15	
D13	Diode	1SS53	
FI1	Crystal Filter	23M15B3	
FI2	Ceramic Filter	CFU455E2	
X1	Crystal	HC-18/T21.345MHz	
X2	Ceramic Discri.	CDB455C7A	
L1	Coil	LA-159	
L2	Coil	LA-159	
L3	Coil	LA-159	
L4	Coil	LA-159	
L5	Coil	LA-159	
L6	Coil	LA-147	
L7	Coil	LS-66	
L8	Coil	LS-66	
L9	Coil	LA-147	
L10	Coil	LA-147	
L11	Coil	LA-147	
L12	Coil	LA-147	
L13	Coil	LA-159	
L14	Coil	LA-158	
L15	Choke	LW-15	
L16	Choke	LAL03NA-121K	
L17	Bead Core	BT01RNI-A61	
L18	Choke	LAL03NA-101K	
R1	Resistor	220	ELR20
R2	Resistor	100	R20
R3	Resistor	47	ELR20
R4	Resistor	22	ELR20
R5	Resistor	470	ELR20
R6	Resistor	100	ELR20
R7	Resistor	1k	ELR20
R8	Resistor	4.7k	ELR20
R9	Resistor	10k	ELR20
R10	Resistor	22k	ELR20
R11	Resistor	47	ELR20
R13	Resistor	100	ELR20
R14	Resistor	3.3k	ELR20

[MAIN] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
R15	Resistor	3.9k	ELR20
R16	Resistor	4.7k	ELR20
R17	Resistor	100k	ELR20
R18	Resistor	3.9k	ELR20
R19	Resistor	10k	ELR20
R20	Resistor	330k	ELR20
R21	Resistor	82k	ELR20
R22	Resistor	10k	ELR20
R23	Resistor	22k	R20
R24	Resistor	1.5k	ELR20
R25	Resistor	1.5k	ELR20
R26	Resistor	47k	ELR20
R27	Resistor	1.5k	ELR20
R28	Resistor	47	R20
R29	Resistor	15k	ELR20
R30	Resistor	47	R20
R31	Resistor	100	ELR20
R32	Resistor	1k	ELR20
R33	Resistor	1k	ELR20
R34	Resistor	470	R20
R35	Resistor	47	ELR20
R36	Resistor	47	ELR20
R37	Resistor	220	R20
R38	Resistor	470	ELR20
R39	Resistor	47	ELR20
R40	Resistor	47	ELR20
R41	Resistor	1k	ELR20
R42	Resistor	2.2k	ELR20
R43	Resistor	1k	ELR20
R44	Resistor	2.2k	ELR20
R45	Resistor	1k	ELR20
R46	Resistor	22k	ELR20
R47	Resistor	10k	ELR20
R48	Resistor	1k	R20
R49	Trimmer	1k	H0651A
R50	Thermistor	33D28	
R51	Resistor	680	R20
R52	Resistor	10k	ELR20
R53	Resistor	10k	ELR20
R54	Resistor	100	R20
R55	Resistor	15k	R20
R56	Resistor	100k	ELR20
R57	Resistor	4.7k	R20
R58	Resistor	4.7k	R20
R59	Resistor	470	R20
R60	Resistor	5.6k	R20
R61	Resistor	15k	ELR20
R62	Resistor	5.6k	ELR20
R63	Trimmer	33k	H0521A
R64	Resistor	47k	ELR20
R65	Resistor	47k	ELR20
R66	Resistor	22k	ELR20
R67	Resistor	470k	ELR20
R68	Resistor	330	R20
R69	Resistor	47	ELR20
R70	Resistor	680k	ELR20
R71	Trimmer	470k	H0651A
R72	Resistor	180k	R20
R73	Resistor	18k	ELR20
R74	Trimmer	4.7k	H0651A
R75	Resistor	150	ELR20
R76	Resistor	4.7	R20
R77	Resistor	1k	ELR20
R78	Resistor	1.8k	ELR20

[MAIN] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
R79	Resistor	5.6k	ELR20	
R80	Resistor	220	ELR20	
R81	Resistor	1k	ELR20	
R82	Resistor	100	ELR20	
R83	Resistor	270k	ELR20	
R84	Resistor	220k	R20	
R85	Resistor	18k	ELR20	
R86	Resistor	47	R20	
R87	Resistor	100	ELR20	
R88	Trimmer	220k	H0521A	
R89	Resistor	150k	R20	
R90	Resistor	390k	ELR20	
R91	Resistor	270k	ELR20	
R92	Resistor	82k	R20	
R93	Resistor	82k	ELR20	
R94	Trimmer	3.3k	H0651A	
R97	Resistor	10k	R10	
R98	Resistor	10k	ELR20	
R99	Thermistor	33D28		
R100	Resistor	15k	ELR20	
R101	Resistor	120k	R20	
R102	Resistor	10k	ELR20	
R103	Resistor	470k	R20	
R104	Resistor	4.7	ELR20	
C1	Ceramic	12p	50V	SL
C2	Trimmer	ECR-GA006A30		
C3	Ceramic	3p	50V	SL
C4	Ceramic	0.001	50V	B
C5	Ceramic	0.001	50V	B
C6	Ceramic	0.001	50V	B
C7	Ceramic	3p	50V	SL
C8	Trimmer	ECR-GA006A30		
C9	Ceramic	0.001	50V	B
C10	Ceramic	0.001	50V	B
C11	Ceramic	0.75p	50V	SL
C12	Ceramic	0.5p	50V	SL
C13	Ceramic	3p	50V	SL
C14	Trimmer	ECR-GA006A30		
C15	Ceramic	0.001	50	B
C16	Trimmer	ECR-GA006A30		
C17	Ceramic	1p	50V	SL
C18	Ceramic	0.5p	50V	SL
C19	Ceramic	0.35p	50V	SL
C20	Ceramic	0.001	50V	B
C21	Ceramic	0.001	50V	B
C22	Trimmer	ECR-GA006A30		
C23	Ceramic	3p	50V	SL
C24	Trimmer	ECR-GA006A30		
C25	Ceramic	0.001	50V	B
C26	Ceramic	0.001	50V	B
C27	Ceramic	27p	50V	SL
C28	Ceramic	0.001	50V	B
C29	Ceramic	5p	50V	SL
C30	Ceramic	27p	50V	SL
C31	Ceramic	82p	50V	SL
C32	Ceramic	0.001	50V	B
C33	Ceramic	0.0047	50V	B
C34	Ceramic	0.0047	50V	B
C35	Electrolytic	2.2	50V	MS7
C36	Electrolytic	1	50V	MS7
C37	Electrolytic	10	10V	MS7
C38	Barrier Layer	0.0022	35V	
C39	Ceramic	470p	50V	

[MAIN] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
C40	Barrier Layer	0.0015	35V	
C41	Ceramic	33p	50V	SL
C42	Barrier Layer	0.0015	35V	
C43	Electrolytic	1	35V	MS7
C44	Ceramic	0.001	50V	B
C45	Electrolytic	10	16V	MS7
C46	Ceramic	120p	50V	SL
C47	Ceramic	68p	50V	SL
C48	Tantalum	1	35V	
C49	Tantalum	0.1	35V	
C50	Barrier Layer	0.1	16V	
C51	Ceramic	82p	50V	SL
C52	Ceramic	5p	50V	SL
C53	Trimmer	ECR-GA010D30		
C54	Ceramic	0.001	50V	B
C55	Ceramic	0.001	50V	B
C56	Ceramic	0.001	50V	B
C57	Ceramic	5p	50V	SL
C58	Trimmer	ECR-GA006A30		
C59	Ceramic	0.001	50V	B
C60	Ceramic	0.001	50V	B
C61	Ceramic	0.001	50V	B
C62	Ceramic	0.001	50V	B
C63	Ceramic	10p	50V	SL
C64	Trimmer	ECR-GA006A30		
C65	Ceramic	3p	50V	SL
C66	Ceramic	1p	50V	SL
C67	Ceramic	3p	50V	SL
C68	Trimmer	ECR-GA006A30		
C69	Ceramic	0.001	50V	B
C70	Ceramic	0.001	50V	B
C71	Ceramic	0.001	50V	B
C72	Ceramic	0.001	50V	B
C73	Ceramic	10p	50V	
C74	Electrolytic	4.7	25V	BP
C75	Barrier Layer	0.1	16V	
C76	Barrier Layer	0.1	16V	
C77	Electrolytic	4.7	25V	MS7
C78	Tantalum	0.1	35V	
C79	Tantalum	1	35V	
C80	Tantalum	0.1	35V	
C81	Ceramic	10p	50V	SL
C82	Barrier Layer	TBD05X103M		
C83	Barrier Layer	TBD05X103M		
C84	Barrier Layer	0.1	16V	
C85	Barrier Layer	820p	25V	
C86	Ceramic	0.001	50V	B
C87	Barrier Layer	0.1	16V	
C88	Tantalum	2.2	16V	
C89	Electrolytic	2.2	16V	MS7
C90	Ceramic	0.001	50V	B
C91	Ceramic	0.001	50V	B
C92	Ceramic	0.001	50V	B
C93	Barrier Layer	TBD05X103M		
C94	Ceramic	0.001	50V	B
C95	Electrolytic	1	50V	RC3
C96	Ceramic	0.001	50V	B
C97	Electrolytic	100	10V	MS9
C98	Electrolytic	220	10V	MS
C99	Electrolytic	470	16V	12.5×12.5
C100	Tantalum	0.1	35V	
C101	Tantalum	0.1	35V	
C102	Barrier Layer	TBD05X103M		
C103	Barrier Layer	0.0047	25V	

[MAIN] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
C104	Electrolytic	10	16V	MS5
C105	Ceramic	0.001	50V	B
C106	Barrier Layer	0.047	25V	
C107	Electrolytic	100	10V	MS7
C108	Ceramic	0.001	50V	B
C109	Electrolytic	0.47	25V	BP
C110	Barrier Layer	0.01	25V	
C111	Ceramic	0.001	50V	B
C112	Ceramic	0.001	50V	B
C113	Electrolytic	0.22	50V	MS7
C114	Electrolytic	10	16V	MS5
C115	Ceramic	0.001	50V	B
C116	Mylar	0.0022	50V	
C117	Ceramic	120p	50V	
C118	Ceramic	0.001	50V	B
C119	Ceramic	0.001	50V	B
C120	Monolithic	470p	50V	GR42-6
C121	Electrolytic	0.47	50V	BP
C123	Ceramic	0.001	50V	
C124	Ceramic	0.001	50V	
B1	MAIN. PCB	B-916C		
P1	Connector	EHR-7		
J1	MINI PIN	TMP-J01X-A1		
J2	MINI PIN	TMP-J01X-A1		
J3	Connector	B2B-EH-S		
J4	Connector	B3B-EH-S		
J5	Connector	B2B-EH-S		
J6	Connector	B3B-EH-S		
J7	Connector	B2B-EH-S		
J8	Connector	B4B-EH-S		
J9	Connector	B3B-EH-S		
J10	Connector	B5B-EH-S		
J11	Connector	B2B-EH-S		
J12	Connector	B2B-EH-S		

[PLL] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
IC201	IC	TC9123BP	
Q201	Transistor	2SC3399	(#04)
Q202	Transistor	2SC3399	
Q203	Transistor	2SC3399	(#04)
Q204	Transistor	2SA1348	
Q205	Transistor	2SA1348	
Q206	Transistor	2SC383-TM	
Q207	Transistor	2SC763-C	
Q208	FET	3SK74-M	
Q209	Transistor	2SC763-C	
Q210	Transistor	2SC2458	
Q211	FET	3SK74-M	
Q212	FET	3SK74-M	
Q213	Transistor	2SC763-C	
Q214	Transistor	2SC2026	
Q215	Transistor	2SC2026	
Q216	Transistor	2SA1348	(#04)
D201	Diode	1SS53	(#04)
D202	Diode	1SS53	(#04)

[PLL] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
D203	Diode	1SS53	
D204	Diode	1SS53	
D205	Diode	1SS53	(#04)
D206	Diode	1SS53	(#04)
D207	Varactor	1SV50	
D208	Varactor	1SV50	
D209	Diode	1SS53	
D210	Diode	1SS53	
D211	Diode	1SS53	
D212	Diode	1SS53	
D214	Zener	RD6.8EB3	
D215	Diode	1SS53	(#04)
D216	Diode	1SS53	
X201	Crystal	HC43/U	34.912MHz (#04, 07)
X201	Crystal	HC43/U	35.745MHz (#05)
X202	Crystal	HC43/U	33.095MHz (#04, 07)
X202	Crystal	HC43/U	33.929MHz (#05)
X203	Crystal	HC12/U	2.560MHz
L201	Coil	LS-107	
L202	Coil	LS-107	
L203	Coil	LS-145	
L204	Coil	LS-230A	
L205	Coil	LS-230A	
L206	Choke	EL0810SK13R9K	
L207	Choke	LAL04NA-102K	
L208	Coil	LA-126	
L209	Coil	LA-159	
L210	Coil	LA-135	
R201	Resistor	100k	ELR20 (#04)
R202	Resistor	10k	ELR20
R203	Resistor	47	ELR20
R204	Trimmer	220k	H0521A (#04)
R205	Trimmer	100k	H0521A (#04)
R206	Trimmer	47k	H0521A
R207	Trimmer	22k	H0521A
R208	Trimmer	22k	H0521A (#04)
R209	Trimmer	2.2k	H0521A (#04)
R210	Resistor	39k	ELR20 (#04)
R211	Resistor	8.2k	ELR20
R212	Resistor	82k	ELR20 (#04)
R213	Resistor	22k	ELR20 (#04)
R213	Resistor	8.2k	ELR20 (#05, 07)
R214	Resistor	470	ELR20
R216	Resistor	470	ELR20
R217	Resistor	47k	ELR20 (#04)
R217	Resistor	33k	ELR20 (#05, 07)
R218	Resistor	33k	ELR20
R221	Resistor	3.9k	ELR20
R222	Resistor	100	ELR20
R223	Resistor	3.9k	ELR20
R225	Resistor	47k	ELR20
R226	Resistor	15k	ELR20
R228	Resistor	4.7k	ELR20
R229	Resistor	100	ELR20
R230	Resistor	47k	ELR20
R231	Resistor	22k	ELR20
R232	Resistor	1k	ELR20
R235	Resistor	15k	ELR20
R236	Resistor	47k	ELR20
R237	Resistor	47	ELR20
R238	Resistor	22k	ELR20

[PLL] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
R239	Resistor	4.7k	ELR20	
R240	Resistor	1.5k	ELR20	
R242	Resistor	100k	ELR20	
R243	Resistor	120	ELR20	
R244	Resistor	100	ELR20	
R246	Resistor	68k	R20	
R247	Resistor	100	ELR20	
R248	Resistor	470	R20	
R249	Resistor	47	ELR20	
R250	Resistor	47	R20	
R251	Resistor	47k	R25	
R252	Resistor	10k	R20	
R253	Resistor	470	R20	
R254	Resistor	1k	ELR20	
R255	Resistor	10k	R20	
R256	Resistor	8.2k	ELR20	
R257	Resistor	270	R20	
R258	Resistor	220	ELR20	
R259	Resistor	47	R20	
R260	Resistor	100	ELR20 (#04, 07)	
R261	Resistor	56k	ELR20	
R262	Resistor	68k	ELR20	
R263	Resistor	15k	ELR20	
R264	Resistor	2.7k	ELR20	
R265	Resistor	120	R20	
R266	Resistor	47k	ELR20	
R267	Resistor	470	R20	
C201	Ceramic	51p	50V	CH
C202	Ceramic	5p	50V	UJ (#05, 07)
C203	Ceramic	0.0047	50V	
C204	Ceramic	100p	50V	CH (#04, 07)
C204	Ceramic	51p	50V	CH (#05)
C205	Ceramic	7p	50V	UJ
C206	Electrolytic	4.7	25V	MS7
C207	Ceramic	100p	50V	
C208	Ceramic	47p	50V	CH
C209	Ceramic	51p	50V	CH
C210	Ceramic	0.001	50V	(#04, 07)
C210	Barrier Layer	TMD05×103M		(#05)
C211	Ceramic	15p	50V	(#04, 07)
C211	Ceramic	12p	50V	(#05)
C212	Ceramic	7p	50V	(#04, 07)
C212	Ceramic	5p	50V	(#05)
C213	Ceramic	0.001	50V	
C214	Ceramic	10p	50V	(#04, 07)
C214	Ceramic	9p	50V	(#05)
C215	Ceramic	0.001	50V	(#04, 07)
C215	Barrier Layer	TMD05×103M		(#05)
C216	Ceramic	0.5p	50V	
C217	Ceramic	10p	50V	
C218	Ceramic	0.001	50V	
C219	Ceramic	33p	50V	
C220	Ceramic	33p	50V	
C221	Ceramic	0.0047	50V	
C222	Ceramic	0.0047	50V	
C223	Ceramic	0.0047	50V	
C224	Barrier Layer	0.1	16V	
C225	Barrier Layer	0.1	16V	
C226	Ceramic	470p	50V	
C227	Ceramic	470p	50V	
C228	Ceramic	470p	50V	
C229	Ceramic	470p	50V	
C230	Ceramic	470p	50V	

[PLL] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
C231	Ceramic	470p	50V	
C232	Ceramic	470p	50V	
C233	Ceramic	470p	50V	
C234	Ceramic	470p	50V	
C235	Ceramic	470p	50V	
C236	Ceramic	33p	50V	CH
C237	Ceramic	33p	50V	CH
C238	Tantalum	2.2	16V	
C239	Barrier Layer	0.1	16V	
C240	Electrolytic	47	10V	
C241	Ceramic	0.0047	50V	
C242	Electrolytic	470	16V	
C243	Ceramic	0.001	50V	
C244	Tantalum	10	16V	
C245	Tantalum	2.2	16V	
C246	Ceramic	0.0047	50V	
C247	Cylinder	47p	UP125SL	
C248	Ceramic	0.001	50V	
C249	Ceramic	3p	50V	
C250	Ceramic	0.001	50V	
C252	Trimmer	ECR-GA006A30		
C253	Ceramic	1p	50V	
C254	Trimmer	ECR-GA006A30		
C255	Ceramic	3p	50V	
C256	Ceramic	15p	50V	
C258	Ceramic	0.0047	50V	
C259	Ceramic	0.0047	50V	
C260	Barrier Layer	0.1	16V	
J201	Connector	TLB-P04H-B1		
J202	Connector	TLB-P12-B1		
P201	Connector	EHR-7		
P202	Connector	EHR-9		

[VCO] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
Q1	FET	2SK125	
Q2	Transistor	2SC2026	
D1	Varactor	1SV50	
D2	Diode	MI301	
L1	Choke	LAL03NA1R0M	
L2	Coil	LB-140	
L3	Choke	LAL03NA1R0M	
L4	Choke	LAL03NA1R0M	
L5	Choke	LAL03NA1R0M	
L6	Choke	LAL03NA1R0M	
R1	Resistor	470	ELR10
R2	Resistor	100	ELR10
R3	Resistor	47	ELR10
R4	Resistor	4.7k	ELR10
R5	Resistor	4.7k	ELR10
R6	Resistor	22k	ELR10
R7	Resistor	330	ELR10
R8	Resistor	330	ELR10
R9	Resistor	5.6k	ELR10
R10	Resistor	1k	ELR10
R11	Resistor	220	ELR10

[VCO] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
C1	Ceramic	470p	50V	
C2	Ceramic	10p	50V	SH
C3	Ceramic	3p	50V	CH (#04, 07)
C3	Ceramic	2p	50V	CH (#05)
C4	Ceramic	0.001	50V	
C5	Ceramic	22p	50V	(#04, 07)
C5	Ceramic	18p	50V	(#05)
C6	Trimmer	CTZ-31E		
C7	Ceramic	470p	50V	
C8	Ceramic	0.001	50V	
C9	Ceramic	15p	50V	TH
C10	Ceramic	0.001	50V	
C11	Ceramic	0.001	50V	
C12	Ceramic	10p	50V	CH (#04, 07)
C12	Ceramic	8p	50V	CH (#05)
C13	Ceramic	1p	50V	
C14	Ceramic	0.001	50V	
C15	Ceramic	0.5p	50V	
C16	Ceramic	12p	50V	
B1	VCO PCB	B-917		

[LOGIC] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
IC1	IC	4013B	
IC2	IC	4001UBP	
IC3	IC	4030B	
IC4	IC	4081B	
IC5	IC	μA78L062AW	
IC6	IC	TMP47C40-6001	
IC7	IC	4028B	
IC8	IC	4511B	
IC9	IC	BA612	
IC10	IC	TMS1024NLC or M50781SP	
IC11	IC	BA612	
IC12	IC	BA612	
IC13	IC	S-7116A	(#05, 07)
IC14	Diode Array	DAN601	(#05, 07)
Q1	Transistor	2SA1345	(#04)
Q2	Transistor	2SC945P	
Q3	Transistor	2SD468C	
Q6	Transistor	2SC2458GR	
Q8	Transistor	2SA1345	
Q9	Transistor	2SC2458GR	
Q10	Transistor	2SC2458GR	
Q11	Transistor	2SC2458GR	
Q12	Transistor	2SC2458GR	
Q13	Transistor	2SC2458GR	
Q14	Transistor	2SA1048Y	
Q15	Transistor	2SA1048Y	
Q16	Transistor	2SC2458GR	
Q17	Transistor	2SC3399	
Q18	Transistor	2SC2458GR	
Q19	Transistor	2SA1048Y	
Q20	Transistor	2SA1048Y	
Q21	Transistor	2SA1048Y	
Q22	Transistor	2SA1048Y	
Q23	Transistor	2SA1048Y	
Q24	Transistor	2SA1048Y	
Q25	Transistor	2SC2458GR	

[LOGIC] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)	
Q26	Transistor	2SC2458GR	
Q27	Transistor	2SA1048Y	
Q28	Transistor	2SC2458GR	
Q29	Transistor	2SC3399	
Q30	Transistor	2SC3399	
Q31	Transistor	2SD1225M, R or Q	
Q32	Transistor	2SD1225M, R or Q	
Q33	Transistor	2SA1048Y	
Q34	Transistor	2SC3399	
Q35	Transistor	2SC3399	(#05, 07)
Q36	Transistor	2SC3399	(#04)
Q37	Transistor	2SC3399	(#04)
Q38	Transistor	2SA1048Y	(#05)
Q39	Transistor	2SA1048Y	(#05)
D2	Diode	1SS133	
D7	Diode	1SS133	
D8	Diode	1SS133	
D10	Diode	1SS133	
D11	Diode	1SS133	
D13	Diode	1SS133	
D14	Diode	1SS133	
D15	Diode	1SS133	
D17	Diode	1SS133	
D18	Diode	1SS133	
D19	Diode	1SS133	
D20	Diode	1SS133	
D21	Diode	1SS133	
D22	Diode	1SS133	
D23	Diode	1SS133	
D24	Diode	1SS133	
D25	Diode	1SS133	
D26	Diode	1SS133	
D27	Diode	1SS133	
D28	Diode	1SS133	
D29	Diode	1SS133	
D30	Diode	1SS133	
D31	Diode	1SS133	
D32	Diode	1SS133	
D33	Diode	1SS133	
D34	Diode	1SS133	
D35	Diode	1SS133	
D36	Diode	1SS133	
D37	Diode	1SS133	
D39	Diode	1SS133	
D40	Diode	1SS133	
D41	Diode	1SS133	
D42	LED	TLR123	
D43	Zener	RD5.1EB2	
D44	Zener	RD6.8EB3	
D45	Diode	1SS133	
D46	Diode	1SS133	
D47	Diode	1SS133	
D48	Diode	1SS133	
D49	Diode	1SS133	
D50	Diode	1SS133	
D51	Diode	1SS133	
D52	Diode	1SS133	
D53	Diode	1SS133	
D54	Diode	1SS133	(#04)
D55	Diode	1SS133	(#05)
D56	Diode	1SS133	(#05)
D57	Diode	1SS133	(#05)
D58	Diode	1SS133	

[LOGIC] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
D59	Diode	1SS133		
D60	Diode	1SS133		
D61	Diode	1SS133		
D62	Diode	1SS133		
D63	Diode	1SS133		
D65	Diode	1SS133		
D66	Diode	1SS133		
D67	Diode	1SS133		
D70	Diode	1SS133		
D71	Diode	1SS133		(#04)
D72	Diode	1SS133		
D75	Diode	1SS133		(#04)
D76	Diode	1SS133		(#04)
D78	Diode	1SS133		
D79	Diode	1SS133		
D82	Diode	1SS133		(#04, 07)
D83	Diode	1SS133		
D84	Diode	1SS133		(#05)
D90	Diode	1SS133		(#05)
D91	Diode	1SS133		(#05)
D92	Diode	1SS133		
D93	Diode	1SS133		
D94	Diode	1SS133		
X1	Ceralock	CSA5.00MT or MG		
X2	Crystal	HC-43/U	3.5795MHz (#05, 07)	
R1	Resistor	3.3k	ELR20	
R2	Resistor	470	R20	
R3	Resistor	22	ELR20	
R4	Resistor	1k	R20	
R5	Resistor	22k	ELR20	
R6	Resistor	22k	ELR20	
R8	Resistor	22k	ELR20	
R9	Resistor	100k	ELR20	
R13	Resistor	47k	ELR20	
R14	Resistor	220k	ELR20	
R15	Resistor	1M	ELR20	
R16	Resistor	22k	ELR20	
R17	Resistor	1M	ELR20	
R18	Resistor	22k	ELR20	
R19	Resistor	4.7k	ELR20	
R20	Resistor	47k	ELR20	
R21	Resistor	10k	ELR20	
R22	Resistor	22k	ELR20	
R23	Resistor	2.2k	ELR20	
R24	Resistor	4.7k	ELR20	
R26	Resistor	47k	ELR20	
R27	Resistor	47k	ELR20	
R28	Resistor	47k	ELR20	
R30	Resistor	47k	ELR20	
R31	Resistor	10k	R20	
R32	Resistor	82k	ELR20	
R33	Resistor	4.7k	R20	
R34	Resistor	150k	ELR20	
R35	Resistor	1k	ELR20	
R36	Resistor	220k	ELR20	
R37	Resistor	47k	ELR20	
R38	Resistor	1M	ELR20	
R39	Resistor	4.7k	R20	
R40	Resistor	1k	ELR20	
R41	Resistor	1M	R20	
R42	Resistor	100k	ELR20	
R43	Resistor	22k	ELR20	

[LOGIC] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
R44	Resistor	100k	R20	
R45	Resistor	47k	R20	
R46	Resistor	47k	R20	
R47	Resistor	47k	R20	
R48	Resistor	47k	R20	
R49	Resistor	47k	R20	
R50	Resistor	47k	R20	
R51	Resistor	47k	R20	
R52	Resistor	47k	R20	
R53	Resistor	22k	R20	
R54	Resistor	47k	R20	
R55	Resistor	47k	R20	
R56	Resistor	47k	R20	
R57	Resistor	390k	ELR20	
R58	Resistor	1M	ELR20	
R59	Resistor	47k	ELR20	
R60	Resistor	47k	ELR20	
R61	Resistor	10k	ELR20	
R62	Resistor	10k	ELR20	
R63	Resistor	22k	ELR20	
R64	Resistor	22	R50X	
R65	Resistor	4.7k	R20	
R66	Resistor	4.7k	ELR20	
R67	Resistor	27	R50X	
R68	Resistor	120	R50X	
R69	Resistor	10k	ELR20	
R70	Resistor	4.7k	R20	
R71	Resistor	22k	R20	
R72	Resistor	47k	R20	
R73	Resistor	47k	R20	
R74	Resistor Array	RNSA 05S472J		
R75	Resistor Array	RNSA 05S472J		
R76	Resistor Array	RNSA 05S472J		
R77	Resistor Array	RNSA 05S472J		
R78	Resistor Array	RNSA 05S373J		
R79	Resistor Array	RNSA 05S472J		
R80	Resistor	4.7k	ELR20	
R81	Resistor	47k	ELR20	
R82	Resistor	47k	R20	
R83	Resistor Array	RNSA 05S472J		
R84	Resistor	47k	ELR20	
R85	Resistor	1k	ELR20	
R86	Resistor	39	ELR20	
R87	Resistor	39	ELR20	
R88	Resistor	39	ELR20	
R89	Resistor	39	ELR20	
R90	Resistor	39	ELR20	
R91	Resistor	39	ELR20	
R92	Resistor	39	ELR20	
R93	Resistor	22k	ELR20	(#04)
R94	Resistor	22k	ELR20	(#04)
R95	Resistor	22k	ELR20	
R96	Trimmer	47k	H0651A	(#05, 07)
R97	Resistor	33k	ELR20	(#05, 07)
R98	Resistor	47k	R20	(#05)
R99	Resistor	100k	ELR20	
R100	Resistor	47k	R20	
R102	Resistor	100k	R20	(#05)
R103	Resistor	100k	R20	
R104	Resistor	220	R20	
R106	Resistor	47k	R20	
C1	Electrolytic	10	16V	MS7 (#04)
C2	Ceramic	0.001	50V	(#04)
C3	Barrier Layer	0.0047	25V	

[LOGIC] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
C4	Barrier Layer	0.0047	25V	
C5	Electrolytic	1	50V	MS7
C6	Barrier Layer	0.0047	25V	
C7	Electrolytic	1	50V	MS7
C8	Barrier Layer	TBD05X103M	25V	
C10	Electrolytic	10	16V	MS7
C11	Electrolytic	10	16V	MS7
C12	Barrier Layer	0.047	25V	
C13	Ceramic	470p	50V	
C14	Ceramic	0.001	50V	
C15	Barrier Layer	0.047	25V	
C16	Barrier Layer	0.047	25V	
C17	Electrolytic	4.7	16V	MS7
C18	Electrolytic	4.7	16V	MS7
C19	Barrier Layer	0.0022	25V	
C20	Barrier Layer	0.1	16V	
C22	Electrolytic	47	16V	MS7
C23	Barrier Layer	0.1	16V	
C24	Barrier Layer	0.1	16V	
C25	Electrolytic	100	10V	MS7
C26	Electrolytic	100	10V	MS7
C27	Electrolytic	10	16V	MS7
C29	Ceramic	33p	50V	
C30	Ceramic	33p	50V	
C31	Ceramic	0.001	50V	
C33	Ceramic	22p	50V	(#05, 07)
C34	Ceramic	22p	50V	(#05, 07)
C35	Barrier Layer	0.0047	16V	
C36	Electrolytic	10	16V	MS7 (#05, 07)
C37	Electrolytic	2.2	16V	MS7
C38	Barrier Layer	0.0047	25V	
C39	Electrolytic	100	10V	MS7
C40	Electrolytic	47	10V	MS9
C41	Barrier Layer	0.1	16V	
J1	Connector	B02B-EH		
J2	Connector	B05B-EH		
J3	Connector	B04B-EH		
J4	Connector	B07B-EH		
J5	Connector	B04B-EH		
J6	Connector	B07B-EH		
J7	Connector	B02B-EH		
J8	Connector	B03B-EH		
J9	Connector	B06B-EH		
J10	Connector	B07B-EH		
J11	Connector	B05B-EH		
J12	Connector	B03B-EH		
J13	Connector	B09B-EH		
J14	Connector	B08B-EH		
J15	Connector	B05B-EH		
J16	Connector	B07B-EH		
J17	Connector	B06B-EH		
J18	Connector	B05B-EH		
P1	Connector	EHR-06		
S1	Switch	KHH-10910		
S2	Switch	SGK1062		
BT1	Lithium Battery	BR2325-1HC		
B1	LOGIC PCB	B-843D		

[LOGIC] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)
W10	Jumper	JPW-02A
W14	Jumper	JPW-02A
W33	Jumper	JPW-02A
W34	Jumper	JPW-02A
W36	Jumper	JPW-02A
W37	Jumper	JPW-02A

[PA] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)		
IC1	IC	SC-1027		
Q1	Transistor	2SB596 O or Y		
D1	Diode	MI-407		
D2	Diode	1SS97		
D3	Diode	MI-407		
D4	Diode	15CD11		
L1	Coil	LA-136		
L2	Coil	LA-242		
L3	Coil	LA-253		
L4	Coil	LA-232		
L5	Coil	LA-147		
L6	Choke	LW-19		
L7	Coil	LA-242		
L8	Coil	LA-232		
R1	Resistor	0.15	RGB2	
R2	Resistor	0.15	RGB2	
R3	Resistor	100	R50X	
R4	Resistor	330	R20	
R5	Resistor	100k	R20	
R6	Resistor	4.7k	R20	
R7	Resistor	10	R20	
C1	Electrolytic	10	16V	MS7
C2	Electrolytic	10	16V	MS7
C3	Ceramic	0.001	50V	B
C4	Ceramic	0.001	50V	B
C6	Ceramic	0.001	50V	B
C7	Ceramic	0.001	50V	B
C8	Electrolytic	10	16V	MS7
C9	Ceramic	0.001	50V	B
C10	Ceramic	0.001	50V	B
C11	Ceramic	0.5	500V	SL
C12	Ceramic	20p	50V	SL
C13	Ceramic	5p	50V	SL
C14	Ceramic	20p	50V	SL
C15	Ceramic	3p	500V	SL
C16	Ceramic	18p	500V	SL
C17	Ceramic	12p	500V	SL
C18	Ceramic	15p	500V	SL
C19	Ceramic	3p	500V	SL
C20	Ceramic	8p	500V	SL
C21	Ceramic	6p	500V	SL
C22	Ceramic	0.001	50V	B
C23	Ceramic	0.0047	50V	B
C24	Ceramic	0.001	50V	B
C25	Ceramic	0.001	50V	B
C26	Ceramic	5p	500V	SL
C27	Feedthrough	TF240-602	SS332Z	50V

[PA] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)
C28	Feedthrough	TF240-602 SS332Z 50V
C29	Ceramic	5p 500V SL
J1	SP. Jack	SJ-296
J2	Connector	TLB-P08H-B1
P1	Connector	LR02-1
P2	Connector	EHR-05
P3	Connector	EHR-02

[PA] UNIT

REF. NO.	DESCRIPTION	TYPE (PARTS NO.)
P4	Connector	EHR-03
P5	Connector	TMP-P01X-A
P6	Connector	TMP-P01X-A
P7	ANT. Code	OPC-050B
P8	Connector	EHR-02
B1	PA. PCB	B-875A
B2	SPJ. PCB	B-855A

SECTION 12 UT-16 VOICE SYNTHESIZER UNIT

12 - 1 ASSEMBLY PROCEDURE

1) Remove the top cover by unscrewing the four screws. (Fig. 1)

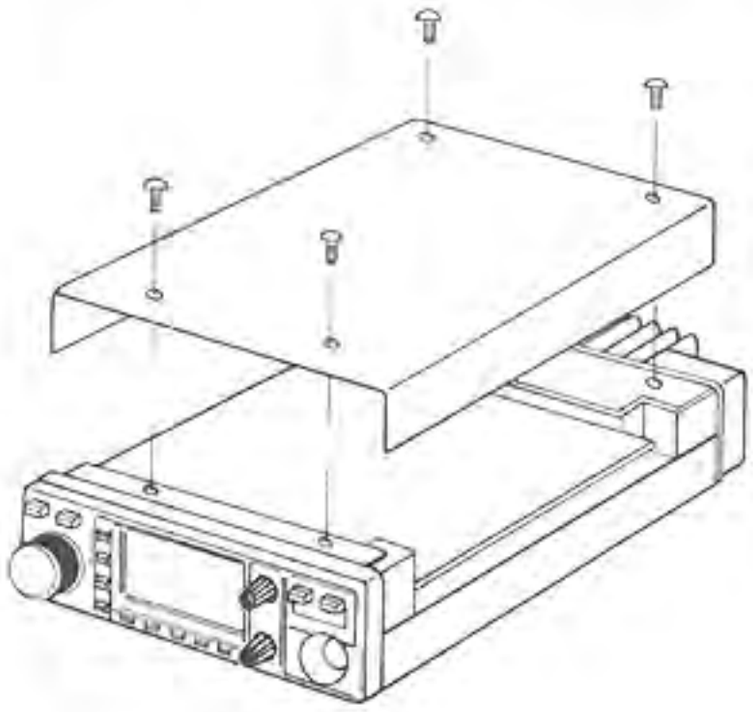
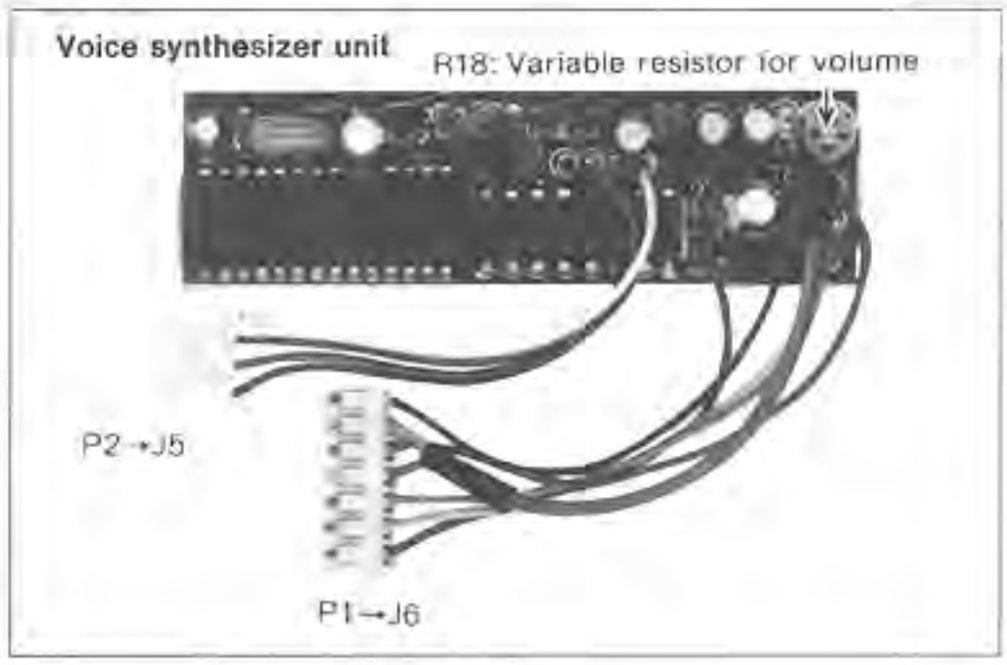


Fig. 1



2) Install the unit onto the spot as shown in the photo below. (Fig. 2)
   - Adhesive is applied on the sponge on the back of the unit, so remove the thin sheet from over the adhesive to attach the synthesizer unit.
3) Install the brown wire. (Fig. 2)
   - An unconnected lead wrapped in a vinyl tube is located as shown in the photo. Plug it into the pin "1" of J4. (Unplug the connector once before plugging in the lead.)
4) Insert the connectors P1 and P2 from the unit into the connectors J5 and J6. (Fig. 3)

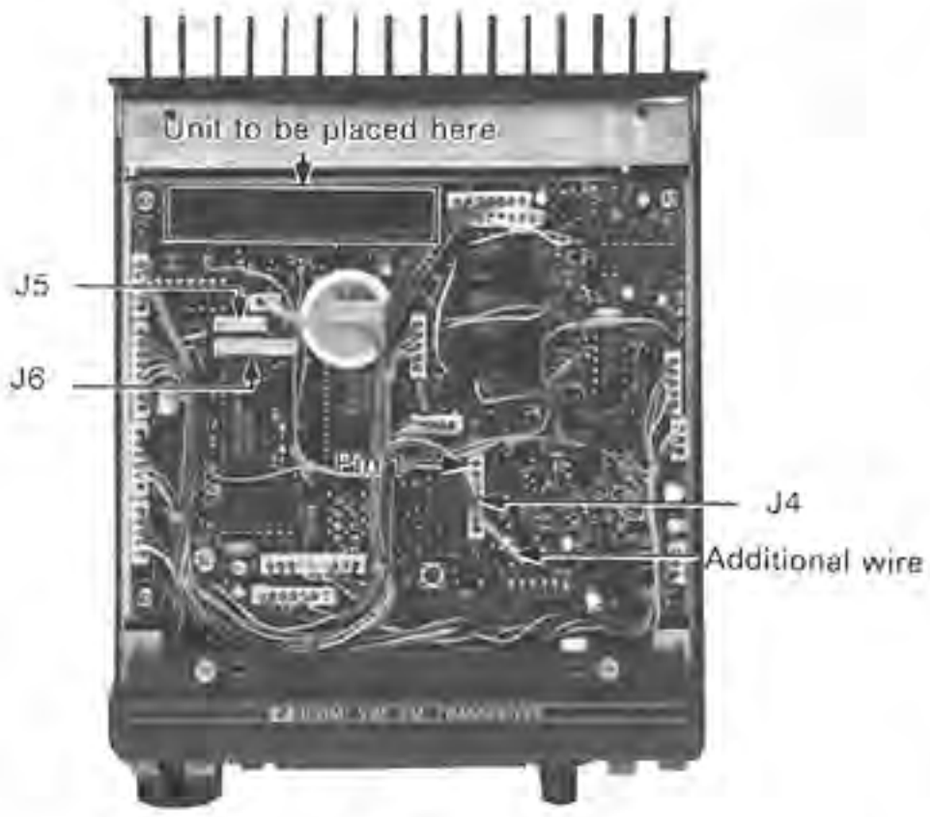


Fig. 2

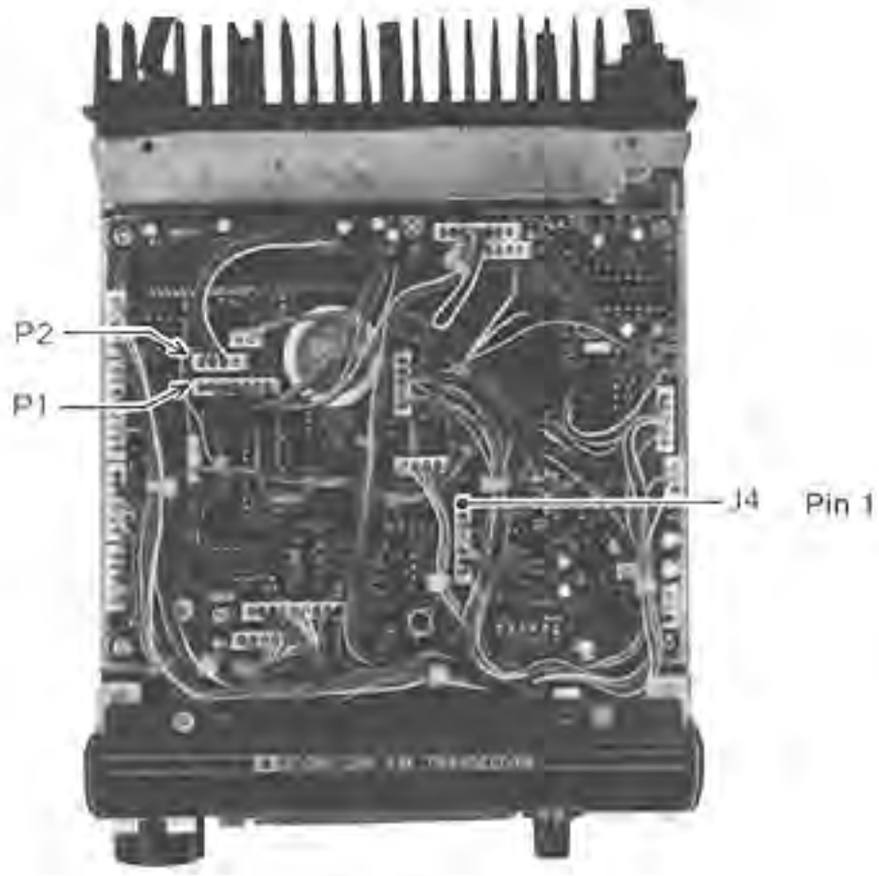


Fig. 3

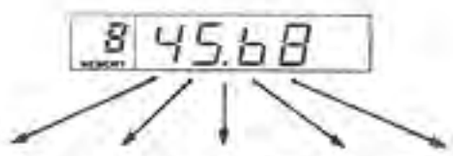
12 - 2 OPERATION AFTER INSTALLATION

- When the SPEECH button on the front panel is pushed, the synthesizer unit verbally announces the displayed frequency in English.

  For example: for 145.68MHz,

  Display:

  Announcement:



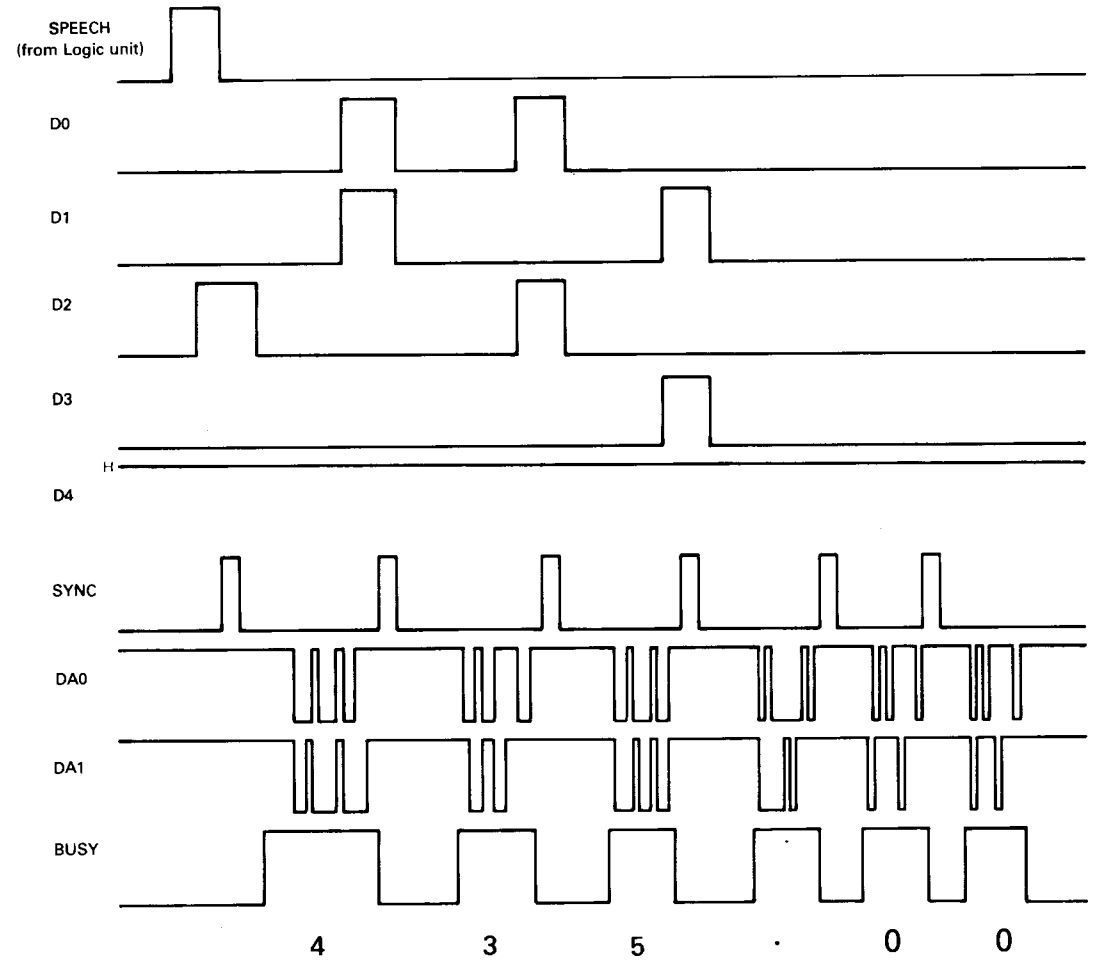
"One" "Four" "Five" "Point" "Six" "Eight"

- While the volume of the announcement is adjustable with the volume control on the front panel of the transceiver, you can also adjust it with R18 in the unit if you want to make it louder or softer against the receive sound.

12 - 3 CIRCUIT DESCRIPTION

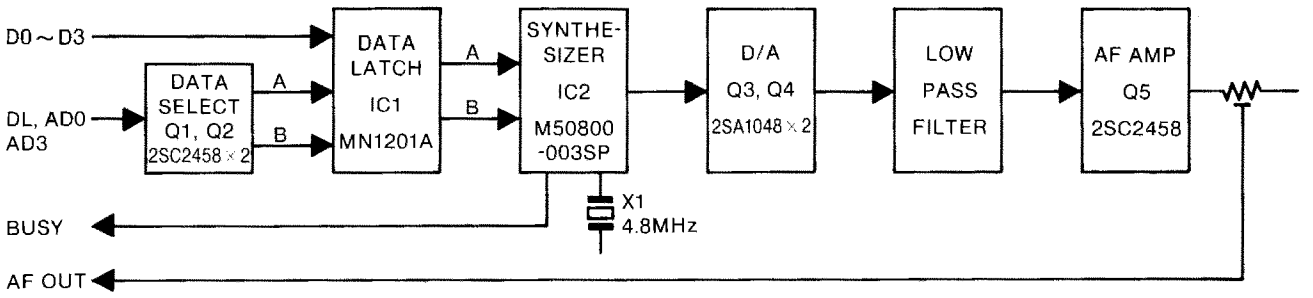
When the "SPEECH" button on the front panel is pushed, the data (D0 ~ D3) from the CPU (IC6) are fed to the inputs (IN1 ~ IN4) of IC1 (VOICE SYNTHESIZER UNIT). The data are tansferred to either A port or B port by the singals at the "CKA" and "CKB" terminals. After receiving a pulse signal at the "Sync" terminal, IC2 produces voice singals from the data (D0 ~ D3) and outputs these signals to a mixer consisting of Q3 and Q4. The mixed signal is passed through a filter consisting of R11, R12, C5 and C6, and is amplified by Q5. The "BUSY" signal becomes "L" level on completion of a word indicating the cirucit is ready for the next word. The announcement is made for the 100MHz through the 10kHz digits.

Timing chart of IC 2 (435.00MHz)

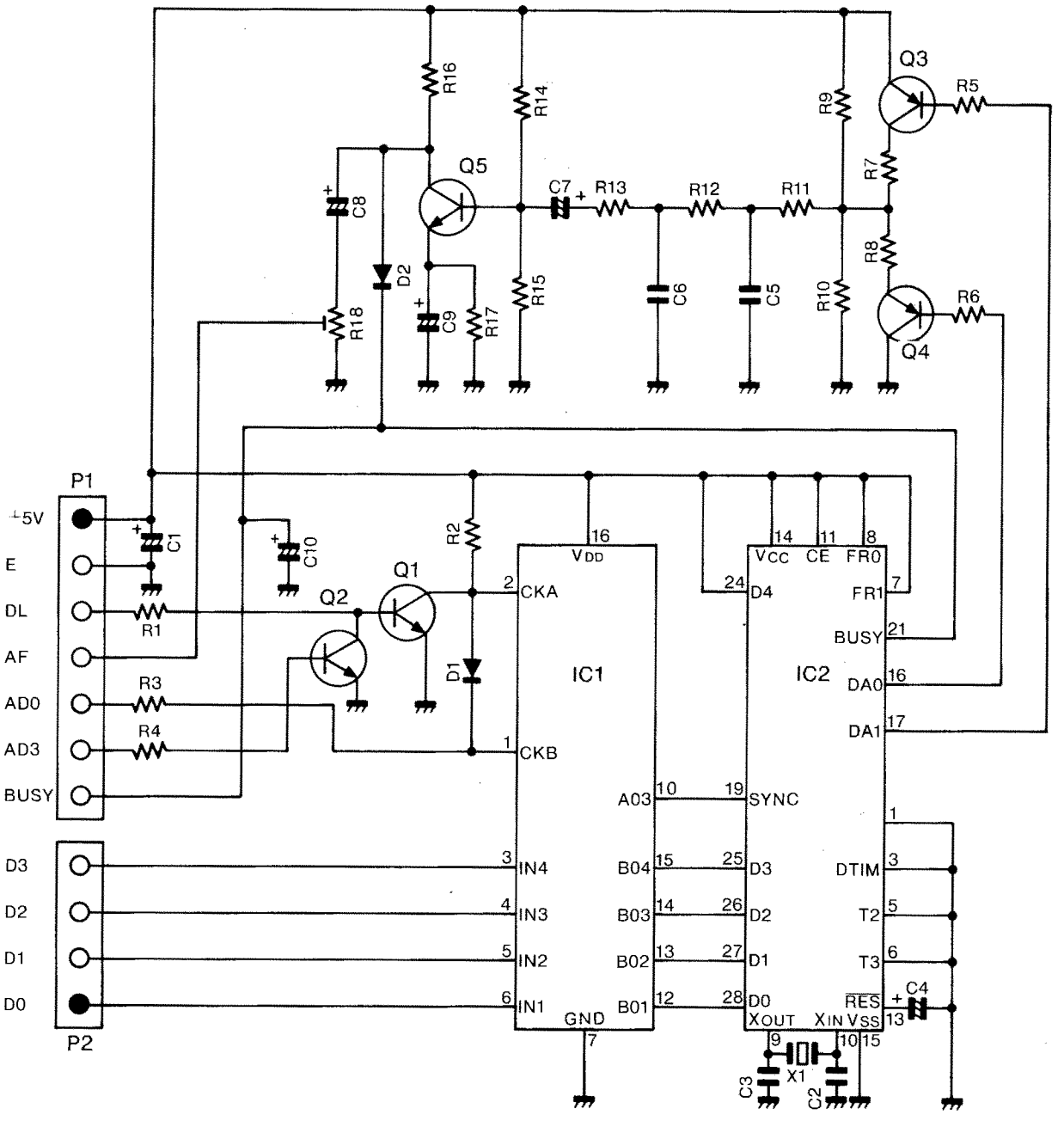


D0	D1	D2	D3	D4	
0	0	0	0	1	0 (Zero)
1	0	0	0	1	1 (One)
0	1	0	0	1	2 (Two)
1	1	0	0	1	3 (Three)
0	0	1	0	1	4 (Four)
1	0	1	0	1	5 (Five)
0	1	1	0	1	6 (Six)
1	1	1	0	1	7 (Seven)
0	0	0	1	1	8 (Eight)
1	0	0	1	1	9 (Nine)
0	1	0	1	1	• (Point)

BLOCK DIAGRAM



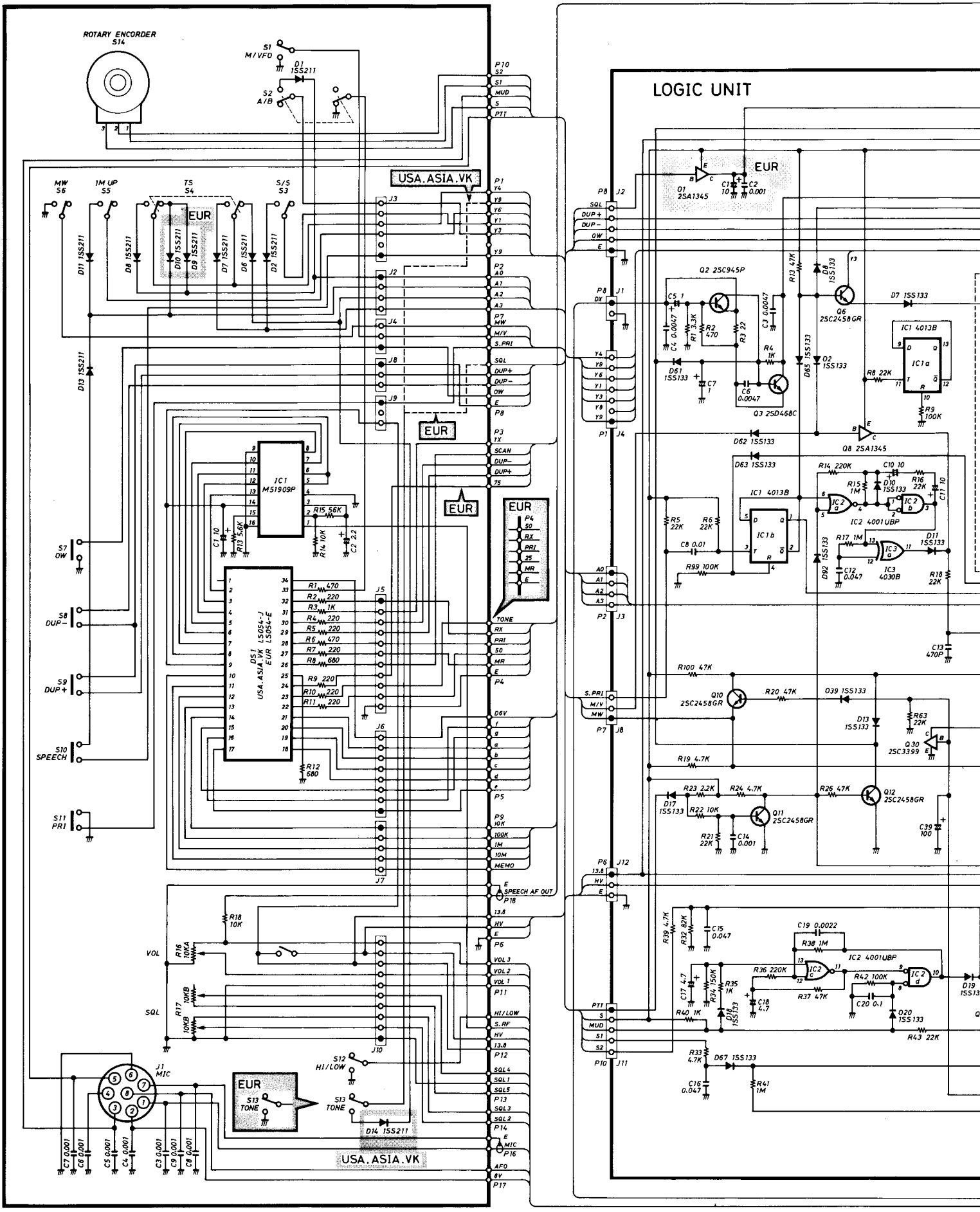
SCHEMATIC



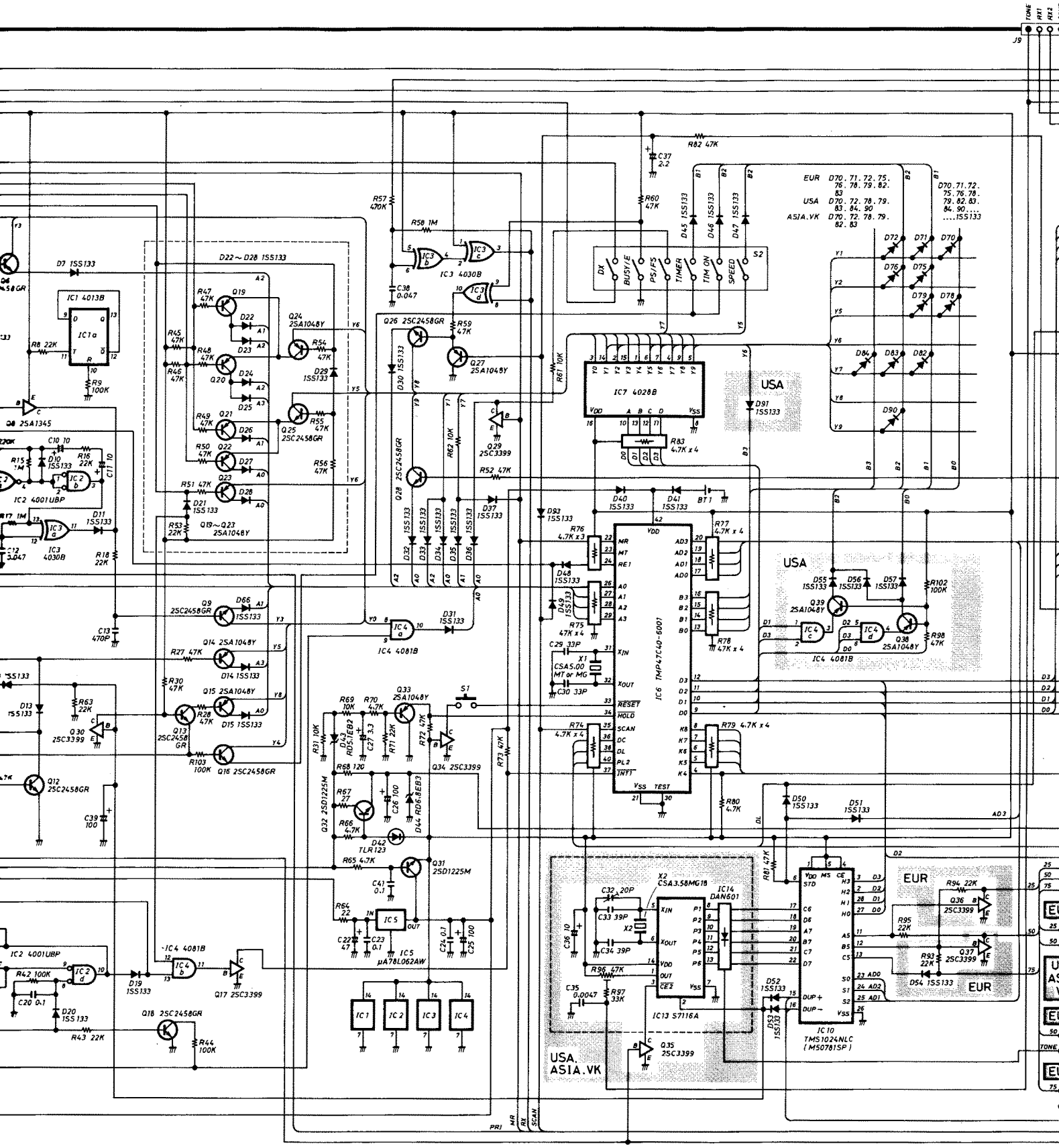
PARTS LIST

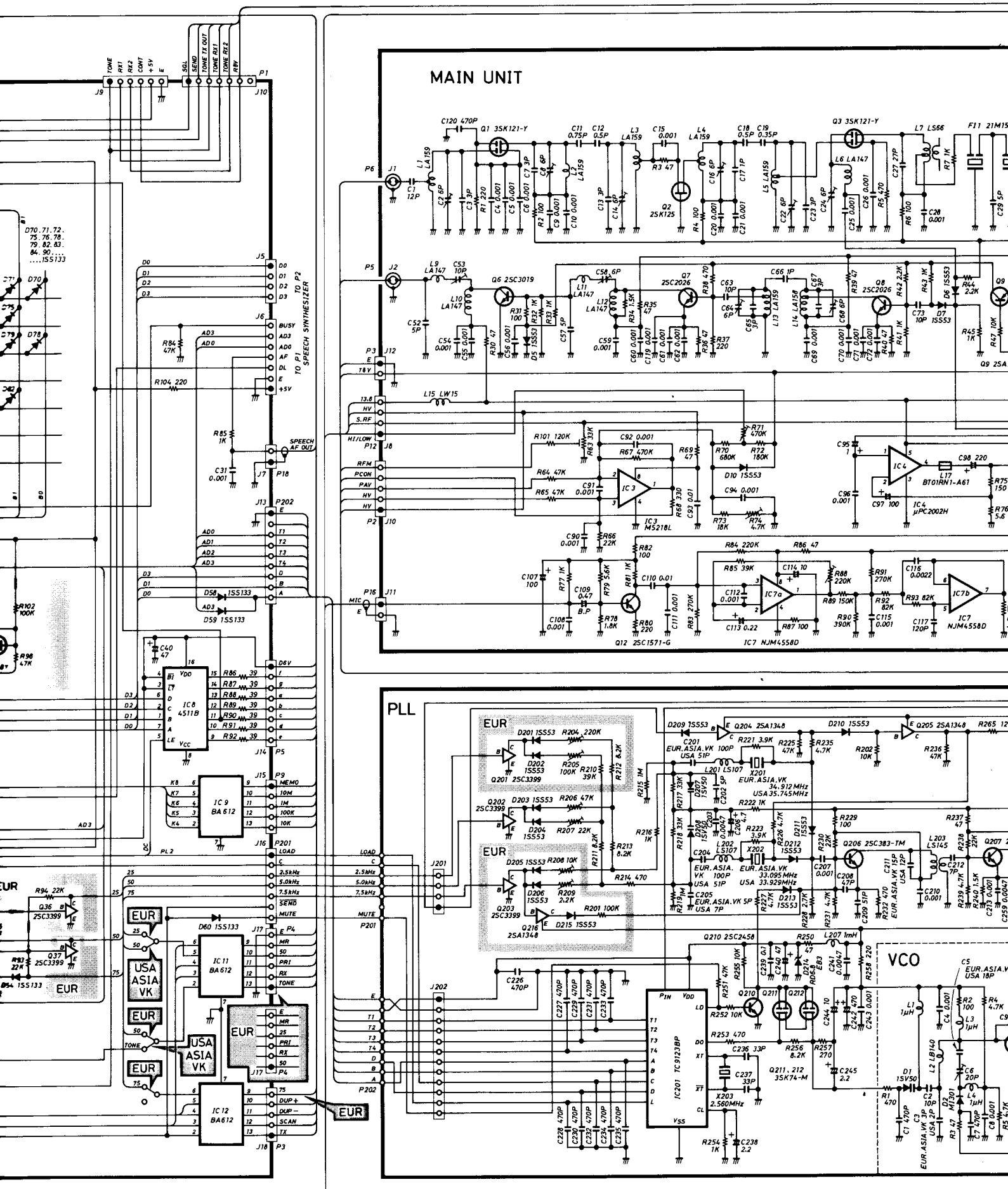
REF. NO.	DESCRIPTION	PART NO.		
IC1	IC	MN1201A		
IC2	IC	M50800-003SP		
Q1	Transistor	2SC2458-GR		
Q2	Transistor	2SC2458-GR		
Q3	Transistor	2SA1048		
Q4	Transistor	2SA1048		
Q5	Transistor	2SC2458-GR		
D1	Diode	1SS133		
D2	Diode	1SS211		
X1	Ceramic resonator	CSA480MG		
R1	Resistor	47K	ELR10	
R2	Resistor	10K	ELR10	
R3	Resistor	100K	ELR10	
R4	Resistor	47K	ELR10	
R5	Resistor	3.3K	ELR10	
R6	Resistor	3.3K	ELR10	
R7	Resistor	47K	ELR10	
R8	Resistor	47K	ELR10	
R9	Resistor	5.6K	ELR10	
R10	Resistor	5.6K	ELR10	
R11	Resistor	10K	ELR10	
R12	Resistor	10K	ELR10	
R13	Resistor	1K	ELR10	
R14	Resistor	100K	ELR10	
R15	Resistor	47K	ELR10	
R16	Resistor	2.2K	ELR10	
R17	Resistor	2.2K	ELR10	
R18	Trimmer	100K	H0521	
C1	Electrolytic	33	10V	RC3
C2	Ceremic	33P	50V	RC3
C3	Ceremic	33P	50V	
C4	Electrolytic	0.1	50V	RC3
C5	Barrier Layer	TBD05X-103M		25V
C6	Barrier Layer	TBD05X-103M		25V
C7	Electrolytic	0.47	50V	RC3
C8	Electrolytic	4.7	25V	RC3
C9	Electrolytic	22	6.3V	RC3
C10	Electrolytic	100	10V	MS7
P1	Connector	EHR-07		
P2	Connector	EHR-04		
B1	PCB	B-879A		

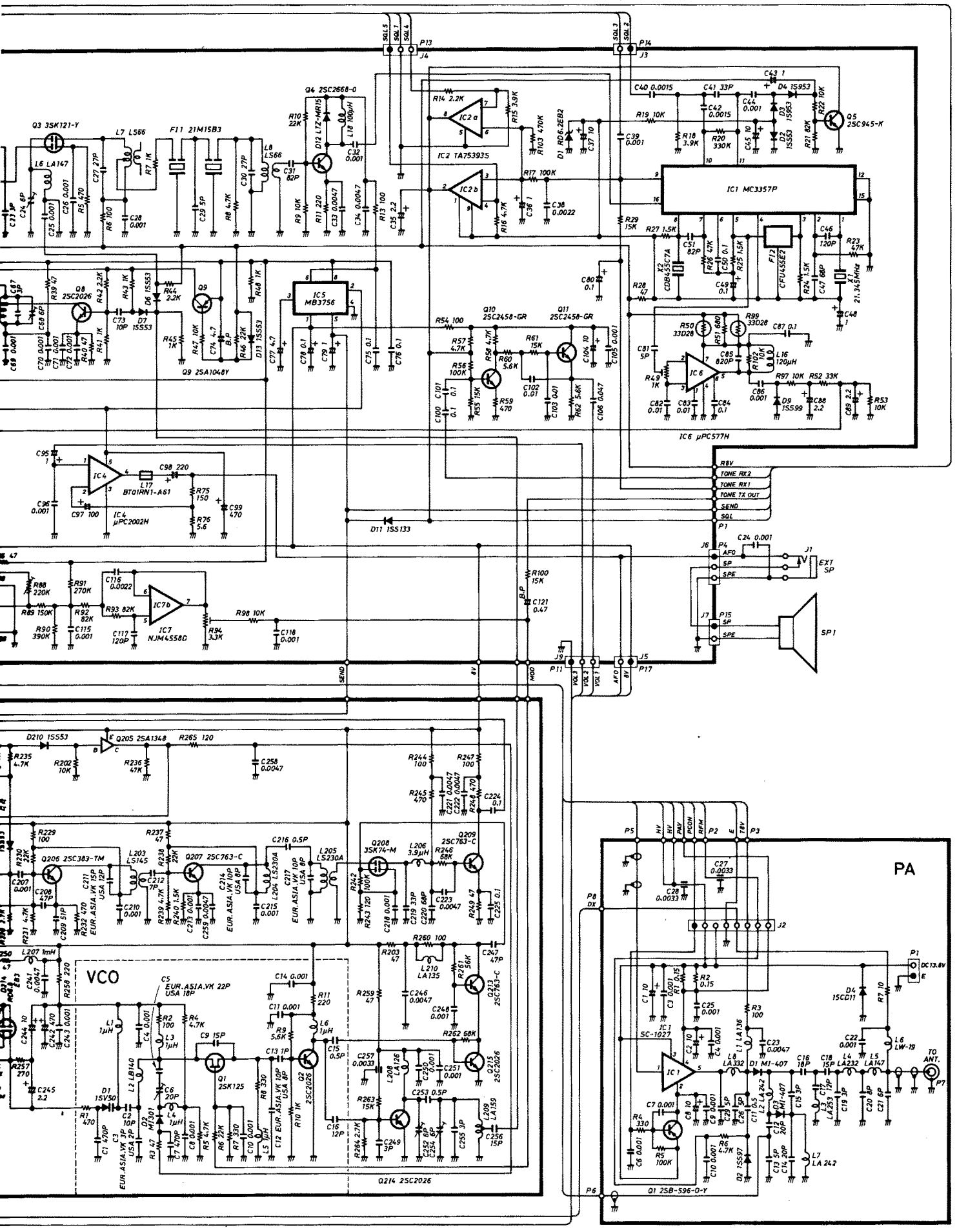
IC-47 A/E SCHEMATIC



DIAGRAM


IC1 4013B
IC2 4001UBP
IC3 4030B
IC4 4081B
IC5 μA78L062AW
IC6 TMP47C40-6001
IC7 4028B
IC10 TMS1024NLC (M50781SP)
IC13 S7116A
IC14 DAN601
IC 1
IC 2
IC 3
IC 4
D7 1SS133
D22~D28 1SS133
Q19~Q23 2SA1048Y
Q24 2SA1048Y
Q25 2SC2458GR
Q26 2SC2458GR
Q27 2SA1048Y
Q28 2SC2458GR
Q29 2SC3399
D30 1SS133
D31 1SS133
D32 1SS133
D33 1SS133
D34 1SS133
D35 1SS133
D36 1SS133
D37 1SS133
Q8 2SA1345
Q9 2SC2458GR
Q10 2SC2458GR
Q11 2SC2458GR
Q12 2SC2458GR
Q13 2SC2458GR
Q14 2SA1048Y
Q15 2SA1048Y
Q16 2SC2458GR
Q17 2SC3399
Q18 2SC2458GR
Q30 2SC3399
Q31 2SD1225M
Q32 2SD1225M
Q33 2SA1048Y
Q34 2SC3399
Q35 2SC3399
Q36 2SC3399
Q37 2SC3399
Q38 2SA1048Y
D40 1SS133
D41 1SS133
D42 TLR123
D43 RD5.1EB2
D44 RD6.8EB3
D45 1SS133
D46 1SS133
D47 1SS133
D48 1SS133
D49 1SS133
D50 1SS133
D51 1SS133
D52 1SS133
D53 1SS133
D54 1SS133
D55 1SS133
D56 1SS133
D57 1SS133
D66 1SS133
D68 1SS133
D70 D71 D72 D75 D76 D78 D79 D82 D83 D84 D90
D91 1SS133
D93 1SS133
BT1
S1
S2
DX
BUSY/E
PS/FS
TIMER
TIM ON
SPEED
EUR D70. 71. 72. 75. 76. 78. 79. 82. 83
USA D70. 72. 78. 79. 83. 84. 90
ASIA.VK D70. 72. 78. 79. 82. 83
D70. 71. 72. 75. 76. 78. 79. 82. 83. 84. 90 .... 1SS133
USA
EUR
USA. ASIA.VK
X1 CSA5.00 MT or MG
X2 CSA3.58MG18
C10 10
C11 10
C12 0.047
C13 470P
C20 0.1
C22 47
C23 0.1
C24 0.1
C25 100
C26 100
C27 3.3
C29 33P
C30 33P
C32 20P
C33 39P
C34 39P
C35 0.0047
C36 10
C37 2.2
C38 0.047
C39 100
C41 0.1
R8 22K
R9 100K
R15 1M
R16 22K
R17 1M
R18 22K
R30 47K
R31 10K
R42 100K
R43 22K
R44 100K
R45 47K
R46 47K
R47 47K
R48 47K
R49 47K
R50 47K
R51 47K
R52 47K
R53 22K
R54 47K
R55 47K
R56 47K
R57 470K
R58 1M
R59 47K
R60 47K
R61 10K
R62 10K
R63 22K
R64 22
R65 4.7K
R66 4.7K
R67 27
R68 120
R69 10K
R70 4.7K
R71 22K
R72 47K
R73 47K
R74 4.7K x 4
R75 47K x 4
R76 4.7K x 3
R77 4.7K x 4
R78 47K x 4
R79 4.7K x 4
R80 4.7K
R81 47K
R82 47K
R83 4.7K x 4
R93 22K
R94 22K
R95 22K
R96 47K
R97 33K
R98 47K
R102 100K
R103 100K
TONE
PRI
MIR
RX
SCAN


MAIN UNIT
PLL
VCO
SPEECH SYNTHESIZER
TO P1
TO P2
TONE
RX1
RX2
CONT
+5V
E
SQL
SEND
TONE TX OUT
TONE RX1
TONE RX2
RBW
P1
J9
J10
J1
J2
J5
J6
J7
J8
J10
J11
J12
J13
J14
J15
J16
J17
J18
P2
P3
P4
P5
P6
P12
P16
P18
P201
P202
SPEECH AF OUT
MIC
IC3 M5218L
IC4 µPC2002H
IC7 NJM4558D
IC8 4511B
IC9 BA612
IC11 BA612
IC12 BA612
IC201 TC9123BP
Q12 2SC1571-G
Q210 2SC2458
Q211, 212 3SK74-M
EUR
USA
ASIA
VK
LOAD
2.5kHz
5.0kHz
7.5kHz
SEND
MUTE
MEMO
10M
1M
100K
10K
DUP+
DUP−
SCAN
TX
MR
PRI
RX
TONE
SCP
D70.71.72.
75.76.78.
79.82.83.
84.90.....
....1SS133



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Some components subject to change for an improvement without notice.

A-0551

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