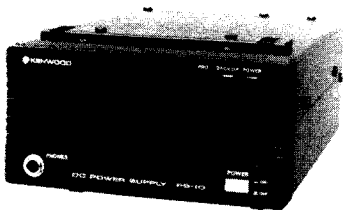
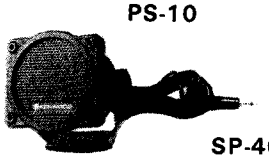
TR-8400



PS-10



SP-40

KENWOOD

SERVICE MANUAL

TR-8400, PS-10, SP-40

UHF FM CAR TRANSCEIVER

SPECIFICATIONS

[K, X type]

GENERAL

Semiconductors	MPU 1 ICs 13 Transistors 52 FETs 6 Diodes 74 (K), 76 (X)
Frequency range	440.000 to 449.975 MHz (K) 430.000 to 439.975 MHz (X)
Frequency synthesizer	Digital control, phase locked VCO
Mode	FM (F3)
Antenna impedance	50 ohms
Power requirement	13.8V DC ±15%
Grounding	Negative
Operating temperature	−20°C to +50°C
Current drain	0.45A in receive mode with no input signal 3.4A in HI transmit mode (Approx.) 1.4A in LOW transmit mode (Approx.) Less than 3 mA for memory back up (from power supply)
Dimensions	147.5 mm (5 − 13/16") wide 51.5 mm (2") high 193.0 mm (7 − 5/8") deep (projections excluded)
Weight	1.5 kg (3.3 lbs) (approx.)

TRANSMITTER SECTION

RF output power (at 13.8V, DC, 50Ω load)	HI 10 Watts min. LOW 1 Watts approx. (Adjustable)
Modulation	Variable reactance direct shift
Frequency tolerance (−20°C ~ +50°C)	Less than $\pm 15 \times 10^{-6}$
Spurious radiation	HI Less than −60 dB LOW Less than −50 dB
Maximum frequency deviation (FM)	±5 kHz
RPT. Tone burst frequency	1,750 Hz
Microphone	Dynamic microphone with PTT, UP, DWN, switches, 500Ω

RECEIVER SECTION

Circuitry	Double conversion superheterodyne
Intermediate frequency	1st IF 21.6 MHz 2nd IF 455 kHz
Receiver sensitivity	Better than 1 μV for 30 dB S/N Better than 0.4 μV for 12 dB SINAD
Receiver selectivity	More than 14 kHz (−6 dB) Less than 30 kHz (−60 dB)
Spurious response	Better than 60 dB
Squelch sensitivity	0.35 μV (threshold)
Audio output	More than 20 watts across 8 ohm load (10% dist)

Note: Circuit and ratings are subject to change without notice due to developments in technology

[W, T type]

GENERAL

Semiconductors	MPU 1 ICs 13 Transistors 54 (W), 53 (T) FETs 6 Diodes 80 (W), 79 (T)
Frequency range	430.000 to 439.975 MHz
Frequency synthesizer	Digital control phase locked VCO
Mode	FM (F3)
Antenna impedance	50 ohms
Power requirement	13.8V DC ±15%
Grounding	Negative
Operating temperature	−20°C to +50°C
Current drain	0.45A in receive mode with no input signal 3.4A in HI transmit mode (Approx.) 1.4A in LOW transmit mode (Approx.) Less than 3 mA for memory back up (from power supply)
Dimensions	147.5 mm (5 − 13/16") wide 51.5 mm (2") high 193.0 mm (7 − 5/8") deep (projections excluded)
Weight	1.5 kg (3.3 lbs) (approx.)

TRANSMITTER SECTION

RF output power (at 13.8V DC, 50Ω load)	HI 10 Watts min. LOW 1 Watts approx. (Adjustable)
Modulation	Variable reactance direct shift
Frequency tolerance (−20°C ~ +50°C)	Less than $\pm 15 \times 10^{-6}$
Spurious radiation	HI Less than −60 dB LOW Less than −50 dB
Maximum frequency deviation (FM)	±5 kHz
RPT. Tone frequency (W)	1,750 Hz
RPT. Tone burst frequency (T)	1,750 Hz
Microphone	Dynamic microphone with PTT, UP, DWN switches, 500 Ω

RECEIVER SECTION

Circuitry	Double conversion superheterodyne
Intermediate frequency	1st IF 21.6 MHz 2nd IF 455 kHz
Receiver sensitivity	Better than 1 μV for 30 dB S/N Better than 0.4 μV for 12 dB SINAD
Receiver selectivity	More than 14 kHz (−6 dB) Less than 30 kHz (−60 dB)
Spurious response	Better than 60 dB
Squelch sensitivity	0.35 μV (threshold)
Audio output	More than 2.0 watts across 8 ohm load (10% dist)

Note: Circuit and ratings are suject to change without notice due to developments in technology

CONTENTS

CIRCUIT DESCRIPTION

<Receiver Section>

The front end consists of the RF unit, the 1st mixer and a 2-stage 21.6 MHz MCF (monolithic crystal filter); the RF unit consists of a 2-stage RF amplifier using a dual gate MOS FET Q1 (3SK76 or 3SK92), junction FET Q2 (2SK125), and helical resonators with a bandwidth of 10 MHz. The 1st mixer (Q1, located on the RX•TX unit) uses a 3SK48.

The 21.6 MHz IF signal is applied to 2nd mixer Q3 (2SC1923 (O)) to obtain the 455 kHz 2nd IF signal. The 2nd IF signal is then applied to the 5-stage IF amplifier, Q5 ~ Q9 (2SC460 (B)), through a CFW455E ceramic filter. It is then detected to obtain an AF signal.

Item	Rating
Nominal center frequency (fo)	21.6 MHz
3 dB bandwidth	±15 kHz or more
Attenuation bandwidth	±50 kHz or less at 40 dB ±100 kHz or less at 60 dB
Ripple	1.0 dB or less
Loss	1.5 dB or less
Guaranteed attenuation	70 dB or more within fo ±1 MHz
Spurious	25 dB or more within fo to fo + 500 kHz 80 dB or more within fo − (910 ±20)kHz
Input and output impedance	1.5 kΩ

Table 1 MCF (L71-0218-05) (RX•TX unit: L4)

The squelch circuit amplifies noise signals by Q12 and Q13 and then rectifies this by D11 and D12 to control switching transistors Q14-Q17, which turns AF amplifier Q10 and the BUSY indicator, on and off. The squelch circuit also supplies the scan stop signal to the microprocessor, IC7. The AF signal is amplified by Q10 (2SC1815 (Y)) and is then applied to power amplifier IC2 (HA1366W) through an active L.P.F., Q11 (2SC2603 (E)), and the AF GAIN control.

Item	Rating
Nominal center frequency	455 kHz
6 dB bandwidth	±7.5 kHz or more
50 dB bandwidth	±15 kHz or less
Ripple (within 455 ±5 kHz)	3 dB or less
Loss	6 dB or less
Guaranteed attenuation (within 455 ±100 kHz)	35 dB or more
Input and output impedance	1.5 kΩ

Table 2 Ceramic filter (L72-0316-05) CFW445E (RX•TX unit: L7)

Item	Sym-bol	Condition (Ta=25°C)	Rating			Unit
			MIN	TYP	MAX	
DC current with no input	Iq	Vin = 0	—	30.0	60.0	mA
Gain in voltage	Gv	Vin = −50 dB	50.0	52.5	55.0	dB
Output power	Po	THD = 10%	4.5	5.5	—	W
Distortion	THD	Po = 0.5W	—	—	1.5	%
Noise level	WBN	Rg = 10 kΩ, BW=20 Hz ~ 20 kHz	—	—	2.0	mV
Hum ratio	HR	f = 500 Hz	28.0	—	—	dB
Voltage allowance with a shorted load		f = 500 Hz Vin = 10 mV, t = 5 sec.	16.0	—	—	V

Rank	1	2	3
Gv (dB)	50.0 ~ 52.2	51.4 ~ 53.6	52.8 ~ 55.0

Table 3 HA1366W (RX•TX unit: IC2)

CIRCUIT DESCRIPTION

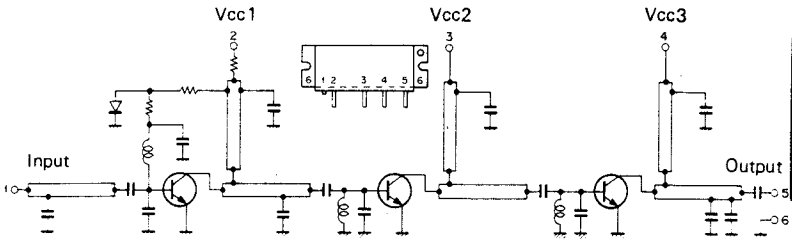


Fig. 1 Power module M57704M

Max. rating M57704M

Item	Symbol	TC (°C)	Rating
Operating voltage	Vcc	25	17V
DC current	Icc	25	5A
Operating temperature	TC (op)		−30～+110°C
Storage temperature	Tstg		−40～+110°C

Electrical characteristic M57704M

Item	Symbol	TC (°C)	Condition	Value	
				Min.	Typ.
Output	Po	25	f=430～450 MHz, Vcc=12.5V Pin=0.2W, ZG=ZL=50Ω	13W	15W
Total efficiency	ηT	25		35%	40%

<Transmitter Section>

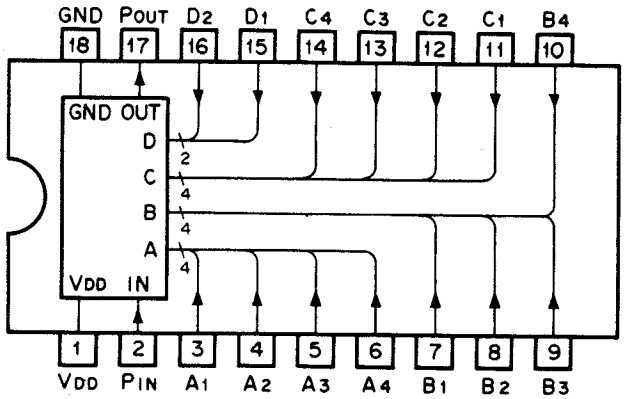
The microphone signal is amplified in the RX•TX unit by the microphone amplifier IC1 (TA7061AP) and is then applied to the VCO through D1 (1S2208) in the PLL unit. VCO Q1 (2SK125) in the PLL unit directly generates a 430 MHz signal. The 430 MHz signal is buffer amplified by Q2 (2SC2212) and Q3 (2SC2026) and is then amplified by Q29 (2SC2026) and Q30 (2SC2407) in the RX•TX unit.
This signal is applied to the final power module M57704M where it is amplified and then fed to an antenna through the L.P.F. Power module M57704 provides excellent performance.

<PLL Circuit>

The VCO circuit directly generates 408.400 — 418.375 MHz during reception and 430.000 — 439.975 MHz during transmission (418.400 — 428.374 MHz and 440.000 — 449.975 MHz for the K type model). This signal is buffer amplified by Q2 (2SC2212) and Q4 (3SK76 or 3SK92), and then mixed with the HET signal by a DBM consisting of D6 (ND487C2-3R), to obtain a 5.5 — 10.48 MHz IF signal. The IF signal is amplified by IC3 (TA7302P) and Q11 (2SC1923 (O)), and then frequency divided by IC4 (TC9122P) according to data from the microprocessor to obtain a 10 kHz reference signal. At the same time, the 10.24 MHz signal generated by IC2 (TC5082) is frequency divided to obtain a 10 kHz standard signal. Phase comparator IC1 (TC5081P) compares the 10 kHz reference signal with the standard signal. The comparator output signal is applied to varicap diode D3 (1SV50S) in the VCO circuit through a low-pass filter consisting of Q7 (2SK30A (Q)) and Q8 (2SC2240 (GR)) to control Q1, the Voltage Controlled Oscillator.
The HET signal applied to the DBM is generated by a 3rd-overtone oscillator, Q12 (2SC1923), and a tripler, Q13 (2SC2212).

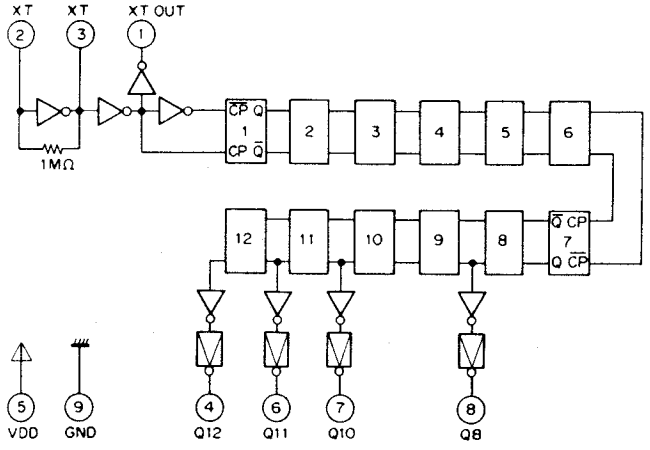
<Control Circuit>

Microprocessor IC7 is the same as that used in the model TR-9000 VHF transceiver.
The display unit uses a 4-digit LED. Three digits are lit by dynamic scanning, while the first digit and the decimal are preset.
The microprocessor D-port output data (BCD code) (from pins 8 to 11) is converted into 7-segment data by decoder-driver IC6 (TC5022BP). The digit signals from the E-port (pins 13 to 15) switch Q20 — Q22 on sequentially so that each LED digit is scanned ON.



Symbol	Name	Content and operation	Remarks
Pin	Programmable counter input terminal	Programmable counter input terminal to which the signal to be divided is input	Build-in bias circuit
Pout	Programmable counter output terminal	Programmable counter output terminal. Output is 1/N of the input frequency. The output pulse width equals 5 bit of the input	
A_1～A_4: ×1 B_1～B_4: ×10 C_1～C_4: ×100 D_1～D_4: ×1000	Program input terminals	Terminal to set the dividing ratio. The following input combination is prohibited A_1 A_2 A_3 A_4 B_1 B_2 B_3 B_4 C_1 C_2 C_3 C_4 D_1 D_2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0	Built-in pull-down resistor

Fig. 2 TC9122P (PLL unit: IC4)



PIN NO	8	7	6	4	1
PIN NAME	Q_8	Q_{10}	Q_{11}	Q_{12}	XT_{out}
Dividing ratio	1/256	1/1024	1/2048	1/4096	1/1
Output frequency X-tal 10.24 MHz	40 kHz	10 kHz	5 kHz	2.5 kHz	10.24 MHz

Fig. 3 TC5082P (PLL unit: IC2)

CIRCUIT DESCRIPTION

● **Data output for PLL**

1 MHz, 100 kHz and 10 kHz data signals for the PLL are output as BCD codes from the G—, H— and I— ports (pins 22 — 32) of IC7. When the frequency is 430 MHz (440 MHz for the K model type) or 435 MHz (445 MHz), the 3 digit BCD code output data is 550. When it is 434.975 MHz (444.975 MHz) or 439.975 MHz (449.975 MHz), the 3 digit BCD code output data is 1047.

● **Reset circuit**

When the MB (Memory Back-up) voltage for the microprocessor is within the ON-range of diode D26 (MA522 (W)) current flows into the base of Q19 (2SC1815 (Y)) and the collector level is "L". When the MB voltage drops below the ON-range, the collector level rises to "H" and a reset pulse signal is generated by the CR differentiating circuit to reset the microprocessor.

● **Encoder input data and UP/DOWN data**

The pulse signal from the mechanical encoder (50 steps/revolution) is applied to the Schmitt circuit IC101 (TC7404 UBP) to prevent chattering, then applied to the A-port (pins 33 — 36) of the microprocessor. The microprocessor counts the number of pulses and performs UP/DOWN operation.

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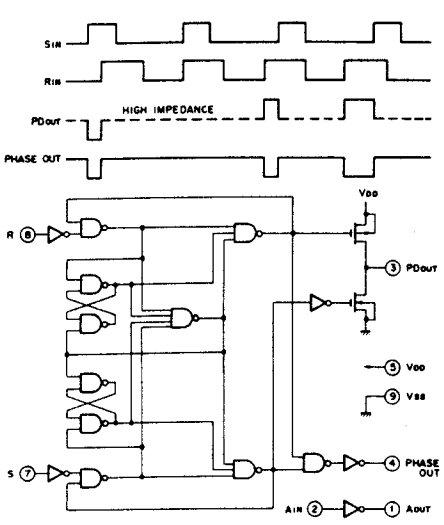


Fig. 4 TC5081P (PLL unit: IC1)

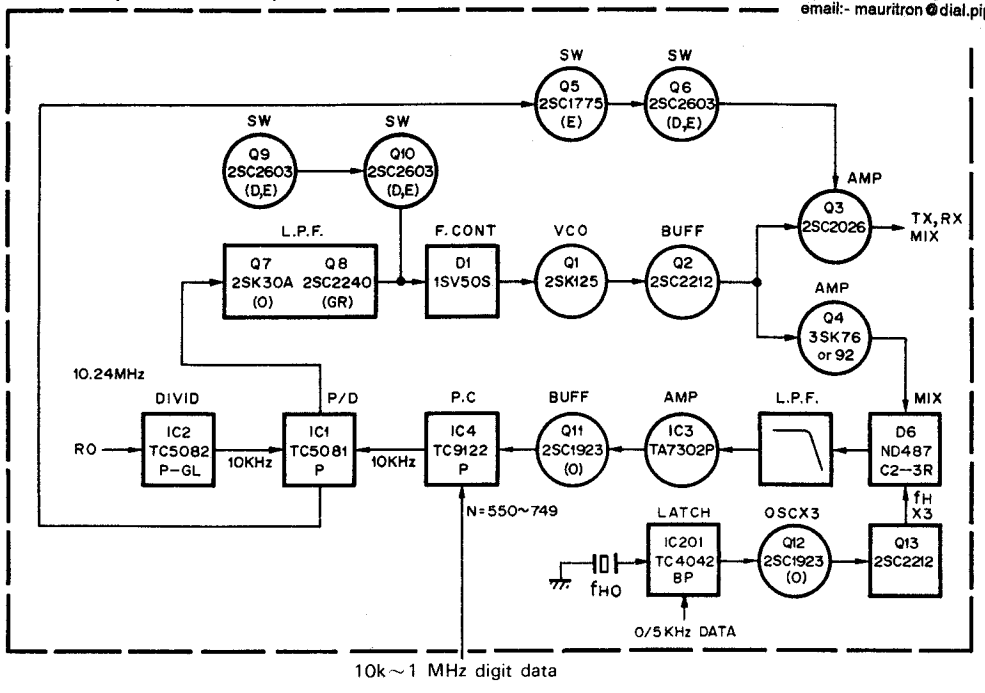


Fig. 5 PLL unit block diagram

VCO FREQ.

TYPE	RX (MHz)	TX (MHz)
T.W.X	408.4~418.375	430.0~439.975
K	418.4~428.375	440.0~449.975

HET OSC FREQ. fHO

	RX (MHz)	TX (MHz)	TX OFFSET (MHz)				
			−1.6	+1.6	−7.6	−5	+5
LOW BAND	44.7667 (W)(T)(X) 45.8778 (K)	47.1667 (W)(T)(X) 48.2778 (K)	46.9889 (W)(T)(X)	47.3444 (T)	—	—	48.8333 (K)
HIGH BAND	45.3222 (W)(T)(X) 46.4333 (K)	47.7222 (W)(T)(X) 48.8333 (K)	—	—	46.8778 (W)	47.1667 (X) 48.2778 (K)	—

PLL HET FREQ. fH (fH = fHO × 9)

		RX (MHz)	TX (MHz)	TX OFFSET (MHz)				
				−1.6	+1.6	−7.6	−5	+5
0 kHz	LOW BAND	402.9 (W)(T)(X) 412.9 (K)	424.5 (W)(T)(X) 434.5 (K)	422.9 (W)(T)(X)	426.1 (W)(T)(X)	—	—	439.5 (K)
	HIGH BAND	407.9 (W)(T)(X) 417.9 (K)	429.5 (W)(T)(X) 439.5 (K)	—	—	421.9 (W)	424.5 (X) 434.5 (K)	—
5 kHz	LOW BAND	402.905 (W)(T)(X) 412.905 (K)	424.505 (W)(T)(X) 434.505 (K)	422.905 (W)(T)(X)	426.105 (W)(T)(X)	—	—	439.505 (K)
	HIGH BAND	407.905 (W)(T)(X) 417.905 (K)	429.505 (W)(T)(X) 439.505 (K)	—	—	421.905 (W)	424.505 (X) 434.505 (K)	—

CIRCUIT DESCRIPTION

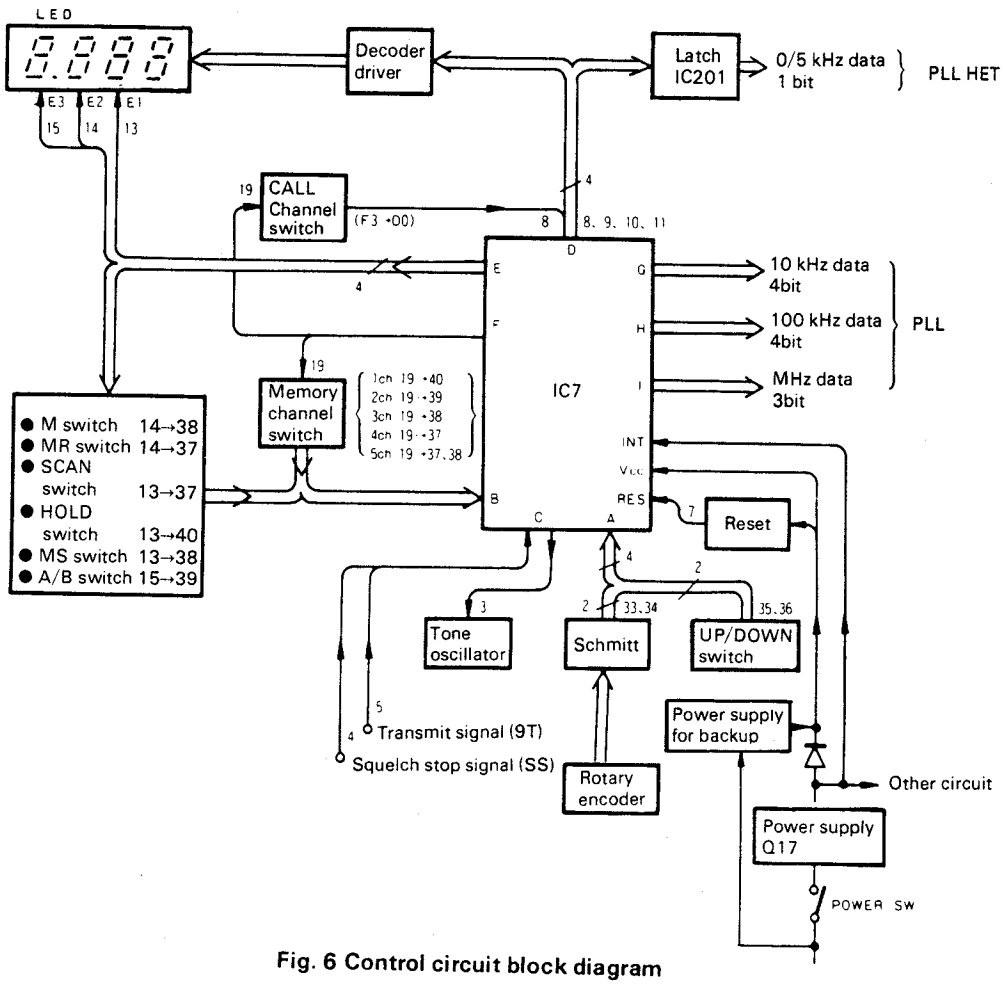
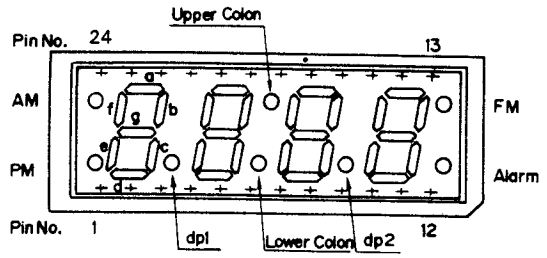


Fig. 6 Control circuit block diagram

Pin No.	Pin	Input signal	Output signal	Note	Pulse signal
1	CLO			Clock signal 400 kHz	
2	PC0	○		Normally "L"	
3	PC2	○		Normally "L", the buzzer sounds when "H".	
4	PC2	○		Squelch signal, BUSY stops when "H".	
5	PC3	○		Normally "L", "H" during transmission.	
6	$\overline{INT}$	○		Normally "H"	
7	RES	○		Microprocessor is reset when "H".	
8 PD0 9 PD1 10 PD2 11 PD3		○	○ ○ ○ ○	→CALL CH signal is input. 0/5 kHz data signal is output. 1 MHz, 100 kHz, and 10 kHz data signals are output.	○ ○ ○ ○
12	PE0			1 kHz data signal is output.	
13	PE1		○	10 kHz digit signal, SCAN, MS, HOLD, 10 or 1 MHz latch pulse signal is output.	○
14	PE2		○	100 kHz digit signal, M, MR, 430～434 band or 435～439 band latch pulse signal is output.	○
15	PE3		○	1 MHz digit signal or VFO A/B is output.	○
16	PF0			Not connected.	
17	PF1		○	10 MHz data for PLL or 435～439 data is output.	
18	PF2		○	1 MHz data for PLL or 430～434 data is output.	
19	PF3		○	Memory output signal	○

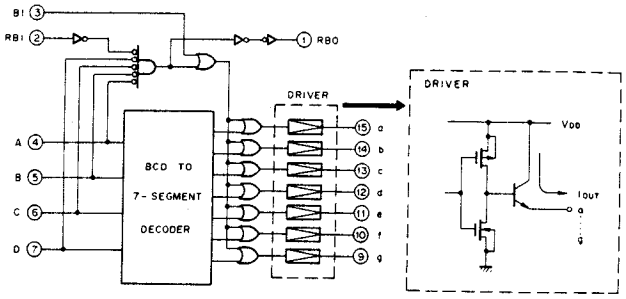
Pin No.	Pin	Input signal	Output signal	Note	Pulse signal
20	TEST			Normally 5V	
21	VCC			5V power supply	
22 PG0 23 PG1 24 PG2 25 PG3			○ ○ ○ ○	Level at 430.00 MHz A L B L C L D L 10 kHz data signals for PLL	
26 PH0 27 PH1 28 PH2 29 PH3			○ ○ ○ ○	A H B L C H D L 100 kHz data signals for PLL	
30 PI0 31 PI1 32 PI2			○ ○ ○	A H B L C H 1 MHz data signals for PLL	
33	PA0	○		Encoder signal (clock)	
34	PA1	○		Encoder signal (UP/DOWN)	
35	PA2	○		Normally "H", "L" when microphone UP switch is pressed.	
36	PA3	○		Normally "H", "L" when microphone DOWN switch is pressed.	
37	PB0	○		MR, SCAN, Memory CH4 or 5 pulse signal is input. Connector B3	○
38	PB1	○		M, MS, Memory CH3 or 5 pulse signal is input. B2	○
39	PB2	○		VFO-B or memory CH2 pulse signal is input. B1	○
40	PB3	○		Memory CH1 pulse signal is input. B0	○
41	VSS			Ground	
42	CL0			400 kHz clock signal	

Table 5 Microprocessor functions (μPD 650C-100 PLL Unit, IC7)



PIN NO	FUNCTION		PIN NO	FUNCTION	
1	PM	Anode	13	FM, Alarm	Cathode
2	Dig 1	Cathode	14	FM	Anode
3	Seg d	Anode	15	Seg a	Anode
4	dp 1	Anode	16	dp 2	Cathode
5	Dig 2	Cathode	17	Upper/Lower Colon	Cathode
6	Lower Colon	Anode	18	Seg f	Anode
7	Upper Colon	Anode	19	Seg b	Anode
8	Dig 3	Cathode	20	Seg c	Anode
9	dp 2	Anode	21	dp 1	Cathode
10	Dig 4	Cathode	22	Seg g	Anode
11	Seg e	Anode	23	AM	Anode
12	Alarm	Anode	24	AM, PM	Cathode

Fig. 7 LED LN543 RK (DISPLAY unit: D1)



INPUT						OUTPUT							
BI	RBI	A	B	C	D	a	b	c	d	e	f	g	
H	*	*	*	*	*	L	L	L	L	L	L	L	☆
L	H	L	L	L	L	L	L	L	L	L	L	L	H
L	L	L	L	L	L	H	H	H	H	H	H	L	L
L	*	H	L	L	L	L	H	H	L	L	L	L	L
L	*	L	H	L	L	H	H	L	H	H	L	H	L
L	*	H	H	L	L	H	H	H	H	L	L	H	L
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L	*	H	H	H	L	H	H	H	L	L	H	H	L
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L	*	L	H	L	H	H	H	H	H	H	H	L	L
L	*	H	H	L	H	L	H	H	L	L	L	L	L
L	*	L	L	H	H	H	H	L	H	H	L	H	L
L	*	H	L	H	H	H	H	H	L	L	H	L	L
L	*	L	H	H	H	L	H	H	L	L	H	H	L
L	*	H	H	H	H	H	L	H	H	L	H	H	L

☆ : Undetermined
* : Don't Care

Fig. 8 TC5022BP (PLL unit: IC6)

- **Scanning circuit**

This circuit operates when SCAN switch S104 is pressed. Scanning operation is completely controlled by the microprocessor. The circuit continues to operate until HOLD switch S103 is pressed or the 9T (transmission signal line) is set to "H". Scanning operation is suspended while the squelch stop signal (at terminal SS) is "H".
Frequencies stored in all memory channels, can be scanned by pressing MS switch S105. Scanning operation stops when the level at terminal SS becomes "H" or the 9T line is set to "H". However, after these signals return to "L" scanning operation resumes.

- **Control circuit power supply**

In the power supply circuit, Q15 (2SC496 (Y)) outputs 6V for the display and Q14 (2SC1959 (Y)) outputs 6.6V for the microprocessor through a reverse current protection diode, D14.

<LED Meter Circuit (Display Unit X54-1520-00)>

Voltage appearing at the M terminal is applied to the LED meter driver IC1 (TA7612AP) so that an appropriate number of LEDs are lit according to the input voltage level.

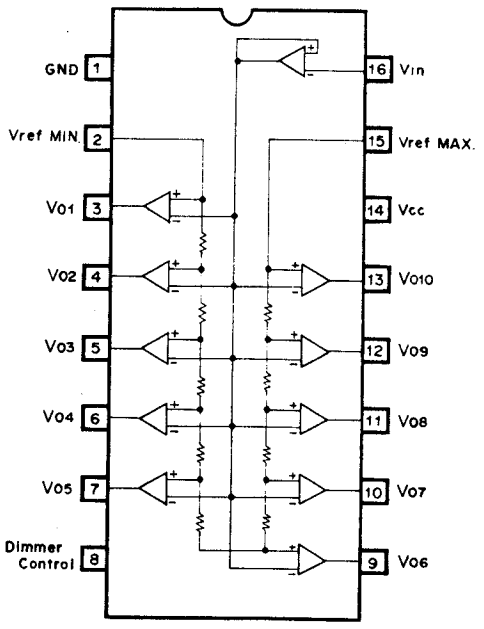

Fig. 9 TA7612AP (DISPLAY unit: IC1)

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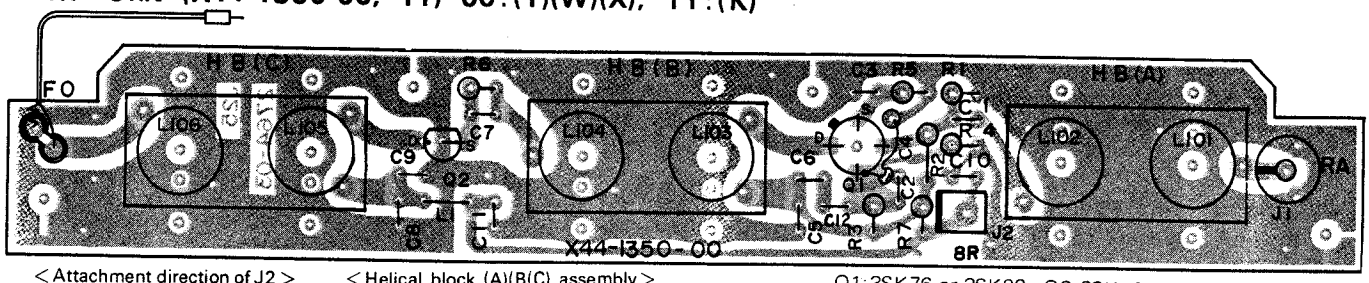
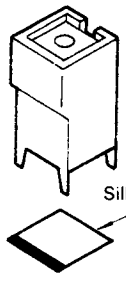
PC BOARD VIEWS

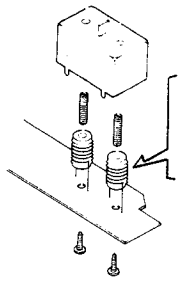
▼ RF Unit (X44-1350-00, 11) 00:(T)(W)(X), 11:(K)



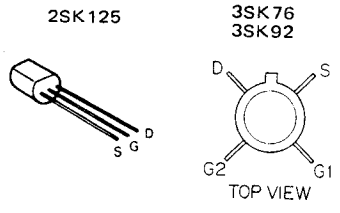
< Attachment direction of J2 >



< Helical block (A)(B(C) assembly >

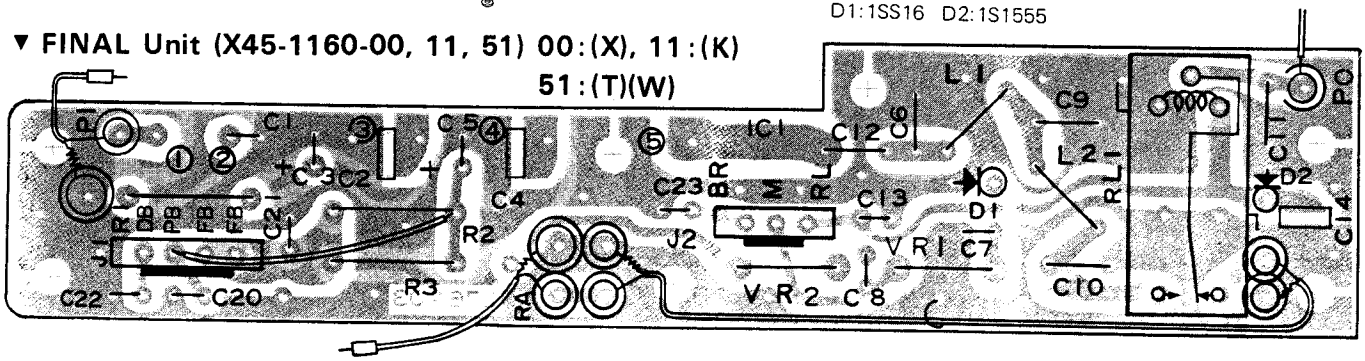


Q1:3SK76 or 3SK92 Q2:2SK125

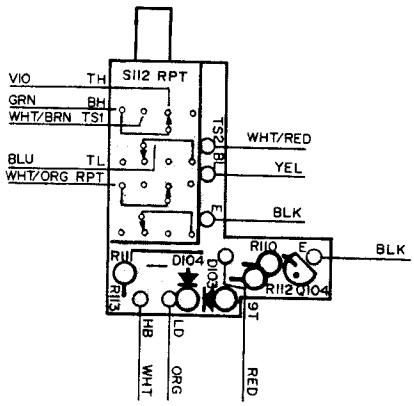


D1:1SS16 D2:1S1555

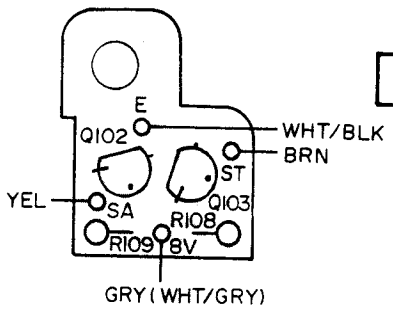
▼ FINAL Unit (X45-1160-00, 11, 51) 00:(X), 11:(K) 51:(T)(W)



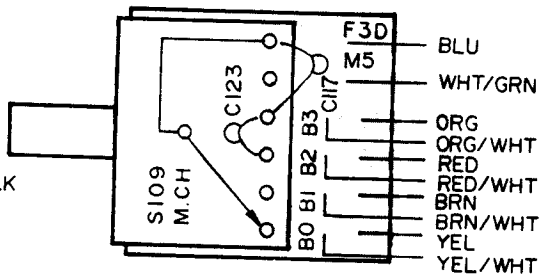
▼ RPT (J25-2799-04) (W) type



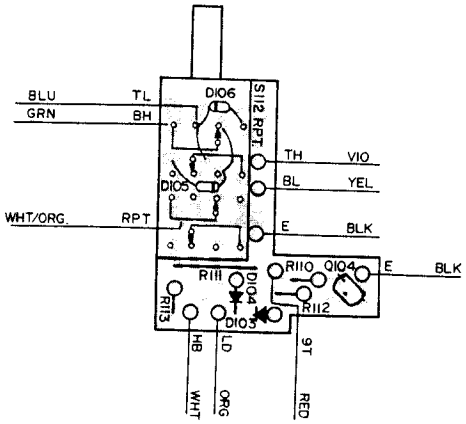
▼ STBY (J25-3001-04)



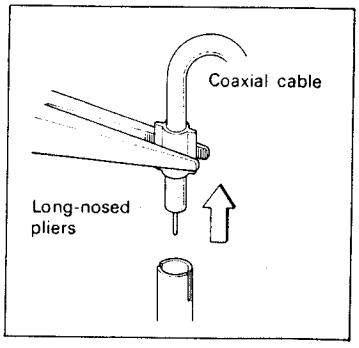
▼ Memory CH. (J25-2715-04)



▼ RPT (J25-2799-04) (K) type

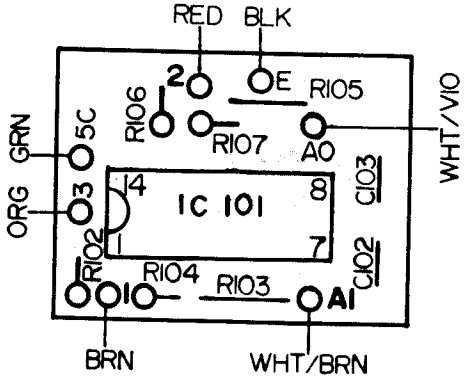


< Disconnecting the coaxial cable >



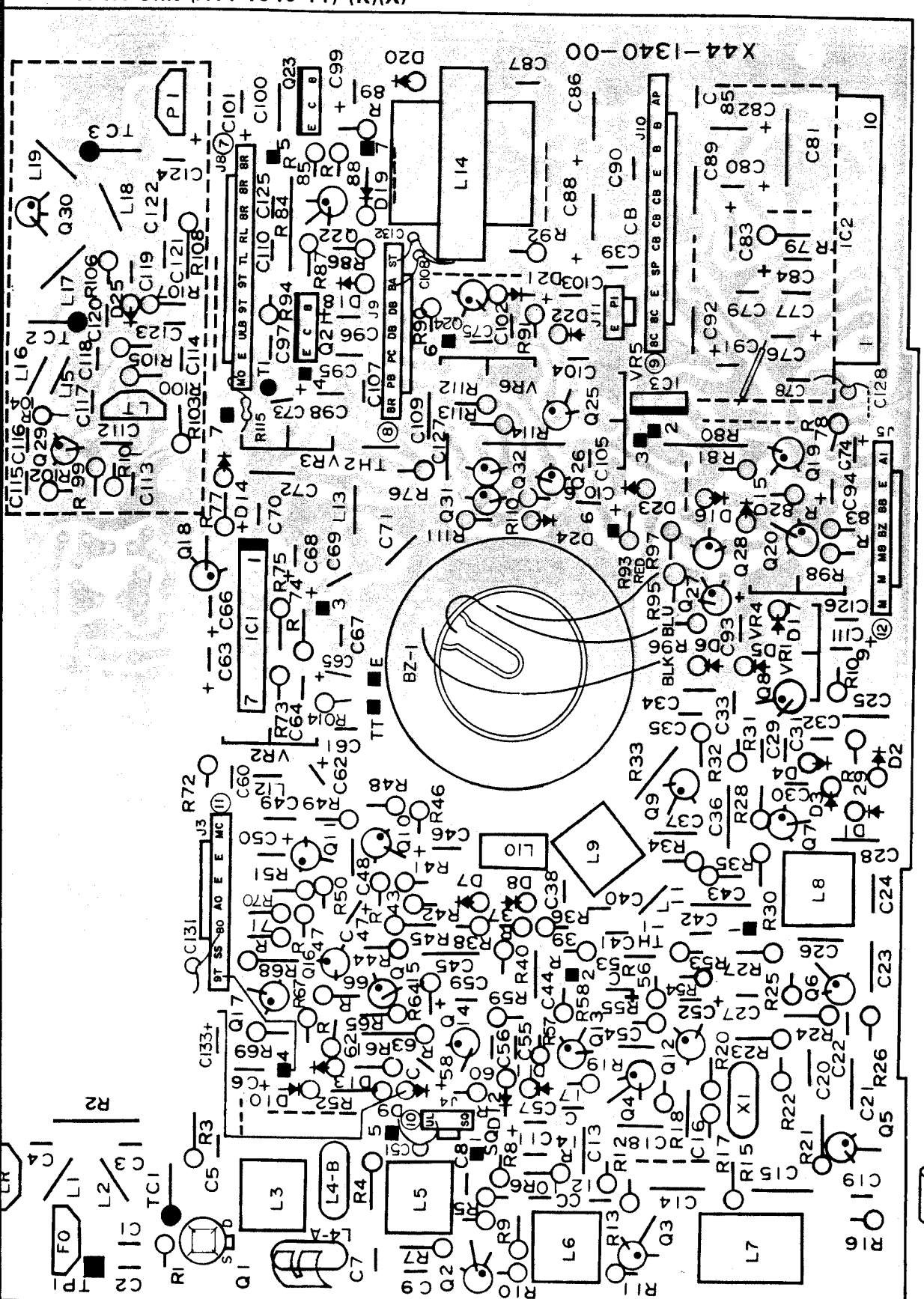
Hold the crimped metal sleeve with pliers and pull up as shown.
Caution: DO NOT pull on the cable.

▼ Schmitt (J25-2755-14)

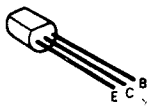


PC BOARD VIEW

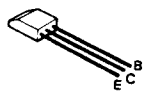
▼ RX·TX Unit (X44-1340-11) (K)(X)



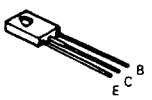
2SA1015(Y)
2SC1815(Y)
2SC1923(O)
2SC1959(Y)



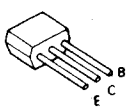
2SC460(B)



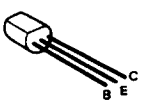
2SC496(Y)



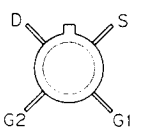
2SA1115(E)
2SC2603(E)



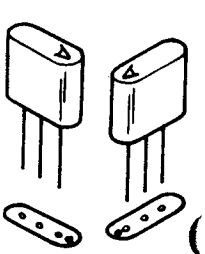
2SC2026
2SC2407



3SK48



TOP VIEW

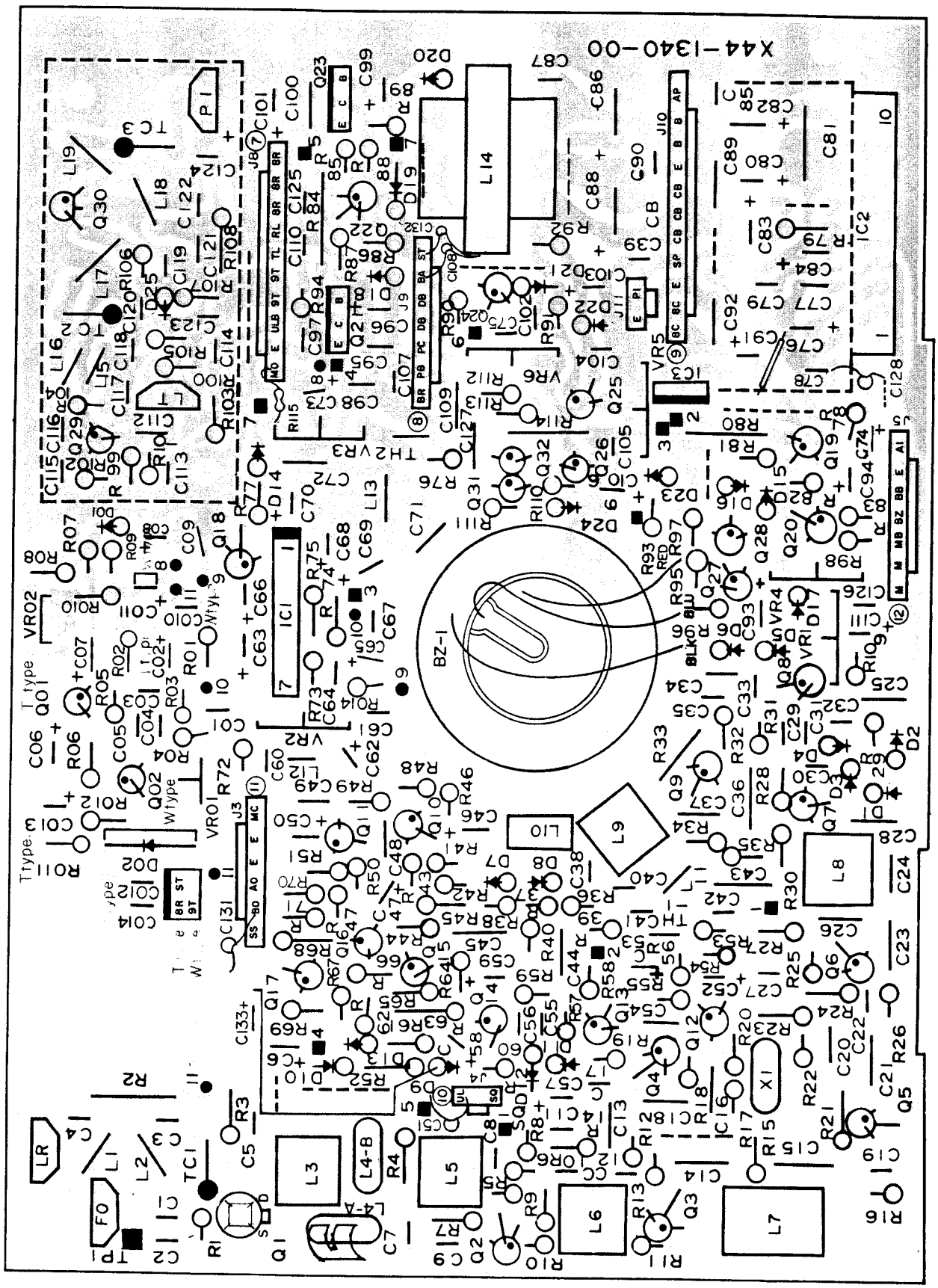


< Attachment direction of L4 >
(L4 should be used as a pair.)

Q1: 3SK48 Q2,3: 2SC1923 (O) Q4~9: 2SC460 (B) Q10,12,13,19,20,27,28: 2SC1815 (Y) Q11,14~16,18,26: 2SC2603 (E)
Q17,31,32: 2SA1115 (E) Q21,23: 2SC496 (Y) Q22,25: 2SA1015 (Y) Q24: 2SC1959 (Y) Q29: 2SC2026 Q30: 2SC2407
IC1: TA7061AP IC2: HA13066W IC3: μPC78L08A
D1,2,11,12: 1N60 D3~6,9,10,15,19,21,23~25: 1S1555 D7,8: 1SS16 D13: 1S1212 D14: WZ-040 D16: XZ-066
D17: XZ-070 D18: WZ-100 D20: XZ-094 D22: XZ-060 TH-1,2: D33A

PC BOARD VIEW

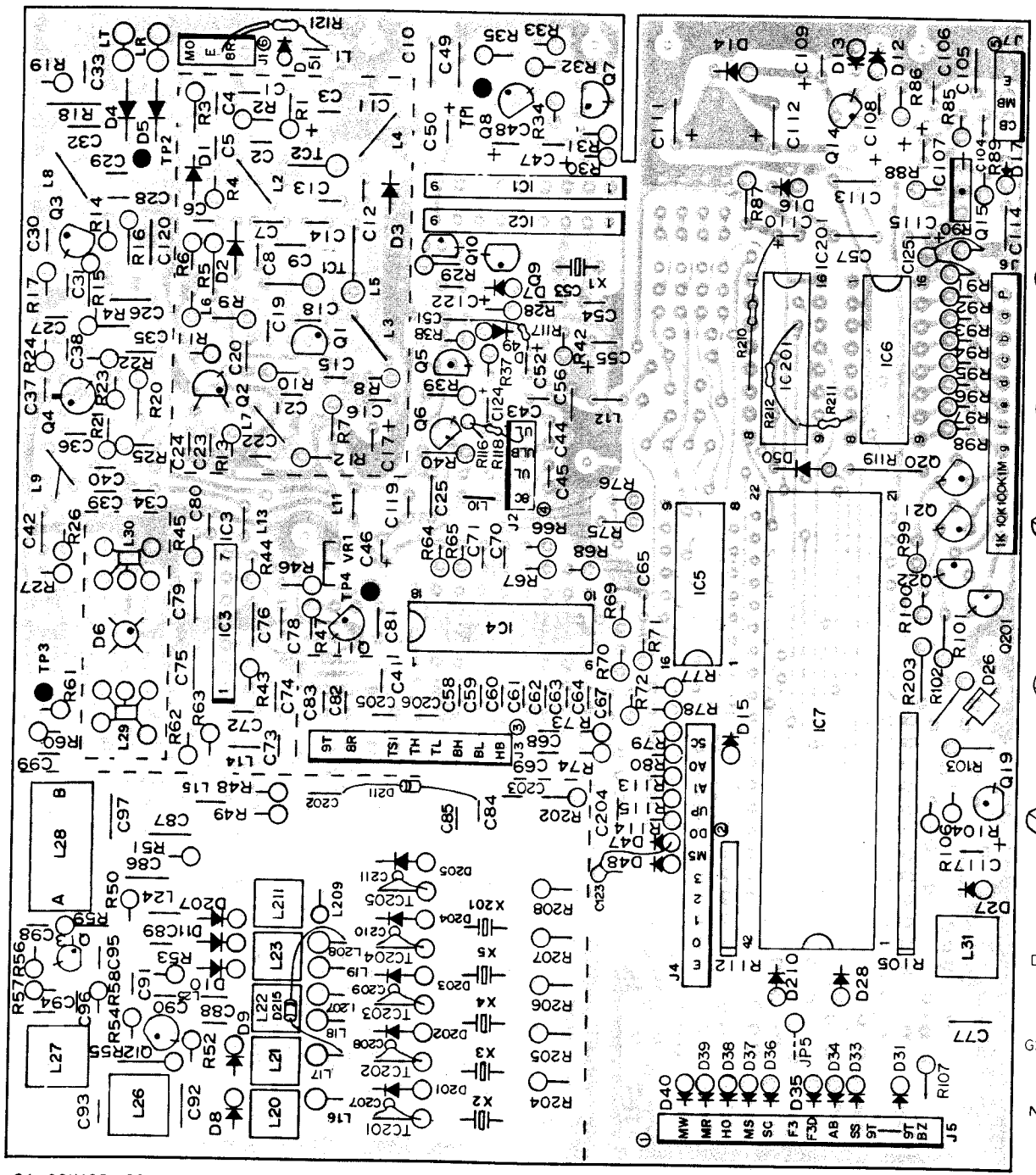
▼ RX•TX unit (X44-1340-51, 61) 51 : (W), 61 : (T)

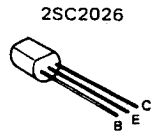


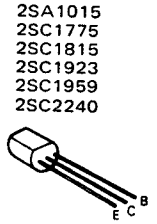
Q1: 3SK48 Q2,3: 2SC1923 (O) Q4~9: 2SC460 (B) Q10,12,13,19,20,27,28: 2SC1815 (Y) Q11,14~16,18,26: 2SC2603 (E)
Q17,31,32: 2SA1115 (E) Q21,23: 2SC496 (Y) Q22,25: 2SA1015 (Y) Q24: 2SC1959 (Y) Q29: 2SC2026 Q30: 2SC2407
Q01,02: 2SC458 (B)
IC1: TA7061AP IC2: HA13066W IC3: μPC78L08A
D1,2,11,12: 1N60 D3~6,9,10,15,19,21,23~25,01,02: 1S1555 D7,8: 1SS16 D13: 1S1212 D14: WZ-040 D16: XZ-066
D17: XZ-070 D18: WZ-100 D20: XZ-094 D22: XZ-060 TH-1,2: D33A

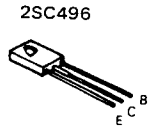
PC BOARD VIEW

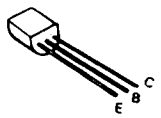
▼ PLL Unit (X50-1670-11, 71) 11:(K), 71:(X)

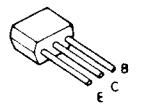


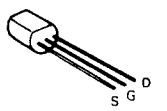


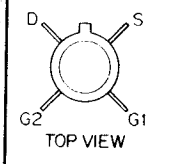


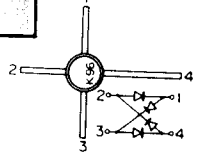




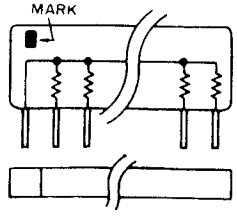






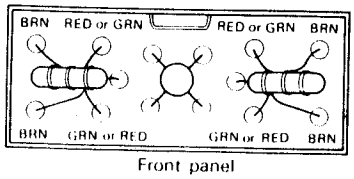


Q1: 2SK125 Q2,13: 2SC2212 Q3: 2SC2026 Q4: 3SK76 or 3SK92 Q5: 2SC1775 (E) Q6,9,10: 2SC2603 (D) or (E)
Q7: 2SK30A (O) Q8: 2SC2240 (GR) Q11,12: 2SC1923 (O) Q14,20~22,201: 2SC1959 (Y) Q15: 2SC496 (Y)
Q19: 2SC1815 (Y)
IC1: TC5081P IC2: TC5082P-L IC3: TA7302P IC4: TC9122P IC5: MN1201A IC6: TC5022BP IC7: μPD650-C-100
IC201: TC4042BP
D1: 1S2208 D2: MI301 D3: 1SV50S D4,5: BA243S D6: ND487C2-3R D7: XZ-062 D8~11,207,208: BA244A
D12,14~16,27,31,51,211,212,215,216: 1S1555 D13,17: XZ-066 D26: MA-522 (Q) D28,33~40,47~50,210: 1N60
D201~206: 1S2588



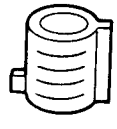
· Attachment direction of R105, R102 ·

L29 and L30 should be installed parallel to the surface of the shield case.



Front panel

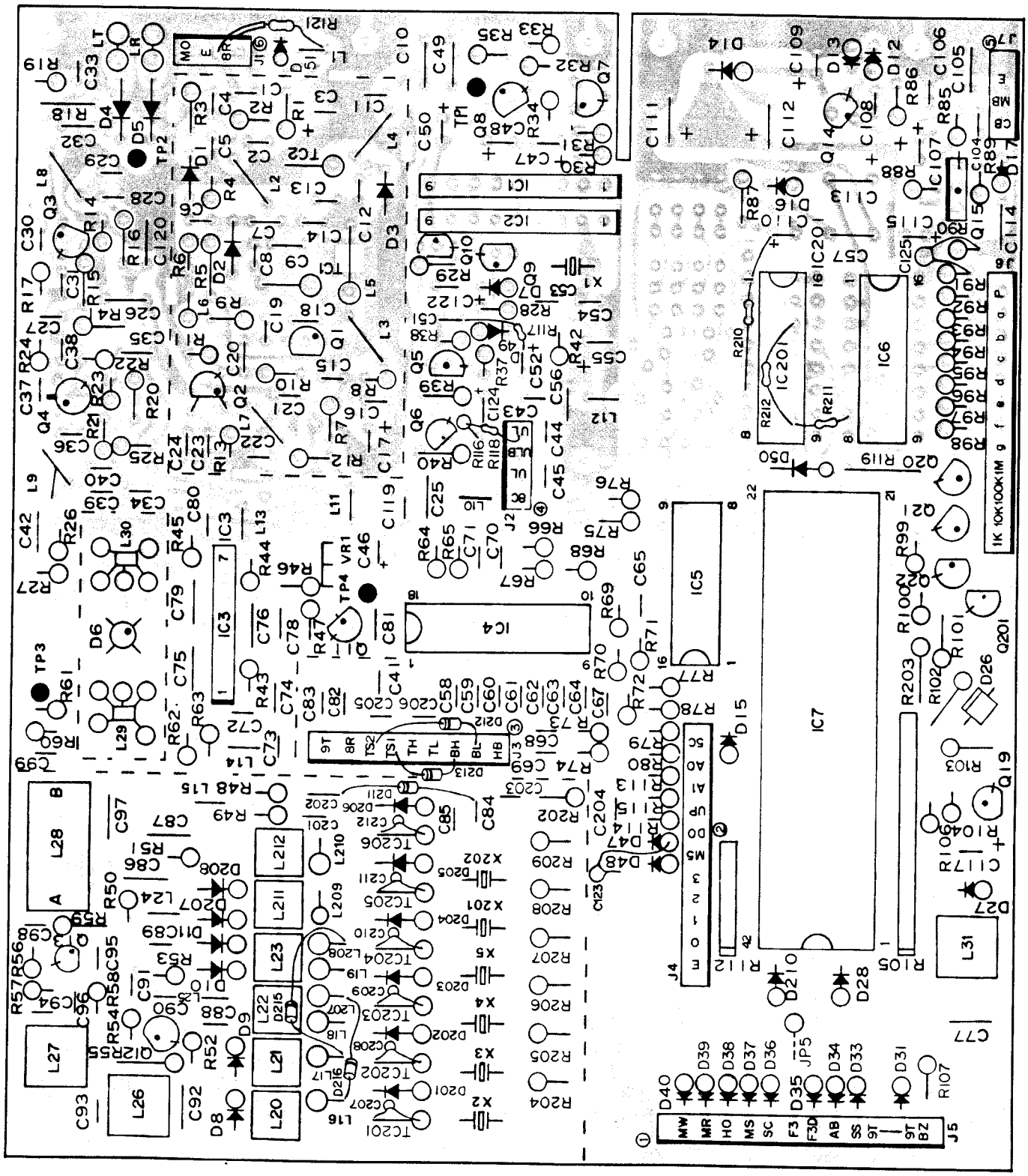
X201
R208
D205
D211
D215
C202
C211
L209
L211
TC205
} (X) type only



< Attachment direction of L5 >

PC BOARD VIEW

▼PLL unit (X50-1670-51, 61) 51 : (T), 61 (W)

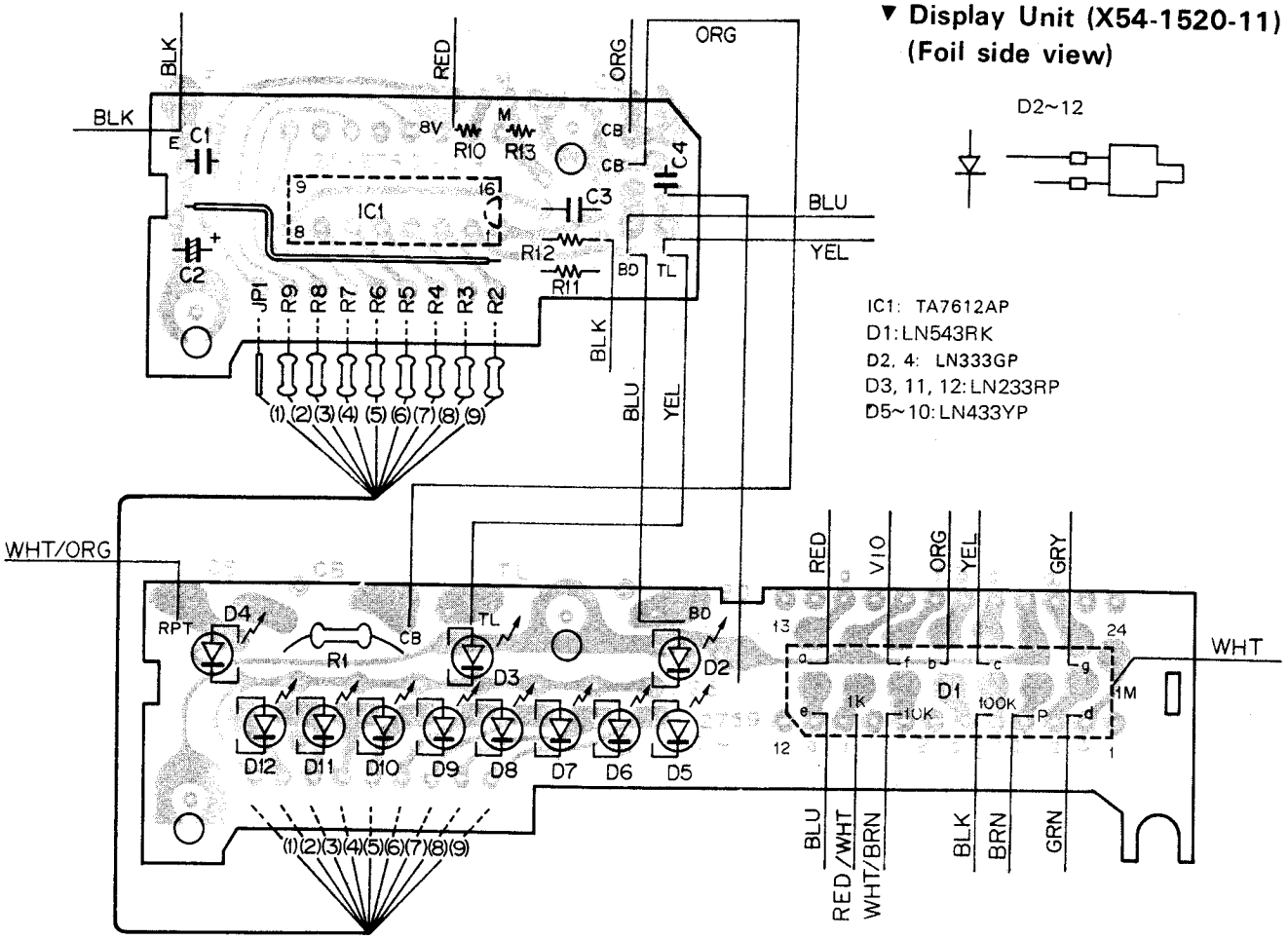


Q1: 2SK125 Q2,13: 2SC2212 Q3: 2SC2026 Q4: 3SK76 or 3SK92 Q5: 2SC1775 (E) Q6,9,10: 2SC2603 (D) or (E)
Q7: 2SK30A (O) Q8: 2SC2240 (GR) Q11,12: 2SC1923 (O) Q14,20~22,201: 2SC1959 (Y) Q15: 2SC496 (Y)
Q19: 2SC1815 (Y)
IC1: TC5081P IC2: TC5082P-L IC3: TA7302P IC4: TC9122P IC5: MN1201A IC6: TC5022BP IC7: μPD650-C-100
IC201: TC4042BP
D1: 1S2208 D2: MI301 D3: 1SV50S D4,5: BA243S D6: ND487C2-3R D7: XZ-062 D8~11,207,208: BA244A
D12,14~16,27,31,51,211,212,215,216: 1S1555 D13,17: XZ-066 D26: MA-522 (Q) D28,33~40,47~50,210: 1N60
D201~206: 1S2588

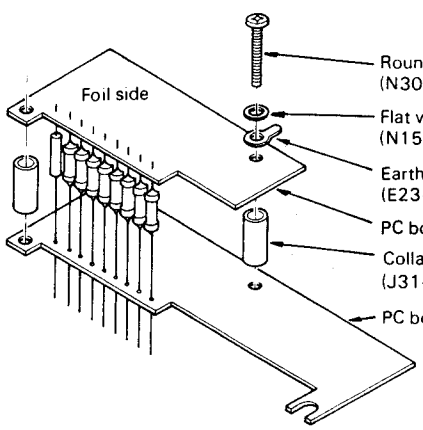
Type	W Type	T Type
D213	Used	Not used

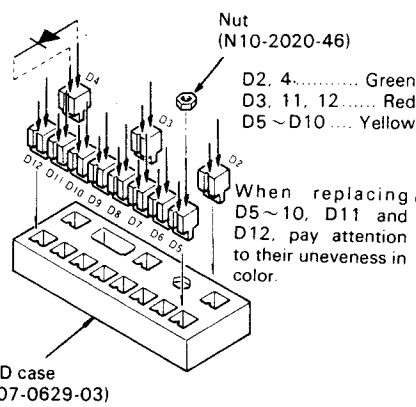
PC BOARD VIEWS

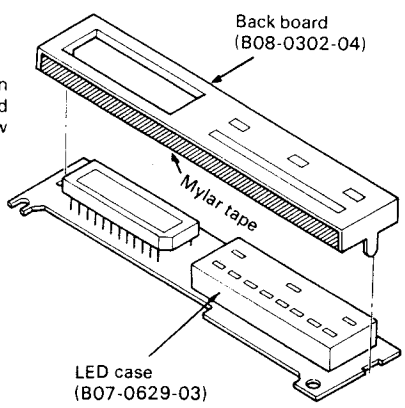
▼ Display Unit (X54-1520-11) (Foil side view)



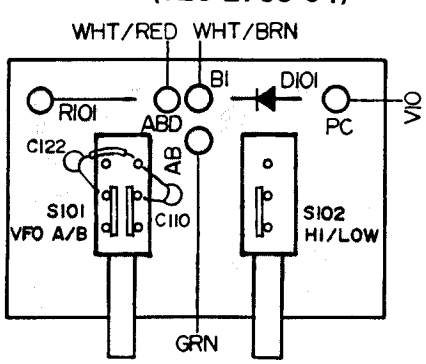
IC1: TA7612AP
D1: LN543RK
D2, 4: LN333GP
D3, 11, 12: LN233RP
D5~10: LN433YP





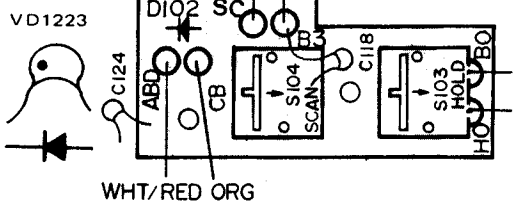


▼ VFO A/B HI/LOW (J25-2756-04)

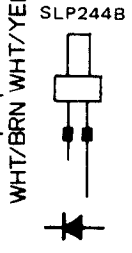


D101: VD1223

▼ SCAN, HOLD (J25-2758-14)

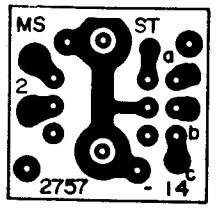


D102: SLP244B



▼ TONE (W), M, MR/M. SCAN (J25-2757-14)

(Foil side view)



For Service Manuals
MAURITRON SERVICES
8 Cherry Tree Road, Chinnor
Oxfordshire, OX9 4QY.
Tel (01844) 351694
Fax (01844) 352554
email:- mauritron@dial.pipex.com

PARTS LIST

Note 1:
K USA T Britain W Europe X Australia

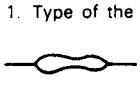
Note 2:
Only special type of resistors (example cement, metal film, etc) and capacitors (example electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration.
Resistors not otherwise detailed are carbon type (1/4W or 1/8W).
Order carbon resistors and capacitors according to the following example.

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J

RESISTOR

1. Type of the carbon resistor



RD14BY
RD14BB (small size)

RD14CY
RD14CB (small size)

2. Wattage

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3' = CC45 ○ ○ ...
Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

3 = CK45 ○
Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ +75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

Abbreviation		Abbreviation	
Cap	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

3. Resistance value

②② ② → means 22 × 10² = 2200Ω (2.2 kΩ)

Example 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. Tolerance
J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

1 = Type ceramic, electrolytic, etc
2 = Shape round, square, etc
3 = Temp range
3' = Temp coefficient

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

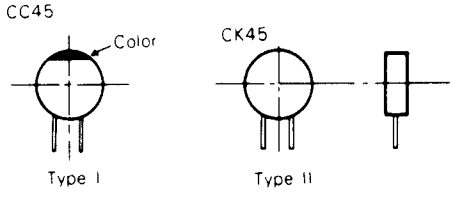
4 = Voltage rating
5 = Value
6 = Tolerance

Ex. **CC45TH** = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

5 = Capacitor value

Example 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF



☆ : New parts
● : Accessory parts

TR-8400 Semiconductor

Item	Name	Parts No.	Remarks
Diode	1N60	V11-0051-05	
	1S1555	V11-0076-05	
	1SS16	V11-0374-05	
	1S2588	V11-0414-05	
	BA243S	V11-7767-06	☆
	BA244A	V11-7776-66	
	MA-522(Q)	V11-1173-46	
	MI-301	V11-0255-05	
	U05B	V11-0270-05	
Varistor	1S1212	V11-1262-06	
	VD1223	V11-1262-46	
Vari-cap diode	1S2208	V11-0317-05	
	1SV50S	V11-1260-36	
Thermistor	D33A	V11-3161-86	
Double balanced diode	ND487C2-3R	V11-1266-06	☆
Zener diode	WZ-040	V11-4102-50	
	XZ-060	V11-4101-20	
	XZ-062	V11-4101-50	
	XZ-066	V11-4106-70	
	XZ-070	V11-4161-96	
	XZ-094	V11-4173-26	
	WZ-100	V11-0247-05	
LED	LN233RP	V11-1173-06	Red ☆
	LN333GR	V11-1173-16	Green ☆
	LN433YP	V11-1173-26	Amber ☆
	LN543RK	V11-1173-36	4 Digit ☆
	SLP244B	V11-6172-66	
TR	2SA671(B)	V01-0671-16	
	2SA1115(E)	V01-1115-16	
	2SA1015(Y)	V01-1015-06	
	2SC458(B)	V03-0093-05	
	2SC460(B)	V03-0079-05	
	2SC496(Y)	V03-0336-05	
	2SC1775(E)	V03-1775-06	
	2SC1815(Y)	V03-1815-06	
	2SC1923(O)	V03-1923-06	
	2SC1959(Y)	V03-1959-06	

PARTS LIST

Item	Name	Parts No.	Remarks
	2SC2026	V03-2026-06	
	2SC2212	V03-2212-06	
	2SC2240(GR)	V03-2240-06	
	2SC2407	V03-2407-06	
	2SC2603(E)	V03-2603-06	
FET	2SK30A(O)	V09-0056-05	
	2SK125	V09-0136-10	
	3SK48	V09-1003-16	
	3SK76	V09-1012-06	(T)(W)(X)
	3SK92	V09-1006-16	
IC	FS7808C	V30-1135-06	
	HA1366W	V30-1045-06	
	M57704M	V30-1168-06	(T)(W)(X)
	M57704M-1	V30-1168-06	(K) ☆
	MN1201A	V30-1008-66	
	TA7061AP	V30-0039-05	
	TA7302P	V30-1134-06	
	TA7612AP	V30-1169-06	☆
	TC4042BP	V30-1052-06	
	TC5022BP	V30-1054-06	☆
	TC5081P	V30-1132-06	
	TC5082P-GL	V30-1147-06	
	TC5082P-L	V30-1133-06	
	TC7404UBP	V30-1028-06	
	TC9122P	V30-1036-16	
	μPD650C-100	V30-1228-16	
	μPC78L08A	V30-1030-26	
	μPC78M08H	V30-1222-16	

☆ : New parts
● : Accessory parts

TR-8400

Ref. No.	Parts No.	Description	Remarks
	A01-0774-12	Case (upper)	☆
	A01-0775-22	Case (lower)	☆
	A13-0618-22	Angle ass'y	☆
	A20-2394-04	Panel (T)(W)(X)	☆
	A20-2418-04	Panel (K)	☆
	B01-0630-03	Panel escutcheon (K)	☆
	B01-0631-03	Panel escutcheon (T)	☆
	B01-0632-03	Panel escutcheon (W)(X)	☆
	B03-0517-04	Switch mask (B) × 2 M.MR	☆
	B03-0518-04	Switch mask × 4 A/B, H/L, MS, TONE	
	B05-0714-04	SP grill cloth	☆
	B07-0628-14	Side escutcheon × 2	☆
	B10-0629-04	Front glass	☆
	B46-0058-10	Warranty card (K)	
	B50-2766-00	Operating manual (K)	☆
	B50-2767-00	Operating manual (T)	☆
	B50-2768-00	Operating manual (W)	☆
	B50-2769-00	Operating manual (X)	☆
C102,103	C91-0430-05	Laminated cap. 0.047μF	
C104～109	C91-0469-05	Cap. 0.001μF	
C110～114	CC45SL1H470J	C 47pF	
C115,116	CC45SL1H330J	C 33pF	
C117,118	CC45SL1H470J	C 47pF	
121～123 C124	CC45SL1H101J	C 100pF	
	E06-0651-05	6P male socket MIC	
	E09-0471-05	4P plug TONE PAD (K)	●
	E12-0001-05	Phone plug	●
	E23-0426-05	Earth lug φ2.0	
	E23-0427-05	Earth lug φ2.6	☆
	E30-1648-05	DC cord ass'y	●

Ref. No.	Parts No.	Description	Remarks
	F05-4022-05	Fuse 4A	
	F20-0078-05	Insulating plate (Q101)	
	F29-0014-05	Shoulder washer (Q101)	
	G02-0520-04	GND spring	☆
	G02-0521-04	GND spring (D)	☆
	G02-0522-04	GND spring (E)	☆
	G02-0523-14	GND spring (F)	☆
	G10-0607-04	Cushion cloth × 4 side escutcheon	
	G10-0610-04	Cushion cloth × 4 A 17 × 5	
	G10-0611-04	Cushion cloth B 30 × 13	
	G10-0612-04	Cushion cloth C 150 × 45	
	G10-0613-14	Cushion cloth D 140 × 24	
	G13-0638-04	Cushion (A) × 2 58 × 24 × 5	
	G16-0504-03	Conductive rubber sheet	☆
	H01-2700-03	Carton (inside) (K)(W)(X)	☆
	H01-2701-03	Carton (inside) (T)	☆
	H10-2535-12	Packing fixture (A)	☆
	H10-2536-04	Packing fixture (B)	☆
	H12-0474-04	Cushion	☆
	H20-1417-03	Protective bag	☆
	H25-0029-04	Protective bag	
	H25-0049-03	Accessory bag	
	H25-0079-04	Protective bag MIC	
	H25-0103-04	Protective bag Cord	
	J02-0022-05	Foot × 2	●
	J02-0420-04	Foot	☆●
	J21-2676-04	Foot mounting hard ware × 2	☆●
	J25-2715-04	PC board Memory CH	
	J25-2755-14	PC board (A) Schmitt	☆
	J25-2756-04	PC board (B) A/B	☆
	J25-2757-14	PC board (C) M.MR, M.SCAN	☆
	J25-2758-14	PC board (D) SCAN.HOLD	☆
	J25-2799-04	PC board (E) RPT	☆
	J25-3001-04	PC board (F)	☆
	J30-0514-04	LED spacer	☆
	J32-0747-04	Round boss × 2	☆
	J32-0748-04	Flat washer (angle) × 4	☆
	K21-0752-03	Main knob	☆
	K23-0736-04	Knob (A) × 2 VOL,SQU	☆
	K23-0737-04	Knob (B) M.CH	☆
	K23-0743-04	Knob (C) RPT	☆
	K27-0416-05	Push knob (A) M	☆
	K27-0417-05	Push knob (B) MR	☆
	K27-0418-05	Push knob (C) × 3 A/B, H/L, TONE	
	K27-0419-05	Push knob (D) MS	☆
	K27-0420-04	Push knob (E) × 2 SCAN, HOLD	☆
	N09-0008-04	Round screw (Angle)	●
	N13-0302-04	Ornamental nut M.CH	☆
	N14-0510-04	Flange nut	●
	N14-0512-05	Speed nut	
	N15-1020-46	Flat washer	
	N15-1060-46	Flat washer	●
	N16-0060-46	Spring washer	●
	N30-2004-46	Round screw	
	N30-2020-46	Round screw	
	N30-2604-11	Round screw	
	N30-2606-71	Round screw	
	N30-3004-46	Round screw	
	N30-3008-11	Round screw	
	N32-2604-46	Flat screw	
	N32-2606-11	Flat screw	
	N33-2605-45	Round flat screw	
	N33-2606-45	Round flat screw	
	N33-2608-45	Round flat screw	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
	N35-3006-45	Bind screw	●
	N35-3012-45	Bind screw	●
VR101	R05-3410-05	Pot. 10kΩ(A)with SW VOL	☆
VR102	R05-4405-05	Pot. 50kΩ(B) SQU	☆
	S01-1422-05	Rotary switch M.CH	☆
	S01-2427-05	Rotary switch RPT	☆
	S40-1401-05	Push switch × 2 H/L, MS	
	S40-1402-05	Push switch × 2 M	
	S40-2417-05	Push switch × 3 A/B, MR, TONE	☆
	S40-2421-05	Push switch TONE (W)	☆
	S50-1406-05	Tact switch × 2 MIC	
	S59-1405-05	Key board switch × 2 SCAN, HOLD	
	T07-0209-15	Speaker	☆
	T91-0311-05	Microphone TRIO (T)	
	T91-0313-05	Microphone KENWOOD (K)(W)(X)	
	W02-0316-05	Rotary encoder	☆
	X44-1340-11	RX.TX unit (K)(X)	☆
	X44-1340-51	RX.TX unit (T)	☆
	X44-1340-61	RX.TX unit (W)	☆
	X44-1350-00	RF unit (T)(W)(X)	☆
	X44-1350-11	RF unit (K)	☆
	X45-1160-00	Final unit (X)	☆
	X45-1160-11	Final unit (K)	☆
	X45-1160-51	Final unit (T)(W)	☆
	X50-1670-11	PLL unit (K)	☆
	X50-1670-51	PLL unit (T)	☆
	X50-1670-61	PLL unit (W)	☆
	X50-1670-71	PLL unit (X)	☆
	X54-1520-11	Display unit	☆

RX·TX UNIT (X44-1340-11, -51, -61)
11 : (K)(X), 51 : (T), 61 (W)

Ref. No.	Parts No.	Description	Remarks
C1	CC45SL1H470J	C 47pF	
C2	CC45CH1H0R5C	C 0.5pF ±0.25pF	
C4	CC45CH1H050C	C 5pF ±0.25pF	
C5	C91-0131-05	C 0.01μF	
C6	CE04W1A470M	E 47μF 10V	
C7	CC45CH1H040C	C 4pF ±0.25pF	
C8 ~ 12	C91-0131-05	C 0.01μF	
C13	CC45CH1H020C	C 2pF ±0.25pF	
C14	CQ92M1H393K	ML 0.039μF	
C15	CQ92M1H223K	ML 0.022μF	
C17	CC45CH1H120J	C 12pF	
C18	CC45SL1H221J	C 220pF	
C19	CQ92M1H102K	ML 0.001μF	
C20	CQ92M1H103K	ML 0.01μF	
C21,23,26	CQ92M1H223K	ML 0.022μF	
C27	CE04W1A101M	E 100μF 10V	
C28	CQ92M1H223K	ML 0.022μF	
C29	CC45SL1H470J	C 47pF	
C32,35	CQ92M1H222K	ML 0.0022μF	
C36	CQ92M1H473K	ML 0.047μF	
C37	CQ92M1H223K	ML 0.0022μF	
C38	CQ92M1H102K	ML 0.001μF	
C39	CC45SL1H101J	C 100pF	
C40	CQ92M1H332K	ML 0.0033μF	
C41,42	CQ92M1H222K	ML 0.0022μF	
C43	CQ92M1H393K	ML 0.039μF	
C44,45	CQ92M1H223K	ML 0.022μF	
C46	CE04W1A470M	E 47μF 10V	
C47	CS15E1A220M	T 22μF 10V	
C48	CQ92M1H103K	ML 0.01μF	
C49	CQ92M1H392K	ML 0.0039μF	
C50	CS15E1V0R1M	T 0.1μF 35V	
C52	CC45SL1H330J	C 33pF	
C53	CS15E1A100M	T 10μF 10V	
C54	CQ92M1H103K	ML 0.01μF	
C55	CC45SL1H330J	C 33pF	
C56	CQ92M1H332K	ML 0.0033μF	
C57,58	CS15E1C3R3M	T 3.3μF 16V	
C59	CS15E1C4R7M	T 4.7μF 16V	
C60	C90-0131-05	C 0.01μF	
C62	CS15E1V0R1M	T 0.1μF 35V	
C63	CE04W1A330M	E 33μF 10V	
C65	CS15E1V0R1M	T 0.1μF 35V	
C66	CE04W1C220M	E 22μF 16V	
C68	CS15E1C4R7M	T 4.7μF 16V	
C69	CE04W1H010M	E 1μF 50V	
C70	CE04W1A330M	E 33μF 10V	
C71	CQ92M1H103K	ML 0.01μF	
C72	CQ92M1H473K	ML 0.047μF	
C74	CS15E1E010M	T 1μF 25V	
C76	CE04W1A101M	E 100μF 10V	
C77	CQ92M1H332K	ML 0.0033μF	
C79,80	CE04W1A470M	E 47μF 10V	
C81	CQ92M1H104K	ML 0.1μF	
C82	CE04W1A101M	E 100μF 10V	
C83	CE04W1H010M	E 10μF 50V	
C84,85	CC45SL1H101J	C 100pF	
C86	C90-0820-05	E 470μF 16V	
C87	C91-0131-05	C 0.01μF	
C88	C90-0820-05	E 470μF 16V	
C91,93,94	CE04W1A470M	E 47μF 10V	
C96	CE04W1C220M	E 22μF 16V	
C97	C91-0131-05	C 0.01μF	
C98,99	CE04W1C100M	E 10μF 16V	
C101,103	CE04W1C100M	E 10μF 16V	
C106	CS15E1C100M	T 10μF 16V	
C108	CC45SL1H101J	C 100pF	
C114	C91-0131-05	C 0.01μF	
C115,117	CC45SL1H101J	C 100pF	
C119,121	CC45SL1H101J	C 100pF	
C123	C91-0131-05	C 0.01μF	
C124	CE04W1H4R7M	E 4.7μF 50V	
C126	CS15E1VR47M	T 0.47μF 35V	
C133	CS15E1A100M	T 10μF 10V	
C02	CE04W1C220M	E 22μF 16V (T)(W)	
C03 ~ 05	C91-0433-05	Laminated cap. 0.0039μF (T)(W)	
C06	CE04W1C220M	E 22μF 16V(T)(W)	
C07,08	CE04W1H010M	E 10μF 50V(T)(W)	
C011,013	CS15E1A150K	T 15μF 10V(T)	
TC1	C05-0062-05	Ceramic trimmer 6pF	
TC2,3	C05-0031-15	Ceramic trimmer 10pF	
	E04-0154-05	Coax. connector × 4	
	E23-0046-04	Square terminal	
	E23-0047-04	Square terminal (K)(X)	
	E40-0273-05	Mini connect wafer 2P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0773-05	Mini connect wafer 7P	
	E40-1073-05	Mini connect wafer 10P	
	E40-1173-05	Mini connect wafer 11P	
	G02-0516-04	GND spring (B)	
	G11-0605-04	Cushion for transducer	
L1,2	L34-0909-05	Coil 4φ2T	☆
L3	L30-0508-05	IFT 21.6MHz	☆
L4(A,B)	L71-0227-05	MCF 21.6MHZ	☆

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
L5	L30-0510-05	IFT 21.6MHz	☆
L6	L30-0508-05	IFT 21.6MHz	☆
L7	L72-0316-05	Ceramic filter CFW455E	
L8	L30-0504-05	IFT 455kHz	
L9	L30-0503-05	IFT 455kHz	
L10	L79-0464-05	Ceramic discri CFA455S	☆
L11	L40-6825-04	Ferri-inductor 6.8mH	
L12	L40-1021-03	Ferri-inductor 1mH	
L13	L40-1541-27	Ferri-inductor 150mH	
L14	L15-0016-05	Choke coil	
L15,16	L34-0910-05	Coil 4φ3T	☆
L17	L34-0907-05	Coil 4.5φ2T	
L18	L34-0911-05	Coil 4.5φ1T	☆
L19	L34-0912-05	Coil 4.5φ2T	☆
X1	L77-0870-05	Crystal 22.055MHz	☆
	N30-3008-46	Round screw (IC)	
R02,03	R92-0616-05	Metal film 10kΩ	
R04	R92-0617-05	Metal film 7.5kΩ	
R05	RN14BK2E4703F	Metal film 470kΩ ±1% 1/4W	
VR1	R12-4016-05	Trim.pot 50kΩ(B)	
VR2	R12-1020-05	Trim.pot 1kΩ(B)	
VR3	R12-2015-05	Trim.pot 5kΩ(B)	
VR4	R12-1020-05	Trim.pot 1kΩ(B)	
VR5	R12-1016-05	Trim.pot 3kΩ(B)	
VR6	R12-0042-05	Trim.pot 500Ω (B)	
VR01	R12-2405-05	Trim.pot 5kΩ (T)(W)	
VR02	R12-4403-05	Trim.pot 50kΩ (T)	
BZ1	T95-0051-05	Transducer	

RF UNIT (X44-1350-00, -11) 00:(T)(W)(X), 11:(K)

Ref. No.	Parts No.	Description	Re-marks
C1	CC45CH1H150J	C 15pF	
C4,6,7,9	CC45SL1H101J	C 100pF	
C10	C91-0131-05	C 0.01μF	
C12	CC45SL1H101J	C 100pF	
	E04-0154-05	Coax. connector	
	E18-0110-05	Wire post	☆
	G01-0811-05	Spring	☆
L1	L40-1091-03	Ferri-inductor 1mH	
HB(A)	L79-0463-25	Helical block (A) (T)(W)(X)	☆
HB(A)	L79-0470-15	Helical block (A) (K)	☆
HB(B)	L79-0465-15	Helical block (B) (T)(W)(X)	☆
HB(B)	L79-0471-15	Helical block (B) (K)	☆
HB(C)	L79-0466-25	Helical block (C) (T)(W)(X)	☆
HB(C)	L79-0472-15	Helical block (C) (K)	☆
	N87-2606-46	Self tapping screw × 6	

FINAL UNIT (X45-1160-00, -11, -51) 00:(X), 11:(K), 51:(T)(W)

Ref. No.	Parts No.	Description	Re-marks
	B42-1696-04	Name plate TONE PAD (K)	☆
C2	C91-0466-05	Cap. 0.001μF	☆

Ref. No.	Parts No.	Description	Re-marks
C3	CE04W1C220M	E 22μF 16V	
C4	C91-0466-05	Cap. 0.001μF	☆
C5	CE04W1C220M	E 22μF 16V	
C6	CC45SL2H040C	C 4pF ±0.25pF	
C9	CC45SL2H080D	C 8pF ±0.5pF	
C10	CC45SL2H040C	C 4pF ±0.25pF	
C11	CC45SL2H030C	C 3pF ±0.25pF	
C14	C91-0466-05	Cap 0.001μF	☆
C16,17	CC45SL1H101J	C 100pF	
C01～03	CC45SL1H101J	C 100pF (K)	
J1	E40-0473-05	Mini connect wafer 4P	
J2	E40-0373-05	Mini connect wafer 3P	
J3	E04-0109-15	UHF type receptacle (K)(X)	
J3	E04-0151-05	N type receptacle (T)(W)	
J4	E11-0403-05	Phone jack	
J5	E08-0203-25	2P connector	
J6	E08-0304-05	Power jack (T)(W)(X)	
J6	E08-0471-05	4P socket TONE PAD (K)	
	E23-0015-04	Earth lug	
	F01-0750-05	Heat sing (T)(W)(X)	☆
	F01-0756-05	Heat sink (K)	☆
L1	L34-0928-05	Coil 4.5φ1.5T	☆
L2	L34-0907-05	Coil 4.5φ2T	☆
	N30-2604-46	Round screw PC board	
	N30-2606-11	Round screw	
	N35-3006-46	Bind screw ANT, MODULE	
R1	R92-0116-05	Cement resistor 0.47Ω	
R2,3	R92-0624-05	Cement resistor 0.68Ω	☆
VR1	R12-4020-05	Trim.pot 50kΩ	
VR2	R12-2407-05	Trim.pot 3kΩ	☆
RL1	S51-1408-05	Lead relay DC12V	☆

PLL UNIT (X50-1670-11, -51, -61, -71) 11:(K), 51:(T), 61:(W), 71:(X)

Ref. No.	Parts No.	Description	Re-marks
C1	C91-0131-05	C 0.01μF	
C3	CS15E1V010M	T 1μF 35V	
C4	C91-0131-05	C 0.01μF	
C7	CC45SL1H101J	C 100pF	
C8	CC45CH1H080D	C 8pF ±0.5pF	
C9	CC45CH1H020C	C 2pF ±0.25pF(K)	
C9	CC45CH1H030C	C 3pF ±0.25pF(T)(W)(X)	
C10	CQ92M1H473K	ML 0.047μF	
C12	CC45PG1H060D	C 6pF ±0.5pF	
C13	CC45CH1H080D	C 8pF ±0.5pF	
C14	CC45CH1H010C	C 1pF ±0.25pF(K)	
C14	CC45CH1H020C	C 2pF ±0.25pF(T)(W)(X)	
C15	CC45SL1H101J	C 100pF	
C17	CE04W1A101M	E 100μF 10V	
C18	CC45CH1H070D	C 7pF ±0.5pF	
C19	CC45CH1H080D	C 8pF ±0.5pF	
C20	CC45CH1H010C	C 1pF ±0.25pF	
C22,23	CC45SL1H101J	C 100pF	
C26	CC45CH1H1R5C	C 1.5pF ±0.25pF	
C29,30	CC45SL1H101J	C 100pF	
C32	CC45CH1H020C	C 2pF ±0.25pF	
C35	CC45CH1H010C	C 1pF ±0.25pF	
C37,39	CC45SL1H101J	C 100pF	
C41	C91-0131-05	C 0.01μF	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
C42	CC45CH1H030C	C 3pF ±0.25pF	
C43～45	C91-0131-05	C 0.01μF	
C46	CE04W1A101M	E 100μF 10V	
C47,48	CS15E1C6R8M	T 6.8μF 16V	
C49	C91-0131-05	C 0.01μF	
C50	CE04W1A101M	E 100μF 10V	
C51	CS15E1V0R1M	T 0.1μF 35V	
C52	CE04W1A101M	E 100μF 10V	
C53	CC45SL1H270J	C 27pF	
C54	CC45CH1H180J	C 18pF	
C55	CE04W1A101M	E 100μF 10V	
C72,73	CC45SL1H470J	C 47pF	
C74	C91-0131-05	C 0.01μF	
C75～77	CQ92M1H223K	ML 0.022μF	
C78	CC45SL1H101J	C 100pF	
C79	CQ92M1H223K	ML 0.022μF	
C80	C91-0131-05	C 0.01μF	
C81	CC45SL1H101J	C 100pF	
C82～85	C91-0131-05	C 0.01μF	
C88,89	C91-0131-05	C 0.01μF	
C90,91	CC45SL1H390J	C 39pF	
C93	CC45CH1H0R5C	C 0.5pF ±0.25pF	
C94	CC45SL1H470J	C 47pF	
C95	CC45SL1H101J	C 100pF	
C99	CC45CH1H050C	C 5pF ±0.25pF	
C104	C91-0131-05	C 0.01μF	
C106	CE04W1C470M	E 47μF 16V	
C107	CE04W1C330M	E 33μF 16V	
C108	C91-0131-05	C 0.01μF	
C109	CE04W1A470M	E 47μF 10V	
C110	CE04W1A101M	E 100μF 10V	
C111,112	C90-0828-05	E 470μF 10V	☆
C113	C90-0827-05	E 330μF 16V	☆
C115	CE04W1A101M	E 100μF 10V	
C117	CE04W1H010M	E 1μF 50V	
C118	CE04W1H2R2M	E 2.2μF 50V	
C123	CC45SL1H470J	C 47pF	
C124	CS15E1VR22M	T 0.22μF 35V	
C151	CS15E1V0R1M	T 0.1μF 16V	
C201	C91-0131-05	C 0.01μF (T)(W)	
C202	C91-0131-05	C 0.01μF (T)(W)(X)	
C203～206	C91-0131-05	C 0.01μF (T)(W)	
C207～210	CC45SL1H820J	C 82pF	
C211	CC45SL1H820J	C 82pF (T)(W)(X)	
C212	CC45SL1H820J	C 82pF (T)(W)	
TC1,2	C05-0308-05	Ceramic trimmer 4pF	
TC201～204	C05-0315-05	Ceramic trimmer 60pF	☆
TC205	C05-0315-05	Ceramic trimmer 60pF(T)(W)(X)	☆
TC206	C05-0315-05	Ceramic trimmer 60pF(T)(W)	☆
	E23-0046-04	Square terminal	
	E31-2061-05	Cable with terminal (A) for TX	☆
J1,7	E40-0373-05	Mini connect wafer 3P	
J2	E40-0473-05	Mini connect wafer 4P	
J3	E40-0973-05	Mini connect wafer 9P	
J4	E40-1173-05	Mini connect wafer 11P	
J5,6	E40-1273-05	Mini connect wafer 12P	
L1	L40-1511-03	Ferri-inductor 150μH	
L2,3	L34-0904-05	Coil 3φ10T	☆
L4	L34-0908-05	Coil 3φ10T	☆
L5	L32-0626-05	OSC coil	☆
L6	L33-0605-05	Choke coil 0.47μH	
L7,8	L34-0905-05	Coil 4φ3T	☆
L9	L34-0906-05	Coil 4φ4T	☆
L10～12	L40-1511-03	Ferri-inductor 150μH	
L13	L40-1021-03	Ferri-inductor 1mH	
L14	L40-3391-03	Ferri-inductor 3.3μH	

Ref. No.	Parts No.	Description	Re-marks
L15	L40-1511-03	Ferri-inductor 150μH	
L16,17	L40-1001-03	Ferri-inductor 10μH	
L20～23	L32-0627-05	OSC coil 5A-13T	☆
L24,25	L40-1511-03	Ferri-inductor 150μH	
L26,27	L34-0903-05	Tuning coil	☆
L28	L79-0462-05	Helical block	☆
L29,30	L19-0309-05	Wide bandwidth transformer	
L31	L30-0503-05	IFT	
L207,208	L40-1001-03	Ferri-inductor 10μH	
L209	L40-1001-03	Ferri-inductor 10μH (T)(W)(X)	
L210	L40-1001-03	Ferri-inductor 10μH (T)(W)	
L211	L32-0627-05	OSC coil 5A-13T (T)(W)(X)	☆
L212	L32-0627-05	OSC coil 5A-13T (T)(W)	☆
X1	L77-0720-05	Crystal 10.240MHz	
X2	L77-0875-05	Crystal R-L 45.8778MHz (K)	☆
X2	L77-0907-05	Crystal R-L 44.7667MHz (T)(W)(X)	☆
X3	L77-0876-05	Crystal R-H 46.4333MHz (K)	☆
X3	L77-0908-05	Crystal R-H 45.3222MHz (T)(W)(X)	☆
X4	L77-0877-05	Crystal T-L 48.2778MHz (K)	☆
X4	L77-0909-05	Crystal T-L 47.166MHz (T)(W)(X)	☆
X5	L77-0878-05	Crystal T-H 48.8333MHz (K)	☆
X5	L77-0910-05	Crystal T-H 47.7222MHz (T)(W)(X)	☆
X201	L77-0879-05	Crystal +1.6MHz 47.3444MHz (T)	☆
X201	L77-0881-05	Crystal −7.6MHz 46.8778MHz (W)	☆
X201	L77-0880-05	Crystal −1.6MHz 56.9889MHz (X)	☆
X202	L77-0880-05	Crystal −1.6MHz 46.9889MHz (T)(W)	☆
R105	R90-0531-05	Resistor block 47kΩ × 10	☆
R112	R90-0526-05	Resistor block 27kΩ × 4	
	R92-0150-05	Short jumper	

DISPLAY UNIT (X54-1520-11)

Ref. No.	Parts No.	Description	Re-marks
	B07-0629-03	LED case	☆
	B08-0302-04	Back board	☆
C2	CE04W1C100M	E 10μF 16V	
	E23-0426-05	Earth lug φ2	☆
	J31-0515-14	Collar for spacer	☆
	N10-2020-46	Nut	
	N15-1020-46	Flat washer	
	N30-2020-46	Round screw	
	R92-0150-05	Short jumper	

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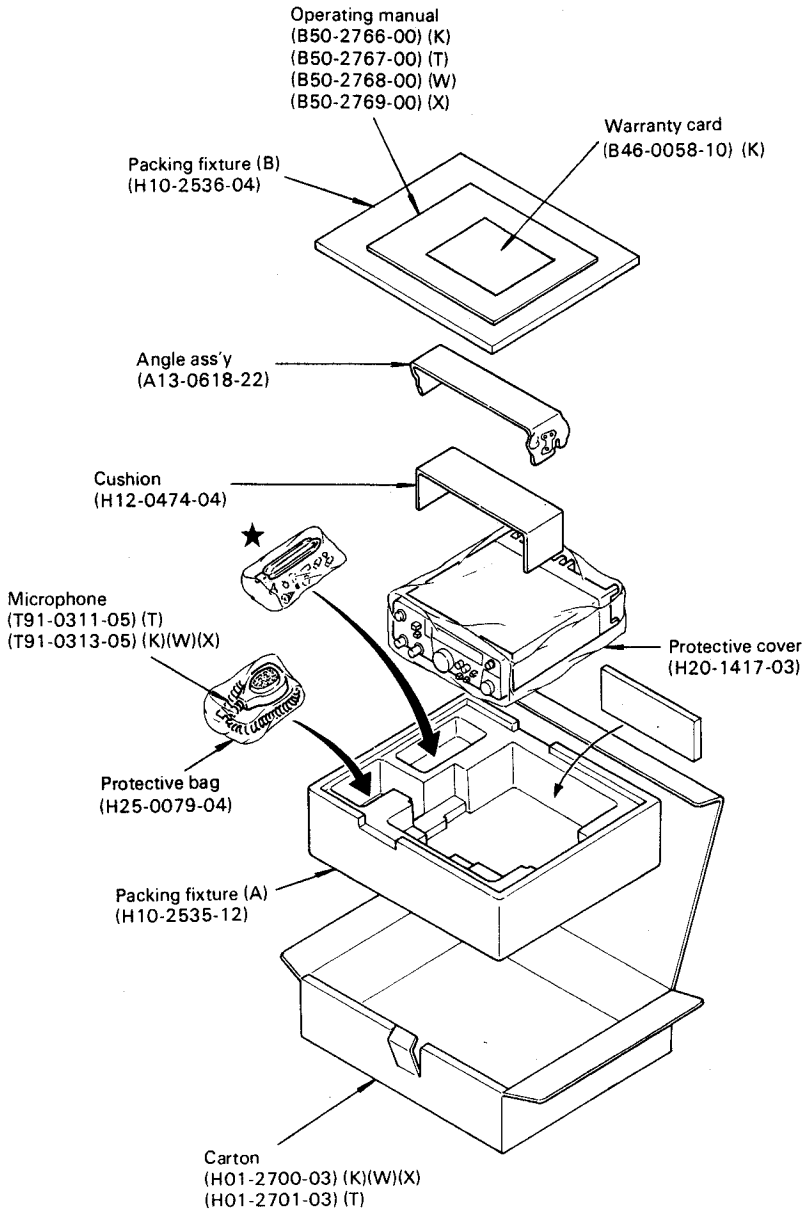
PACKING

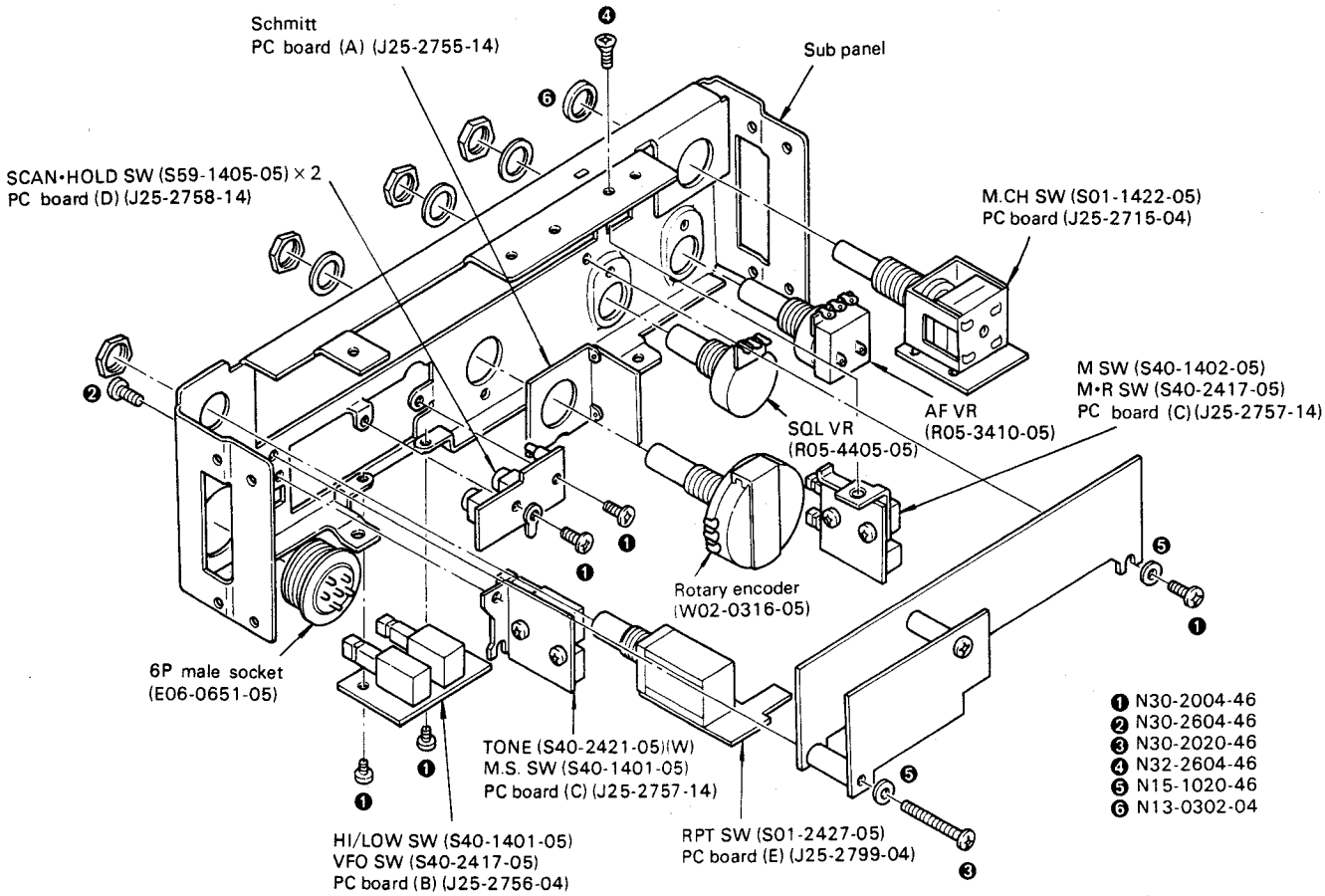


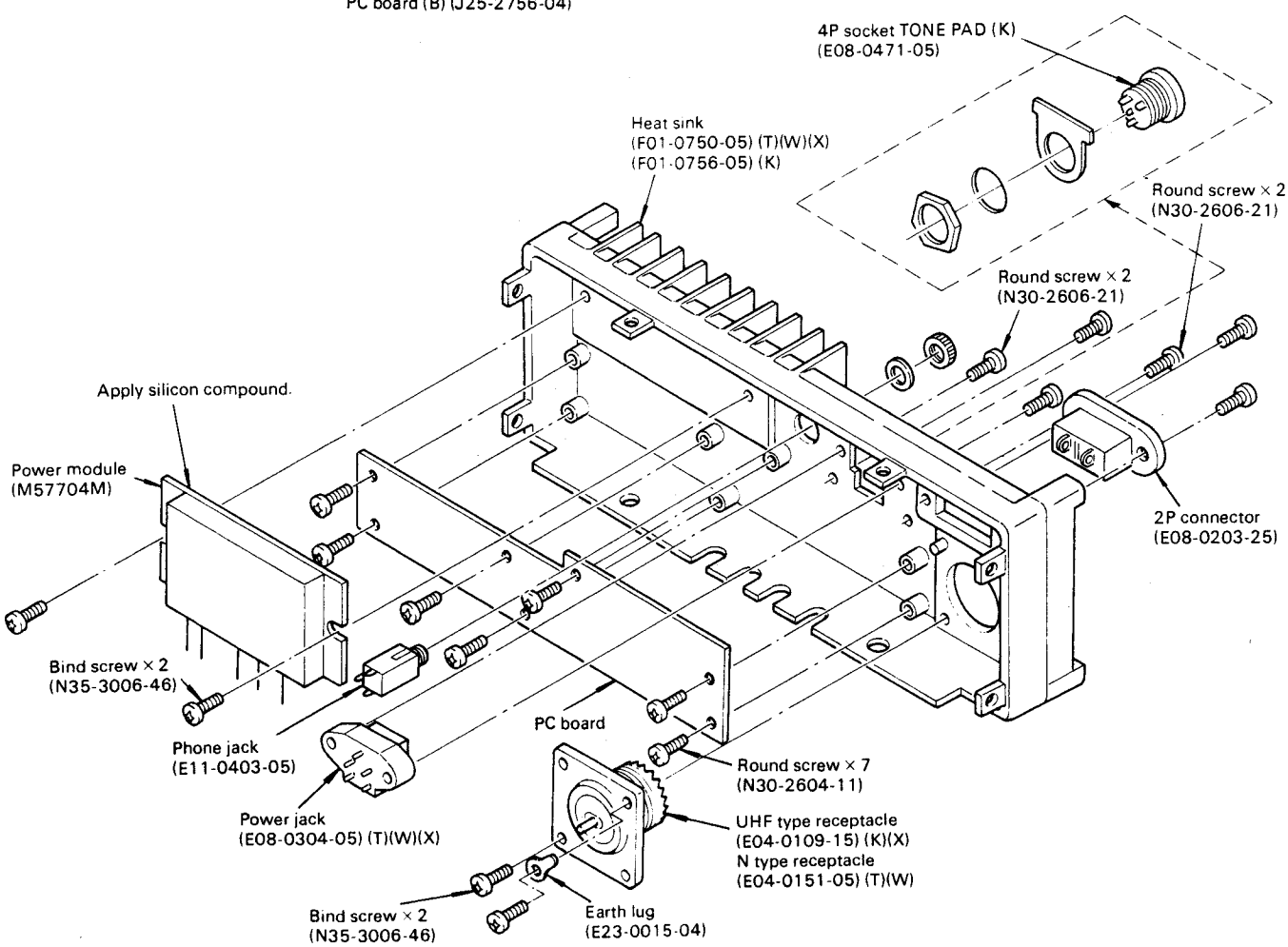
★ Protective bag (H25-0103-04)
- 4P plug (TONE PAD)(E09-0471-05) ..... 1 (K)
- Phone plug (E12-0001-05) 1
- DC cord ass'y (E30-1648-05) 1
- Front foot (J02-0420-04) 1
- Rear foot (J02-0022-05) 2
- Foot mounting hard ware (J21-2676-04) 2
- Fuse (4A) (F05-4022-05) 1

Protective bag (H25-0029-04)
- Flat washer (angle) (J32-0748-04) 4
- Bind screw (N35-3012-45) 4

Protective bag (H25-0049-03)
- Round screw (N09-0008-04) 4
- Flange nut (N14-0510-04) 4
- Flat washer (N15-1060-46) 4
- Spring washer (N16-0060-46) 4
- Bind screw (N35-3006-45) 6

DISASSEMBLY





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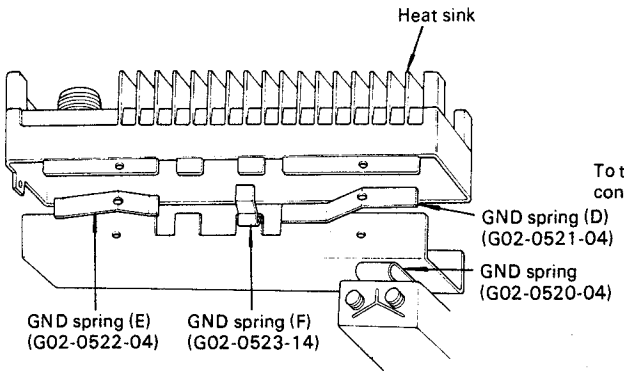
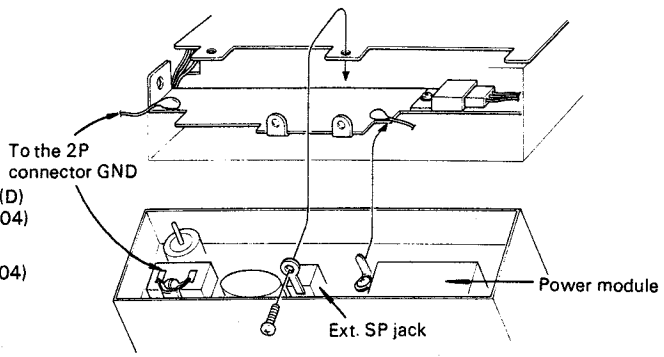
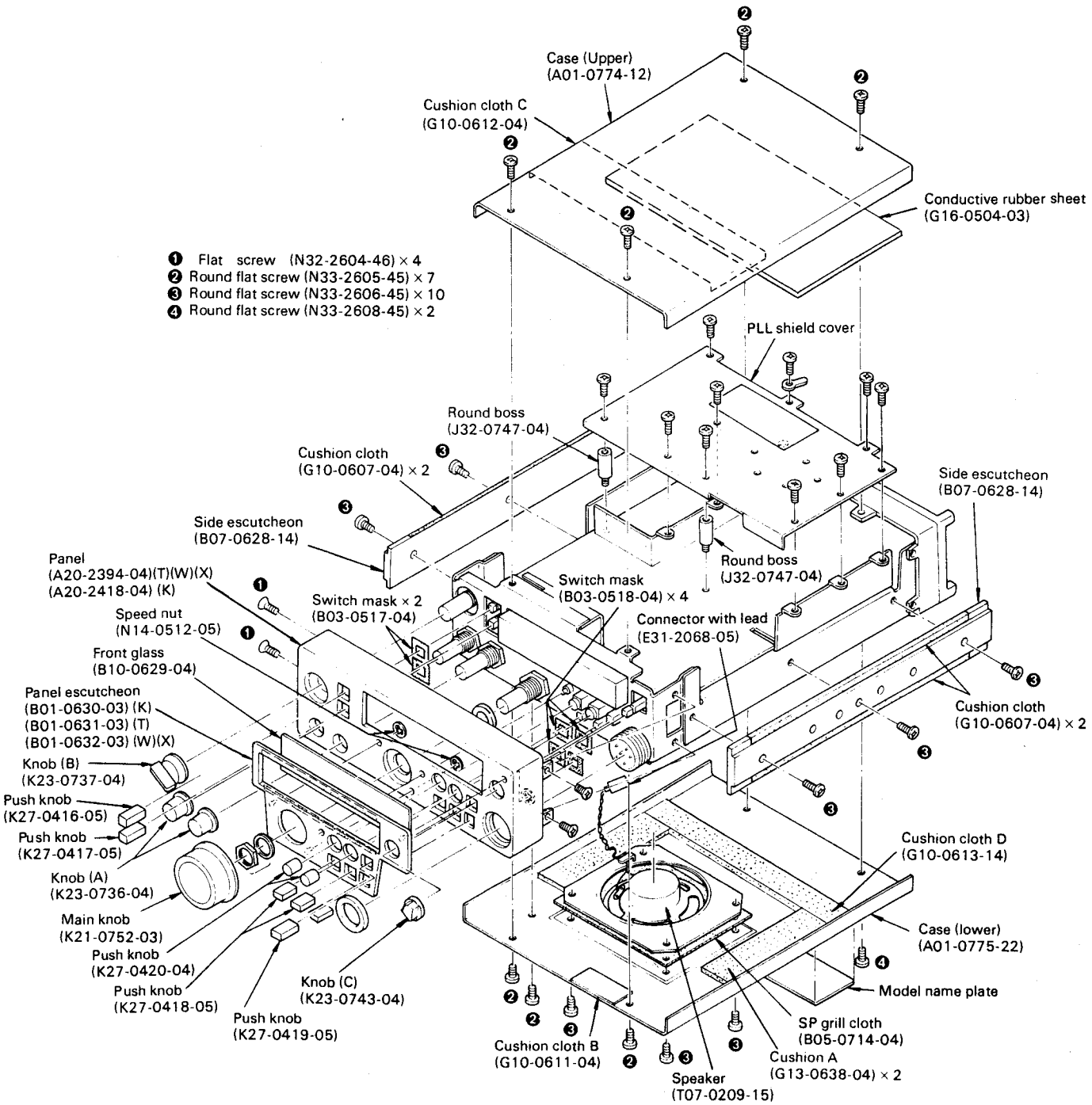


<GND spring>

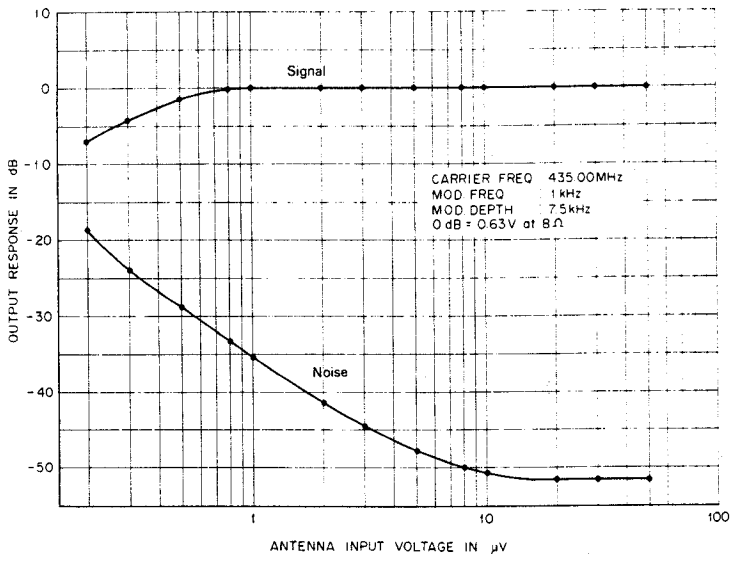


<FINAL unit grounding>

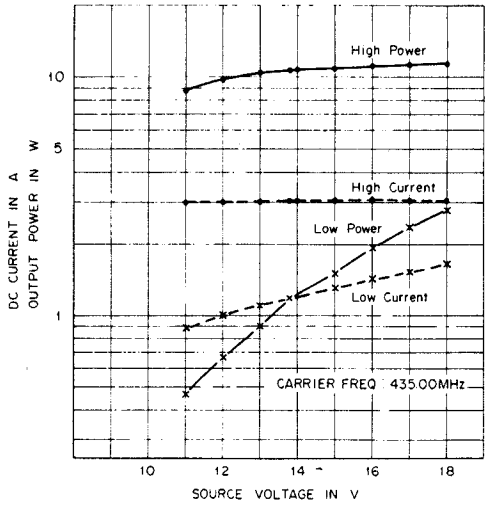


REFERENCE DATA

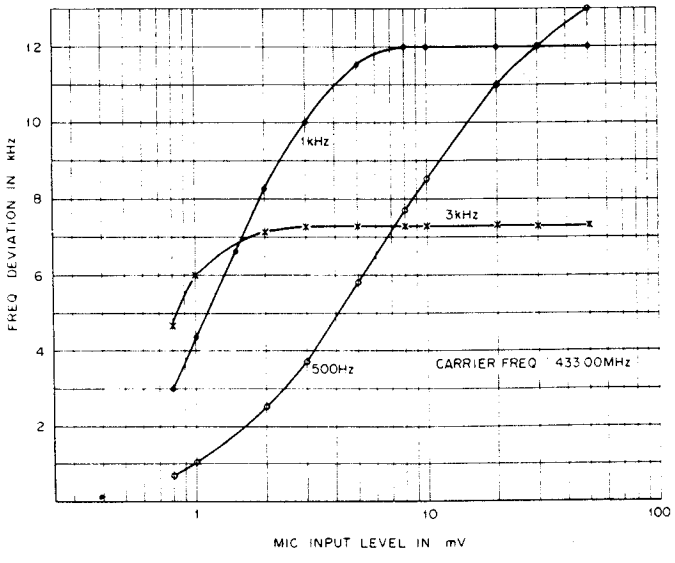
[RX Sensitivity]



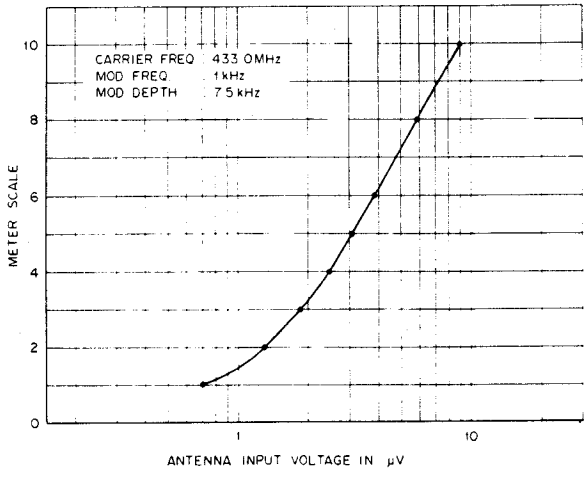
[Output power]



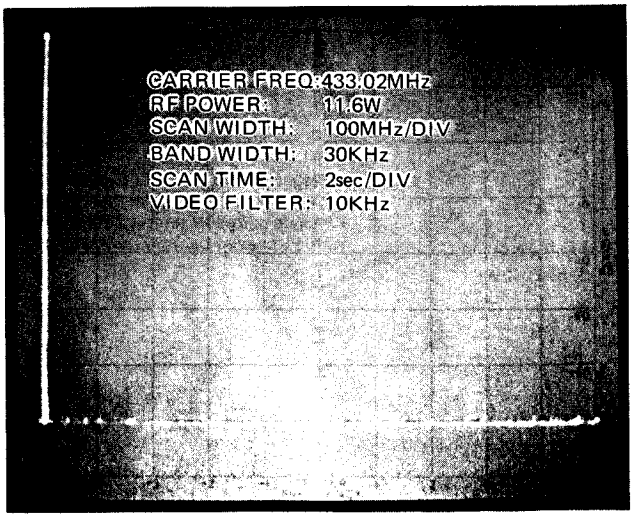
[Deviation]



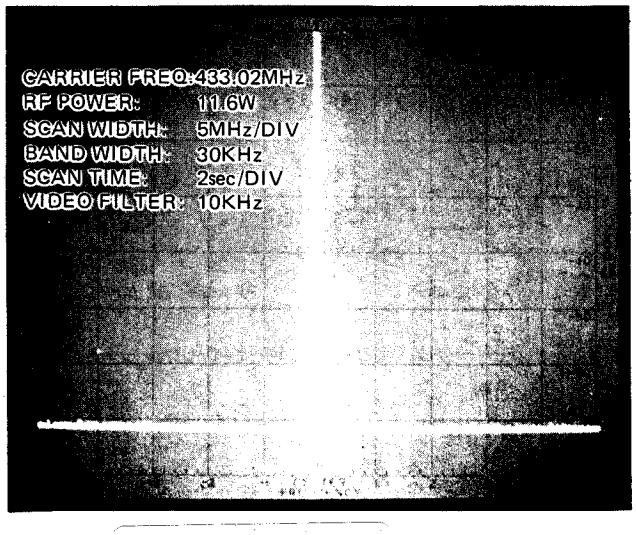
[S meter]



[Harmonics spurious response]



[Near spurious response]



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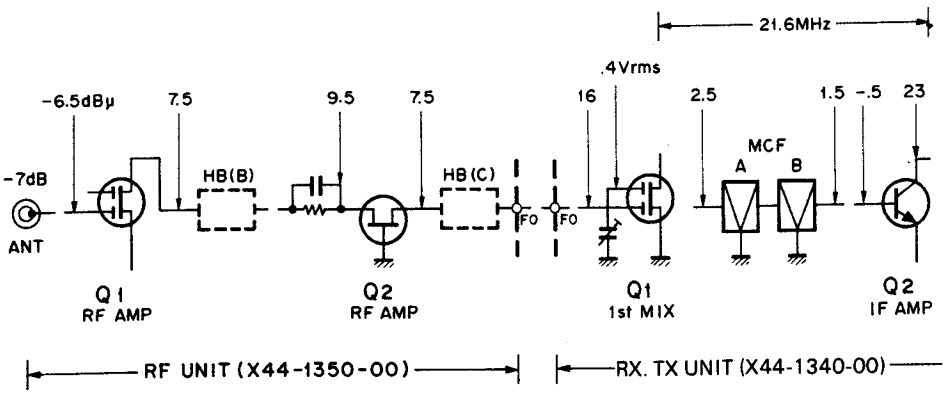
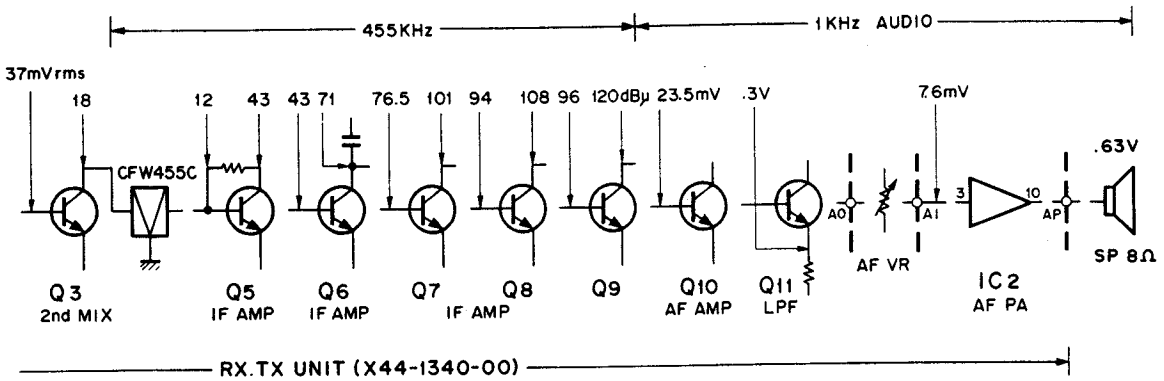
LEVEL DIAGRAM

RX Section

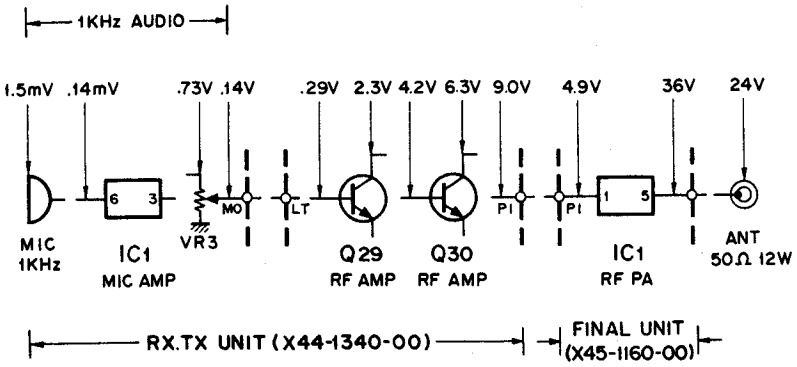


Note:

1. To inject signal generator output connect a 0.01 μF 500V capacitor between the signal generator and the check point.
2. In measuring the circuit from the ANT terminal to the collector of Q9, unmodulated 435.000 MHz (445.000 MHz: K type), 21.6 MHz, and 455 kHz signals from an SSG are applied to the check point to obtain a 10 dB NQ sensitivity.
3. In measuring the circuit from the base of Q10 to the SP terminal, an SSG signal of 435.000 MHz (445.000 MHz: K type), 6 dBμ, 1 kHz MOD, 5 kHz DEV is applied to the ANT terminal, and the AF control is adjusted to obtain an AF output of 0.63V/8Ω. The signal voltage at each point is measured with an AF VTVM.



TX Section



Note:

1. All voltage measurements except MIC AMP section are read from an RF VTVM at HI power position.
   Voltages in MIC AMP are measured by AF VTVM with an input of 1 kHz, 1.5 mV.
2. Voltages before PI terminal are measured with PI coaxial cable disconnected.

ADJUSTMENTS

TR-8400

<Test Equipment>

1. **VTVM or DVM**
   - Input resistance: More than 1 MΩ
   - Voltage range: 1.5 to 1000V AC/DC
2. **RF VTVM (RF V.M.)**
   - Input impedance: 1 MΩ and less than 2 pF
   - Voltage range: 10 mV to 300V
   - Frequency range: 450 MHz or greater
3. Frequency counter (F count)
   - Minimum input voltage: 50 mV
   - Frequency range: 450 MHz or greater
4. **DC power supply**
   - Voltage: 10V to 17V variable
   - Current: 6A min.
5. **RF Dummy Load**
   - Dissipation: 20W
   - Impedance: 50Ω
   - Frequency range: 450 MHz
6. **AF VTVM (AF V.M.)**
   - Input impedance: 1 MΩ or greater
   - Voltage range: 1 mV to 30V
   - Frequency range: 50 Hz to 10 kHz
7. **AF Generator (AG)**
   - Frequency range: 100 Hz to 10 kHz
   - Output: 0.5 mV to 1V
8. **Linear detector**
   - Frequency range: 450 MHz
9. **Directional coupler**
10. **Oscilloscope**
    - With horizontal input and high sensitivity
11. **Standard signal generator (SSG)**
    - Frequency range: 450 MHz band
    - Modulation: amplitude and frequency modulation
    - Output: −20 dB/0.1 μV ~ 120 dB/1V
12. **AF Dummy load**
    - 8Ω, 5W (approx.)
13. **Sweep generator**
    - Frequency range: 420 ~ 460 MHz

<Preparation>

Unless otherwise specified, set the controls as follows.

POWER / VOL SW	ON
SEND / REC	REC
SQUELCH VOL	MIN
M. CH SW	1
M. SW	OFF
M. R SW	OFF
TX OFF SET	S
SCAN SW	OFF
HOLD SW	OFF
M. S SW	OFF
VFO A / B SW	A
HI / LOW SW	HI

Notes:

- When adjusting the trimmers or coils, use a non-inductive adjusting rod of bakelite, etc.
- NEVER transmit when SSG is connected to the ANT terminal.
- Connect MIC connector as shown in Fig. 18.
- The SSG output level as indicated is open circuit voltage.

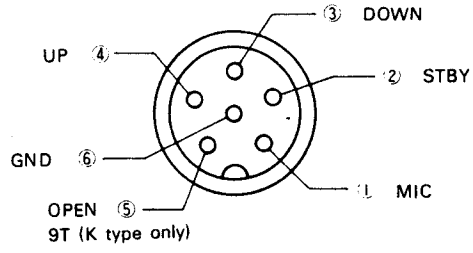


Fig. 18 MIC terminals (view from front panel side)

ADJUSTMENTS

VOLTAGE CHECK

Item	Condition	Measurement			Adjustment			Specifications	Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
1. Voltage check	(1) Connect a DC power supply (13.8V) to the DC terminal on the rear panel.	DVM	RX/TX	8C				7.8～8.25V	
				8R				8.4～9.0V	
				9T				0V	
				DB MB				0.5V or less 5.7～6.1V	
			PLL	Pin 16 of IC6				5.7～6.1V	
	(2) POWER: OFF	DVM	RX/TX	MB	RX/TX	VR4	5.9±0.2V		
	(3) POWER: ON Set in transmit mode.	DVM	RX/TX	9T 8R DB				8.8～9.8V 0.5V or less 8～13.8V	
	(4) Set in receive mode.								

PLL ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications	Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
1. PLL (I)	(1) Remove the PLL shield. VFO dial: 0.000 Disconnect the coaxial connector from the RX•TX unit PI terminal. Ground TP5 (R21) on the PLL unit.	RF V.M	PLL	TP3	PLL	L27 L28	} MAX (repeat)	0.03～0.07V	
	(2) VFO dial: 9.975 Set in transmit mode.	RF V.M	PLL	TP3	PLL	L26 L28 (B)	} MAX	0.03～0.07V	
	(3) Repeat steps (1) and (2) several times.								
	(4) Set in receive mode. VFO dial: 9.975	RF V.M	PLL	TP3				0.03～0.07V	Check
	(5) Set in transmit mode. VFO dial: 0.000	RF V.M	PLL	TP3				0.03～0.07V	Check
2. PLL (II)	(1) Disconnect TP5 from ground.								
	(2) VFO dial: 9.975 Set in transmit mode.	DVM	PLL	TP1	PLL	TC2	6.45±0.2V		
	(3) Set in receive mode. VFO dial: 0.000 9.975 (K) type	DVM	PLL	TP1	PLL	TC1	0.95±0.2V 6.45±0.2V (K)		
	(4) Repeat steps (2) and (3) several times.								
	(5) VFO dial: 0.000 Set in transmit mode.	DVM	PLL	TP1				1.0V or more	Check
	(6) Set in receive mode.	DVM	PLL	TP1				1.0V or more	Check
3. PLL (III)	(1) VFO dial: 9.975 Set in transmit mode.	RF V.M	PLL	TP6	PLL	L9	Adjust coil spacing for maximum voltage.		
	(2) VFO dial: 0.000 Set in receive mode.	RF V.M	PLL	TP4				1.8V or more	
	(3) VFO dial: 9.975 Set in transmit mode.	RF V.M	PLL	TP2	PLL	L7, 8	Adjust coil spacing for maximum voltage.	Approx. 0.2V	
4. Unlock	(1) Set in receive mode. Ground TP5 on the PLL unit.								
	(2) VFO dial: 0.000	DVM	PLL	TP1				5.3～5.7V	
	(3) VFO dial: 9.975	DVM	PLL	TP1				7.3V or more	
				UL				Approx. 1.2V	
				ULB				0.2V or less	
	(4) Disconnect TP5 from ground.								

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specifications	Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
5. PLL shield	(1) Install PLL shield.								
6. Frequency adjustment	(1) Set in receive mode.	F. counter	PLL	TP2	PLL				

VFO dial		Part	(T)(W)(X) type	(K) type	Specifi-cations
0.000 0.025 9.950 9.975		L20 TC201 L21 TC202	408.400.00 MHz 408.425.00 MHz 418.350.00 MHz 418.375.00 MHz	418.400.00 MHz 418.425.00 MHz 428.350.00 MHz 428.375.00 MHz	±200 Hz

(2) Set in transmit mode.

VFO dial		Part	(T)(W)(X) type	(K) type	Specifi-cations
0.000 0.025 9.950 9.975		L22 TC203 L23 TC204	430.000.00 MHz 430.025.00 MHz 439.950.00 MHz 439.975.00 MHz	440.000.00 MHz 440.025.00 MHz 449.950.00 MHz 449.975.00 MHz	±200 Hz

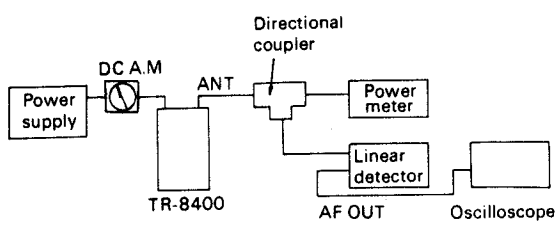
(3) Set in transmit mode.

(K) type	TX OFF SET: ⊖ VFO dial: 9.950 TX OFF SET: ⊕ VFO dial: 0.000		— —	444.950.00 MHz 445.000.00 MHz	Check
(T) type	TX OFF SET: ⊖ VFO dial: 0.000 0.025 TX OFF SET: ⊕ VFO dial: 0.000 0.025	L212 L211	L211 TC205 L212 TC206	428.400.00 MHz 428.425.00 MHz 431.600.00 MHz 431.625.00 MHz	±200 Hz ±200 Hz
(W) type	TX OFF SET: D-A VFO dial: 9.950 9.975 TX OFF SET: D-B VFO dial: 0.000 0.025		L211 TC205 L212 TC206	432.350.00 MHz 432.375.00 MHz 428.400.00 MHz 428.425.00 MHz	±200 Hz ±200 Hz
(X) type	TX OFF SET: D-A VFO dial: 9.950 0.000 0.025		— L211 TC205	434.350.00 MHz 428.400.00 MHz 428.425.00 MHz	Check ±200 Hz

7. Lock voltage	(1) TX OFF SET: S VFO dial: 9.975 Set in transmit mode.	DVM	PLL	TP1	PLL	TC2	6.45V	±0.05V	
	(2) Set in receive mode VFO dial: 0.000 9.975 (K) type	DVM	PLL	TP1	PLL	TC1	0.95V 6.45V (K)	Repeat ±0.05V	
	(3) Connect the coaxial connector to the PI terminal on the RX•TX unit.								

TX ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications	Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
1. Setting	(1) VR2 on the FINAL unit: Fully counterclockwise								
	(2) VR5 on the TX•RX unit: 10 o'clock								
	(3) Connect the power meter to the ANT terminal.								

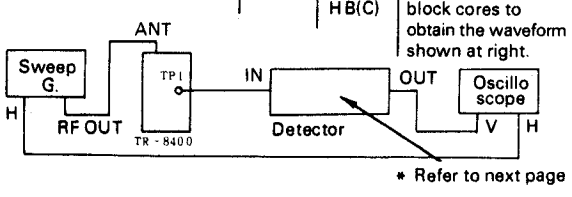


ADJUSTMENTS

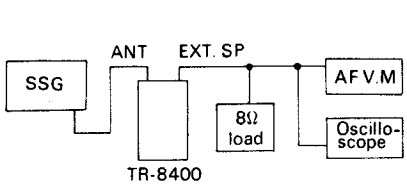
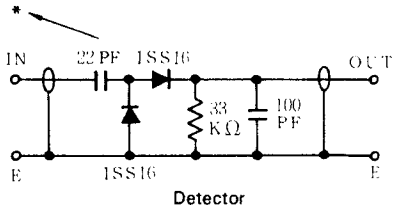
Item	Condition	Measurement			Adjustment			Specifications	Remaks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
2. Power adjustment	(1) VFO dial: 5.000 Set in transmit mode.	DC A.M, Power meter			RX/TX	TC2, 3	Adjust TC2 and 3 for maximum DC current. Then adjust TC3 for maximum RF power with less current.		
		Power meter			RX/TX	VR5	Set VR5 to obtain 12W.		
					Final	VR1	Set VR1 so that LED "6" is lit.		
	(2) HI/LOW SW: LOW	Power meter			RX/TX	VR6	Set VR6 to obtain 1.2W.		
		RF meter						LEDs "1", "2" and/ or "3" must be lit.	Check
3. Protection	(1) HI/LOW SW: HI Disconnect the power meter from the ANT terminal.	DC A.M			Final	VR2	Adjust VR2 to read 3.7A.	±0.1A	
	(2) Connect the power meter to the ANT terminal.	Power meter, DC A.M						10～14W 3.4A or less	Check
4. Power check	(1) Set the power supply voltage to 13.8V VFO dial: 0.000 and 9.975	Power meter, DC A.M						10～14W 3.4A or less	
	(2) Set the power supply voltage to 11.5V. VFO dial: 0.000 and 9.980	Power meter						6W or more	
5. Modulation	(1) Set power supply voltage to 13.8V VFO dial: 5.000 Connect the AG (20 mV, 1 kHz) to the MIC terminal.	Linear detector			RX/TX	VR3	Adjust VR3 for 5 kHz deviation.	±0.5 kHz	
	(2) Set AG output to 2 mV, 1 kHz.				RX/TX	VR2	Adjust VR2 for 3.5 kHz deviation.	±0.5 kHz	
	(3) Check for abnormal oscillation by varying the power supply voltage from 11.5V to 13.8V at the any channel.							There should be no abnormal oscillation.	
	(4) Set in receive mode.								
6. Tone (W, T type)	(1) Frequency adjustment Tone SW: ON Set in transmit mode.		RX/TX	R5	RX/TX	VR01		1750 Hz±10 Hz	
	(2) Deviation adjustment Tone: OFF Set in transmit mode.	Linear detector						±2.5 kHz or more	Check
	(3) T type only Set in transmit mode.	Linear detector or receiver			RX/TX	VR02	Adjust VR02 so that tone is heard approx. in 7 sec. after transmit.		

RECEIVER ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications	Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
1. Helical resonator	(1) Disconnect the coaxial connector from the LR terminal on the RX•TX unit. Connect a sweep generator to the ANT terminal.	Sweep G.	RX/TX	TP1	RF	HB(A) HB(B) HB(C)	Adjust the 6 helical resonator block cores to obtain the waveform shown at right.	440.000M (K) 450.000M (K) 430.000M 440.000M 435.000 MHz 445.000M (K)	
	(2) Reconnect the coaxial connector to the LR terminal on the RX•TX unit.								



ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specifications	Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method		
2. Sensitivity adjustment	(1) Connect a S meter (100 μA) to the M terminal on the RX•TX unit. Connect an AF V.M, oscilloscope and an 8Ω load to the EXT. SP terminal. Connect an SSG (MOD: 1 kHz/DEV: 5 kHz) to the ANT terminal.								
	(2) VFO dial: 5.050 Squelch VR: MIN Receive the SSG signal and adjust for maximum signal strength reading.	S meter			RX/TX	TC1 L3, 5, 6	} MAX (repeat)		
	(3) Set the SSG output level to 40 dB.	AF V.M			RX/TX	L9	MAX		
3. S meter (indicator)	(1) Set the SSG output level to 16 dB. Disconnect the S meter from the M terminal.	S-indicator			RX/TX	VR1	Adjust VR1 so that the LED "8" indicator is lit.		
4. Squelch	(1) Set the SSG output level to -10 dB. Fine tune the SSG output frequency so that the SSG signal is received at maximum strength.								
	(2) VFO dial: 5.075 Turn the squelch control until noise is gated.	BUSY lamp						Must go off.	Check
		Squelch control setting						9 o'clock to 12 o'clock	
	(3) VFO dial: 5.050	BUSY lamp						Must be lit when the SSG signal is again received.	Check
	(4) SQUELCH VR: MIN								
5. Sensitivity measurement	(1) SSG output level: -6 dB (VFO dial: 5.050) Fine tune the SSG frequency to obtain the maximum AF VTVM reading.	AF V.M						S/N 20 dB or more	Check
	(2) SSG output level: -5 dB VFO dial: 0.050 and 9.975	AF V.M						S/N 20 dB or more	Check

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Oxfordshire, OX9 4QY.
Tel (01844) 351694
Fax (01844) 352554
email:- mauritron@dial.pipex.com

MICROPROCESSOR OPERATION CHECK

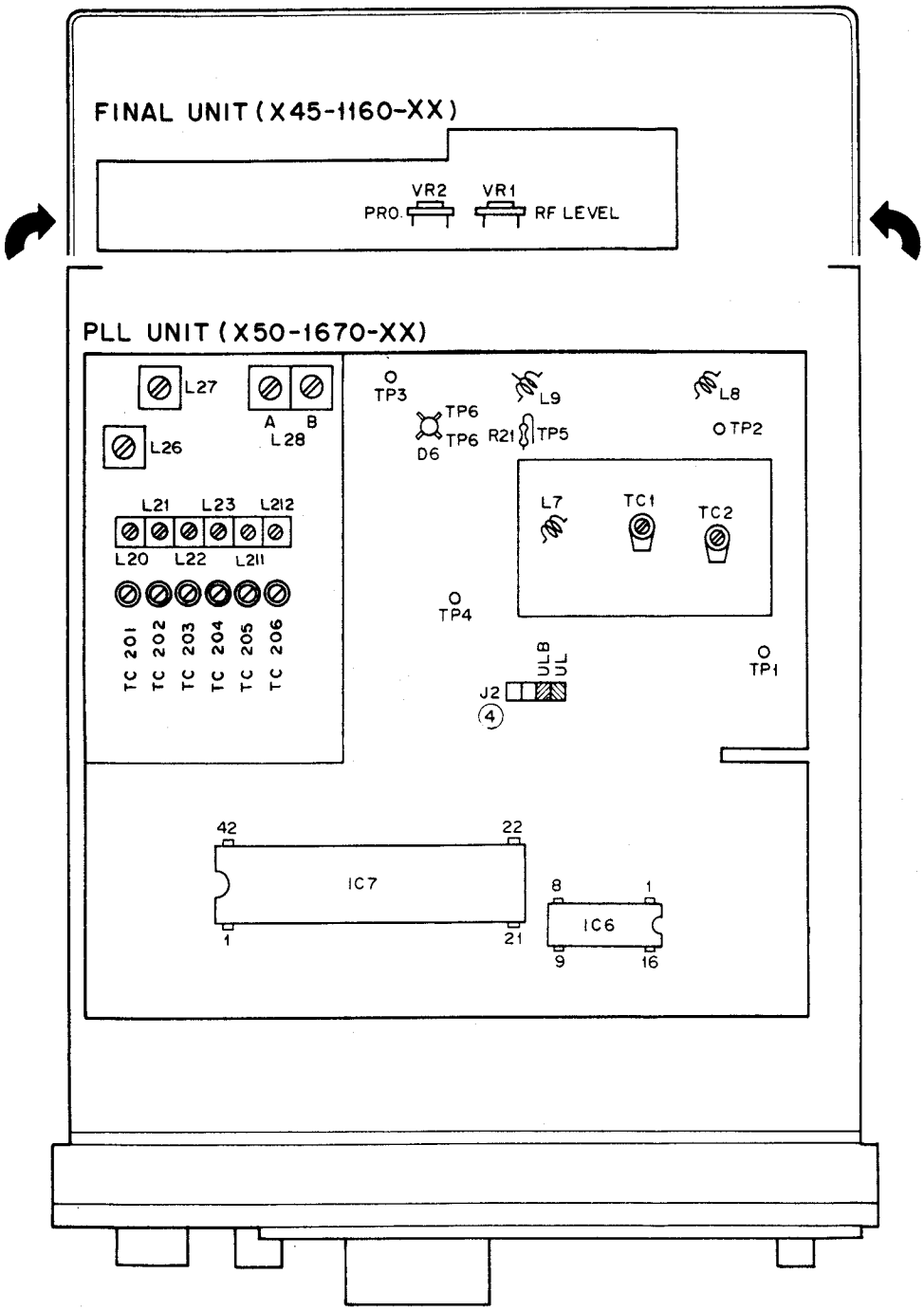
Item	Control functions	Microprocessor functions	Remarks
1. VFO A/B	(1) Pull out the power plug, then reinsert it after waiting 20 sec.	0.000 is displayed.	Reset operation check.
	(2) VFO A/B: B	0.000 is displayed, VFO B indicator is lit.	
2. Main dial	(1) Turn the main dial.	Indication changes in 25 kHz increments.	
3. UP/DOWN	(1) Press the UP or DOWN switch once.	When pressed, a tone is generated and the frequency indication increases or decreases in 25 kHz increments.	
	(2) Press and hold the UP or DOWN switch.	The frequency indication increases or decreases continuously, accompanied by a continuous tone.	
	(3) Press the UP and DOWN switch simultaneously.	The frequency does not change.	

ADJUSTMENTS

Item	Control functions	Microprocessor functions	Remarks
4. Memory entry	(1) M. CH switch: 1～5 M.R switch: ON	0.000 is displayed.	
	(2) M.R switch: OFF M.S switch: ON	0.000 is displayed.	
	(3) M.S switch: OFF M. CH switch: 1～5 M switch: ON	Pressing the M switch causes a tone to be generated and the displayed frequency to be stored in the selected memory corresponding to the M. CH switch setting.	
	(4) M. CH switch: 5 Set the main dial in a position different from that set during step (3). Set in transmit mode and then press the M switch.	A tone is generated and the displayed frequency is stored in the transmit frequency memory of memory channel 5.	In memory channel 5, the transmitting frequency is different from the receiving frequency.
	(5) Set in receive mode.		
5. Memory recall	(1) M. CH switch: 1～5 M. R switch: ON	Each frequency stored during step 4. (3) is displayed.	
	(2) Turn the main dial.	The frequency displayed does not vary.	M. R operation has priority.
	(3) UP/DOWN switch: ON		
	(4) M. S switch: ON		
	(5) SCAN switch: ON		
	(6) M. S switch: OFF		
	(7) M. CH switch: 5 Set in transmit mode.	The frequency stored during step 4. (4) is displayed.	
	(8) Set in receive mode. M. R switch: OFF		
6. SCAN	(1) Squelch control: MAX SCAN switch: ON	The frequency increases in increments of 25 kHz.	
	(2) Squelch control: MIN	BUSY indicator is lit and scan stops.	
	(3) Squelch control: MAX	Scan resumes.	
	(4) Set in transmit mode.	Scan stops.	
	(5) Set in receive mode. SCAN switch: ON		
	(6) HOLD switch: ON	Scan stops.	
	(7) SCAN switch: ON		
7. Memory scan	(1) M. S switch: ON	Frequencies stored in the memory during step 4. (3) are scanned.	Memory scan has priority.
	(2) Squelch control: MIN	BUSY indicator is lit and scan stops.	Scanning order 1→2→3 5←4 1 ～ 5 continuous.
	(3) Squelch control: MAX	Scan resumes.	
	(4) Set in transmit mode.	Scan stops.	
	(5) Set in receive mode. M. S switch: OFF		
8. Switch priority	(1) M. R: ON	Memory reading	Priority 1st
	(2) M. S: ON	Memory scan	2nd
	(3) SCAN. HOLD: ON	Scanning operation	3rd
	(4) UP. DOWN: ON	UP/DOWN operation	4th
	(5) Main dial	VFO A/B	5th
	(6) M: ON	Memory entry	6th

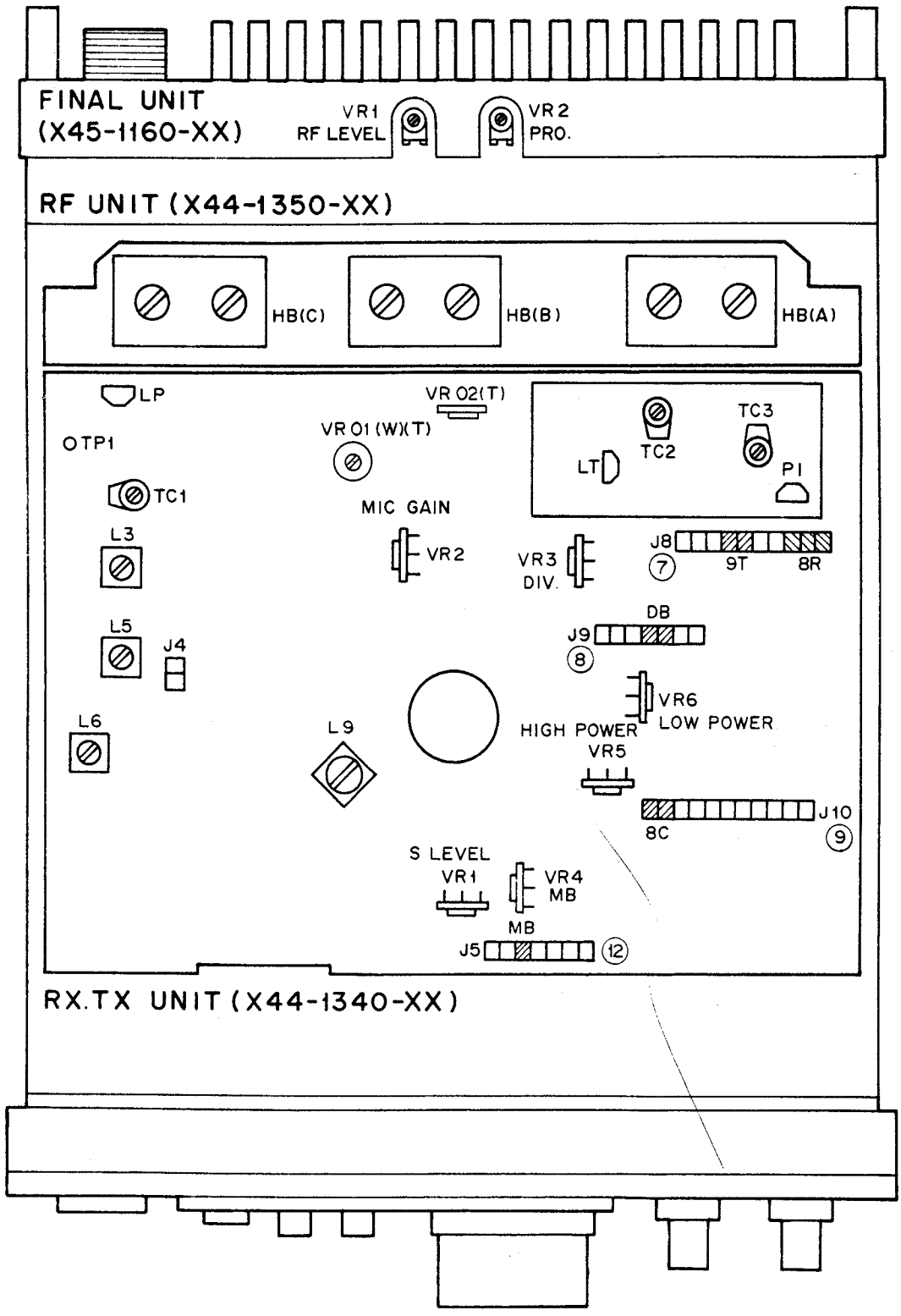
ADJUSTMENTS

<Top View>



ADJUSTMENTS

< Bottom View >



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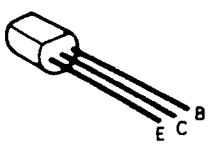
2SA1015
2SC1775
2SC1815
2SC1923
2SC1959
2SC2240



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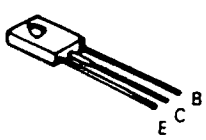

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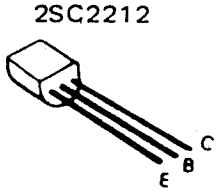

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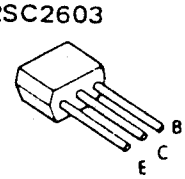
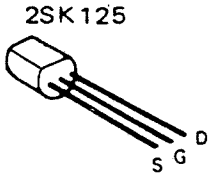
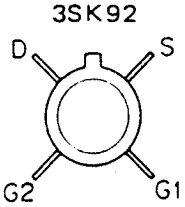
2SC2603



2SK30A
2SK125

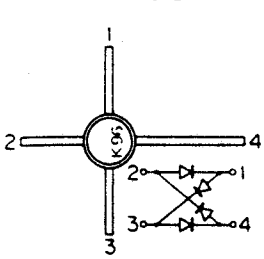


3SK48
3SK76
3SK92



TOP VIEW

ND487C2-3R



2SC460

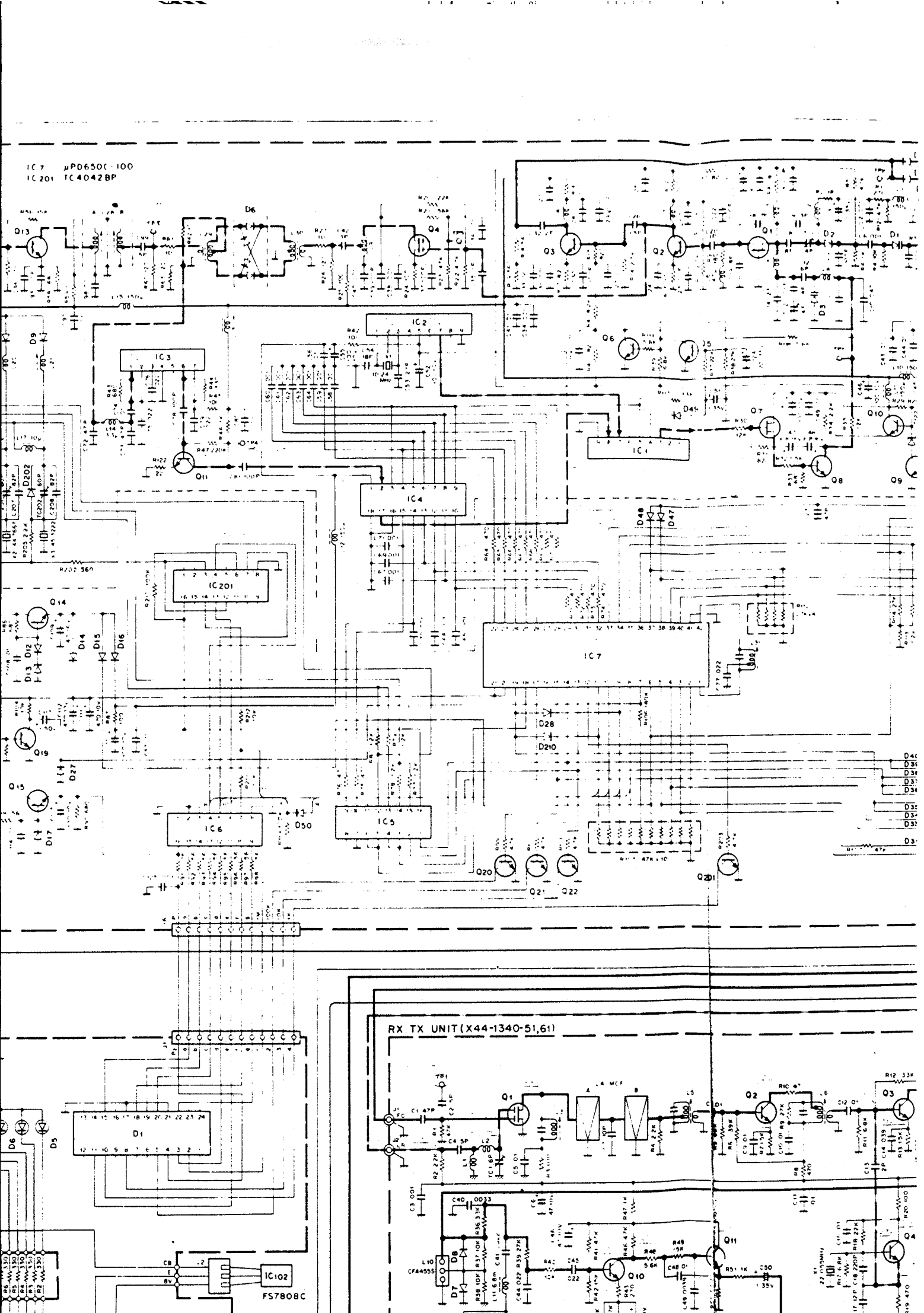
PLL UNIT (X50-1670-51,61)

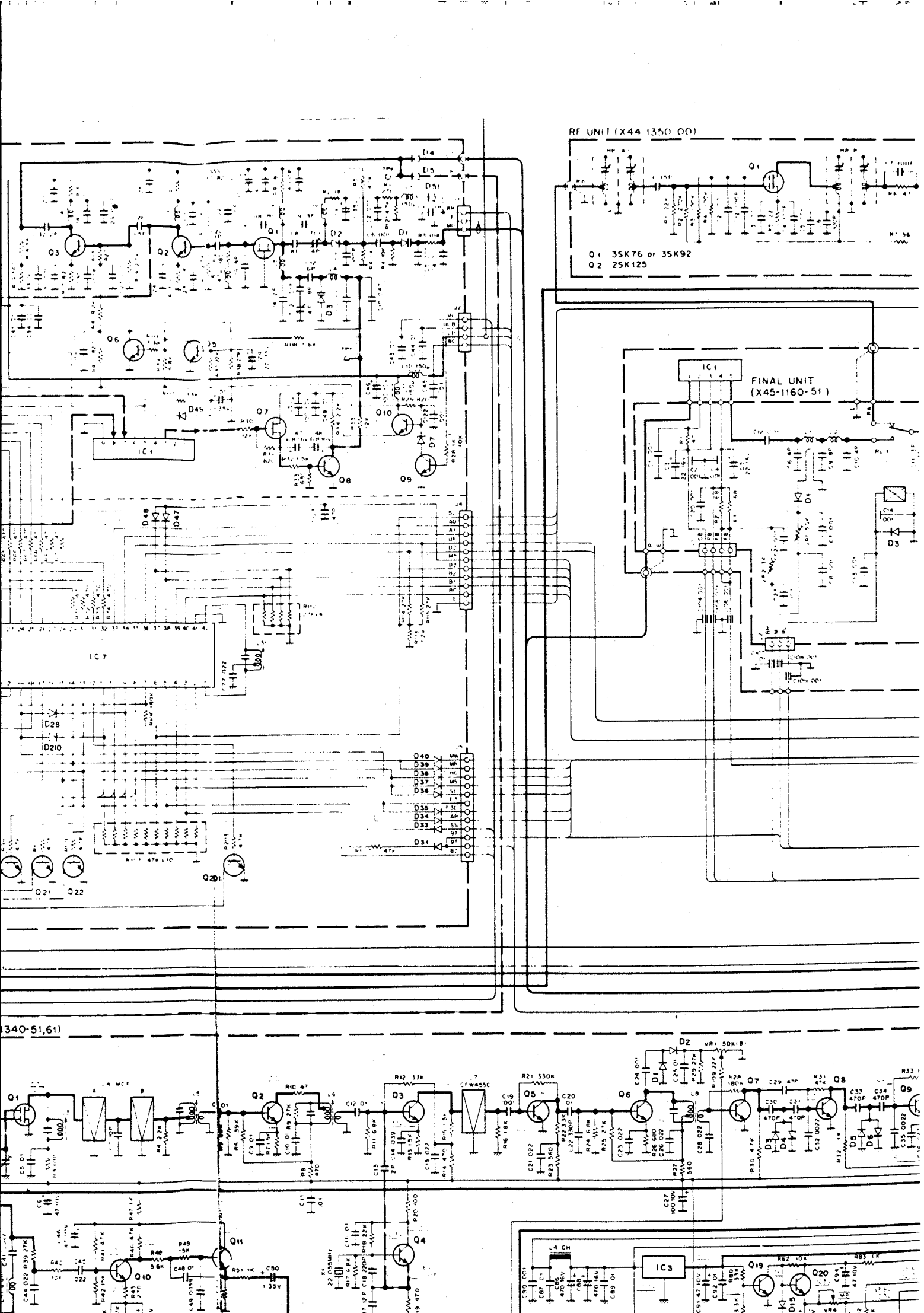
IC1 TC5081P
IC2 TC5082P L
IC3 TA7302P
IC4 TC9122P
IC5 MN1201A
IC6 TC5022BP
IC7 μPD650C-100
IC201 TC4042BP

Q1	2SK125
Q2,13	2SC2212
Q3	2SC2026
Q4	3SK76 or 3SK92
Q5	2SC1775(E)
Q6,9,10	2SC2603(D,E)
Q7	2SK30A(O)
Q8	2SC2240(GR)
Q11,12	2SC1923(O)
Q14,20~22,201	2SC1959(Y)
Q15	2SC496(Y)
Q19	2SC1815(Y)
D1	1S2208
D2	MI301
D3	1SV505
D4,5	BA243S
D6	ND487C2-3R
D7	XZ-062
D8~11, 207,208	BA244A
D12,14~16,27,31,51,211, 212,213 215,216	1S1555
D13,17	XZ-066
D26	MA522(Q)
D28,33~40,47~50,210	1N60
D201~206	1S2588

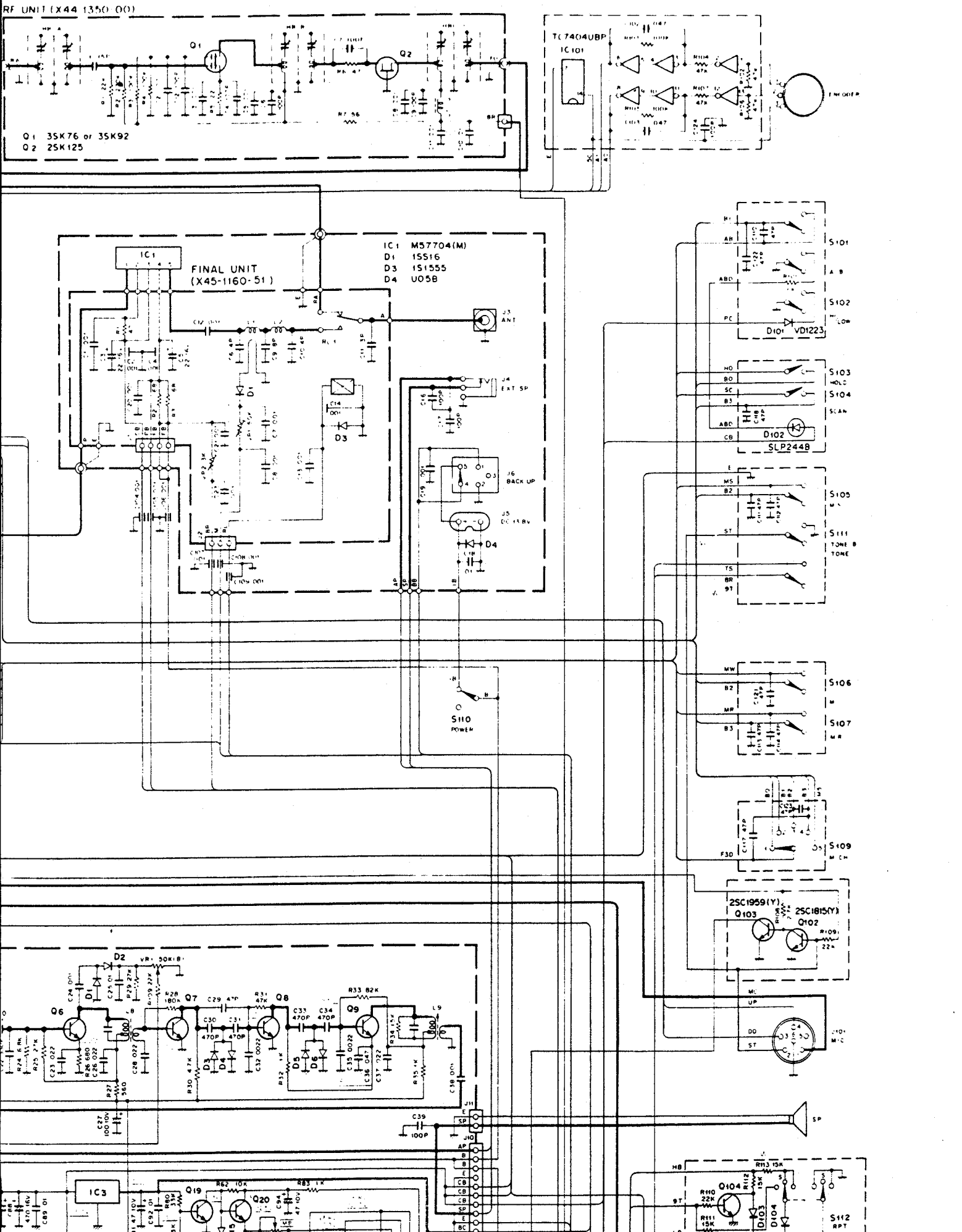
INDICATOR UNIT
(X54-1520-00)

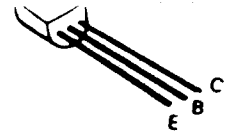
IC102
FS7808C


IC 7 μPD650C-100
IC 201 TC4042BP
RX TX UNIT (X44-1340-51,61)
IC102
FS7808C

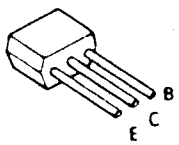

RF UNIT (X44-1350-00)
Q1 35K76 or 35K92
Q2 2SK125
FINAL UNIT
(X45-1160-51)
IC1
IC7
IC4
IC3
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q19
Q20
D2
D3
D4
D5
D6
D7
D28
D210
D31
D33
D34
D35
D36
D37
D38
D39
D40
D45
D46
D47
D48
Q201
Q21
Q22
(340-51,61)

Schematic Diagram (W)(T) TR-8400

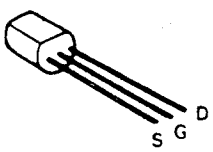




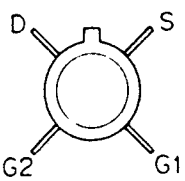
2SA1115
2SC2603



2SK30A
2SK125

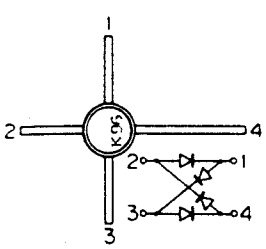


3SK48
3SK76
3SK92



TOP VIEW

ND487C2-3R



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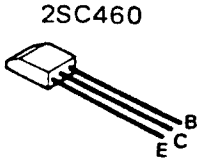
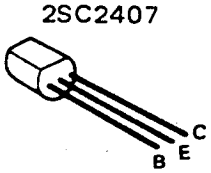


2SC2026
2SC2407



Q1	2SK125
Q2,13	2SC2212
Q3	2SC2026
Q4	3SK76 or 3SK92
Q5	2SC1775(E)
Q6,9,10	2SC2603(D,E)
Q7	2SK30A(O)
Q8	2SC2240(GR)
Q11,12	2SC1923(O)
Q14,20~22,201	2SC1959(Y)
Q15	2SC496(Y)
Q19	2SC1815(Y)

D1	1S2208
D2	MI301
D3	1SV505
D4,5	BA243S
D6	ND487C2-3R
D7	XZ-062
D8~11, 207,208	BA244A
D12,14~16,27,31,51,211, 212,213 215,216	1S1555
D13,17	XZ-066
D26	MA522(O)
D28,33~40,47~50,210	1N60
D201~206	1S2588

INDICATOR UNIT
(X54-1520-00)

IC1	TA7612AP
D1	LN543RK
D2,4	LN333GP
D3,11,12	LN233RP
D5~10	LN433YP

T(-511)	R010	C011	C013	VR02	D02
W(-611)	–	JUMPER	–	–	JUMPER

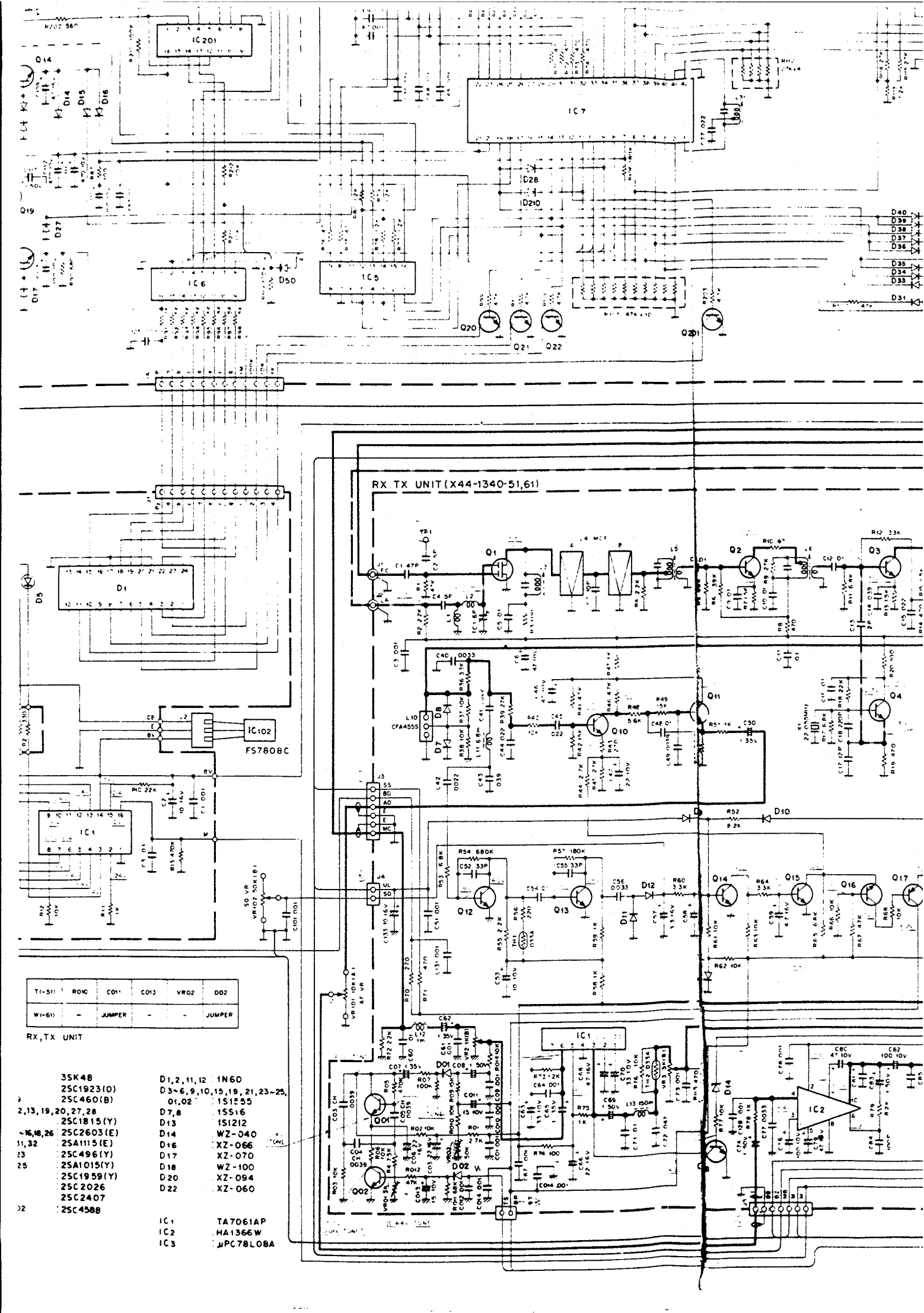
RX,TX UNIT

Signal
Control
Common DC line

Q1	3SK48
Q2,3	2SC1923(O)
Q4~9	2SC460(B)
Q10,12,13,19,20,27,28	2SC1815(Y)
Q11,14~16,18,26	2SC2603(E)
Q17,31,32	2SA1115(E)
Q21,23	2SC496(Y)
Q22,25	2SA1015(Y)
Q24	2SC1959(Y)
Q29	2SC2026
Q30	2SC2407
D01,02	2SC458B

D1,2,11,12	1N60
D3~6,9,10,15,19,21,2	
D1,02	1S1555
D7,8	1SS16
D13	1S1212
D14	WZ-040
D16	XZ-066
D17	XZ-070
D18	WZ-100
D20	XZ-094
D22	XZ-060

IC1	TA7061AP
IC2	HA1366W
IC3	μPC78L0

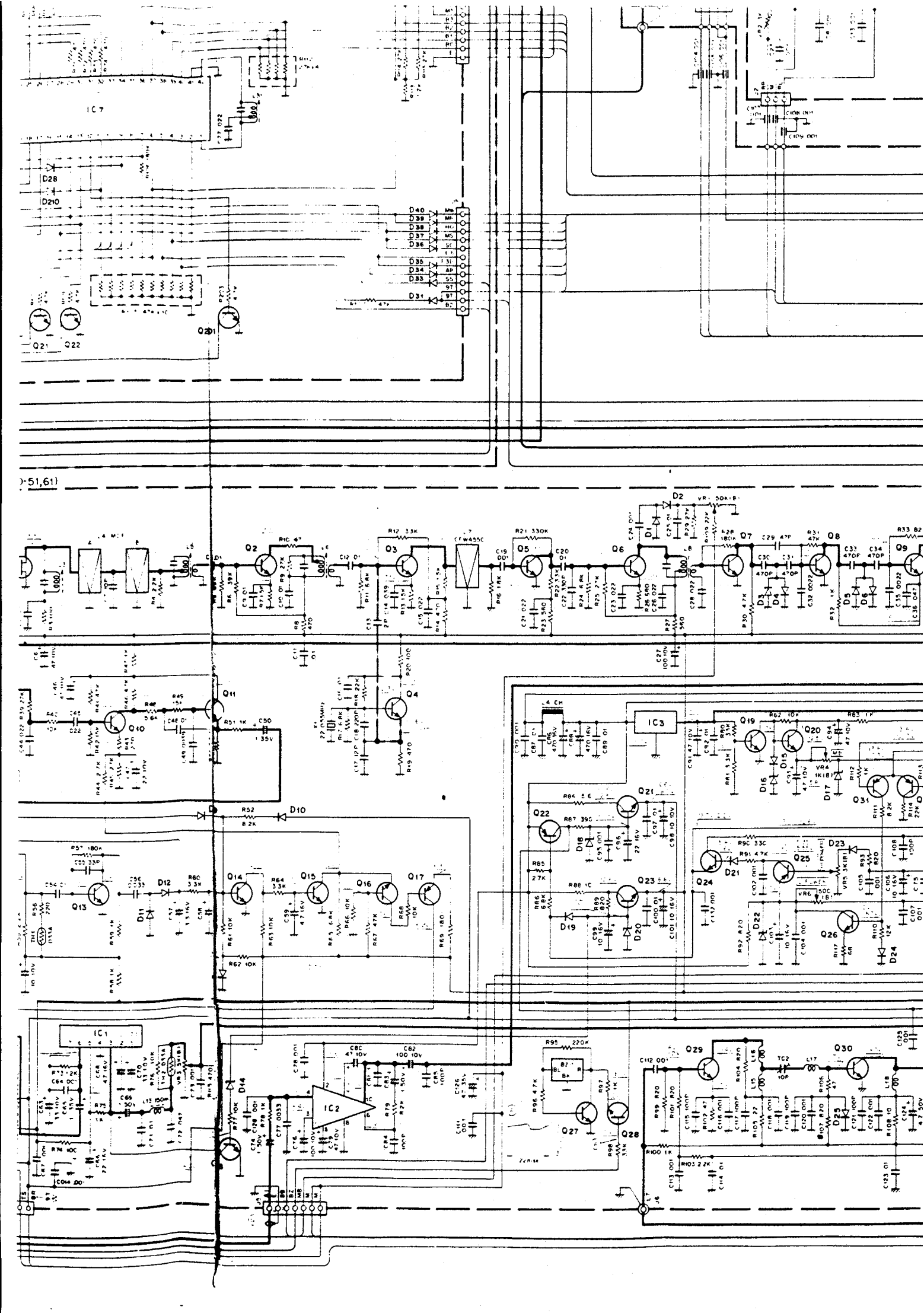


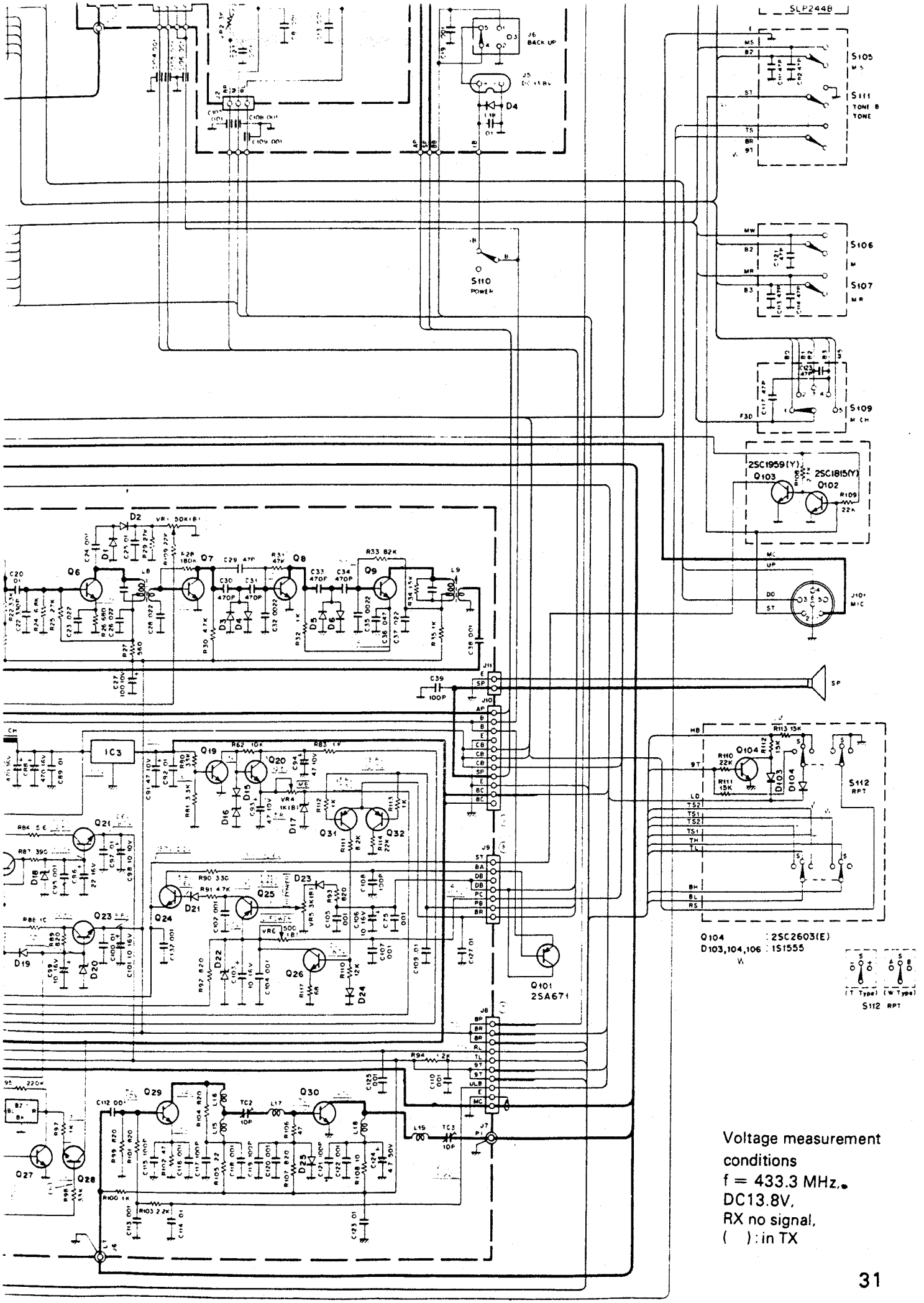
T(-51)	R010	C011	C013	VR02	D02
W(-61)	-	JUMPER	-	-	JUMPER

RX,TX UNIT

	3SK48
	2SC1923(O)
	2SC460(B)
2,13,19,20,27,28	2SC1815(Y)
-16,18,26	2SC2603(E)
31,32	2SA1115(E)
23	2SC496(Y)
25	2SA1015(Y)
	2SC1959(Y)
	2SC2026
	2SC2407
02	2SC4588

D1,2,11,12	1N60
D3~6,9,10,15,19,21,23~25, 01,02	1S1555
D7,8	1SS16
D13	1S1212
D14	WZ-040
D16	XZ-066
D17	XZ-070
D18	WZ-100
D20	XZ-094
D22	XZ-060
IC1	TA7061AP
IC2	HA1366W
IC3	μPC78L08A





Voltage measurement conditions
f = 433.3 MHz,
DC13.8V,
RX no signal,
( ) : in TX

PS-10

SPECIFICATIONS

[POWER SUPPLY SECTION]

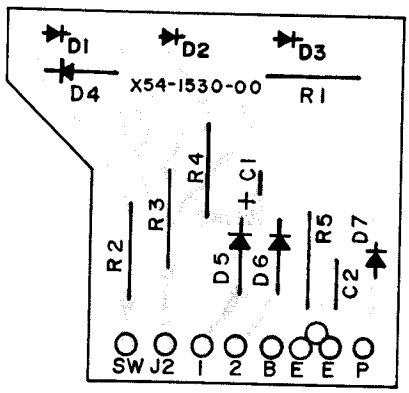
Power Requirement:	AC 120V ±10% or 220V ±10% (K) AC 240V ±10% or 220V ±10% (W)(T)(X) 50 ~ 60 Hz
Power Consumption:	80W (approx.)
Output Voltage:	DC 13.8V (standard)
Output Current:	Intermittent 3.5A (duty cycle 50%), Continuous 3A (max.)
Fluctuation:	Less than ±50 mV [against an input AC voltage variation of 120/220V ±10% (K), 220/240V ±10% (W)(T)(X)]
Ripple Component:	Less than 5 mV (r.m.s.) [at 3.5A output current, AC 120/220V (K), 220/240V (W)(T)(X)]
Dimensions:	147 wide × 73 high × 180 deep (mm)
Weight:	3.3 kg (approx.)

[SPEAKER SECTION]

Impedance:	8 ohms

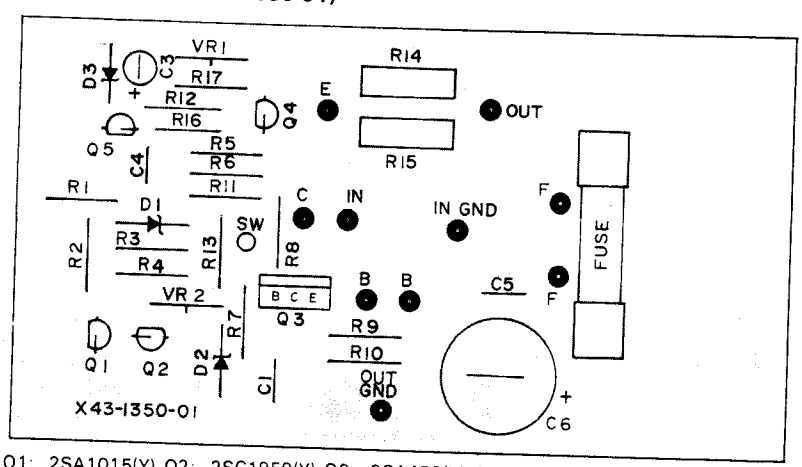
The above specifications are subject to change without notice for further improvement.

▼ INDICATOR UNIT (X54-1530-00)



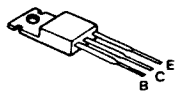
D1: TLR-205 D2: TLY-205
D3: TLG-205 D4: WZ-130
D5~6: 1S1555 D7: 1S1555 or 1N4448

▼ AVR unit (X43-1350-01)



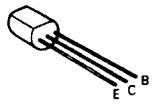
Q1: 2SA1015(Y) Q2: 2SC1959(Y) Q3: 2SA473(Y) Q4, 5: 2SC1815(Y)
D1, 3: XZ-060 D2: XZ-137

2SD525

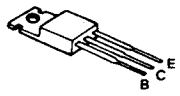


TLG, R, Y-205

2SA1015
2SC1815
2SC1959

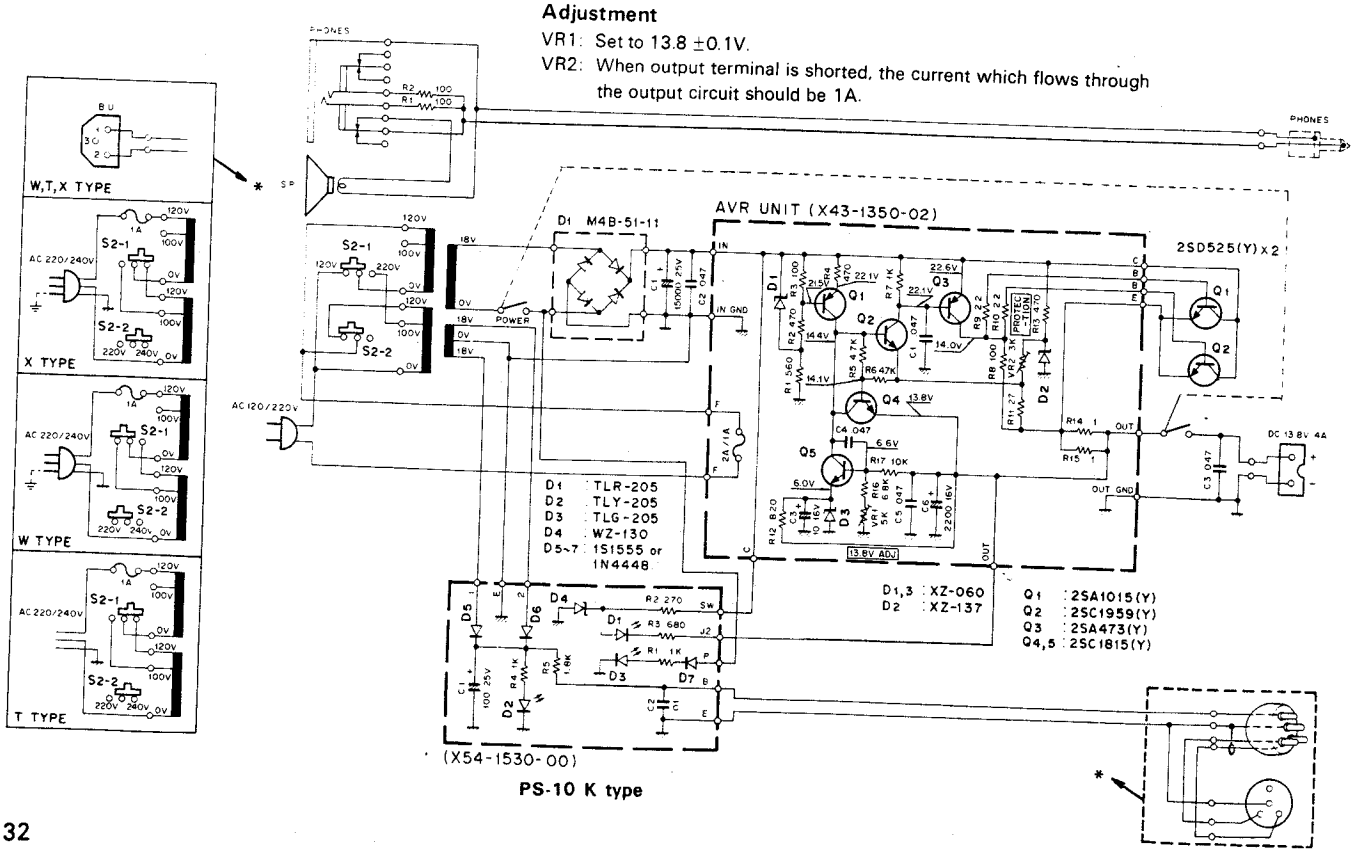


2SA473



Adjustment

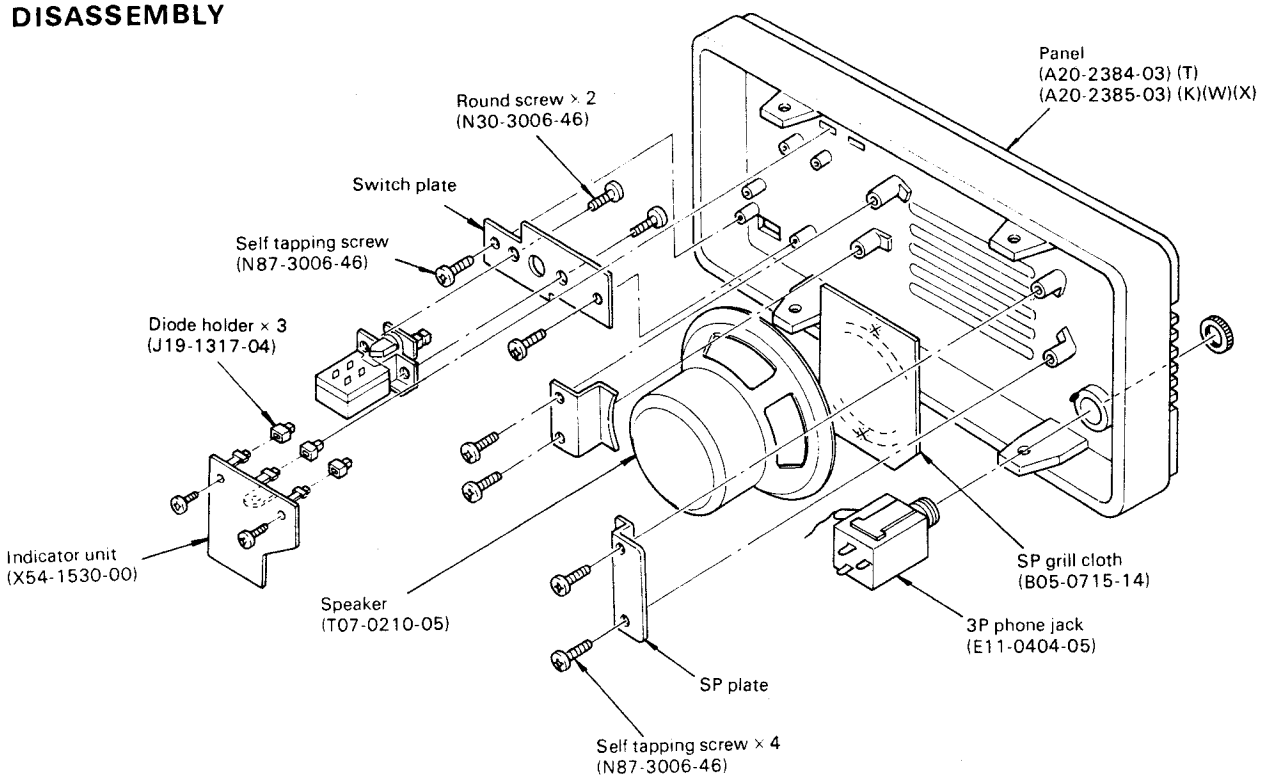
VR1: Set to 13.8 ±0.1V.
VR2: When output terminal is shorted, the current which flows through the output circuit should be 1A.



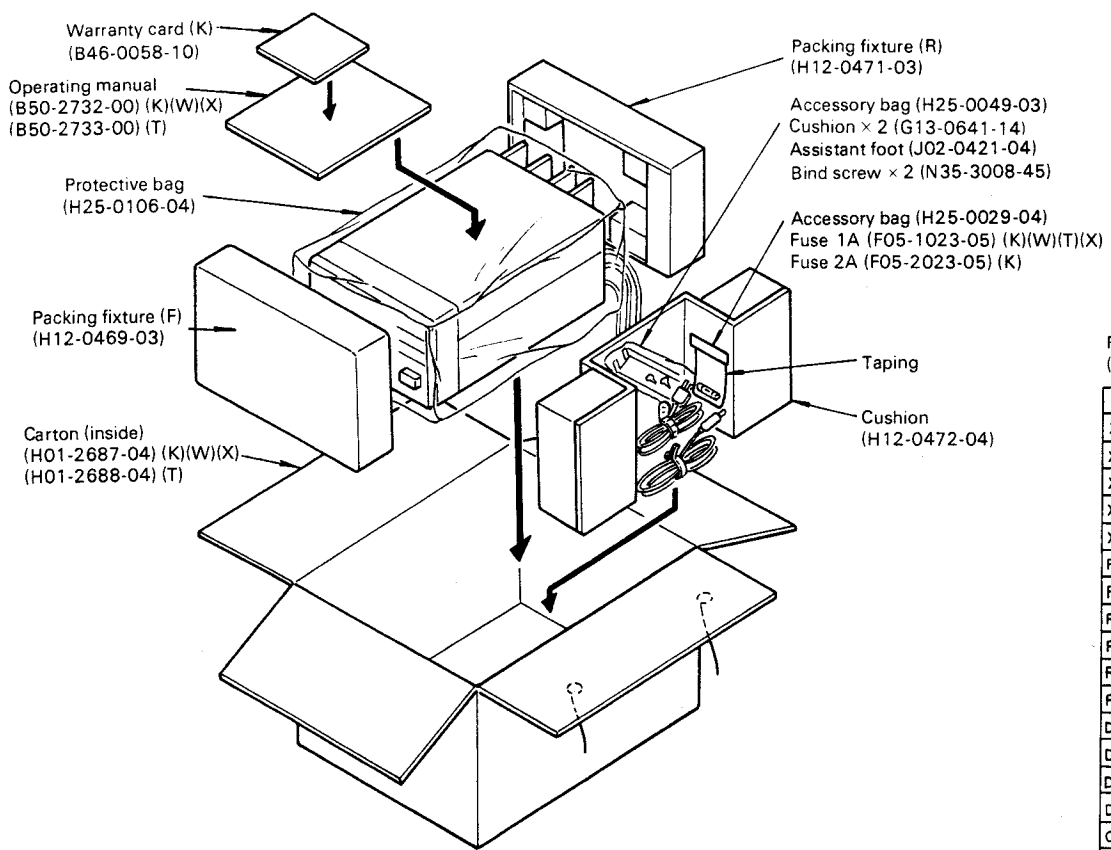
PS-10 K type

PS-10

DISASSEMBLY



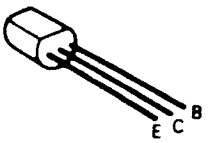
PACKING



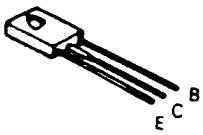
Refer to PLL unit
(X50-1670-11, 71)

	K(-11)	X(-71)
X2	45.8778	44.7667
X3	46.4333	45.3222
X4	48.2778	47.1667
X5	48.8338	47.7222
X201	—	46.9889
R202	1K	720
R204	1.2K	1.8K
R205	1.2K	1.8K
R206	1.2K	1.8K
R207	1.2K	1.8K
R208	—	1.8K
D205	—	1S2588
D207	—	BA244A
D211	—	1S1555
D215	—	1S1555
C9	2P	3P
C14	1P	2P
C202	—	.01
C211	—	82P
L209	—	10μ
L211	—	L32-0627-05
TC205	—	60P

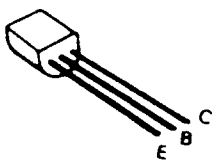
2SA1015
2SC1775
2SC1815
2SC1923
2SC1959
2SC2240



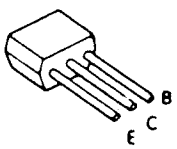
2SC496



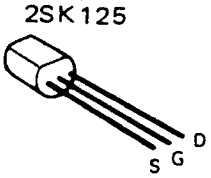
2SC2212



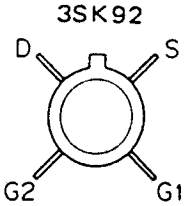
2SA1115
2SC2603



2SK30A
2SK125

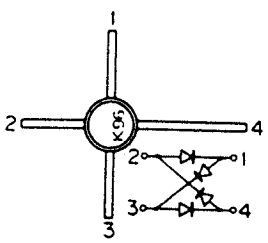


3SK48
3SK76
3SK92

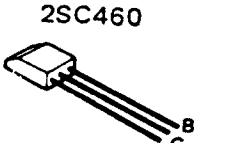


TOP VIEW

ND487C2-3R



2SC460



PLL UNIT (X50-1670-11,-71)

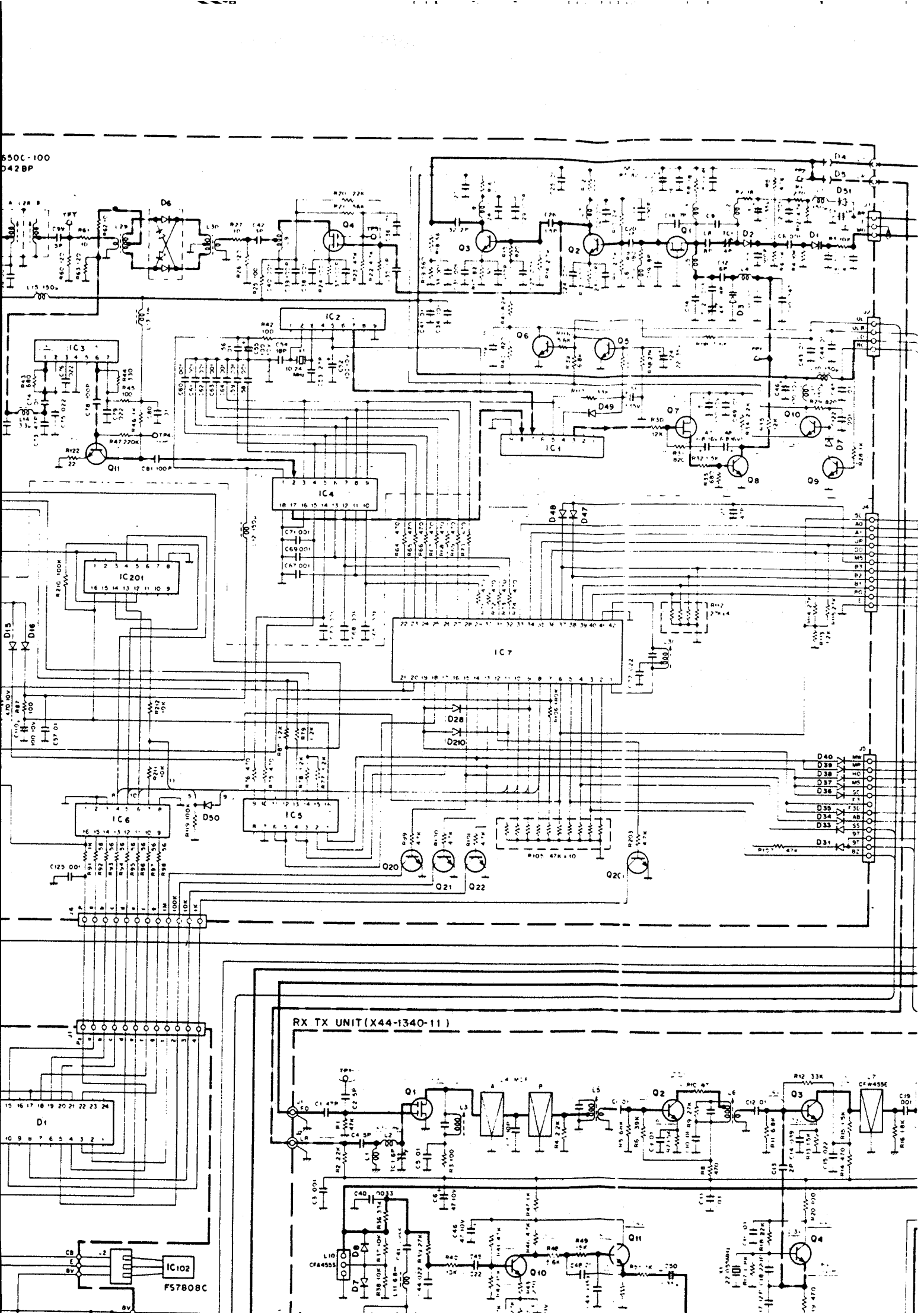
IC1 TC5081P
IC2 TC5082P-L
IC3 TA7302P
IC4 TC9122P
IC5 MN1201A
IC6 TC5022BP
IC7 μPD650C-100
IC201 TC4042BP

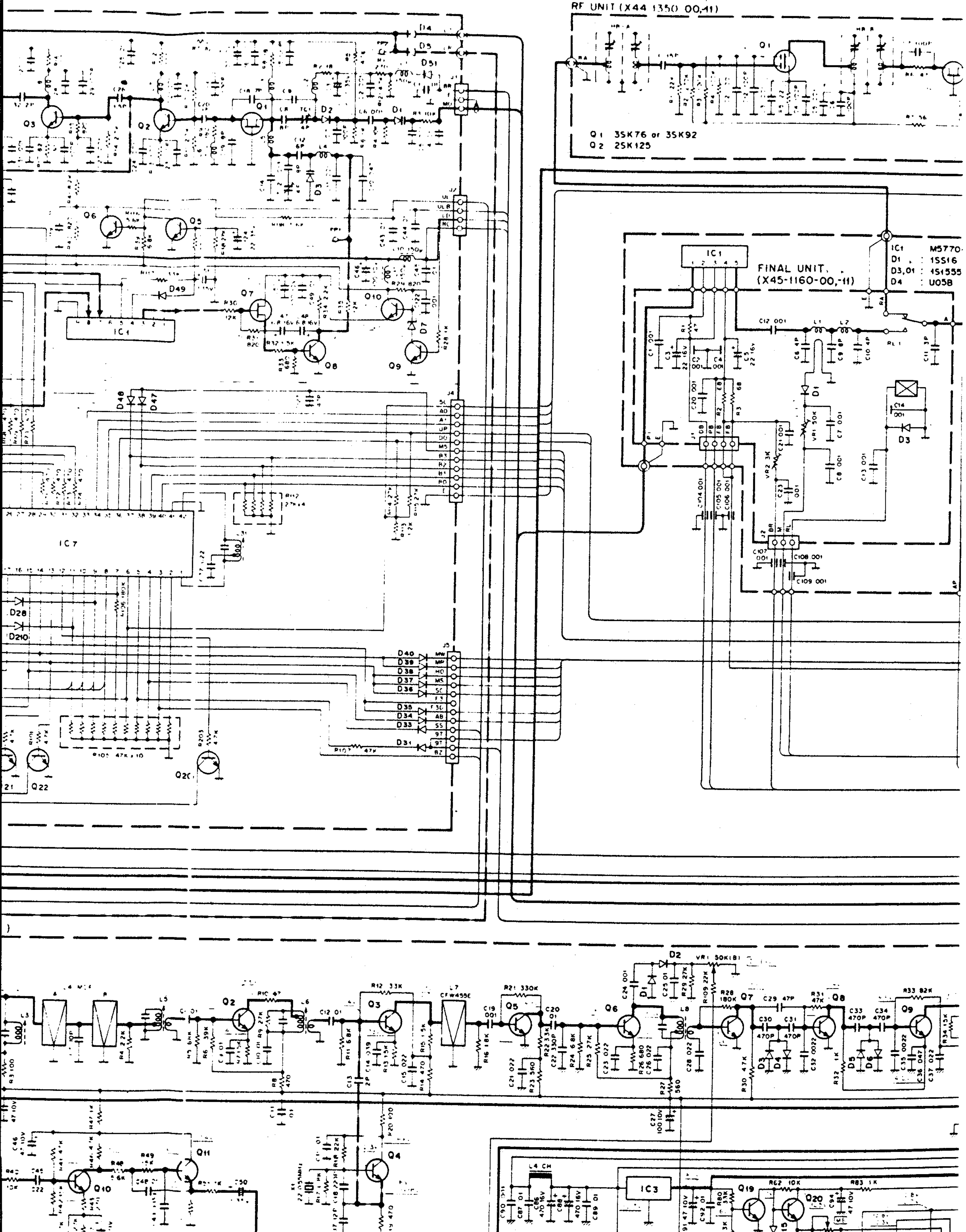
Q1	2SK125
Q2,13	2SC2212
Q3	2SC2026
Q4	3SK76 or 3SK92
Q5	2SC1775(E)
Q6,9,10	2SC2603(D,E)
Q7	2SK30A(O)
Q8	2SC2240(GR)
Q11,12	2SC1923(O)
Q14,20~22,201	2SC1959(Y)
Q15	2SC496(Y)
Q19	2SC1815(Y)

D1	1S2208
D2	MI301
D3	1SV50S
D4,5	BA243S
D6	ND487C2-3R
D7	XZ-062
D8~11, 207	BA244A
D12,14~16,27,31,51,211, 215	1S1555
D13,17	XZ-066
D26	MA522(Q)
D28,33~40,47~50,210	1N60
D201~204,206	1S2588

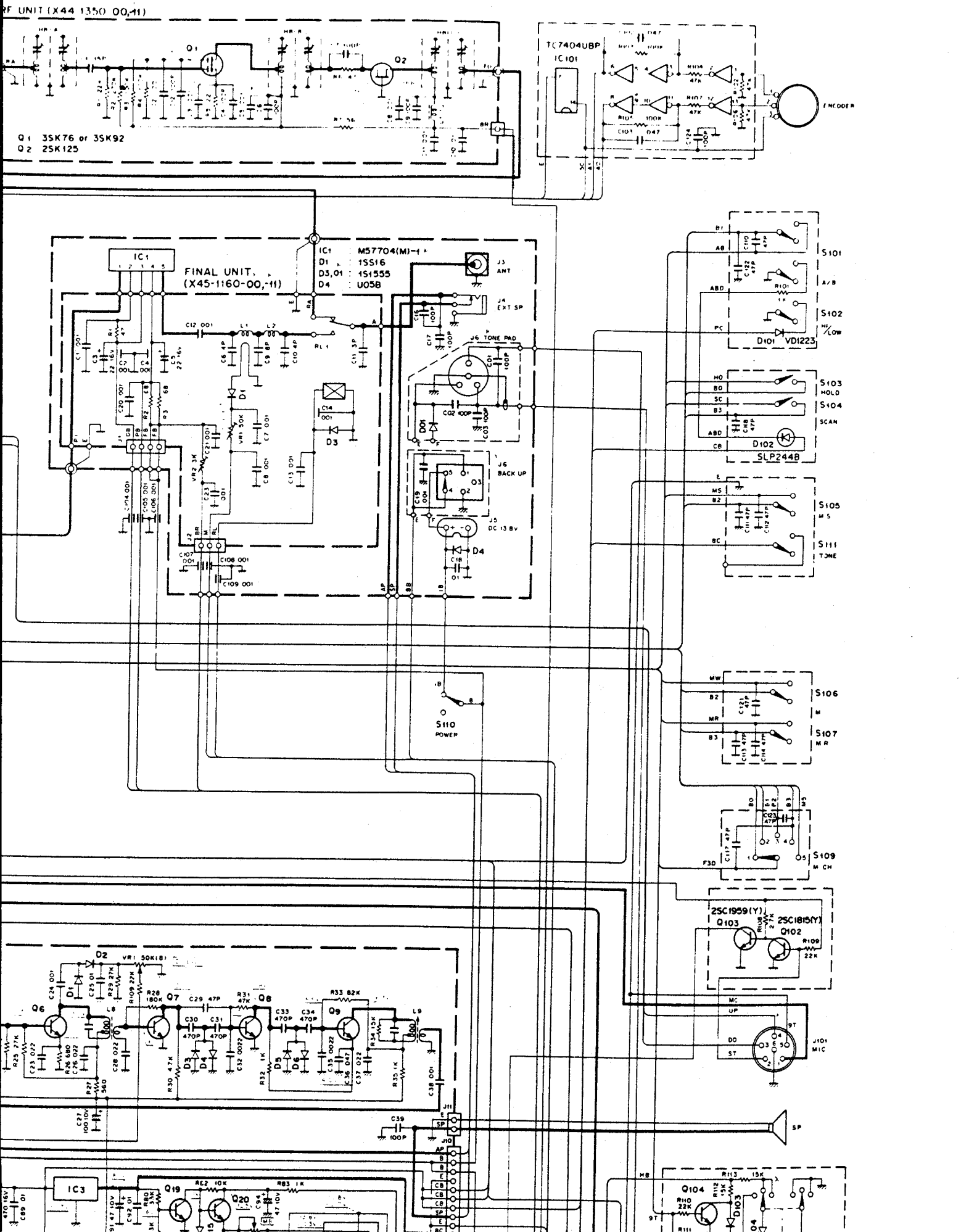
INDICATOR UNIT
(X54-1520-11)

IC102
FS7808C

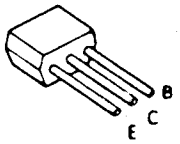

RX TX UNIT(X44-1340-11)
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC102
IC201
FS7808C
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q20
Q21
Q22
D1
D2
D5
D6
D7
D8
D10
D15
D16
D28
D31
D33
D34
D35
D36
D37
D38
D39
D40
D47
D48
D49
D50
D51


RF UNIT (X44 1350 00,-11)
Q1 3SK76 or 3SK92
Q2 2SK125
FINAL UNIT
(X45-1160-00,-11)
IC1 M5770
D1 : 1SS16
D3,01 : 1S1555
D4 : U05B
IC1
IC7
IC3
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q19
Q20
Q22
D47
D48
D49
D51
D31
D33
D34
D35
D36
D37
D38
D39
D40
R105 47K x 10
CFW455E
VR1 50K(B)
L4 CH

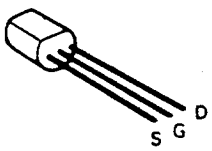
Schematic Diagram (K)(X) TR-8400



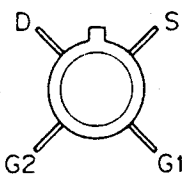
2SA1115
2SC2603



2SK30A
2SK125

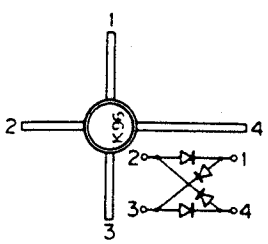


3SK48
3SK76
3SK92

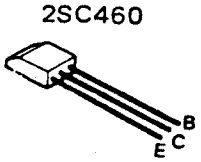


TOP VIEW

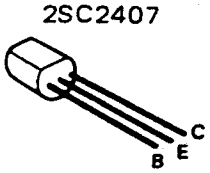
ND487C2-3R



2SC460

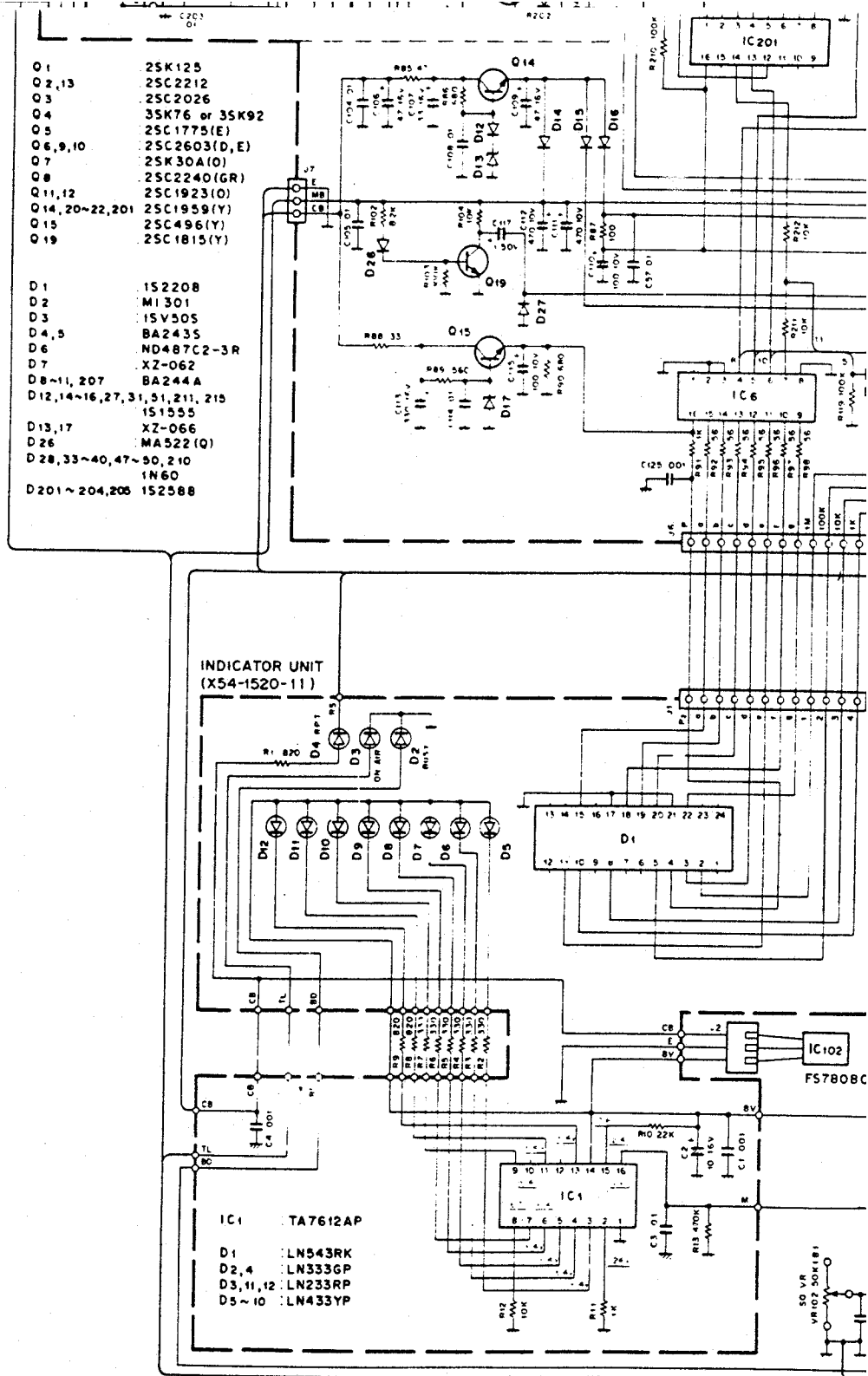


2SC2026
2SC2407



Q1	2SK125
Q2,13	2SC2212
Q3	2SC2026
Q4	3SK76 or 3SK92
Q5	2SC1775(E)
Q6,9,10	2SC2603(D,E)
Q7	2SK30A(O)
Q8	2SC2240(GR)
Q11,12	2SC1923(O)
Q14,20~22,201	2SC1959(Y)
Q15	2SC496(Y)
Q19	2SC1815(Y)

D1	1S2208
D2	MI301
D3	1SV505
D4,5	BA243S
D6	ND487C2-3R
D7	XZ-062
D8~11, 207	BA244A
D12,14~16,27,31,51,211, 215	1S1555
D13,17	XZ-066
D26	MA522(Q)
D28,33~40,47~50,210	1N60
D201~204,206	1S2588



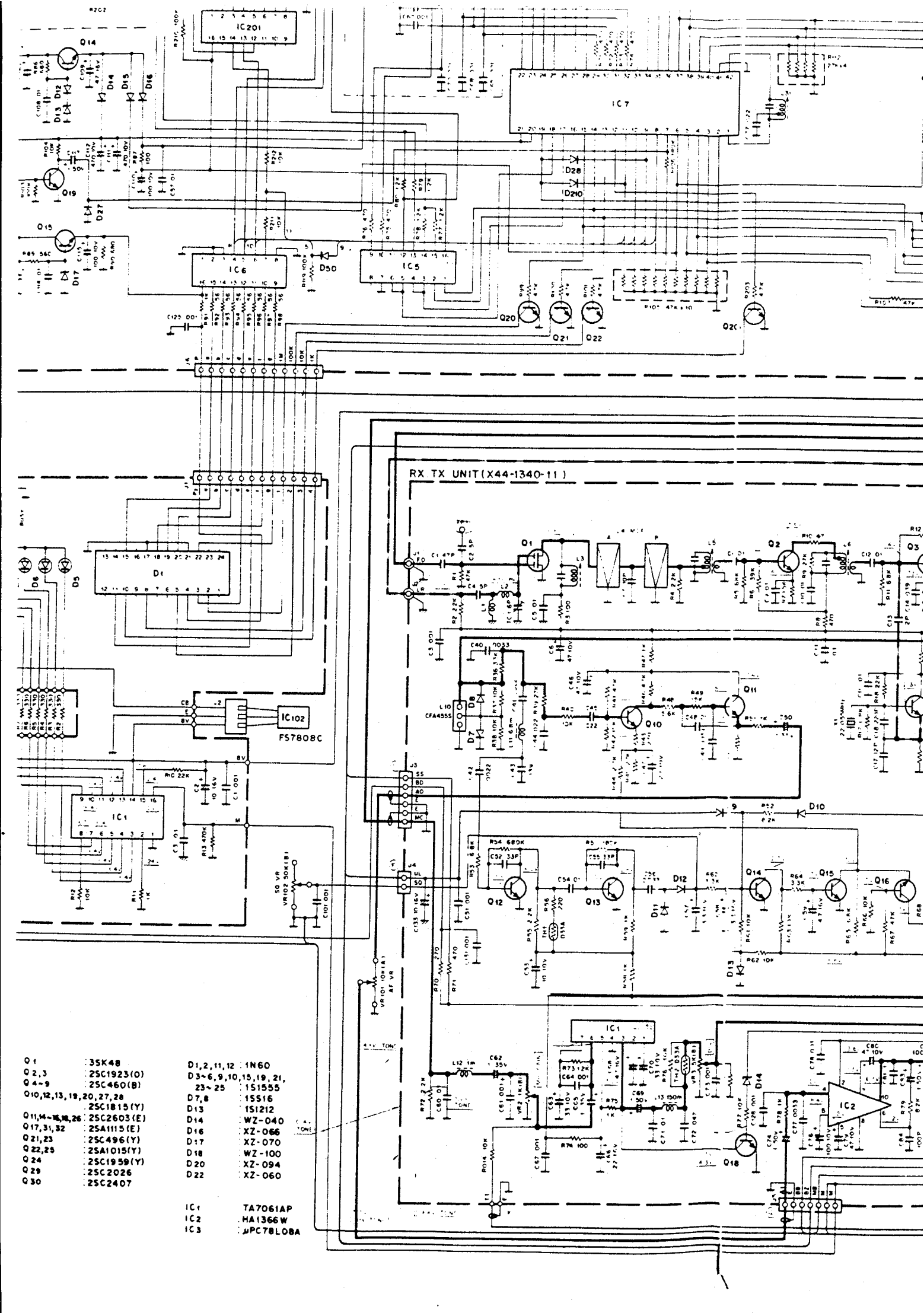
IC1	TA7612AP
D1	LN543RK
D2,4	LN333GP
D3,11,12	LN233RP
D5~10	LN433YP

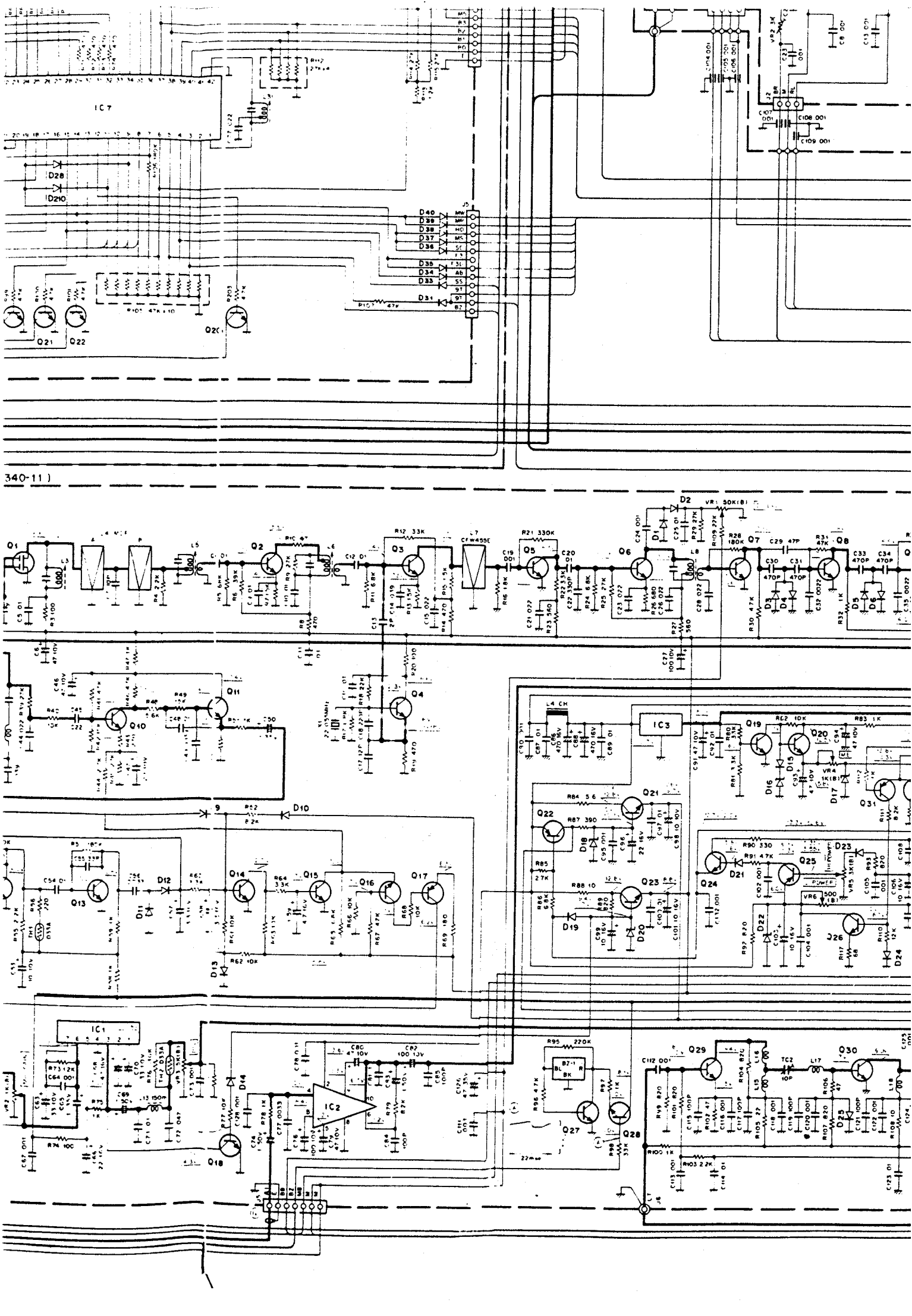
Signal
Control
Common DC line

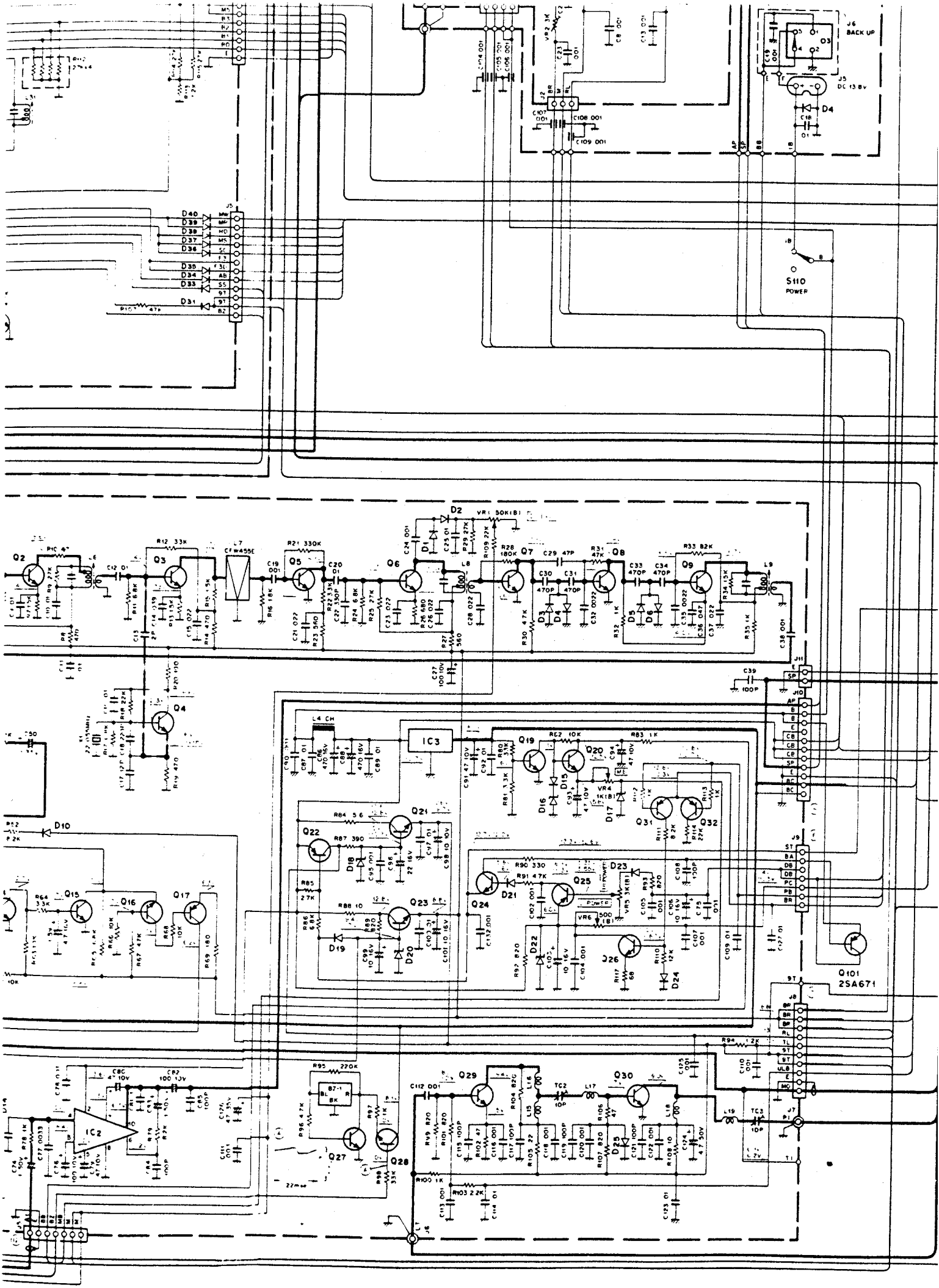
Q1	3SK48
Q2,3	2SC1923(O)
Q4~9	2SC460(B)
Q10,12,13,19,20,27,28	2SC1815(Y)
Q11,14~16,18,26	2SC2603(E)
Q17,31,32	2SA1115(E)
Q21,23	2SC496(Y)
Q22,25	2SA1015(Y)
Q24	2SC1959(Y)
Q29	2SC2026
Q30	2SC2407

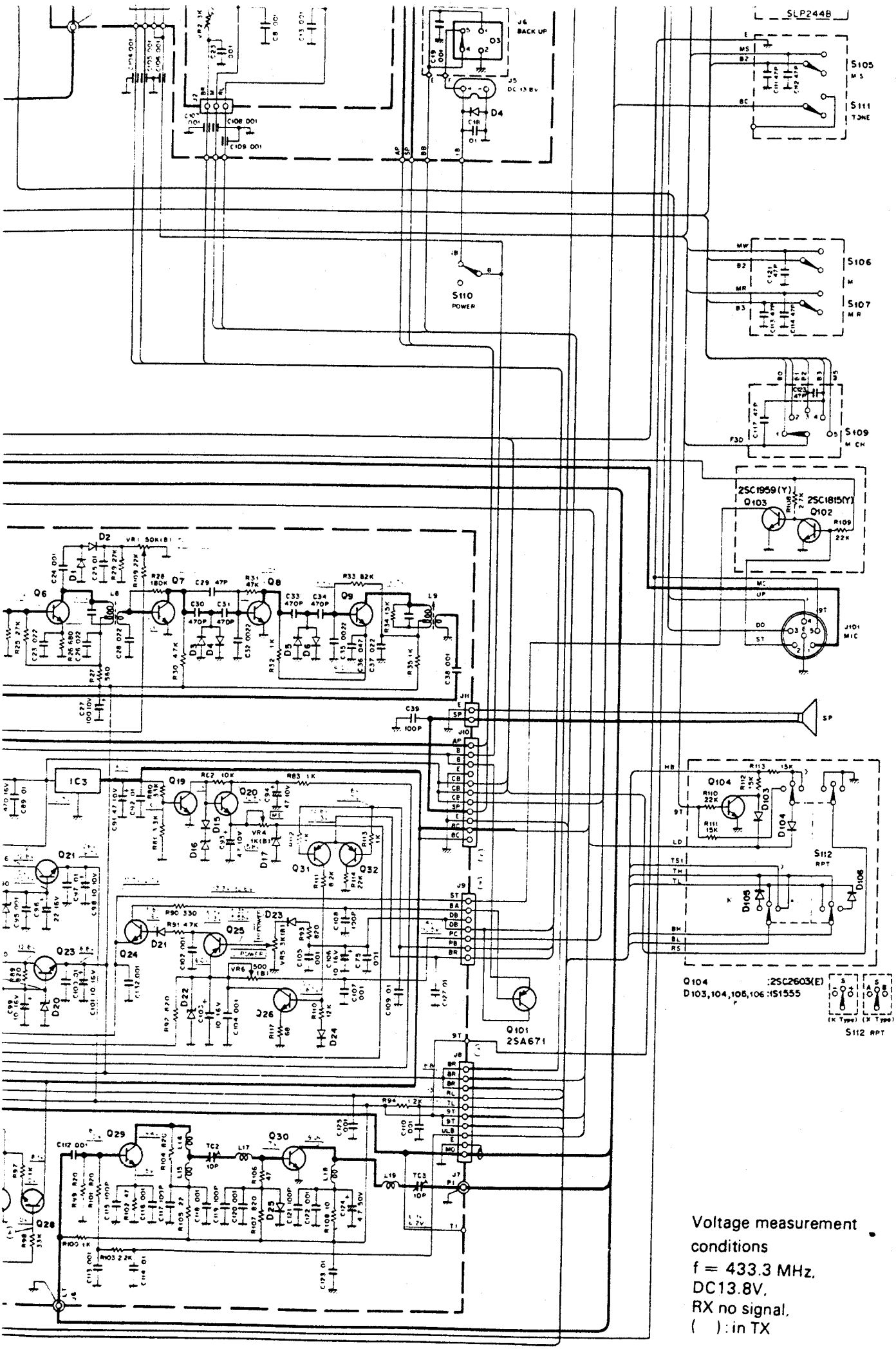
D1,2,11,12	1N60
D3~6,9,10,15,19,21,23~25	1S1555
D7,8	1S516
D13	1S1212
D14	WZ-040
D16	XZ-066
D17	XZ-070
D18	WZ-100
D20	XZ-094
D22	XZ-060

IC1	TA7061AP
IC2	HA1366W
IC3	μPC78L08A


RX TX UNIT (X44-1340-11)
IC201
IC7
IC6
IC5
IC102
FS7808C
IC1
IC2
Q1
Q2
Q3
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q18
Q19
Q20
Q21
Q22
D1
D5
D6
D7,8 : 1SS16
D13 : 1S1212
D14 : WZ-040
D16 : XZ-066
D17 : XZ-070
D18 : WZ-100
D20 : XZ-094
D22 : XZ-060
Q1 : 3SK48
Q2,3 : 2SC1923(O)
Q4~9 : 2SC460(B)
Q10,12,13,19,20,27,28 : 2SC1815(Y)
Q11,14~16,18,26 : 2SC2603(E)
Q17,31,32 : 2SA1115(E)
Q21,23 : 2SC496(Y)
Q22,25 : 2SA1015(Y)
Q24 : 2SC1959(Y)
Q29 : 2SC2026
Q30 : 2SC2407
D1,2,11,12 : 1N60
D3~6,9,10,15,19,21, 23~25 : 1S1555
IC1 : TA7061AP
IC2 : HA1366W
IC3 : μPC78L08A


IC7
D28
D210
D40
D39
D38
D37
D36
D35
D34
D33
D31
J5
Q21
Q22
Q20
340-11)
Q1
Q2
Q3
Q5
Q6
Q7
Q8
D1
D2
Q11
Q10
Q4
IC3
Q19
Q20
Q31
Q13
Q14
Q15
Q16
Q17
D10
D12
D13
Q21
Q22
Q23
D18
D19
D20
Q24
Q25
D21
D22
Q26
D23
D24
IC1
IC2
Q18
D14
Q27
Q28
Q29
Q30
D25


J6
BACK UP
Q3
J5
DC 13.8V
D4
S110
POWER
D40
D39
D38
D37
D36
D35
D34
D33
D31
J5
D2
VR1 50K(B)
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
L7
CFW455E
R12 33K
R21 330K
R109 22K
R28 180K
R31 47K
R33 82K
C29 47P
C30 470P
C31 470P
C33 470P
C34 470P
R30 47K
R32 1K
R34 15K
R35 1K
C39 100P
J11
J10
L4 CH
IC3
Q19
Q20
R62 10K
R83 1K
VR4 1K(B)
Q31
Q32
D15
D16
D17
D10
Q21
Q22
Q23
Q24
Q25
Q26
D18
D19
D20
D21
D22
D23
D24
R64 33K
R87 390
R88 10
R85 27K
R86 8K
R90 330
R91 47K
VR5 3K(B)
VR6 500(B)
R92 820
R110 12K
J9
Q101
2SA671
J8
R94 2K
IC2
R95 220K
R96 47K
R97 1K
R98 33K
Q27
Q28
Q29
Q30
TC2
TC3
L16
L17
L18
L19
R104 82Ω
R105 47
R106 820
R107 820
R108 10
R100 1K
R103 22K
J7
J6


SLP244B
S105 MS
S111 TONE
S106 M
S107 MR
S109 M CH
S110 POWER
2SC1959(Y) Q103
2SC1815(Y) Q102
J101 MIC
SP
IC3
Q104 :2SC2603(E)
D103,104,105,106 :1S1555
S112 RPT
Q101 2SA671
Voltage measurement conditions
f = 433.3 MHz,
DC13.8V,
RX no signal,
( ) : in TX

PS-10/SP-40

PS-10

Ref. No.	Parts No.	Description	Re-marks
	A01-0776-13	Case (upper)	☆
	A01-0777-03	Case (lower)	☆
	A20-2384-03	Panel (T)	☆
	A20-2835-03	Panel (K)(W)(X)	☆
	B05-0715-14	SP grill cloth	☆
	B46-0058-10	Warranty card (K)	☆
	B50-2732-00	Operating manual (K)(W)(X)	☆
	B50-2733-00	Operating manual (T)	☆
	C90-0826-05	E 15000μF 25V	☆
	C91-0456-05	C 0.047μF 25V	
	D32-0075-04	Switch stopper	
	E08-0471-05	4P socket T.PAD (K)	
	E09-0471-05	4P plug T.PAD (K)	
	E11-0404-05	3P phone jack	
	E30-0181-05	AC cord with plug (K)	
	E30-0185-05	AC cord with plug (X)	
	E30-0585-05	AC cord with plug (W)	
	E30-0602-05	AC cord with plug (T)	
	E30-1656-05	DC cord 13.8V	
	E30-1665-15	Cord with 3P connector BACK UP (T)(W)(X)	☆
	E30-1666-05	Cord with plug SP	☆
	E30-1673-05	3P cord BACK UP. T.PAD	☆
	F05-1023-05	Fuse 1A × 2 (T)(W)(X) × 1 (K)	
	F05-2023-05	Fuse 2A × 2 (K)	
	F20-0078-05	Insulating sheet × 2	
	F29-0014-05	Shoulder washer × 2	
	G10-0604-04	Cushion cloth × 2 (Lower case)	
	G13-0641-14	Cushion	☆
	H01-2687-04	Carton (inside) (K)(W)(X)	☆
	H01-2688-04	Carton (inside) (T)	☆
	H12-0469-03	Packing fixture (F)	☆
	H12-0471-03	Packing fixture (R)	☆
	H12-0472-04	Cushion	☆
	H25-0029-04	Accessory bag (Fuse)	
	H25-0049-03	Accessory bag (Foot, screw)	
	H25-0106-04	Protective bag	
	J02-0022-05	Foot × 4	
	J02-0421-04	Assistant foot	☆
	J19-1317-04	Diode holder × 3	☆
	J41-0006-05	Cord bushing × 3	
	J41-0024-15	Cord bushing (T)(W)(X)	
	J42-0420-05	Cord bushing (BACK UP)	☆
	J42-0422-05	Cord bushing (K)	
	J61-0019-05	Vinyletie	
	K29-0739-04	Knob	☆
	L01-8096-05	Power trans.	☆
	N30-3006-46	Round screw × 8	
	N32-3006-46	Flat screw × 3	
	N35-3006-45	Bind screw × 9	
	N35-3008-45	Bind screw × 4	
	N87-2606-46	Self tapping screw × 2	
	N87-3006-46	Self tapping screw × 11	
	N87-3008-46	Self tapping screw × 4	
	N87-3016-46	Self tapping screw × 2	
	N87-4010-41	Self tapping screw × 4	
	N89-3006-45	Self tapping screw × 7	
	S31-2027-05	AC volt. switch	
	S40-2418-05	Push switch (POWER)	☆
	T07-0210-05	Speaker	☆

AVR UNIT (X43-1350-01)

Ref. No.	Parts No.	Description	Re-marks
C1	C91-0456-05	C 0.047μF	
C3	CE04W1C100	E 10μF 16V	
C4,5	C91-0456-05	C 0.047μF	
C6	CE04W1C222MA	E 2200μF 16v	☆
	E23-0047-04	Square terminal	
	J13-0401-05	Fuse holder	
VR1	R12-2015-05	Trim. pot 5kΩ	
VR2	R12-1016-05	Trim. pot 3kΩ	
R14,15	R92-0618-05	Metal film 0.1Ω	☆

INDICATOR UNIT (X54-1530-00)

Ref. No.	Parts No.	Description	Re-marks
C1	CE04W1E101M	E 100μF 25V	

PS-10 Semiconductor

Ref. No.	Parts No.	Description	Re-marks
Diode	1N4448	V11-7766-06	
	1S1555	V11-0076-05	
	M4B-51-11	V11-2164-06	
Zener-Diode	XZ-060	V11-4101-20	
	WZ-130	V11-0297-05	
	XZ-137	V11-4161-76	
LED	TLG-205	V11-3162-86 Green	
	TLR-205	V11-3162-96 Red	
	TLY-205	V11-3163-16 Yellow	
TR	2SA473(Y)	V01-0473-06	
	2SA1015(Y)	V01-1015-06	
	2SC1815(Y)	V03-1815-06	
	2SC1959(Y)	V03-1959-06	
	2SD525(O) or (Y)	V04-0525-26	

SP-40

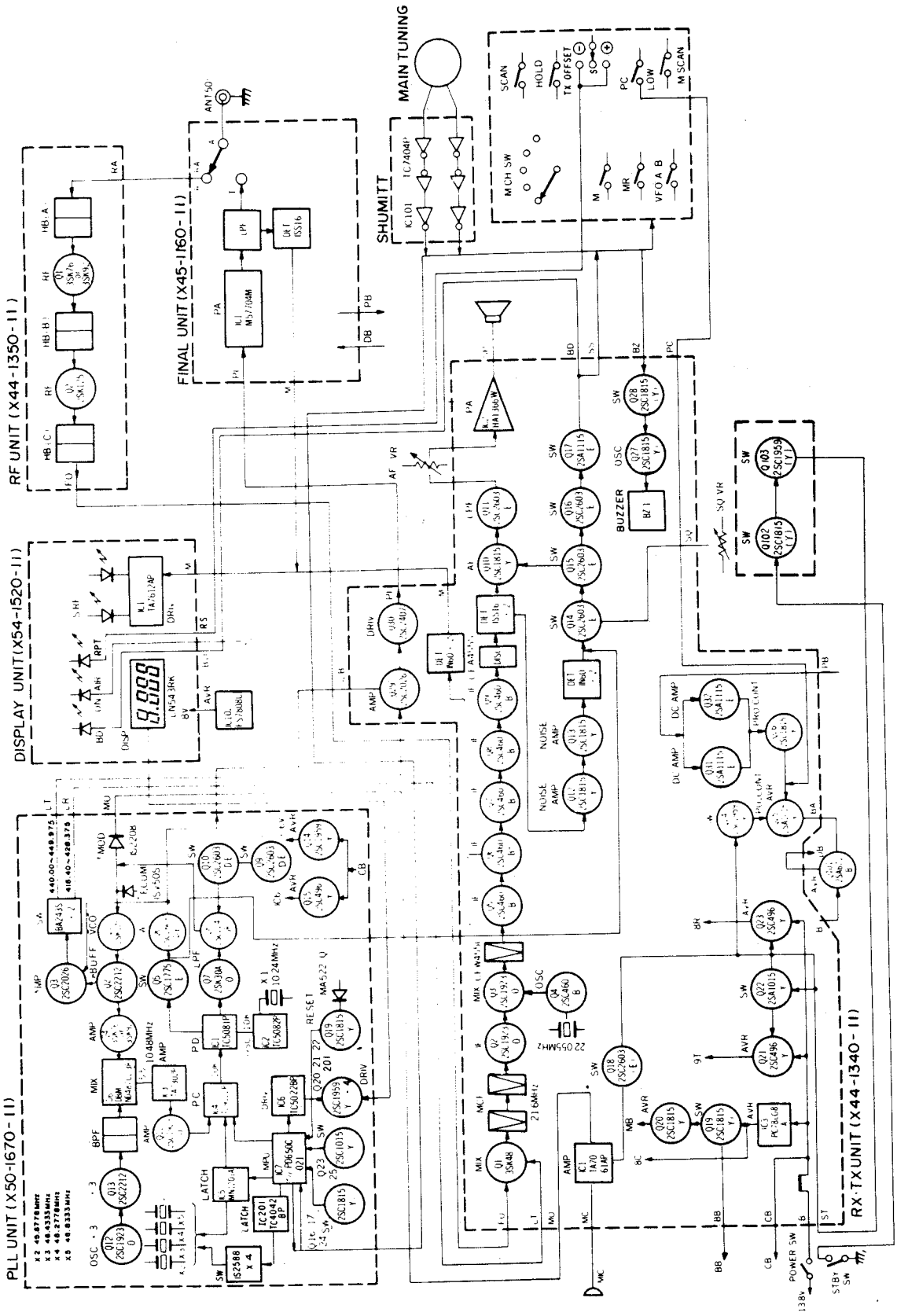
Ref. No.	Parts No.	Description	Re-marks
	E30-1667-08	Cord with plug	☆
	J02-0422-08	Foot	☆
	J19-1336-08	Auxiliary mounting plate	☆
	N09-0620-08	Screw for foot	☆
	N09-0628-08	Screw for aux. mounting plate	☆
	N09-0629-08	Screw for foot	☆
	N14-0404-04	Flange nut	
	N32-3014-46	Flat screw	
	N99-0306-04	Hex head bolt	☆
	T07-0211-08	Speaker	☆

SP-40

SPECIFICATIONS

Speaker size: 57 mm
Maximum input: 3W
Impedance: 4 ohms
Frequency response: 400 Hz – 5 kHz
Input plug: 3.5 mm (dia) 1/8"
Dimensions: 2-11/16 (3) W × 2-1/2 (2-7/8) H × 2-1/8 (2-5/32) D inch
68 (76) W × 64 (72.5) H × 53 (54) D mm (projections)
Weight: 0.44 lbs (200 g)

BLOCK DIAGRAM



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