



SERVICE MANUAL

TR-9500

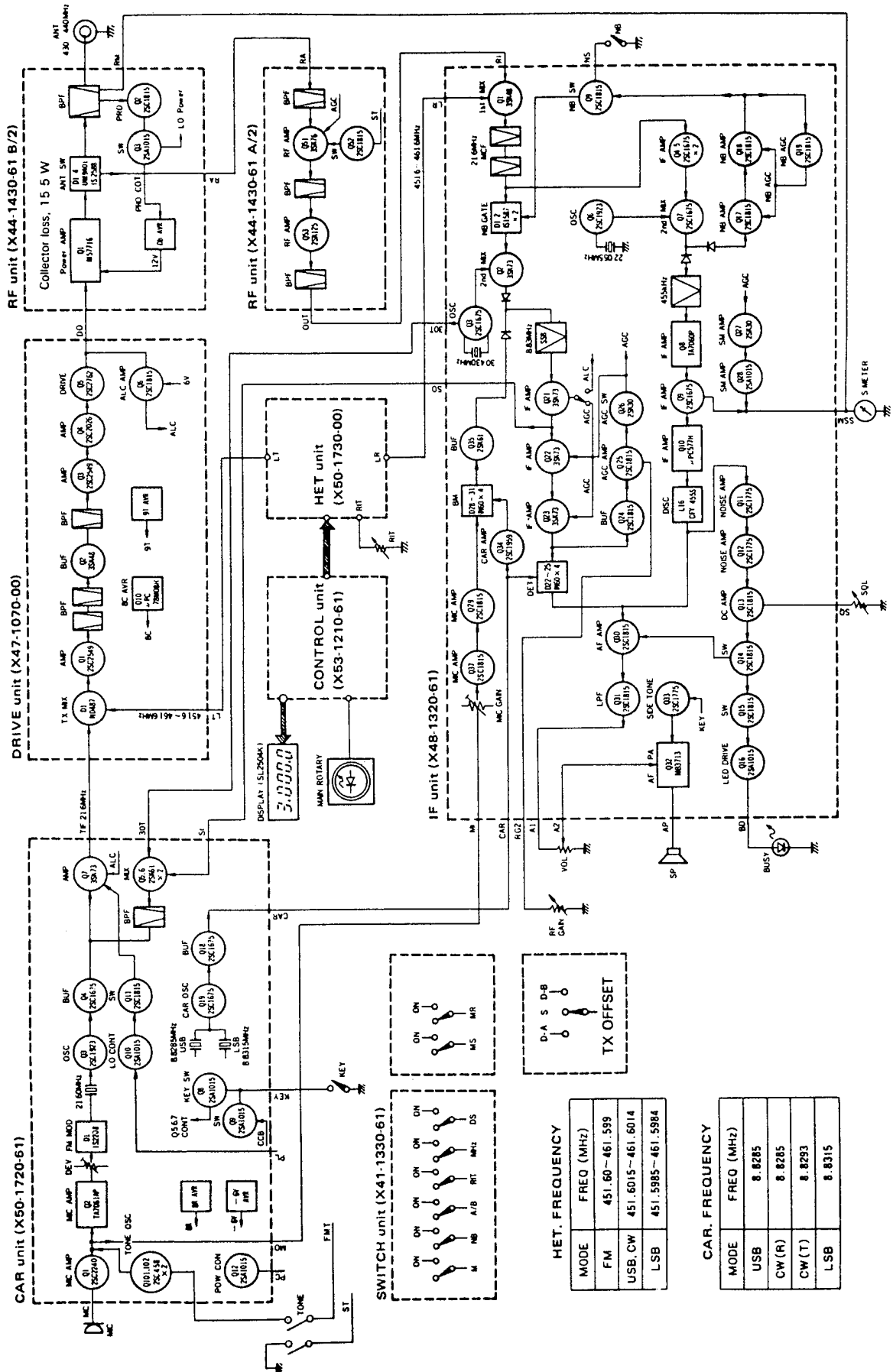


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UHF ALL MODE TRANSCEIVER

BLOCK DIAGRAM(W)



CIRCUIT DESCRIPTION

RECEIVER CIRCUIT

The antenna signal is input to the front end (RF unit A/2) through the diode switch in the final unit (RF unit B/2). The front end is comprised of a two-stage RF amplifier consisting of a dual gate MOS FET (Q51 : 3SK76), a junction FET (Q53 : 2SK125) and a helical resonator with a bandwidth of 10 MHz.

The signal amplified in the front end is then applied to the IF unit. The IF unit has a first mixer (Q1 : 3SK48) followed by a two-stage monolithic filter (MCF), providing high sensitivity and superior two signal characteristics.

The first 21.6 MHz IF signal output from the MCF is applied to both the SSB circuit and the FM circuit.

In the SSB circuit, the SSB signal, after passing through the NB gate, is converted to 8.83 MHz with 2nd mixer Q2, then applied to the crystal filter (YK-88S). The signal is then amplified with IF amplifier Q21 (which is also used for transmission) and IF amplifiers Q22 and Q23 and is demodulated into an audio signal with a ring demodulator. In the NB circuit, the noise signal is converted into a 455 kHz signal with 2nd mixer Q7, then amplified with the 2-stage amplifier consisting of Q17 and Q18 (2SC1815(Y)) to switch the NB gate.

The signal is picked up from the last stage of the IF amplifier (Q23), then detected and amplified to generate the AGC voltage. The AGC time constant is automatically set according to the mode : FAST for CW; SLOW for SSB. The AGC voltage is applied to IF amplifiers Q21, Q22 and Q23 (3SK73(GR)) and RF amplifier Q51. It is also used to drive the S meter.

In the FM circuit, the FM signal is converted into a 455 kHz IF signal with 2nd mixer Q7, then applied to the IF amplifier through the ceramic filter (CFW 455C). The IF signal is amplified with Q8 (TA7060P), Q9 (2SC1675(L)) and Q10 (μ PC577H), then is demodulated. In the squelch circuit, the noise signal is amplified with Q11 and Q12 (2SC1775(E)) and then rectified with D9 and D10 to switch Q13 thru Q16 ON and OFF so that AF amplifier Q30 and the BUSY indicator are switched ON and OFF. The Q16 output signal is also fed to the control unit (X53-1210-XX) as the scan stop signal (SS). The scan stop signal (SS) is applied to pin 4 of microprocessor Q12 in the control unit.

In every mode, the demodulated AF signal is amplified with AF amplifier Q30 (2SC1815(Y)), filtered with active L.P.F. Q31 (2SC1815(Y)) and applied to power amplifier Q32 (MB3713) through the AF gain control to drive the speaker.

Item	Rating
Nominal center frequency (f_o)	21.6 MHz
3 dB bandwidth	$f_o \pm 7.5$ kHz or more
Attenuation bandwidth	$f_o \pm 25$ KHz or less at 40 dB $f_o \pm 45$ kHz or less at 60 dB
Guaranteed attenuation	70 dB or more within $f_o \pm 1$ MHz 80 dB or more within $f_o \pm (910 \text{ kHz} \pm 20 \text{ kHz})$
Spurious	35 dB or more within f_o to $f_o + 500$ kHz
Ripple	1.0 dB or less
Loss	2.0 dB or less
Input and output impedance	1 k Ω //1pF

Table 1 MCF (L71-0227-05) XF1 (A), (B)

Item	Rating
Center frequency (f_o)	8830 kHz
Center frequency deviation	Within ± 150 Hz at 6 dB
Pass bandwidth	± 1.2 kHz or more at 6 dB
Attenuation bandwidth	± 1.5 kHz or less at 20 dB ± 2.2 kHz or less at 60 dB ± 3 kHz or less at 80 dB
Ripple	2 dB or less
Loss	6 dB or less
Guaranteed attenuation	80 dB or more within $f_o \pm 1$ MHz
Input and output impedance	600 Ω //15pF

Table 2 Crystal filter (L71-0208-05) XF2 YK-88S

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 k Ω

Table 3 Ceramic filter (L72-0316-05) CF1, CWF455E

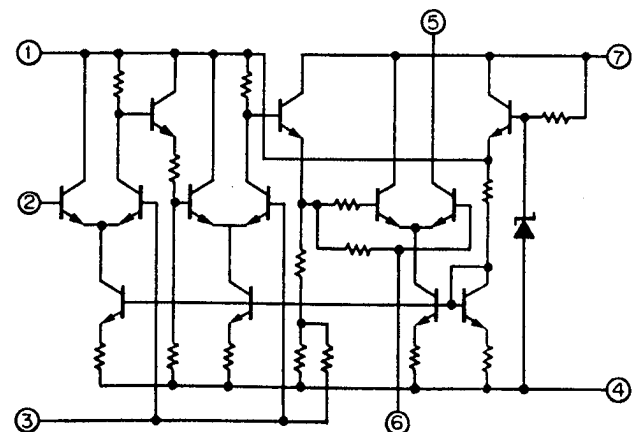


Fig. 1 μ PC577H Equivalent circuit

CIRCUIT DESCRIPTION

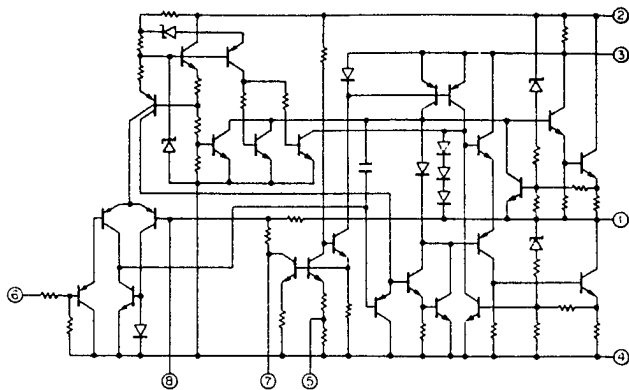


Fig. 2 MB3713 Equivalent circuit

TRANSMITTER CIRCUIT

The microphone signal is amplified with microphone amplifier Q1 (2SC2240(GR)), which is commonly used for both SSB and FM transmission modes and is incorporated in the carrier unit (X50-1720-XX). The amplified signal is then fed to both the SSB and FM circuits.

The microphone signal for SSB transmission is applied to microphone amplifiers Q37 and Q29 (2SC1815(Y)) through MIC GAIN control VR6 in the IF unit (X48-1320-61). Then, the microphone signal is applied to the balanced modulator (BM) along with the carrier (8.83 MHz). The resultant DSB signal is buffered by buffer amplifier Q35 (2SK61(GR)) then filtered by crystal filter XF2 to generate the SSB signal. The SSB signal is amplified with Q21 (3SK73(GR)) and applied through terminal SO to the transmitter balanced mixer consisting of Q5 and Q6 (2SK61(GR)) in the carrier unit to obtain the 21.6 MHz SSB signal. Unnecessary spurious signals accompanying the SSB signal are reduced by the 4-stage BPF, then the SSB signal is amplified with Q7 (this amplifier is used for all modes).

The microphone signal for FM transmission is applied to limiting amplifier Q2 (TA7061AP) in the carrier unit. Then, the signal directly frequency modulates the 21.60 MHz signal generated by oscillator Q3 (2SC1923(O)) through D1 (1S2208). The 21.6 MHz FM signal is amplified by buffer amplifier Q4 (2SC1675(L)), then amplified by Q7 (3SK73(GR)) which is also used for amplifying the SSB signal.

The signal amplified by Q7 is fed to the drive unit (X47-1070-00) through terminal TIF. In the drive unit, the 21.6 MHz signal is mixed with the signal supplied from the HET unit (through terminal LT) to generate the 430 MHz signal. The 430 MHz signal is amplified by Q1 (2SC2549) and Q2 (2SK48) with accompanying spurious signals reduced by the 2-pole, 3-stage helical resonator, then is amplified by Q3 (2SC2549), Q4 (2SC2026) and Q5 (2SC2762) and fed to the final unit (RF unit B/2) (X44-1430-61) through terminal DO.

In the final unit, the signal is first amplified by power module Q1 (M57716), then fed to the antenna through the B.P.F. M57716 provides stable performance, since its power idle current, intermodulation-distortion-product (IMD) and frequency response are appropriately designed. The drive unit output signal is also applied to Q6 (2SC1815(Y)) to generate the ALC voltage. The ALC voltage is supplied to the 2nd gates of IF amplifiers Q21 in the IF unit and Q7 in the carrier unit through the ALC terminals.

Protective operation and HI/LOW switching for FM and CW modes are achieved by varying the source voltage of IF amplifier Q7 in the carrier unit and the voltage applied to terminal 3 of the power module. For CW keying, the B+ line connected to the transmitter balanced mixer consisting of Q5 and Q6 and IF amplifier Q7 in the carrier unit is switched with Q8 (2SA1015(Y)).

Item	Symbol	Tc (°C)	Rating
Operating voltage	V _{cc}	25	17V
Base bias voltage	V _{BB}	25	10V
DC current	I _{cc}	25	6A
Operating case temperature	T _{c (op)}	—	−30~+110°C
Storage temperature	T _{stg}	—	−40~+110°C

Table 4 Power module M57716 Max Rating

Item	Symbol	Tc (°C)	Condition	Rating	
				MIN	TYP
Output power	P _o	25	V _{CC1} = V _{CC2} = 12.5 V, V _{BB} = 9 V	18.5 W	19 W
Total efficiency	η _T	25	f = 430~440 MHz, P _{in} = 0.2 W	40 %	42 %
Power gain linearity	G _p	25	V _{CC1} = V _{CC2} = 12.5 V, V _{BB} = 9 V f = 430~440 MHz, P _{in} = 10 dBm	21 dB	

Table 5 Power module M57716

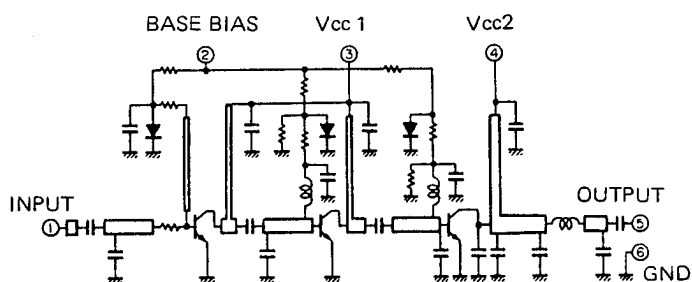


Fig. 3 Power module M57716 Equivalent circuit

CIRCUIT DESCRIPTION

HET CIRCUIT (X50-1730-00)

The 122-127 MHz signal generated by the VCO formed of Q12 (2SK19(GR)) is buffered and amplified by Q13 (2SC1923(O)) and Q17 (3SK73(GR)), then mixed with the 116.5 MHz signal by Q22 (2SC1923(O)) to generate the 5.5-10.49 MHz signal. The 116.5 MHz signal is generated by multiplying the 12.9444 MHz signal output by Q23 (2SC1675(L)) by 9 with D7 (1SS99). The 5.5-10.49 MHz signal is amplified with Q21, Q20 (2SC1675(L) x 2) and Q19 (2SC2603(E)), then applied to pin 9 of Q18 (TC9125P), which divides the frequency into 10 kHz according to the frequency dividing data applied to pins 4-8 through terminals PL through PD from the control unit and phase-compare the 10 kHz signal obtained with the reference frequency to generate the VCO control signal. The VCO control signal output from pin 14 of Q18 is applied to the low pass filter consisting of Q10 and Q11 (2SC2240(GR) x 2), then is applied to vari-cap diode D6 (1SV50S) to control the VCO frequency.

The DC signal level which is generated in the control unit (X53-1210-XX) and is applied to vari-cap diode D8 (1SV 50S) through terminal HCV to vary the frequency output by Q23 within a range of 0-9.9 kHz.

The RIT control voltage is also applied to D8 to vary the frequency.

The signal supplied from the control unit through terminal HL is used to select either the high band or low band crystal. The signal oscillated by Q1 (2SC1923) is tripled by Q2 (2SC1675(L)) then tripled again by Q5 (2SC1923(O)) to obtain the 330 MHz signal. The 330 MHz signal is amplified by Q6 (2SC2549) and mixed with the 120 MHz signal from the PLL by D3 (ND487) to generate a 450 MHz signal.

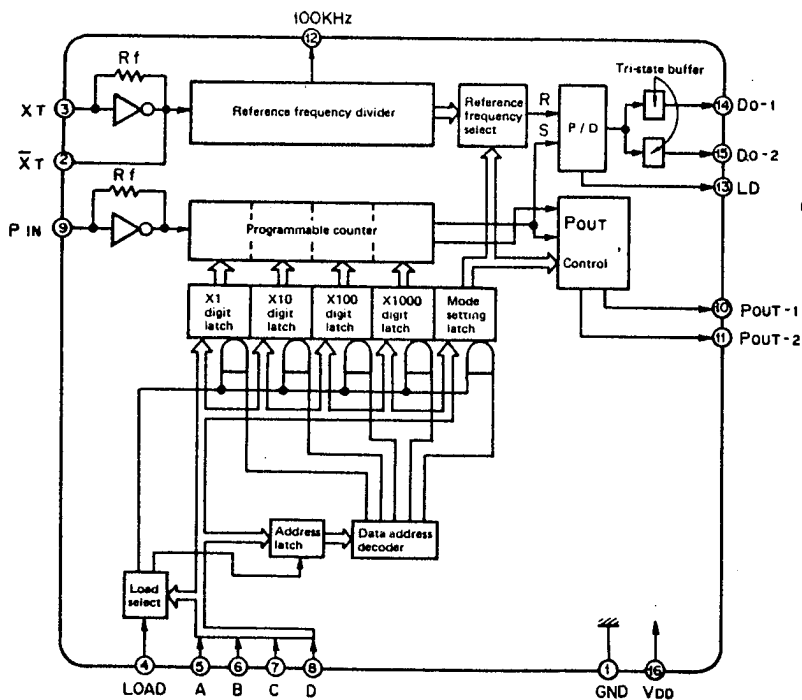


Fig. 4 TC9125P Block diagram

The 450 MHz signal is amplified by Q7, Q8 (2SC2026 x 2) and Q9 (2SC2549) and spurious elements are reduced by the 2-stage helical resonator. The resultant frequency range is 451.6 MHz~461.6 MHz, and is output through terminals LR and LT.

CONTROL CIRCUIT (X53-1210-XX)

Indicator

A 5-digit LED display is used as the indicator. BCD code data appearing at the D port (pins 8 thru 11) of micro-processor Q12 is converted into drive signals by 7-segment driver Q11 (SN74LS247N) to drive Q13 through Q19 (2SA1115). The digit signals output from ports E and F (pins 12~16) of Q12 turn Q22 through Q26 (2SC1959(Y)) ON in order to light each LED digit.

The signals output from ports C3 (pin 5) and F2 (pin 18) of Q12 drive Q21 and Q27 (2SC1815(Y)), then Q20 and Q28 (2SC1015(Y)) to turn the 100 Hz and MHz digit dots ON and OFF.

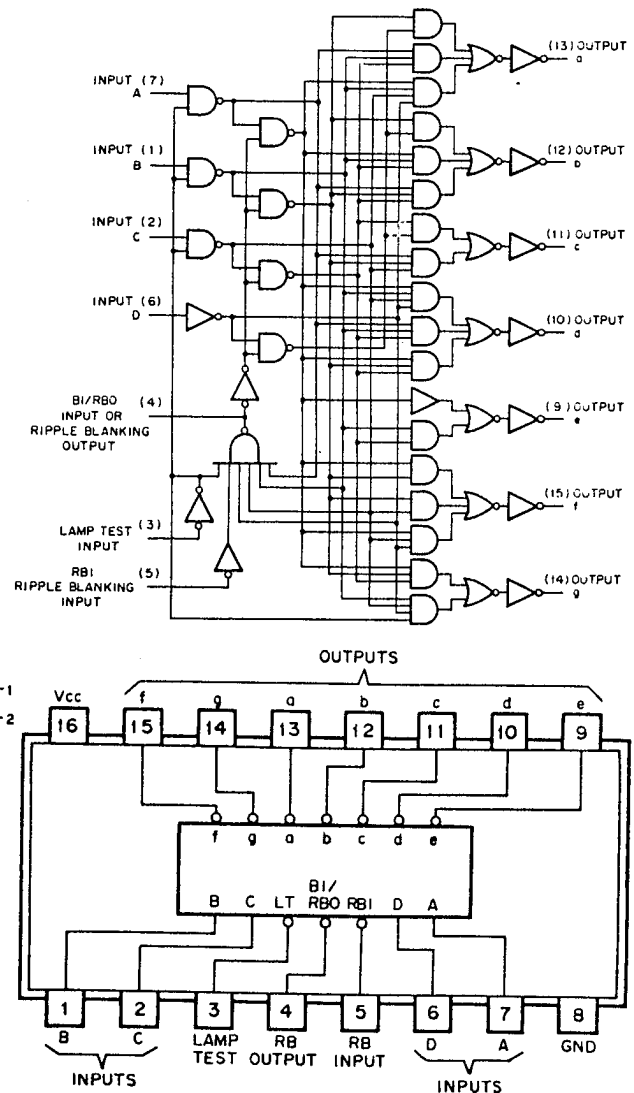
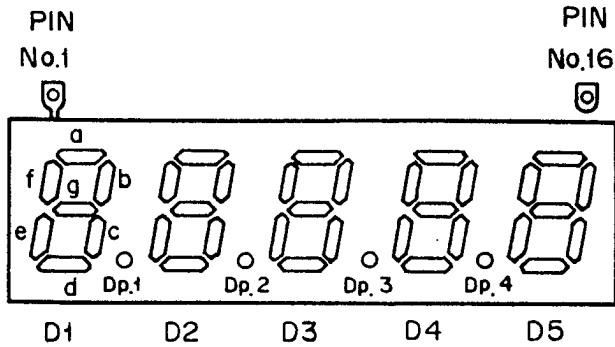


Fig. 5 SN74LS247N

CIRCUIT DESCRIPTION



Pin No.	Address	Pin No.	Address
1	D5 Cathode	9	g Anode
2	D4, Dp4 Cathode	10	b Anode
3	D3, Dp3 Cathode	11	a Anode
4	D2, Dp2 Cathode	12	f Anode
5	D1, Dp1 Cathode	13	Dp4 Anode
6	e Anode	14	Dp3 Anode
7	d Anode	15	Dp2 Anode
8	c Anode	16	Dp1 Anode

Symbol	Terminal name	Explanation
IN1~IN4	Input terminal	Input terminals for 4 bit data
AO1~AO4	Output terminal	Outputs data latched by clock pulse CKA
BO1~BO4	Output terminal	Outputs data latched by clock pulse CKB
CKA	Clock A terminal	Clock signal for latching 4-bit input signal in 4-bit flip flop A. Input signal is latched at the rising of clock signal.
CKB	Clock B terminal	Clock signal for latching 4-bit input signal in 4-bit flip flop B. Input signal is latched at the rising of clock signal.

Table 6 Functions of MN1201A

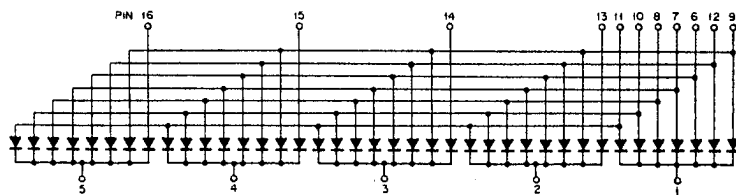


Fig. 6 5 digit LED SL-2504K

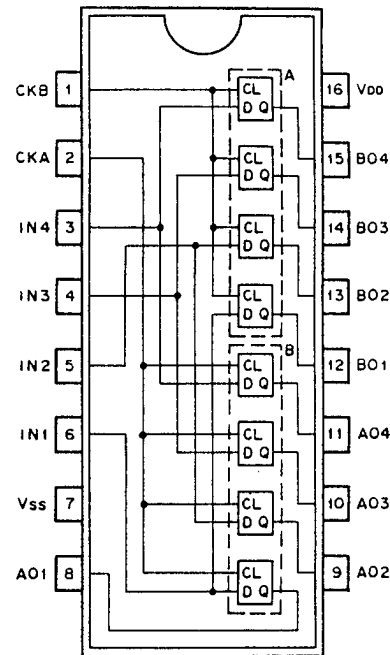


Fig. 7 MN1201A Block diagram

Data for HET circuit

Data output to the HET circuit is the frequency dividing data (output through terminals PL~PD), the 100 Hz and 1 kHz data (the DC signal output through terminal HCV) and the crystal selection data (output through terminal HL). The 100 Hz and 1 kHz data output from G port (pins 22~25) of microprocessor Q12 are latched in dual latch Q10 (MN1201A). The latch output data are converted into a DC signal by the D/A converter consisting of resistors R49 through R57, and the DC voltage is output to the HET circuit through terminal HCV.

The frequency dividing data is 550 when $\square.\square.\square$ is displayed in the FM mode and 1040 when $\square.\square.\square$ is displayed in the FM mode. This data is output only when the frequency varies.

Shifting the frequency for the USB and LSB modes is performed by the microprocessor so that the following relationships are kept.

$$f_{\text{USB}} = f_{\text{FM}} + 1.5 \text{ kHz} \quad f_{\text{LSB}} = f_{\text{FM}} - 1.5 \text{ kHz}$$

Reset circuit

Lambda diode D7 (MA522(Q)) is used to detect the power supply voltage : when the power supply voltage exceeds the valley voltage (about 3.5 V) of the lambda diode, the diode is OFF and Q6 (2SA1015(Y)) is ON so that an "L" level signal is applied to the reset terminal (pin 7) of the microprocessor to reset it.

CIRCUIT DESCRIPTION

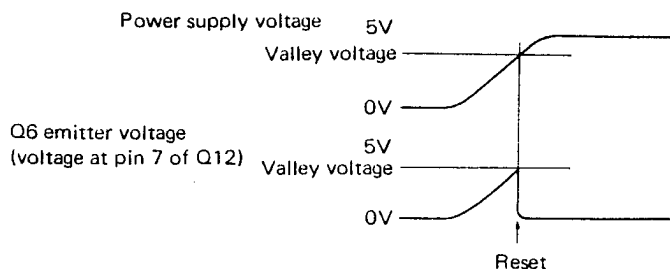


Fig. 8-A Reset timing

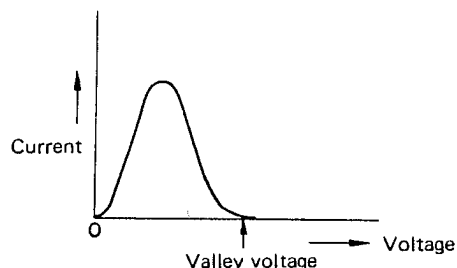


Fig. 8-B Lambda diode characteristics

Encoder and UP/DOWN inputs

Fig. 9 shows the output signal from the encoder (50 steps per rotation). This signal is used to discriminate UP and DOWN counts within the microprocessor. The UP counts starts when U/D is H level at the down edge of the clock signal, and the DOWN count when U/D is L level.

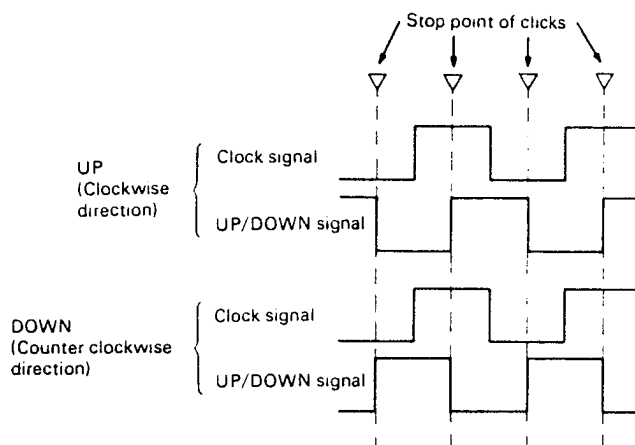


Fig. 9

Switching circuit

Switches are scanned using the signals output from ports E and F (pins 12 through 16) of the microprocessor and the input terminals (B port : pins 37 through 40) to determine if the switch circuit is ON ; various functions are performed according to the scanning result.

The E and F port output signals are kept from being output by Q29 through Q33 (2SA1115(Y)) during transmission to improve the S/N ratio of the transmitted signal. Many diodes (1S1555) are used to prevent the control pulse signals from entering the wrong circuits.

Power supply for the control circuit

There are three power supply circuits incorporated in the control unit : one for the LED display (5V), consisting of Q9 (μ PC78M05H) ; one for back-up, consisting of Q1 (2SC1815(Y)) ; and one for the microprocessor, consisting of Q5 (2SC496(Y)).

When power is fed to the power connector with the power switch OFF, the back-up power supply operates to maintain the microprocessor memory. At this time, all ports are at the "L" level and the power consumption is minimum. When the power switch is ON, the other power supply circuits operate and the back-up power supply is turned off by the control signal from the microprocessor.

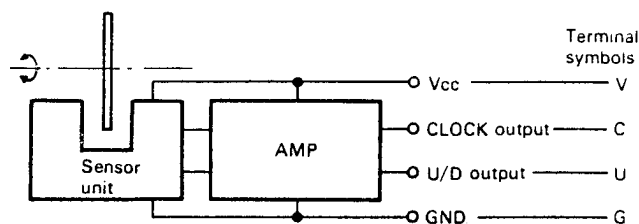


Fig. 10 Rotary encoder

Tone oscillator circuit

When the output for the microprocessor tone oscillator is H level, Q7 (2SC1815(Y)) is energized, allowing a current to flow into the piezo-electric buzzer oscillator, Q8 (2SC1815(Y)), producing a tone.

Repeater shift and tone circuit

Type	Shift SW markings	Shifted freq.	Tone circuit
W	D-A	-7.6 MHz	1750 Hz tone circuit
	D-B	-1.6 MHz	
T	⊕	+1.6 MHz	1750 Hz tone Burst circuit
	⊖	-1.6 MHz	
X	D-A	-5 MHz	None
	D-B	-1.6 MHz	

Table 7 Repeater shift and tone circuit

CIRCUIT DESCRIPTION/OPTION (LSB CRYSTAL)

Pin No.	Terminal name	Input signal	Output signal	Description	Pulse
1	CL1			Clock signal, 400 kHz	
2	PC0	O		L during reception and H during transmission in the FM1 and FM2 modes	
3	PC1	O		BACK UP detection, normally H ; L during back-up operation	
4	PC2	O		Squelch signal : normally L ; H when squelch is open in the FM1 and FM2 modes	
5	PC3		O	100 Hz digit dot signal : L in modes FM1 and FM2 and H in the USB, CW and LSB modes	
6	INT	O		Normally H	
7	RES	O		Normally L ; the micro-processor is reset when the level changes from H to L.	
8	PD0		O	BCD data output signals for display	O
9	PD1		O		O
10	PD2		O		O
11	PD3		O		O
12	PE0		O	1 MHz digit signal for display 100 kHz digit signal for display 10 kHz digit signal for display 1 kHz digit signal for display 100 Hz digit signal for display Matrix scanning signal output terminals; used in conjunction with PB terminals	O
13	PE1		O		O
14	PE2		O		O
15	PE3		O		O
16	PF0		O		O
17	PF1		O		O

Pin No.	Terminal name	Input signal	Output signal	Description	Pulse
18	PF2		O	1 MHz digit dot signal : normally H	
19	PF3		O	Tone oscillator signal output	O
20	TEST	O		Normally 5V	
21	Vcc			5 V DC	
22	PG0		O	BCD data output for MN1201 (D/A converter)	O
23	PG1		O		O
24	PG2		O		O
25	PG3		O		O
26	PH0		O	Data output for TC9125P in the HET unit (normally L ; a pulsed signal is output when the frequency is changed).	O
27	PH1		O		O
28	PH2		O		O
29	PH3		O		O
30	PI0		O	HET unit L33 and L34 switching signal (L33 is selected at L and L34 at H.)	O
31	PI1		O		
32	PI2		O	Normally L ; H during transmission in the FM1 and FM2 modes	
33	PA0	O		Rotary encoder clock signal input	
34	PA1	O		Rotary encoder UP/DOWN signal input	
35	PA2	O		Normally L ; H when the MIC UP SW is pressed	
36	PA3	O		Normally L ; H when the MIC DOWN SW is pressed	
37	PB0	O		Matrix scanning signal input terminals : used in conjunction with the PE terminals	O
38	PB1	O			O
39	PB2	O			O
40	PB3	O			O
41	Vss			Grounded	
42	CL0			Clock signal, 400 kHz	

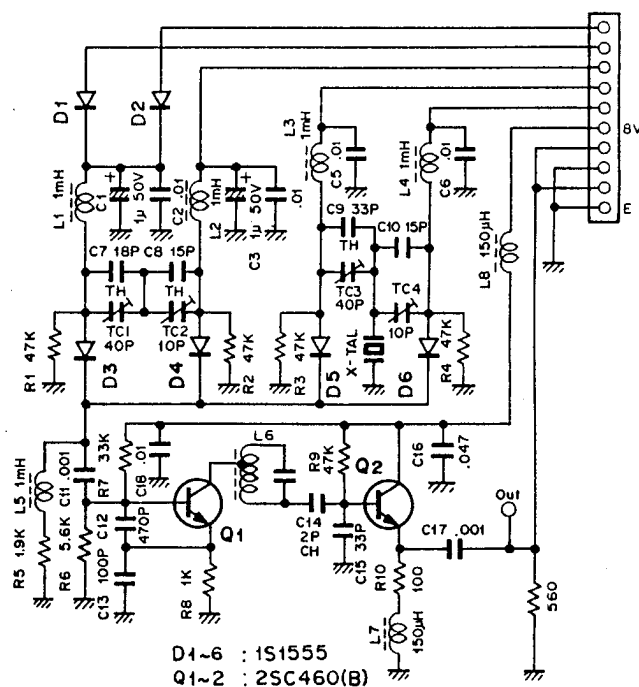
Table 8 μ PC650C-093 Terminal function

LSB Crystal Specifications

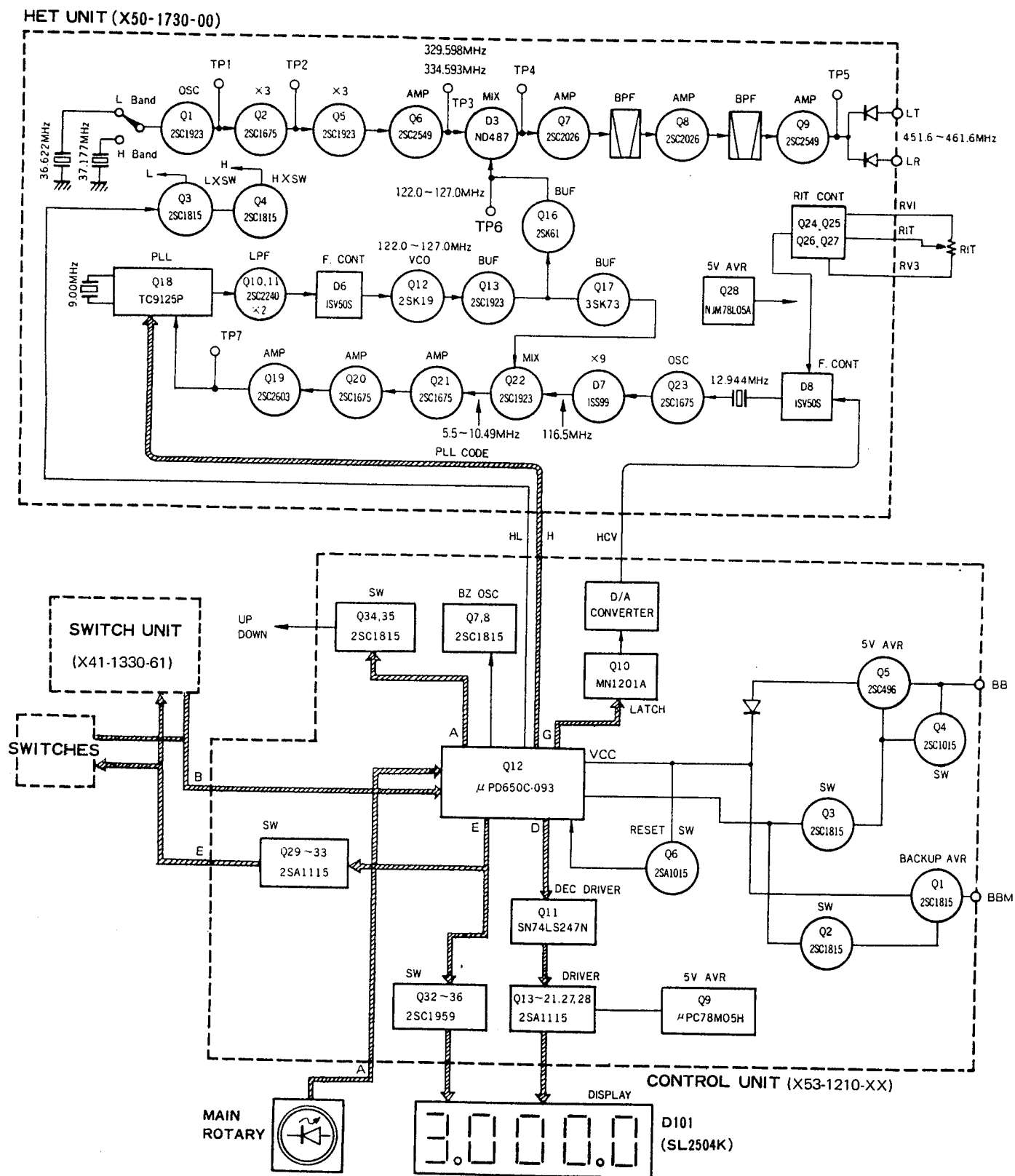
1. Type HC-18/T (lead length 20 m/m)
2. Oscillation Fundamental
3. Frequency & Part No.

Frequency	Part No.
8.8293 MHz	L77-0932-05

4. Frequency Stability Within $\pm 2 \times 10^{-5}$ at 25°C
5. Output Voltage 0.4 Vrms
6. Oscillator Circuit Shown at right



PLL BLOCK DIAGRAM



PARTS LIST

Note 1:

K: U.S.A. T: Britain W: Europe X: Australia

Note 2:

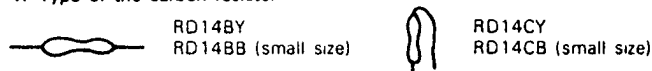
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not 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



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

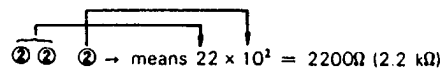
Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 -20	+80 -20	+100 -0	More than 10 μF -10 ~ +50 Less than 4.7 μF -10 ~ +75

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



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

Type II

CC	45	TH	1H	220	J	CK	45	F	1H	103	Z
1'	2	3'	4	5	6	1	2	3	4	5	6

1 = Type ... ceramic, electrolytic, etc. 4 = Voltage rating
2 = Shape ... round, square, etc. 5 = Value
3 = Temp range 6 = Tolerance
3' = Temp coefficient

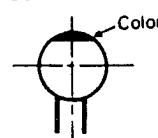
Ex. CC45TH = -470 ±60 ppm/°C

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

5 = Capacitor value

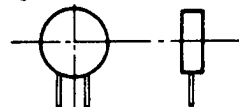
Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF

CC45



Type I

CK45



Type II

TR-9500 SEMICONDUCTOR

☆: New parts

Item	Name	Parts No.	Re- marks	Item	Name	Parts No.	Re- marks
Diode	1N60	V11-0051-05		Zener diode	WZ-032	V11-4172-26	
	1S1555	V11-0076-05			XZ-057	V11-4176-76	
	1S1587	V11-0370-05			XZ-060	V11-4101-20	
	1S2588	V11-0414-05			XZ-070	V11-4161-96	
	1SS99	V11-1277-86	☆		XZ-090	V11-4167-06	
	MA522(Q)	V11-1173-46		Varistor	1S1212	V11-1262-06	
	ND487C1-3R	V11-1277-96	☆		MV-13	V21-0004-05	
	U05B	V11-0270-05			VD1223	V11-1262-46	
	UM9401	V11-7778-16	☆	Thermistor	D33A	V11-3161-86	
	V06B	V11-0219-05					
Vari-cap diode	1S2208	V11-0317-05					
	1SV50S	V11-1260-36					

PARTS LIST

Item	Name	Parts No.	Re- marks	Ref. No.	Parts No.	Description	Re- marks
LED	PR5532K	V11-7272-36		TR-9500 GENERAL			
	PY5532K	V11-7272-46					
	SL-2504 K	V11-6178-36	☆		A01-0798-03	Case (upper)	☆
	SLP144B	V11-6172-56			A01-0799-02	Case (lower)	☆
TR	SLP244B	V11-6172-66			A13-0612-02	Angle ass'y (right)	
					A13-0613-02	Angle ass'y (left)	
					A13-0614-04	Angle (top)	
	2SA1012(O)	V01-1012-16	☆		A20-2424-03	Panel	☆
	2SA1012(Y)	V01-1012-26	☆				
	2SA1015(Y)	V01-1015-06			B01-0636-02	Panel escutcheon	T ☆
	2SA1115(D)	V01-1115-26			B01-0637-02	Panel escutcheon	W ☆
	2SA1115(E)	V01-1115-16			B01-0638-02	Panel escutcheon	X ☆
					B03-0513-14	Switch mask (B) x 4	
	2SC458(B)	V03-0093-05				13 x 13mm	
	2SC460(B)	V03-0079-05			B03-0518-04	Switch mask x 4	7 x 10mm
	2SC496(Y)	V03-0336-05			B05-0712-14	Grill cloth Case (lower)	
	2SC1675(L)	V03-1675-10				30 x 148mm	
	2SC1775(E)	V03-1775-06			B05-0713-04	Grill cloth Case (upper)	
	2SC1815(Y)	V03-1815-06				32 x 32 mm	
	2SC1923(O)	V03-1923-06			B05-0714-04	SP grill cloth	64 x 80 mm
	2SC1959(Y)	V03-1959-06			B07-0635-03	Side escutcheon x 2	☆
	2SC2026	V03-2026-06			B10-0640-04	Front glass	☆
	2SC2240(GR)	V03-2240-06			B30-0821-05	Pilot lamp	8 V, 70mA ☆
	2SC2549	V03-2549-06			B31-0631-05	Meter	☆
	2SC2603(D)	V03-2603-26			B50-2795-00	Operating manual	W ☆
	2SC2603(E)	V03-2603-06			B50-2796-00	Operating manual	T ☆
	2SC2762	V03-2762-06	☆		B50-2797-00	Operating manual	X ☆
Power module	M57716	V30-1235-16	☆		E06-0651-05	6P male socket	MIC
					E07-0651-05	6P metal plug	MIC
FET	2SK19(GR)-TRIO5	V09-1001-16			E12-0001-05	Phone plug (accessary)	
	2SL30A(GR)	V09-0060-05			E12-0401-05	STBY plug (accessary)	
	2SK30A(O)	V09-0056-05			E23-0015-04	Lug terminal x 2 (LED)	
	2SK61(GR)	V09-1014-06			E29-0412-05	1P connector (male)	
	2SK125	V09-0136-10			E29-0413-05	1P connector (female)	
	3SK48	V09-1003-16			E30-1649-05	DC cord ass'y with 5A fuse	
	3SK73(GR)	V09-1002-46			E31-0456-05	Connector with lead (SP)	
	3SK76-O	V09-1012-16	☆		E31-2088-05	Cable with terminal	☆
					E40-0773-05	Mini connect wafer 7P	
IC	MB3713	V30-1233-16	☆		F05-5022-05	Fuse 5A	
	MN1201A	V30-1008-66			F15-0622-04	Shadow mask	Meter
					F15-0627-04	Shadow mask	LED
	NJM78L05A	V30-1149-06			F15-0635-04	Cushion (meter)	☆
	SN74LS247N	V30-1030-56			F20-0078-05	Insulating sheet	Q101
					F29-0014-05	Shoulder washer	Q101
	TA7060P	V30-0087-05			G02-0505-05	Knob spring	RIT
	TA7061AP	V30-0039-05			G09-0417-04	Gnd spring (A)	HET
	TC9125P	V30-1232-16	☆		G13-0608-04	Cushion (A)	Case (upper)
						85 x 138mm	
	μPC577H	V30-0177-05			G13-0644-04	Cushion	☆
	μPC78M05H	V30-1223-16			G53-0510-04	Packing	Case (lower)
	μPC78M08H	V30-1222-16				10 x 184mm	
	μPD650C-093	V30-1234-16	☆		H01-2745-03	Carton case (inside)	T ☆
Micro- processor					H01-2746-03	Carton case (inside)	W, X ☆
					H10-2501-03	Packing fixture	
					H10-2528-22	Packing fixture	
					H25-0049-03	Accessory bag	
					H25-0079-04	Protective bag	MIC
					H25-0103-04	Protective bag	Cord
					H25-0106-04	Protective bag	

PARTS LIST

Ref. No.	Parts No.	Description	Re- marks	Ref. No.	Parts No.	Description	Re- marks
	J02-0069-05	Foot x 2			S50-1406-05	Tact switch x 2 MIC	
	J02-0416-04	Foot (accessary)			S59-1405-05	Key board switch x 2 SCAN, HOLD	
	J25-2714-14	PC board MODE			T07-0216-05	Speaker	☆
	J25-2716-24	PC board SCAN			T91-0311-05	Microphone T	
	J25-2744-04	PC board TX OFFSET			T91-0313-05	Microphone W, X	
	J25-3023-04	PC board M ch, MS	☆		W01-0401-04	Allen key Angle	
	J31-0514-04	Spacer collar HI/LOW			W02-0308-05	Rotary encoder	
	J32-0198-14	Hex. boss x 7 L=17 mm			X41-1330-61	Switch unit	☆
	J32-0753-04	Hex. boss L=28 mm	☆		X44-1430-61	RF unit	☆
	J42-0409-04	Knob bushing			X47-1070-00	Drive unit	☆
	J61-0019-05	Vinyle tie			X48-1320-61	IF unit	☆
	K21-0749-03	Main knob			X50-1720-00	CAR unit X	☆
	K21-0750-04	Knob (C) RF GAIN			X50-1720-51	CAR unit T	☆
	K23-0727-04	Knob (A) x 2 MODE, M.CH			X50-1720-61	CAR unit W	☆
	K23-0728-04	Knob (B) SQL			X50-1730-00	HET unit	☆
	K23-0729-04	Knob (D) RIT			X53-1210-51	Control unit T	☆
	K23-0733-04	Knob (E) TX OFFSET			X53-1210-61	Control unit W	☆
	K23-0742-04	Knob VOL			X53-1210-71	Control unit X	☆
	K27-0408-04	Push knob (A) x 4					
		M, NB, A/B, RIT					
	K27-0409-04	Push knob (B) x 2					
		SCAN, HOLD					
	K27-0416-05	Knob x 3 DS, MR, MS	☆				
	K27-0425-05	Push knob (F) MHz					
	K29-0733-04	Push knob (C) TONE, H/L					
	N09-0008-04	Ornamental screw Angle					
	N09-0256-05	Gnd screw					
	N13-0307-04	Ornamental nut AF GAIN	☆				
	N14-0510-04	Flange nut x 4 Angle					
	N14-0512-05	Speed nut x 4					
	N15-1040-46	Flat washer x 4 Angle					
	N15-1060-46	Flat washer x 4 Angle					
	N16-0060-46	Spring washer x 4 Angle					
	N30-2004-46	Round screw MS					
	N30-2604-46	Round screw x 11					
	N30-3004-46	Round screw x 6					
	N30-3005-46	Flat screw x 10					
	N30-3006-46	Round screw Tr					
	N33-2606-45	Round flat screw x 4 SP					
	N33-3006-45	Round flat screw x 16					
	N35-3004-46	Bind screw x 13					
	N35-3006-46	Bind screw x 13					
	N87-3006-46	Self tapping screw x 13					
	N89-3005-46	Bind tapping screw x 2					
		Lug terminal					
	N99-0304-04	Hex. head screw x 4 Angle					
R103	RS14AB3A121J	Metal film 120Ω 1W					
VR101	R05-3412-05	Pot. 10kΩ(K) AF GAIN (with SW)	☆				
VR102	R01-4409-05	Pot. 50kΩ(B) SQL	☆				
VR103,104	R19-3406-05	Pot. 10kΩ(B) x 2 RF GAIN, RIT					
	S01-1421-05	Rotary switch TX OFFSET					
	S01-2421-05	Rotary switch MODE					
	S01-2430-15	Rotary switch M. CH	☆				
	S40-1401-05	Push switch MS					
	S40-2403-05	Push switch TONE T					
	S40-2403-05	Push switch H/L X					
	S40-2406-05	Push switch TONE W					
	S40-2417-05	Push switch MR					
				SWITCH UNIT (X41-1330-61)			
					E23-0046-04	Square terminal	
					E40-0373-05	Mini connect wafer 3P	
					E40-0573-05	Mini connect wafer 5P	
					E40-0673-05	Mini connect wafer 6P	
					E40-0773-05	Mini connect wafer 7P	
					E40-1273-05	Mini connect wafer 12P	
					N30-2604-46	Round screw	
					R92-0150-05	Short jumper	
				S1	S40-2409-15	Push switch M	
				S2	S40-2405-05	Push switch NB	
				S3,4	S40-2404-05	Push switch X2 A/B, RIT	
				S5,6	S40-1401-05	Push switch X2 MHz, DS	
				RF UNIT (X44-1430-61)			
				C1	CC45SL2H030C	C 3pF ±0.25pF 500V	
				C2	CC45SL2H010C	C 1pF ±0.25pF 500V	
				C3	CC45SL2H030C	C 3pF ±0.25pF 500V	
				C4	CC45SL1H020C	C 2pF ±0.25pF	
				C5,6	CC45SL2H030C	C 3pF ±0.25pF 500V	
				C7	CC45SL2H080D	C 8pF ±0.5pF 500V	
				C8	CC45SL2H120J	C 12pF 500V	
				C9	CC45SL2H030C	C 3pF ±0.25pF 500V	
				C10	CC45SL2H020C	C 2pF ±0.25pF 500V	
				C14	CS15E1C010M	T 1μF 16V	
				C19	CS15E1V0R1M	T 0.1μF 35V	
				C21	C90-0817-05	E 1000μF 16V	
				C23	CE04W1C220M	E 22μF 16V	
				C25	CE04W1C220M	E 22μF 16V	
				C27	CE04W1C220M	E 22μF 16V	
				C30	CC45SL1H101J	C 100pF	
				C31	CC45SL2H020C	C 2pF ±0.25pF 500V	

PARTS LIST

Ref. No.	Parts No.	Description	Re- marks	Ref. No.	Parts No.	Description	Re- marks
C51	CC45SL1H330J	C 33pF		C20	C90-0804-05	Cap. 0.001 μ F	
C52	CC45SL1H220J	C 22pF		C21	CE04W1A470M	E 47 μ F 10V	
C55	C91-0456-05	C 0.047 μ F		C23	CC45CH1H010C	C 1pF ± 0.25 pF	
C56	CC45SL1H101J	C 100pF		C25	C90-0804-05	Cap. 0.001 μ F	
C58	CC45SL1H101J	C 100pF		C26	CC45SL1H101J	C 100pF	
C59	CC45SL1H470J	C 47pF		C27	CC45CH1H010C	C 1pF ± 0.25 pF	
C62	CC45SL1H101J	C 100pF		C28	CC45CH1H020C	C 2pF ± 0.25 pF	
	E04-0154-05	Coax connector X2		C31	CS15E1VR47M	T 0.47 μ F 35V	
	E04-0156-05	N type connector	☆	C33	CE04W1C101M	E 100 μ F 16V	
	E08-0203-25	2P connector		C35	C90-0820-05	E 470 μ F 16V	
	E08-0304-05	Power jack (back up)		C37	C91-0457-05	C 0.022 μ F	
	E11-0405-05	Key Jack		C39	CE04W1A470M	E 47 μ F 10V	
	E11-0406-05	Stand-by Jack		C41	CE04W1A470M	E 47 μ F 10V	
	E11-0409-05	Earphone Jack		TC1,2	C05-0062-05	Ceramic trimmer 6P	
	E23-0046-04	Square terminal		TC3	C05-0030-15	Ceramic trimmer 20P	
	E23-0401-05	Round terminal			E04-0154-05	Coax connector X3	
	E31-2089-05	Cable with terminal	☆		E23-0401-05	Round terminal X2	
	E40-0373-05	Mini connect wafer 3P			E40-0273-05	Mini connector wafer 2P	
	E40-0473-05	Mini connect wafer 4P			E40-0373-05	Mini connector wafer X2 3P	
	F01-0744-15	Heat sink			E40-0573-05	Mini connector wafer 5P	
					E40-0673-05	Mini connector wafer 6P	
L1	L34-1018-05	Coil 3 ϕ 1.5T	☆	F20-0078-05	Insulating sheet (Q7)		
L2	L34-0908-05	Coil		F29-0014-05	Shoulder washer (Q7)		
L3	L34-1018-05	Coil 3 ϕ 1.5T	☆				
L4	L34-1017-05	Coil 3 ϕ 3T	☆	L1	L34-0908-05	Coil	
L5,6	L34-1018-05	Coil 3 ϕ 1.5T	☆	L2,3	L19-0309-05	Wide band width trans	
L7	L33-0026-05	Choke coil 1 μ H	☆	L4	L79-0476-05	Helical block (F)	☆
L51	L79-0479-05	Helical block (I)	☆	L5	L79-0477-05	Helical block (G)	☆
L52	L79-0480-05	Helical block (J)	☆	L6	L79-0478-05	Helical block (H)	☆
L53	L79-0481-05	Helical block (K)	☆	L7,8	L34-0824-05	Coil 3.5 ϕ 3T	
L54	L33-0026-05	Choke coil 1 μ H		L9	L34-1018-05	Coil 3 ϕ 2T	
L55	L34-0908-05	Coil		L10,11	L34-1019-05	Coil 3 ϕ 3T	☆
	N09-0256-05	GND screw		L12	L33-0026-05	Choke coil 1 μ H	
	N30-2606-45	Round screw X2 (Back Up)		L13	L40-1011-03	Ferri-inductor 100 μ H	
	N30-3006-46	Round screw X8		L14	L15-0016-05	Low frequency choke	
	N35-3006-46	Bind screw X2 (Pow module)		L15	L40-1011-03	Ferri-inductor 100 μ H	
	N87-2606-46	Self tapping screw X6			N30-3004-46	Round screw (Q10)	
R1	RC05GF2H221J	Solid 220 Ω 1/2W			N30-3006-46	Round screw (Q7)	
	R92-0150-05	Short jumper			N87-2606-46	Self tapping screw x 6	
VR1	R12-4020-05	Trim. pot 50k Ω (2 pole)		R31	RC05GF2H2R2J	Solid 2.2 Ω 1/2W	
VR2	R12-4016-05	Trim. pot 50k Ω		VR1	R12-3416-05	Trim. pot 47k Ω	
VR3	R12-0417-05	Trim. pot 100 Ω (2 pole)	☆	VR2	R12-1020-05	Trim. pot 1k Ω	
				VR3	R12-3027-05	Trim. pot 30k Ω	
				VR4	R12-0417-05	Trim. pot 100 Ω 2 pole	
					R92-0150-05	Short jumper x 3	
DRIVE UNIT (X47-1070-00)							
C3	CC45CH1H050C	C 5pF ± 0.25 pF					
C5	CC45SL1H101J	C 100pF					
C7	CC45CH1H070D	C 7pF ± 0.5 pF					
C10	CC45CH1H100D	C 10pF ± 0.5 pF					
C12	CC45SL1H101J	C 100pF					
C13,14	C90-0804-05	Cap. 0.001 μ F					
C15	C91-0131-05	C 0.01 μ F					
C17	CC45SL1H101J	C 100pF					
C18	CQ92M1H103K	ML 0.001 μ F					
C19	C91-0131-05	C 0.01 μ F					

PARTS LIST

Ref. No.	Parts No.	Description	Re- marks	Ref. No.	Parts No.	Description	Re- marks
IF UNIT (X48-1320-61)				C95	CC45CH1H100D	C 10pF ±0.5pF	
C1	CC45SL1H470J	C 47pF		C96	C91-0457-05	C 0.022μF	
C2	CC45CH1H0R5C	C 0.5pF ±0.25pF		C97	CC45SL1H470J	C 47pF	
C3	CC45CH1H100D	C 10pF ±0.5pF		C99	C91-0457-05	C 0.022μF	
C4	CC45CH1H010C	C 1pF ±0.25pF		C100	CC45SL1H470J	C 47pF	
C5	CC45SL1H101J	C 100pF		C101	C91-0457-05	C 0.022μF	
C6	C91-0131-05	C 0.01μF		C102	CS15E1E010M	T 1μF 25V	
C7	CC45CH1H100D	C 10pF ±0.5pF		C103	CE04W1H010M	E 1μF 50V	
C8	CC45CH1H010C	C 1pF ±0.25pF		C106	C91-0456-05	C 0.047μF	
C9	C91-0456-05	C 0.047μF		C111	CC45SL1H101J	C 100pF	
C10	CC45SL1H470J	C 47pF		C112	CC45CH1H220J	C 22pF	
C11	CE04W1C100M	E 10μF 16V		C113	CC45CH1H150J	C 15pF	
C12	C91-0131-05	C 0.01μF		C114	C91-0131-05	C 0.01μF	
C13	CC45SL1H101J	C 100pF		C115	CQ92M1H103K	ML 0.01μF	
C14,15	C91-0457-05	C 0.022μF		C116	CQ92M1H104K	ML 0.1μF	
C16	CC45SL1H101J	C 100pF		C118	CE04W1H3R3M	E 3.3μF 50V	
C17	CC45CH1H070D	C 7pF ±0.5pF		C119	CE04W1A470M	E 47μF 10V	
C18	CC45SL1H151J	C 150pF		C121	CQ92M1H104K	ML 0.1μF	
C19	C91-0131-05	C 0.01μF		C122	CE04W1C100M	E 10μF 16V	
C20	CC45RH1H150J	C 15pF		C123	CQ92M1H332K	ML 0.0033μF	
C21	C91-0131-05	C 0.01μF		C124	CQ92M1H103K	ML 0.01μF	
C22	CC45SL1H101J	C 100pF		C125	CS15E1V0R1M	T 0.1μF 35V	
C23,24	C91-0131-05	C 0.01μF		C126	CE04W1C220M	E 22μF 16V	
C25	CC45CH1H120J	C 12pF		C127	CE04W1H010M	E 1μF 50V	
C26	CC45SL1H221J	C 220pF		C129	CE04W1A101M	E 100μF 10V	
C27	C91-0131-05	C 0.01μF		C130	CC45SL1H101J	C 100pF	
C28	CC45CH1H050C	C 5pF ±0.25pF		C131	CE04W1H010M	E 1μF 50V	
C30	C91-0456-05	C 0.047μF		C132	CE04W1A470M	E 47μF 10V	
C32	CE04W1A470M	E 47μF 10V		C133	C90-0834-05	Cap. 0.1μF	
C33,34	C91-0456-05	C 0.047μF		C134	CE04W1A101M	E 100μF 10V	
C36	C91-0456-05	C 0.047μF		C135	C90-0820-05	E 470μF 16V	
C37	CQ92M1H103K	ML 0.01μF		C137	CS15E1V0R1M	T 0.1μF 35V	
C38	CE04W1H010M	E 1μF 50V		C138,139	CQ92M1H103K	ML 0.01μF	
C39,40	C91-0456-05	C 0.047μF		C140,141	CQ92M1H123K	ML 0.012μF	
C42	C91-0131-05	C 0.01μF		C142	CS15E1C4R7M	T 4.7μF 16V	
C43~47	C91-0456-05	C 0.047μF		C143	CE04W1H010M	E 1μF 50V	
C48,49	CQ92M1H102K	ML 0.001μF		C144	CE04W1C100M	E 10μF 16V	
C50	CQ92M1H183K	ML 0.018μF		C147	CC45CH1H100D	C 10pF ±0.5pF	
C51	CQ92M1H222K	ML 0.0022μF		C148	C91-0457-05	C 0.022μF	
C52	CQ92M1H393K	ML 0.039μF		C150	C91-0457-05	C 0.022μF	
C53	CQ92M1H222K	ML 0.0022μF		C151	CC45CH1H330J	C 33pF	
C54	CC45SL1H220J	C 22pF		C152	CC45CH1H270J	C 27pF	
C55	CQ92M1H103K	ML 0.01μF		C153	CC45CH1H030C	C 3pF ±0.25pF	
C56	CC45SL1H330J	C 33pF		C154,155	C91-0457-05	C 0.022μF	
C57	CE04W1A470M	E 47μF 10V		C156	CC45CH1H030C	C 3pF ±0.25pF	
C58	CQ92M1H222K	ML 0.0022μF		C158	CE04W1H3R3M	E 3.3μF 50V	
C59,60	CE04W1H3R3M	E 3.3μF 50V		C161	CQ92M1H473K	ML 0.047μF	
C61	CE04W1H4R7M	E 4.7μF 50V		C162	CC45SL1H101J	C 100pF	
C63	CE04W1A101M	E 100μF 10V		C163	CE04W1H4R7M	E 4.7μF 50V	
C64	C91-0456-05	C 0.047μF		C164	CE04W1H010M	E 1μF 50V	
C67,68	C91-0456-05	C 0.047μF		TC1	C05-0067-05	Ceramic trimmer 25pF	
C70,71	C91-0456-05	C 0.047μF		TC2	C05-0031-15	Ceramic trimmer 10pF	
C74	C91-0131-05	C 0.01μF			E04-0154-05	Coax connector	
C75	CE04W1H010M	E 1μF 50V			E23-0046-04	Square terminal X5	
C76	C91-0456-05	C 0.047μF			E31-2090-05	Cable with terminal	☆
C80	CC45CH1H080D	C 8pF ±0.5pF			E40-0273-05	Mini connect wafer 2P	
C81~84	C91-0457-05	C 0.022μF			E40-0373-05	Mini connect wafer 3P	
C85	CC45CH1H470J	C 47pF			E40-0573-05	Mini connect wafer 5P	
C86	C91-0131-05	C 0.01μF			E40-0973-05	Mini connect wafer 9P	
C87~89	C91-0457-05	C 0.022μF			E40-1173-05	Mini connect wafer 11P	
C90	CC45CH1H470J	C 47pF					
C91	C91-0131-05	C 0.01μF					
C92~94	C91-0457-05	C 0.022μF					

PARTS LIST

Ref. No.	Parts No.	Description	Re- marks	Ref. No.	Parts No.	Description	Re- marks
L1,2	L34-0909-05	Coil		C17	CQ92M1H333K	M 0.033 μ F	
L3	L34-0908-05	Coil		C18	C90-0824-05	E 1 μ F 50V	
L4~7	L30-0508-05	IFT 21.6MHz		C20	CC45UJ1H030C	C 3pF ± 0.25 pF	
L8,9	L34-0781-05	Tuning coil 8.83MHz		C21	CC45TH1H100D	C 10pF ± 0.5 pF	
L10	L34-0505-05	Tuning coil		C23	CC45SL1H221J	C 220pF	
L11	L30-0508-05	IFT 21.6MHz		C24	CC45CH1H101J	C 100pF	
L12	L40-1511-03	Ferri-inductor 150 μ H		C25	CC45CH1H100D	C 10pF ± 0.5 pF	
L13	L40-4711-03	Ferri-inductor 470 μ H		C27	CE04W1C220M	E 22 μ F 16V	
L14	L30-0504-05	IFT 455kHz		C29	CC45RH1H560J	C 56pF	
L15	L30-0503-05	IFT 455kHz		C30,31	CC45SL1H330J	C 33pF	
L16	L79-0446-05	Ceramic disc CFY455S		C32,33	C91-0131-05	C 0.01 μ F	
L17	L40-6825-04	Ferri-inductor 6.8mH		C37	CS15E1A3R3M	T 3.3 μ F 10V	
L18	L34-0536-05	Tuning coil 8.83MHz		C38	CE04W1C100M	E 10 μ F 16V	
L19	L30-0503-05	IFT 455kHz		C39	CC45CH1H150J	C 15pF	
L20	L40-1511-03	Ferri-inductor 15 μ H		C40,41	CC45CH1H010C	C 1pF ± 0.25 pF	
L21	L30-0503-05	IFT 455kHz		C42	CC45CH1H470J	C 47pF	
L22	L30-0504-05	IFT 455kHz		C43	CC45CH1H100D	C 10pF ± 0.5 pF	
L23	L40-1021-03	Ferri-inductor 1mH		C44,45	C91-0457-05	C 0.022 μ F	
L24	L34-0536-05	Tuning coil 8.83MHz		C49	C91-0131-05	C 0.01 μ F	
L25	L34-0781-05	Tuning coil 8.83MHz		C55	CE04W1C100M	E 10 μ F 16V	
L26	L34-0536-05	Tuning coil 8.83MHz		C56	CR04W1A470M	E 47 μ F 10V	
L27	L40-1511-03	Ferri-inductor 150 μ H		C61	CE04W1C101M	E 100 μ F 16V	
L28	L40-1011-03	Ferri-inductor 100 μ H		C62	CE04W1C470M	E 47 μ F 16V	
L29	L40-1511-03	Ferri-inductor 150 μ H		C63	CE04W1C101M	E 100 μ F 16V	
L30	L40-1021-03	Ferri-inductor 1mH		C64	C91-0457-05	C 0.022 μ F	
CF1	L72-0316-05	Ceramic filter CFW455E		C65	C91-0456-05	C 0.047 μ F	
XF1(A),(B)	L71-0227-05	MCF 21.6MHz ± 7.5 kHz		C66	CC45CH1H220J	C 22pF	
XF2	L71-0208-05	MCF YK-88S		C72	CC45SL1H221J	C 220pF	
X1	L77-0938-05	Crystal 30.43MHz	☆	C75	CC45CH1H020J	C 2pF ± 0.25 pF	
X2	L77-0870-05	Crystal 22.055MHz		C76	CC45SL1H270J	C 27pF	
	N30-3004-46	Round screw		C78	CC45SL1H221J	C 220pF	
VR1	R12-4016-05	Trim. pot 50k Ω		C79	C91-0131-05	C 0.01 μ F	
VR2	R12-7402-05	Trim. pot 500k Ω	☆	C80	CC45CH1H120J	C 12pF	
VR3	R12-1016-05	Trim. pot 3k Ω		C81	CC45CH1H070D	C 7pF ± 0.5 pF	
VR4	R12-4015-05	Trim. pot 50k Ω		C103	CE04W1C220M	E 22 μ F 16V W, T	
VR5	R12-0421-05	Trim. pot 100 Ω	☆	C104	CS15E1A150K	T 15 μ F 10V T	
VR6	R12-3027-05	Trim. pot 30k Ω		C105	CE04W1C220M	E 22 μ F 16V W, T	
VR7	R12-3025-05	Trim. pot 10k Ω		C106	CE04W1H010M	E 1 μ F 50V W, T	
	R92-0150-05	Short jumper x 9		C107~109	C91-0433-05	Laminated cap. 0.0039 μ F W, T	
RL1	S51-1407-05	Relay		C110	CQ92M1H472K	ML 0.0047 μ F W, T	
				C111	CS15E1A150K	T 15 μ F 10V T	
CAR UNIT (X50-1720-00, -51, -61) -00 : X, -51 : T -61 : W				TC1	C05-0062-05	Ceramic trimmer 6pF	
C3	C90-0824-05	E 1 μ F 50V		TC2~4	C05-0067-05	Ceramic trimmer 25pF	
C4	C90-0832-05	E 47 μ F 10V			E23-0046-04	Square terminal	
C5	C90-0482-05	E 4.7 μ F 25V			E40-0273-05	Mini connect wafer 2P	
C7	C90-0824-05	E 1 μ F 50V			E40-0373-05	Mini connect wafer 3P	
C8	C90-0832-05	E 47 μ F 10V			E40-0773-05	Mini connect wafer 7P	
C10	CC45SL1H101J	C 100pF			E40-0873-05	Mini connect wafer 8P	
C11	CQ92M1H332K	ML 0.0033 μ F			E40-0973-05	Mini connect wafer 9P	
C12	C90-0832-05	E 47 μ F 10V		L1	L40-1541-27	Ferri-inductor 150mH	
C13	C90-0482-05	E 4.7 μ F 25V		L2	L77-0931-05	Crystal 21.60MHz	☆
C14	C90-0832-05	E 47 μ F 10V		L3	L33-0638-05	Choke coil 3.3 μ H	☆
C15	C90-0824-05	E 1 μ F 50V		L4	L40-1021-03	Ferri-inductor 1mH	
C16	CQ92M1H103K	ML 0.01 μ F		L5	L40-4711-03	Ferri-inductor 470 μ H	
				L6	L31-0313-05	Tuning coil	
				L7	L34-0755-05	Tuning coil	
				L8~11	L34-0749-05	Tuning coil	
				L12	L40-6825-04	Ferri-inductor 6.8mH	
				L13,14	L40-1511-03	Ferri-inductor 150 μ H	
				L15	L32-0201-05	Oscillating coil	

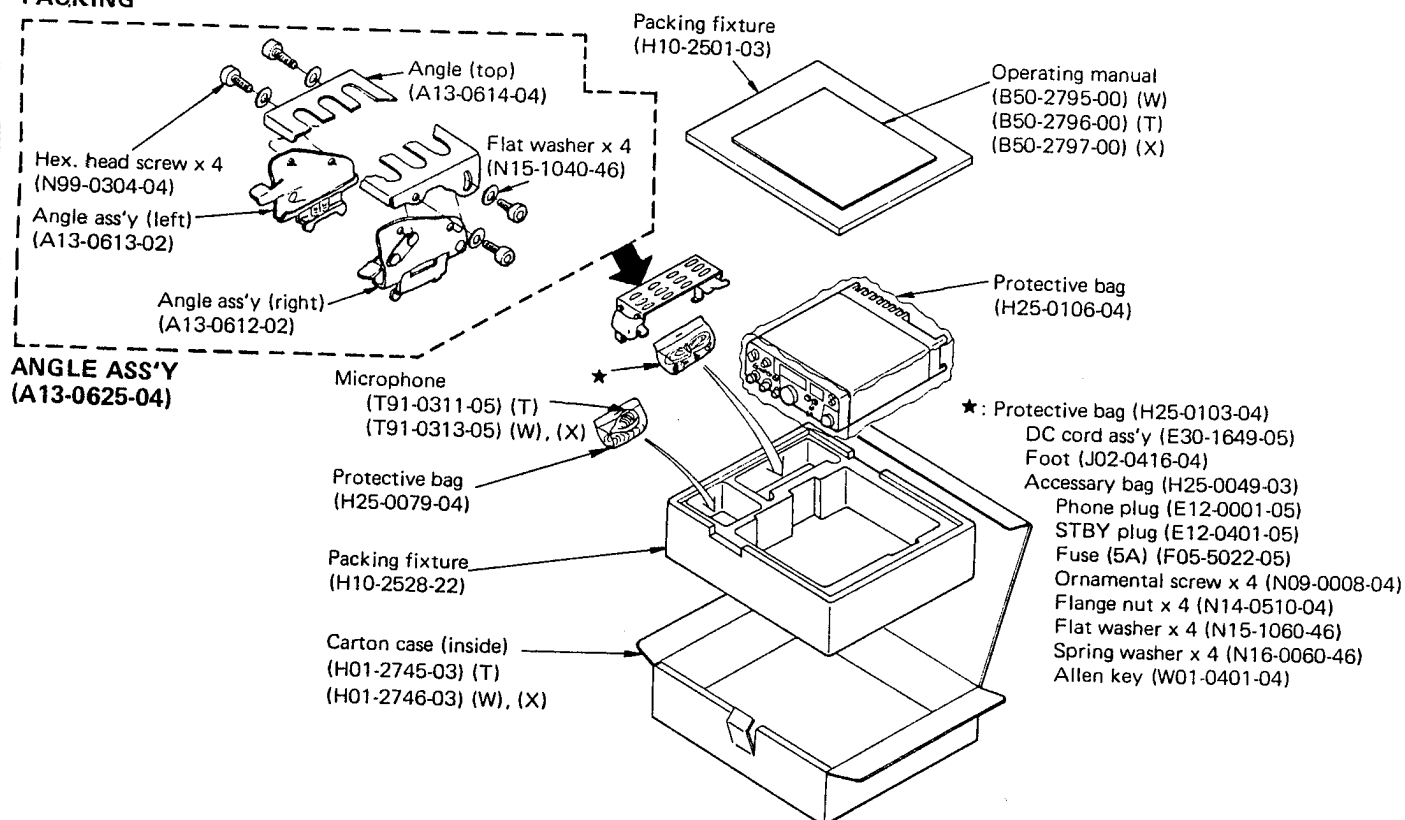
PARTS LIST

Ref. No.	Parts No.	Description	Re- marks	Ref. No.	Parts No.	Description	Re- marks
L16~18	L40-1021-03	Ferri-inductor 1mH		C74	CC45CH1H100D	C 10pF ±0.5pF	
L19	L77-0932-05	Crystal 8.8293MHz	☆	C75	CC45CH1H080D	C 8pF ±0.5pF	
L20	L77-0933-05	Crystal 8.8315 MHz	W, T ☆	C76	C91-0457-05	C 0.022μF	
	N30-3004-46	Round screw		C77	CE04W1C100M	E 10μF 16V	
R102	R92-0616-05	Metal film 10kΩ	W, T	C78	CC45CH1H100D	C 10pF ±0.5pF	
R103	RN14BK2E4703F	Metal film 470kΩ ±1% 1/4W	W, T	C79	CC45CH1H040C	C 4pF ±0.25pF	
R107	R92-0616-05	Metal film 10kΩ	W, T	C80,81	CC45CH1H0R5C	C 0.5pF ±0.25pF	
R108	R92-0617-05	Metal film 7.5kΩ	W, T	C82	CC45CH1H220J	C 22pF	
VR1	R12-1004-05	Trim. pot 4.7kΩ		C83	CE04W1A470M	E 47μF 10V	
VR2	R12-3004-05	Trim. pot 47kΩ	X	C85,86	CC45CH1H101J	C 100pF	
VR101	R12-3041-05	Trim. pot 10kΩ	W, T	C87	CC45UJ1H680J	C 68pF	
VR102	R12-3004-05	Trim. pot 47kΩ	T	C88	CC45UJ1H330J	C 33pF	
	R92-0150-05	Short jumper		C90	CS15E1VR47M	T 0.47μF 35V	
HET UNIT (X50-1730-00)				C92	CS15E1VR47M	T 0.47μF 35V	
C2	CC45CH1H100D	C 10pF ±0.5pF		C93	CE04W1A470M	E 47μF 10V	
C3	CC45RH1H560J	C 56pF		C96	CC45SL1H101J	C 100pF	
C6	CC45SL1H470J	C 47pF		C97	CC45SL1H470J	C 47pF	
C9	CC45CH1H010C	C 1pF ±0.25pF		C98	CC45CH1H0R5C	C 0.5pF ±0.25pF	
C13	CC45CH1H220J	C 22pF		C99	CC45CH1H050C	C 5pF ±0.25pF	
C17	CE04W1A470M	E 47μF 10V		TC1,2	C05-0067-05	Ceramic trimmer 25pF	
C18	CC45CH1H100D	C 10pF ±0.5pF		TC3,4	C05-0308-05	Ceramic trimmer 4pF	
C20	CC45SL1H101J	C 100pF		TC5,6	C05-0062-05	Ceramic trimmer 6pF	
C22	CC45CH1H220J	C 22pF		TC7	C05-0030-15	Ceramic trimmer 20pF	
C23	CC45CH1H050C	C 5pF ±0.25pF			E04-0154-05	Coax connector X2	
C25	CC45SL1H101J	C 100pF			E23-0046-04	Square terminal	
C27	CC45CH1H030C	C 3pF ±0.25pF			E40-0673-05	Mini connect wafer 6P	
C29	CC45SL1H101J	C 100pF			E40-0873-05	Mini connect wafer 8P	
C31	CC45CH1H100D	C 10pF ±0.5pF		L1,2	L40-1511-03	Ferri-inductor 150μH	
C32	C90-0804-05	C 0.001μF		L4	L32-0638-05	Oscillating coil 36MHz	☆
C33,34	CC45SL1H101J	C 100pF		L5	L40-4711-03	Ferri-inductor 470μH	
C38	CQ92M1H223K	ML 0.022μF		L6,7	L34-2016-05	Turning coil	☆
C39,40	CS15E1C2R2M	T 2.2μF 16V		L8	L34-1015-05	Coil 3φ 4.5T	☆
C41	CE04W1H010M	E 1μF 50V		L9	L34-1016-05	Coil 3φ 4.5T	☆
C42	C91-0457-05	C 0.022μF		L10	L40-1511-03	Ferri-inductor 150μH	
C44	CQ92M1H473K	ML 0.047μF		L11,12	L19-0309-05	Wide bandwidth trans	
C45	CC45PG1H100D	C 10pF ±0.5pF		L13	L40-4711-03	Ferri-inductor 470μH	
C46	CC45CH1H080D	C 8pF ±0.5pF		L14	L40-1021-03	Ferri-inductor 1mH	
C47	CC45CH1H0R5C	C 0.5pF ±0.25pF		L15	L34-0824-05	Coil 3.5φ 2.5T	
C48	CC45CH1H060D	C 6pF ±0.5pF		L16	L33-0026-05	Choke coil 1μH	
C49	CC45CH1H150J	C 15pF		L17	L40-3391-03	Ferri-inductor 3.3μH	
C50	CC45CH1H030C	C 3pF ±0.25pF		L18	L32-0624-05	Oscillating coil VCO	
C52	CE04W1A101M	E 100μF 10V		L19	L40-3391-03	Ferri-inductor 3.3μH	
C53	CC45CH1H040C	C 4pF ±0.25pF		L20	L34-0820-05	Tuning coil	
C54	CC45UJ1H100D	C 10pF ±0.5pF		L21	L34-2015-05	Tuning coil	☆
C56	CE04W1H4R7M	E 4.7μF 50V		L22	L34-0683-05	Tuning coil	
C57	CE04W1C100M	E 10μF 16V		L23	L40-4711-03	Ferri-inductor 470μH	
C60	CC45CH1H010C	C 1pF ±0.25pF		L24	L40-1021-03	Ferri-inductor 1mH	
C62	CC45CH1H330J	C 33pF		L25	L40-1501-03	Ferri-inductor 15μH	
C63	CC45CH1H050C	C 5pF ±0.25pF		L26	L40-1021-03	Ferri-inductor 1mH	
C67	CE04W1A470M	E 47μF 10V		L27,28	L34-2014-05	Tuning coil	☆
C68	C91-0457-05	C 0.022μF		L29	L33-0631-05	Choke coil 4.7μH ±0.5%	
C69,70	CC45CH1H330J	C 33pF		L30	L40-1021-03	Ferri-inductor 1mH	
C71	CC45SL1H101J	C 100pF		L31	L77-0934-05	Crystal 9MHz	☆
C72	CQ92M1H223K	ML 0.022μF		L32	L77-0935-05	Crystal 12.9444 MHz	☆
C73	CC45SL1H101J	C 100pF		L33	L77-0936-05	Crystal 36.6222 MHz	☆
				L34	L77-0937-05	Crystal 37.1777 MHz	☆
				L35	L79-0473-05	Helical block 332.1 MHz	☆
				L36	L79-0474-05	Helical block(D) 456.6 MHz	☆
				L37	L79-0475-05	Helical block(E) 456.6 MHz	☆

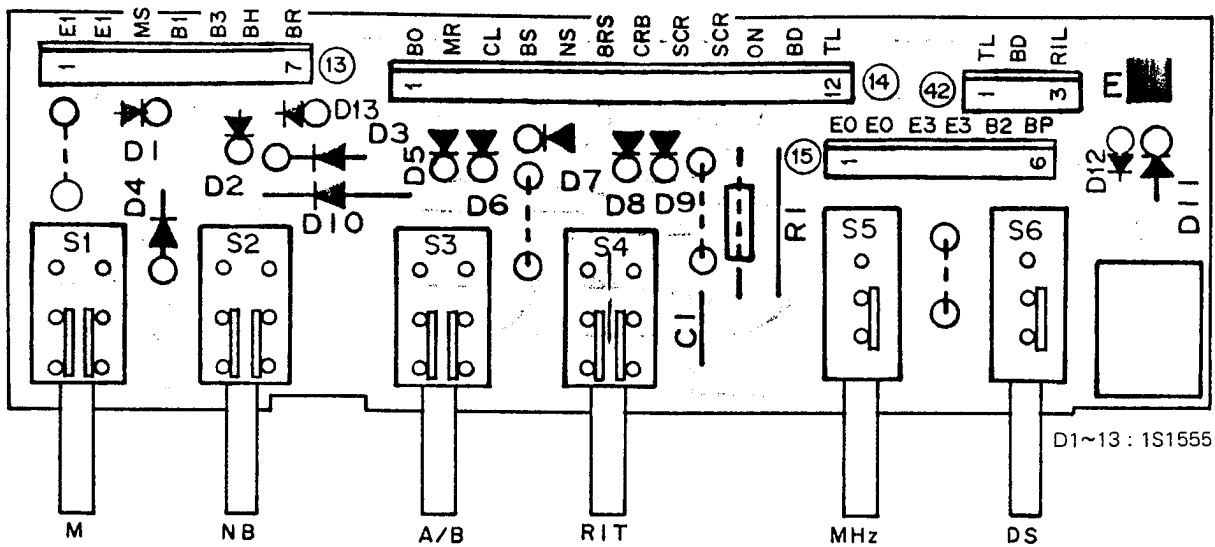
PARTS LIST/PACKING

Ref. No.	Parts No.	Description	Re- marks	Ref. No.	Parts No.	Description	Re- marks
VR1 VR2	N87-2606-46	Self tapping screw			G11-0605-04	Cushion for BZ-1	
	R12-6403-05	Trim. pot 470k Ω			J29-0403-04	Transducer plate	
	R12-3416-05	Trim. pot 47k Ω		L1	L30-0503-05	IFT	
	R92-0150-05	Short jumper			N30-3006-46	Round screw	
	420-0009-05	Silicone (PLL, VCO)			N35-3006-46	Bind screw	
CONTROL UNIT (X53-1210-51, -61, -71) -51 : T, -61 : W, -71 : X				R1	RS14GB3D150J	Metal film 15 Ω 2W	
C1	CE04W1C331M	E 330 μ F 16V		R2	RC05GF2H330J	Solid 33 Ω 1/2W	
C2	CE04W1A221M	E 220 μ F 10V		R49	RN14BK2E1003F	Metal film 100k Ω $\pm$ 1% 1/4W	
C3	CE04W1A470M	E 47 μ F 10V		R50	RN14BK2E2003F	Metal film 200k Ω $\pm$ 1% 1/4W	
C4	CE04W1C470M	E 47 μ F 16V		R51	RN14BK2E4023F	Metal film 402k Ω $\pm$ 1% 1/4W	
C6	CE04W1C470M	E 47 μ F 16V		R52	RN14BK2E8063F	Metal film 806k Ω $\pm$ 1% 1/4W	
C7	CE04W1A470M	E 47 μ F 10V		R53	RN14BK2E1003F	Metal film 100k Ω $\pm$ 1% 1/4W	
C8	CE04W1A471M	E 470 μ F 10V		R54	RN14BK2E4703F	Metal film 470k Ω $\pm$ 1% 1/4W	
C9,10	CE04W1A221M	E 220 μ F 10V		R55	RN14BK2E2003F	Metal film 200k Ω $\pm$ 1% 1/4W	
C11	CQ92M1H223K	ML 0.022 μ F 50V		R56	RN14BK2E4023F	Metal film 402k Ω $\pm$ 1% 1/4W	
C12	CE04W1A101M	E 100 μ F 10V		R57	RN14BK2E8063F	Metal film 806k Ω $\pm$ 1% 1/4W	
C14	CE04W1A221M	E 220 μ F 10V		R58	R90-0530-05	Resistor block 2.7k Ω X4	
	E23-0046-04	Square terminal		R59,60	R90-0526-05	Resistor block 27k Ω X4	
	E40-0373-05	Mini connect wafer 3P		R61	R90-0532-05	Resistor block 27k Ω X5	☆
	E40-0573-05	Mini connect wafer 5P		VR1	R12-1413-05	Trim. pot 1k Ω	☆
	E40-0673-05	Mini connect wafer 6P		BZ-1	T95-0051-05	Transducer	
	E40-0873-05	Mini connect wafer 8P					
	E40-0973-05	Mini connect wafer 9P					

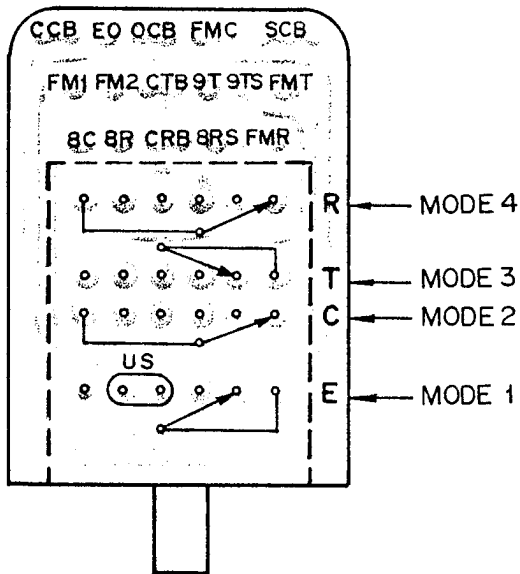
PACKING



▼ SWITCH UNIT (X41-1330-61) Components side view



▼ MODE BOARD (J25-2714-14) Components side view

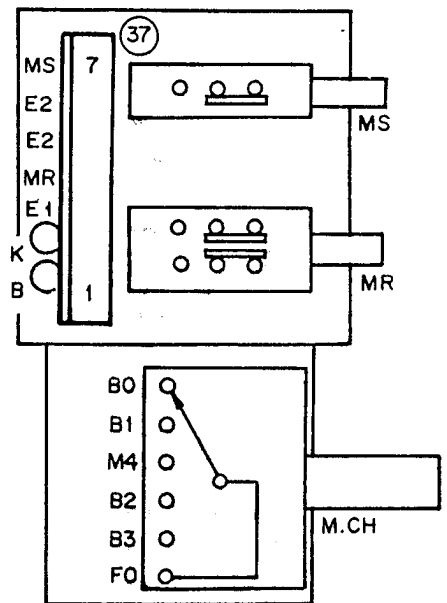
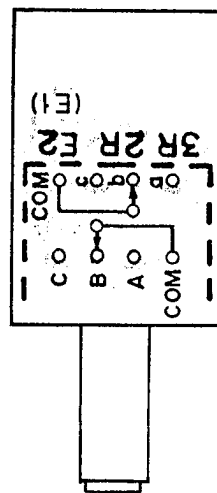


▼ M. CH, MS, MR BOARD (J25-3023-04) Components side view

Components side view

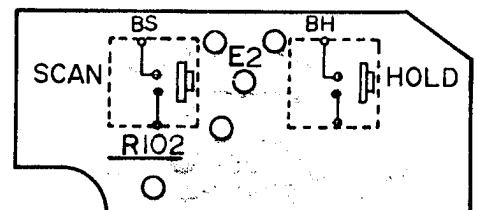
▼ TX OFFSET BOARD (J25-2744-04) Components side view

Components side view

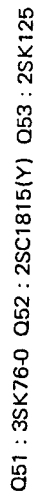


▼ SCAN, HOLD BOARD (J25-2716-24) Components side view

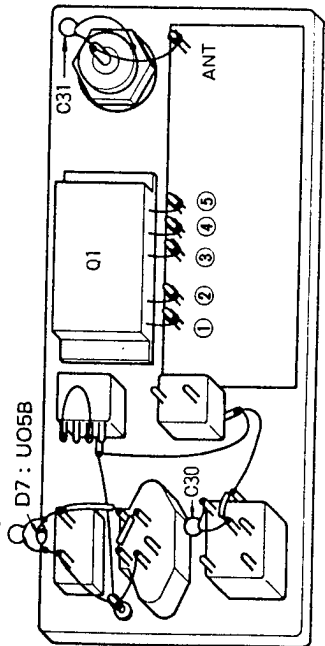
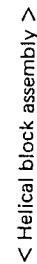
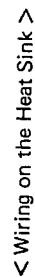
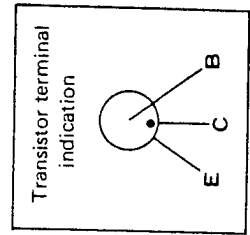
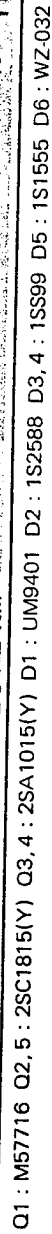
Components side view



Abbreviation	Terminal name	Wire
BLK : BLACK	CCB : BRNX2	
BLU : BLUE	EO : WHT/BLK	
BRN : BROWN	OCB : WHT/BLU	
GRN : GREEN	FMC : WHT/REDX2	
GRY : GRAY	SCB : BLU	
ORA : ORANGE	FM1 : YLW	
RED : RED	FM2 : GRN	
WHT : WHITE	CTB : WHT/ORAX2	
YLW : YELLOW	9T : ORA	
	9TS : BLK	
	FMT : WHT/YLW	
	8C : WHT	
	8R : GRY	
	CRB : WHT/GRNX2	
	8RS : WHT/BRN	
	FMR : WHT/GRY	
	US : RED	

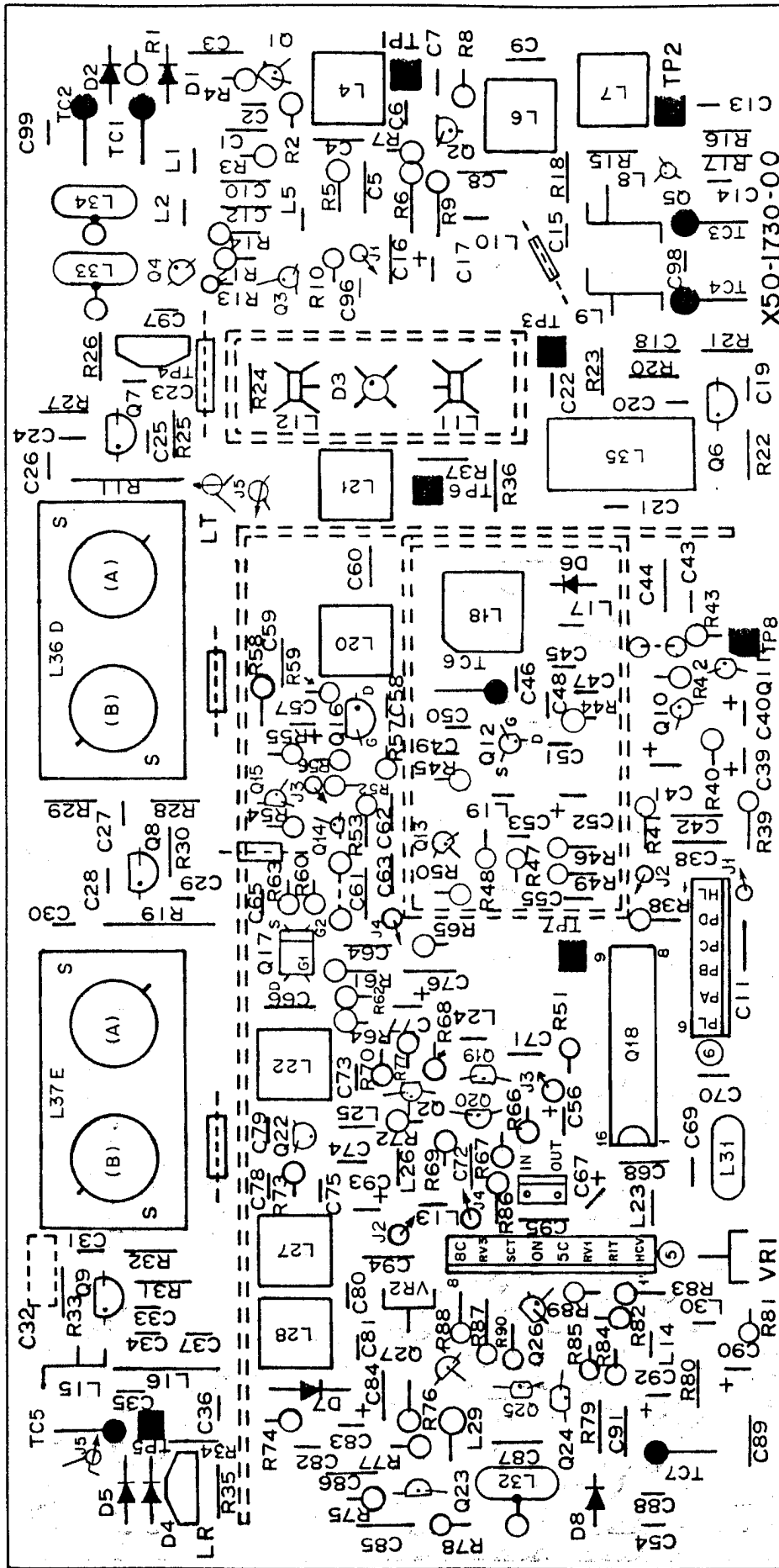


▼ RF UNIT (X44-1430-61) (B/2)

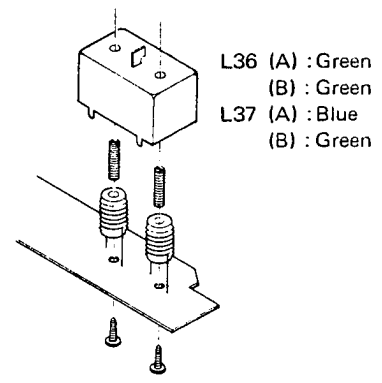


L51 (A) : Red
(B) : Blue
L52 (A) : Black
(B) : Red
L53 (A) : White
(B) : Yellow

* Helical coils are identified by bobbin color.
* L51 (A) and L52 (B) are of the same type.

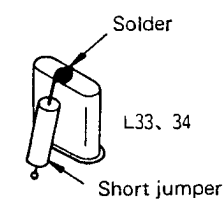


< Helical block assembly >



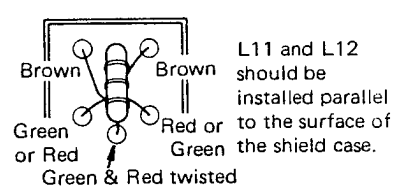
- * Helical coils are identified by bobbin color.
- * L36 (A), (B) and L37 (B) are of the same type.

< Attachment method of L33, 34 >

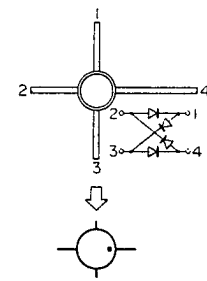


- * Solder as quickly as possible.

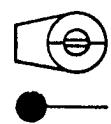
< Attachment direction of L11, 12 >



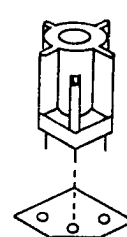
< Attachment direction of D3 >



< Attachment direction of TC1~7 >

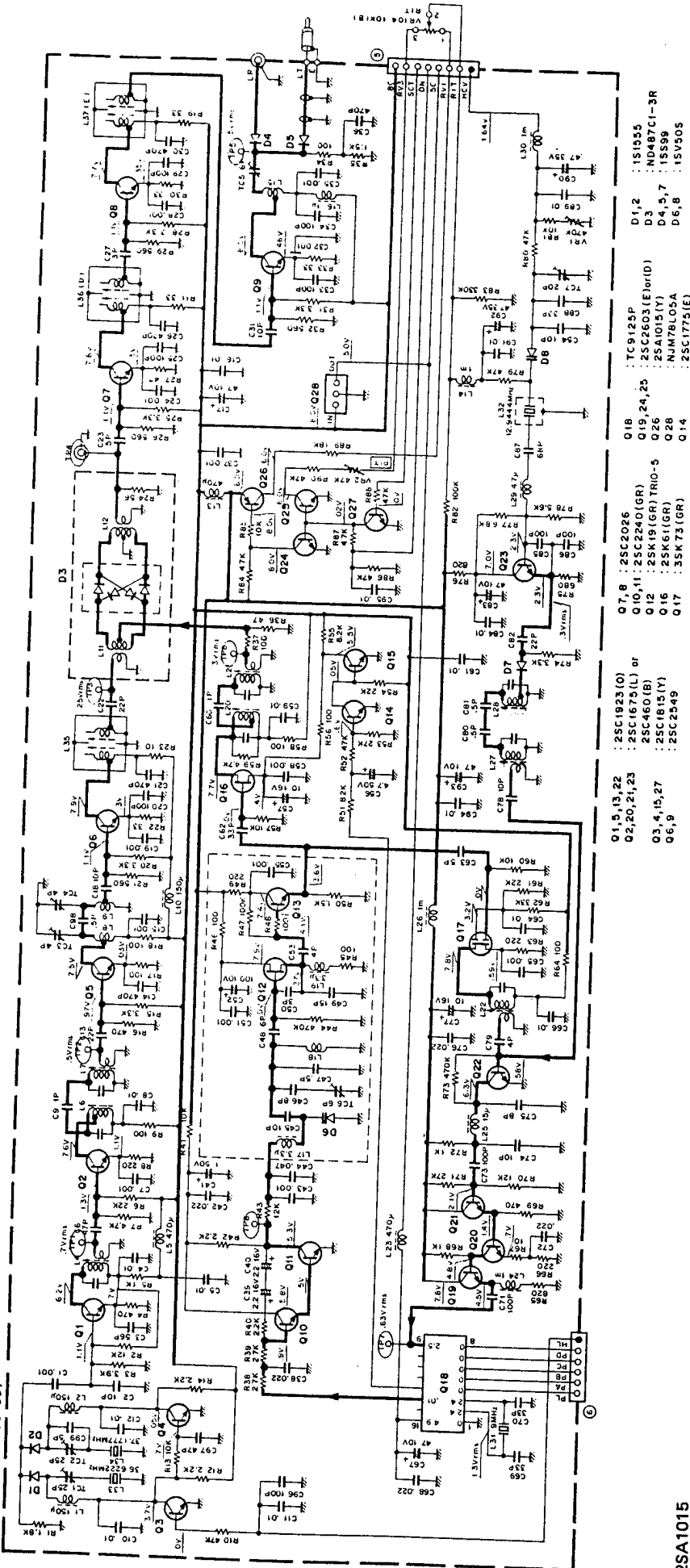


< Attachment direction of L18 >



▼ HET UNIT (X50-1730-00)

HET UNIT (X50-1730-00)



25A1015
25C1675
25C1775
25C1815
25C1923
25C2240

25C2026
25C2549

25C460

25K61

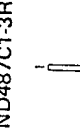
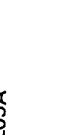
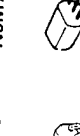
25K19

25C2603

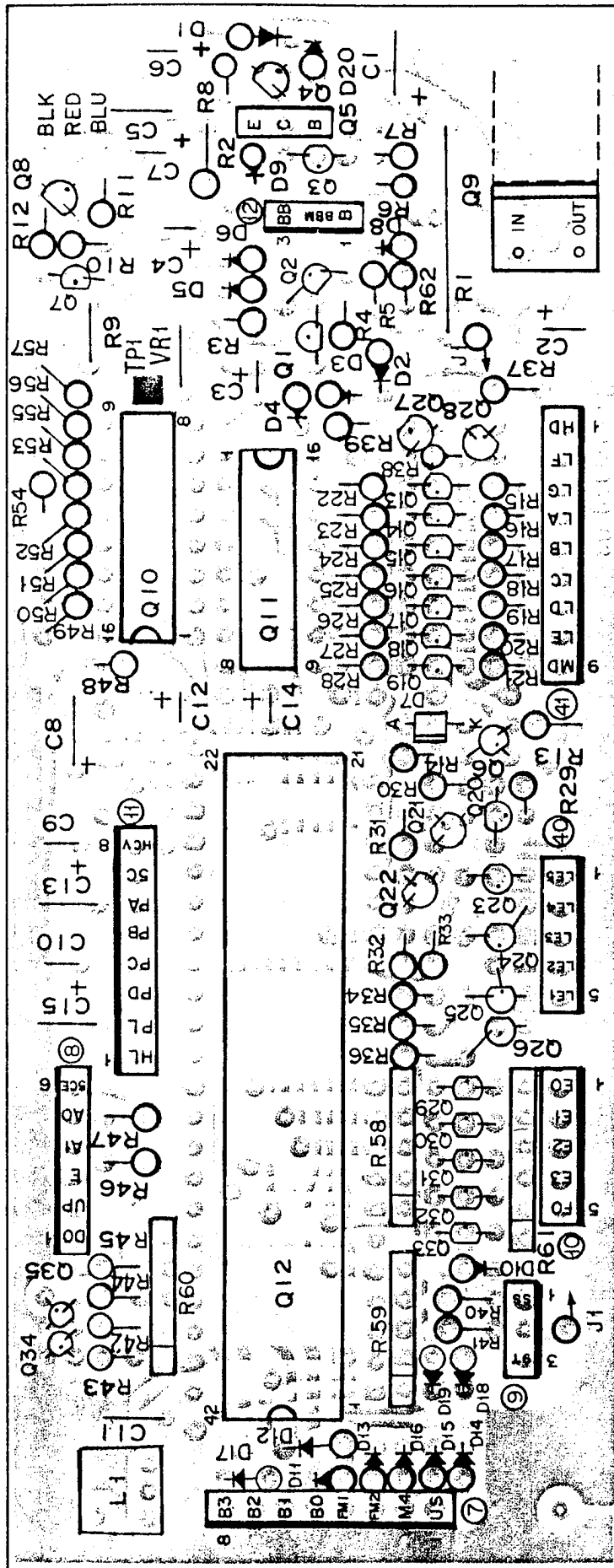
3SK73

NJM78L05A

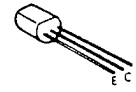
ND487C1-3R



▼ CONTROL UNIT (X53-1210-51, -61, -71) -51: T, -61: W, -71: X Components side view



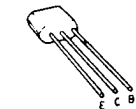
2SA1015
2SC1815
2SC1959



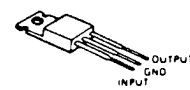
2SC496



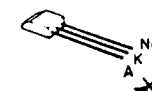
2SA1115



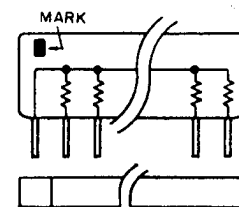
μPC78M05H



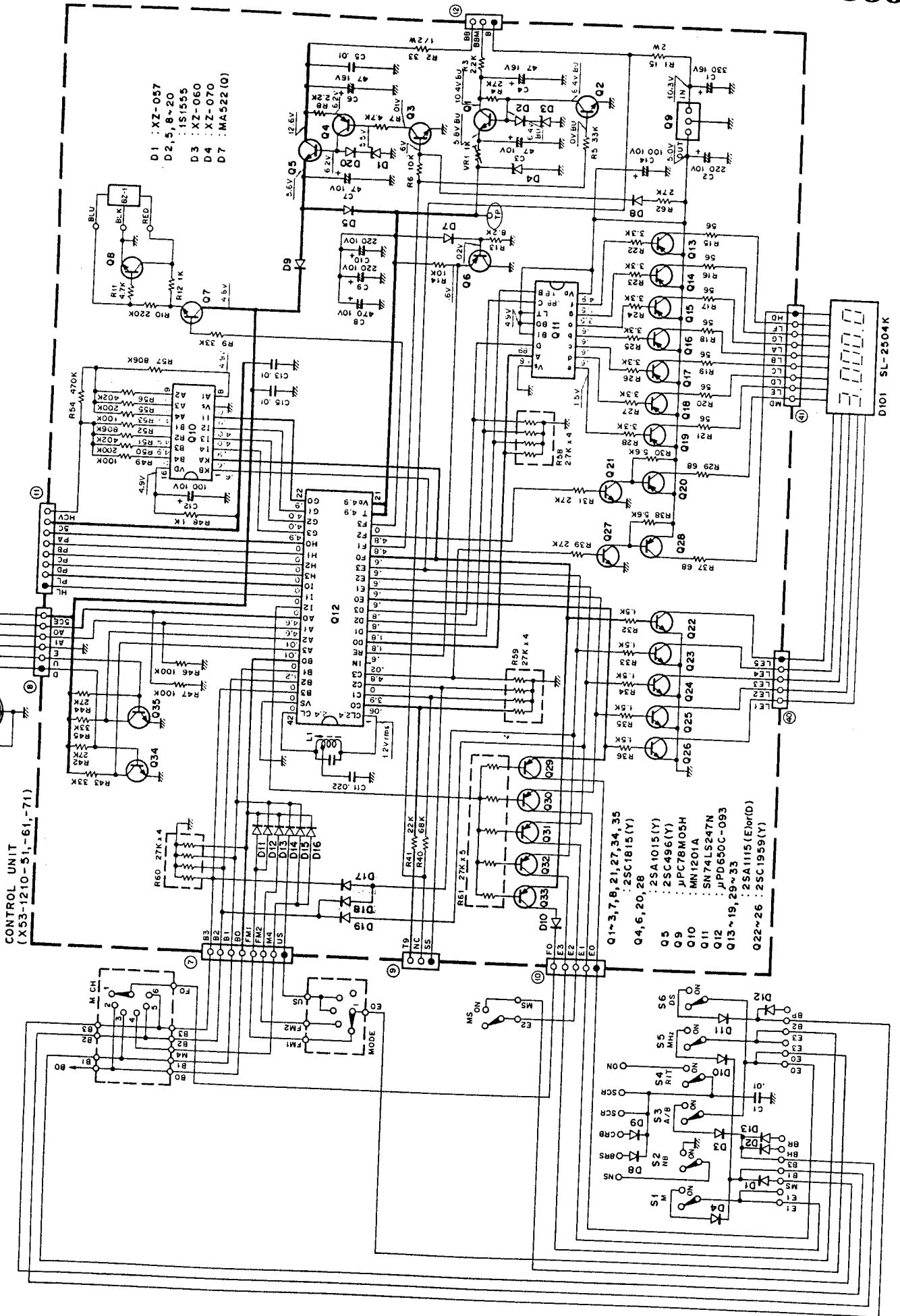
MA522



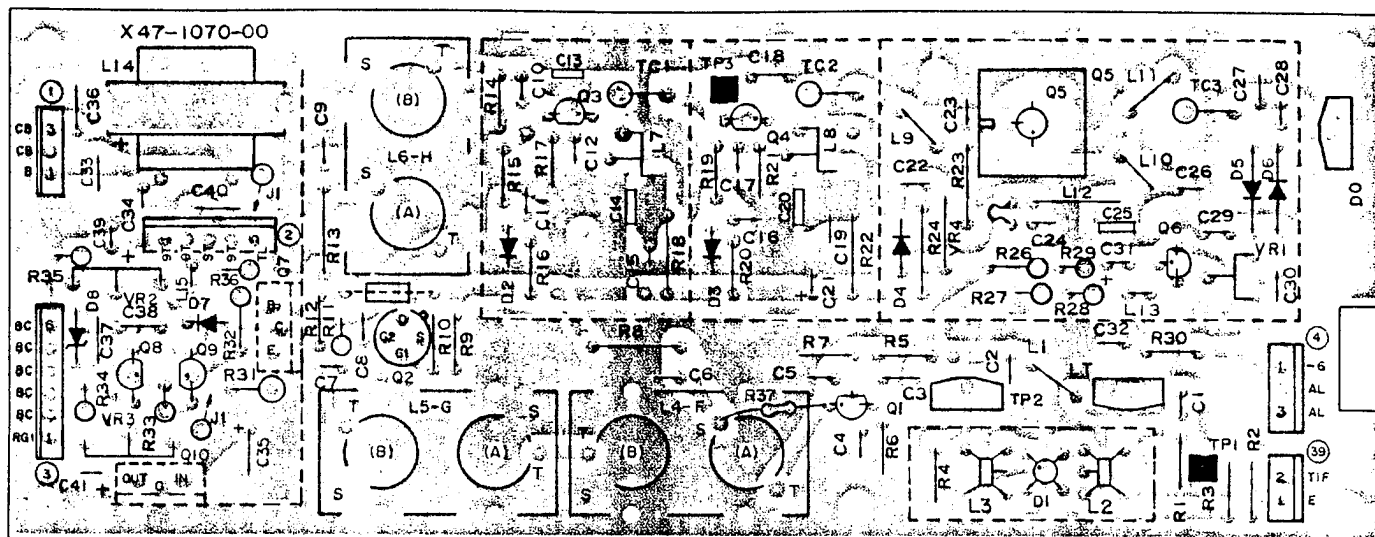
	T	W	X
D17	Not used	Used	Not used
D18	Not used	Not used	Used



R58~61

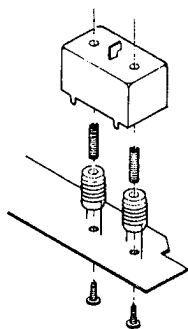


▼ DRIVE UNIT (X47-1070-00) Components side view



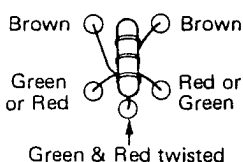
Q1,3 : 2SC2549 Q2 : 3SK48 Q4 : 2SC2026 Q5 : 2SC2762 Q6,9 : 2SC1815(Y) Q7 : 2SA1012(Yor O) Q8 : 2SA1015(Y)
Q10 : μ PC78M08H D1 : ND487C1-3R D2,3 : MV-13 D4 : 1S1555 D5,6 : 1N60 D7 : VD1223 D8 : XZ-060

< Helical block assembly >



L4 (A) : Blue
(B) : Pink
L5 (A) : Pink
(B) : Gray
L6 (A) : Brown
(B) : Gray

< Attachment direction of L2, 3 >



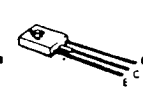
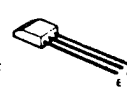
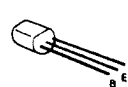
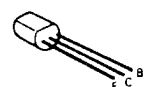
L2 and L3 should be installed parallel to the surface of the shield case.

2SA1015 2SC1815
2SC458 2SC1923
2SC1675 2SC1959
2SC1775 2SC2240

2SC2026
2SC2549

2SC460

2SC496

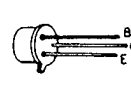
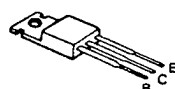


2SA1012

2SC2762

MB3713

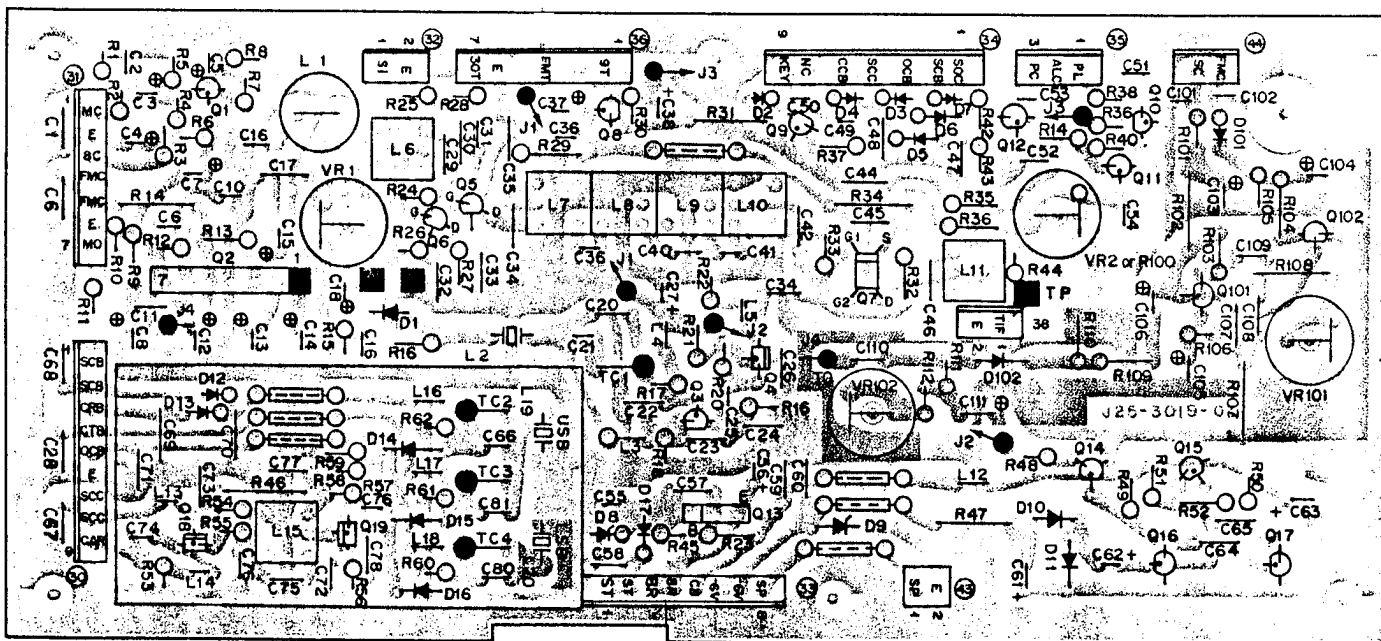
TA7060P



* Helical coils are identified by bobbin color.

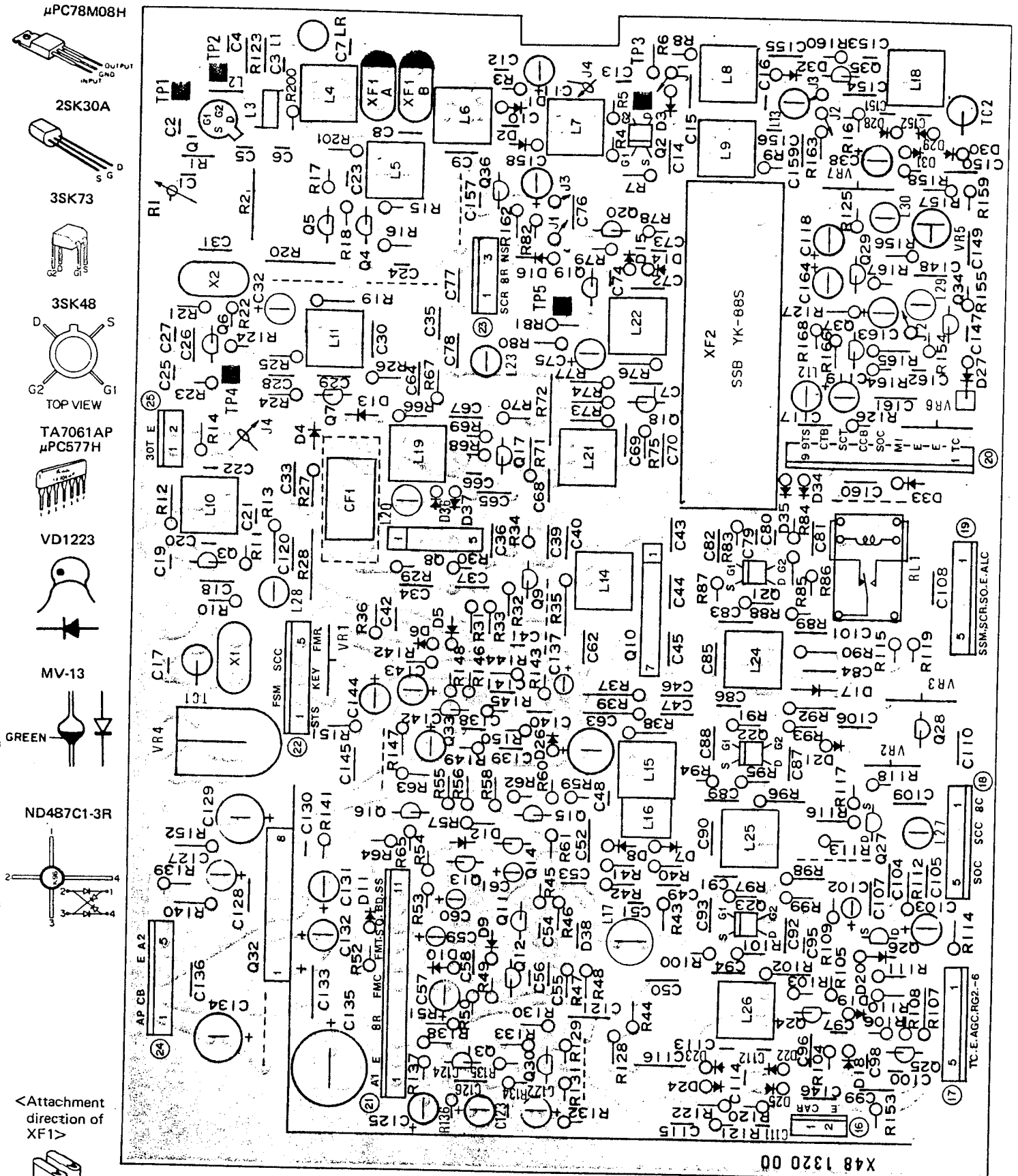
* L4 (B), L5 (A) and L5 (B), L6 (B) are of the same type.

▼ CAR UNIT (X50-1720-00, -51, -61) -00 : X, -51 : T, -61 : W Foil side view



Q1 : 2SC2240(GR) Q2 : TA7061AP Q3 : 2SC1923(O) Q4, 18 : 2SC460(B) or 2SC1675(L) Q5, 6 : 2SK61(GR) Q7 : 3SK73(GR)
Q8~10, 12, 15 : 2SA1015(Y) Q11, 14, 16, 17 : 2SC1815(Y) Q13 : 2SC496(Y) Q19 : 2SC1675(L) Q101, 102 : 2SC458(B)
D1 : 1S2208 D2~7, 10~16, 101, 102 : 1S1555 D8 : XZ-090 D9 : XZ-060 D17 : V06B

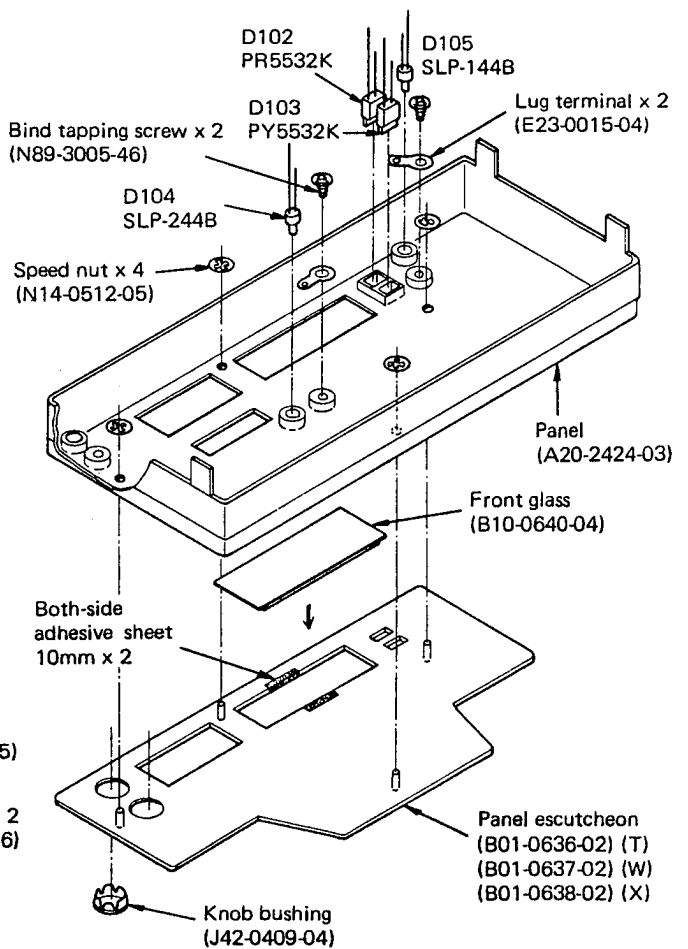
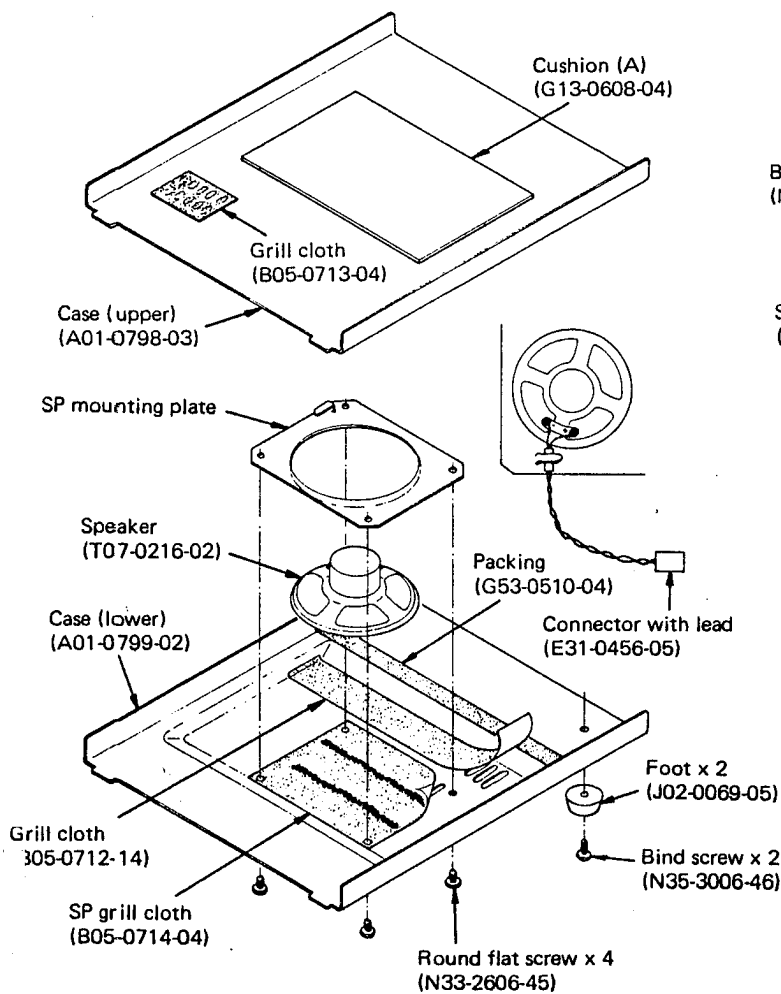
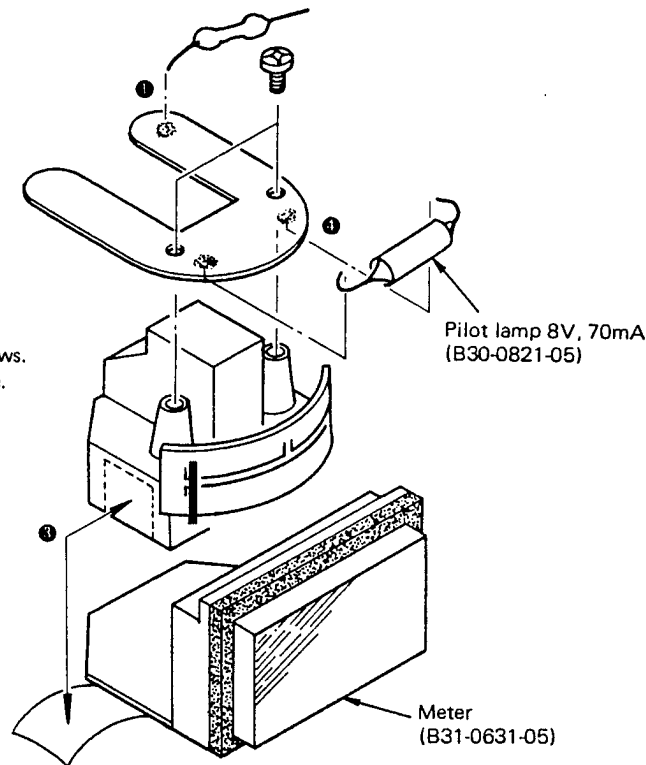
▼ IF UNIT (X48-1320-61) Components side view



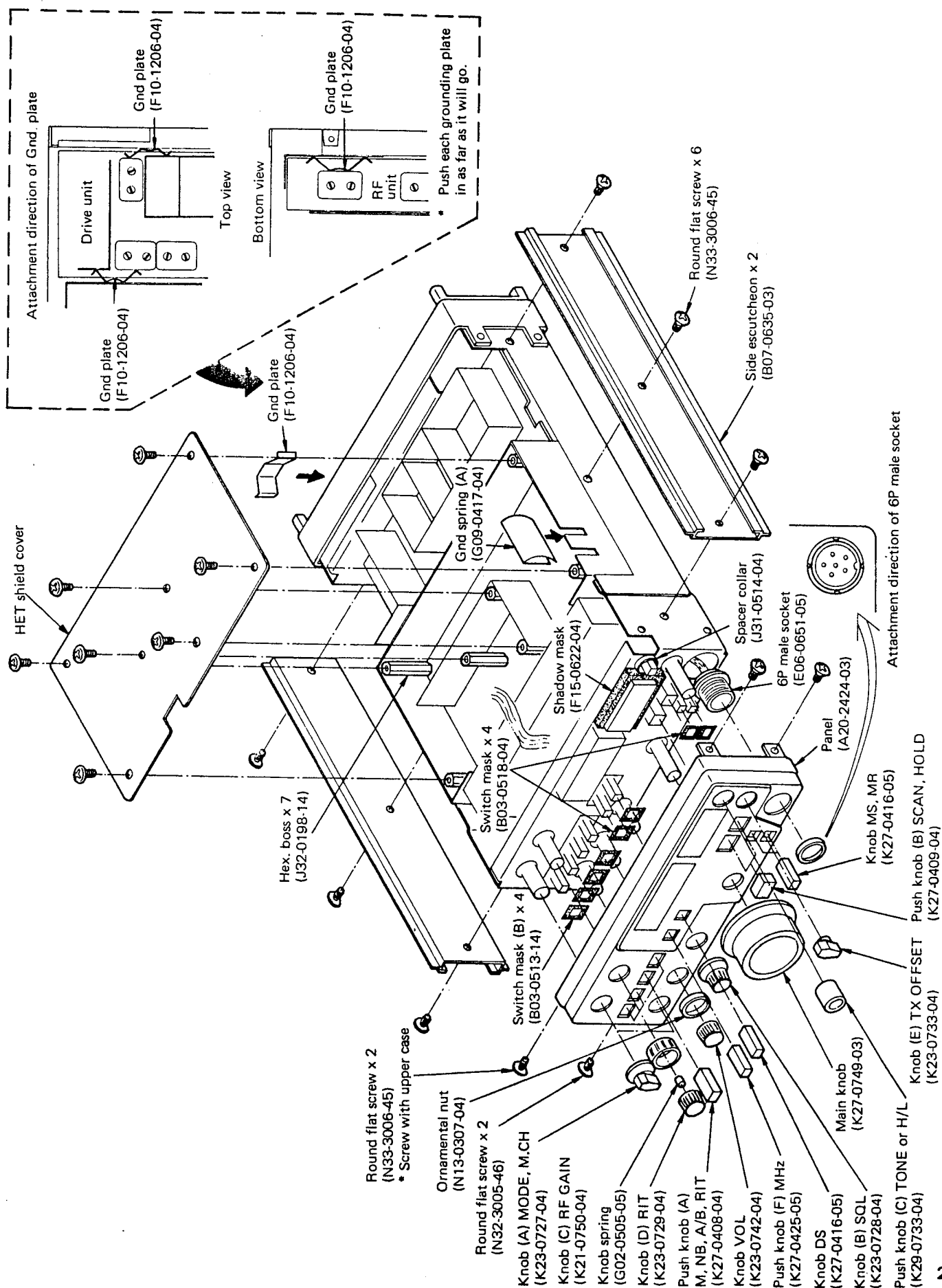
Q1 : 3SK48 Q2, 21~23 : 3SK73(GR) Q3~5, 7, 9 : 2SC460(B) or 2SC1675(L) Q6 : 2SC1923(O) Q8 : TA7060P
 Q10 : μPC577H Q11, 12, 33 : 2SC1775(E) Q13~15, 17~20, 24, 25, 29~31, 36, 37 : 2SC1815(Y) Q16, 28 : 2SA1015(Y)
 Q26 : 2SK30A(GR) Q27 : 2SK30A(O) Q32 : MB3713 Q34 : 2SC1959(Y) Q35 : 2SK61(GR)
 D1~3, 17, 27, 32 : 1S1587 D4, 11, 13, 20, 21, 26, 33~35 : 1S1555 D5~10, 14, 15, 18, 19, 22~25, 28~31, 36, 37 : 1N60
 D12 : 1S1212 D16 : MV13 D38 : D33A

DISASSEMBLY

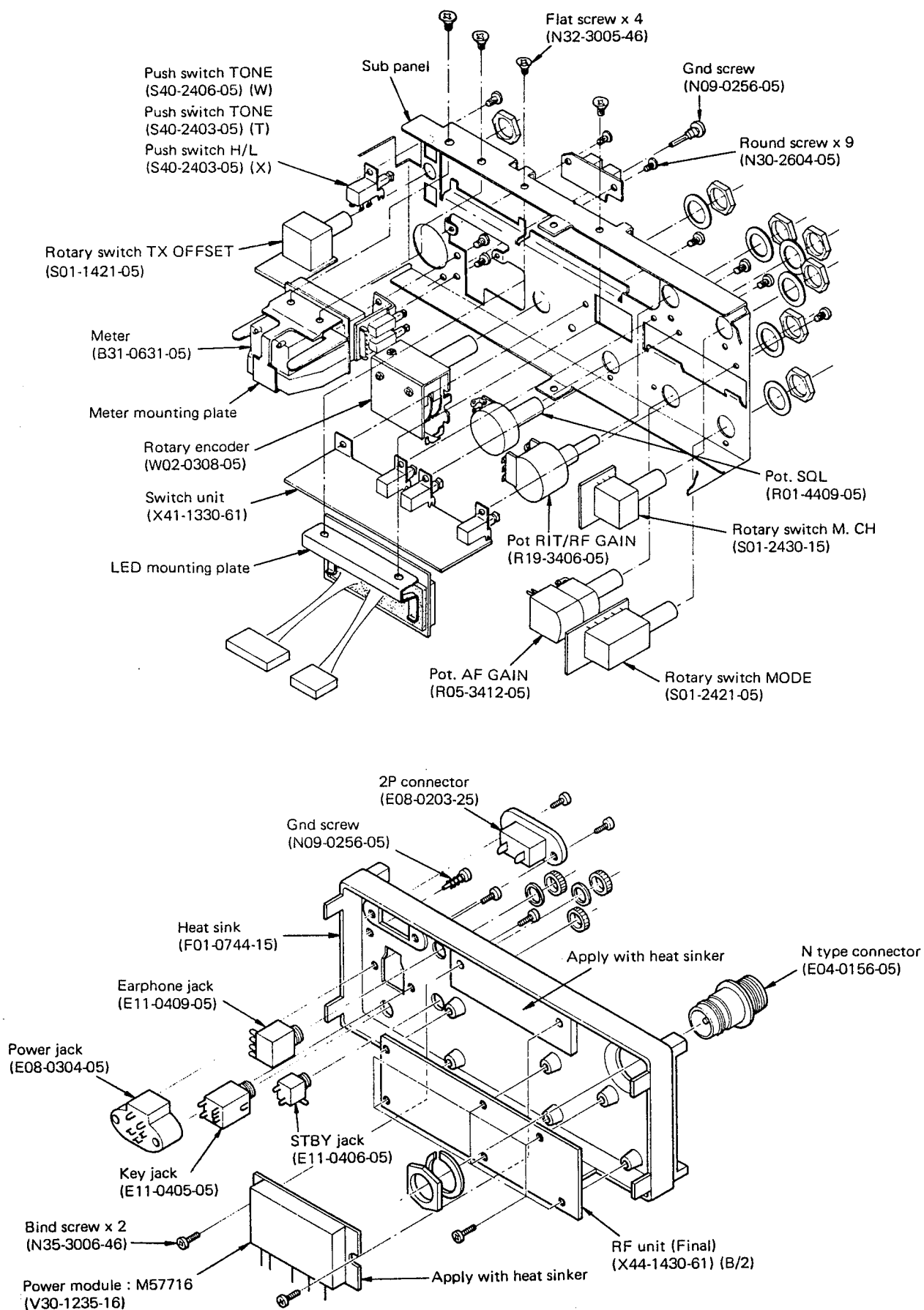
- ① Unsolder.
- ② Remove screws.
- ③ Remove tape.
- ④ Unsolder.



DISASSEMBLY



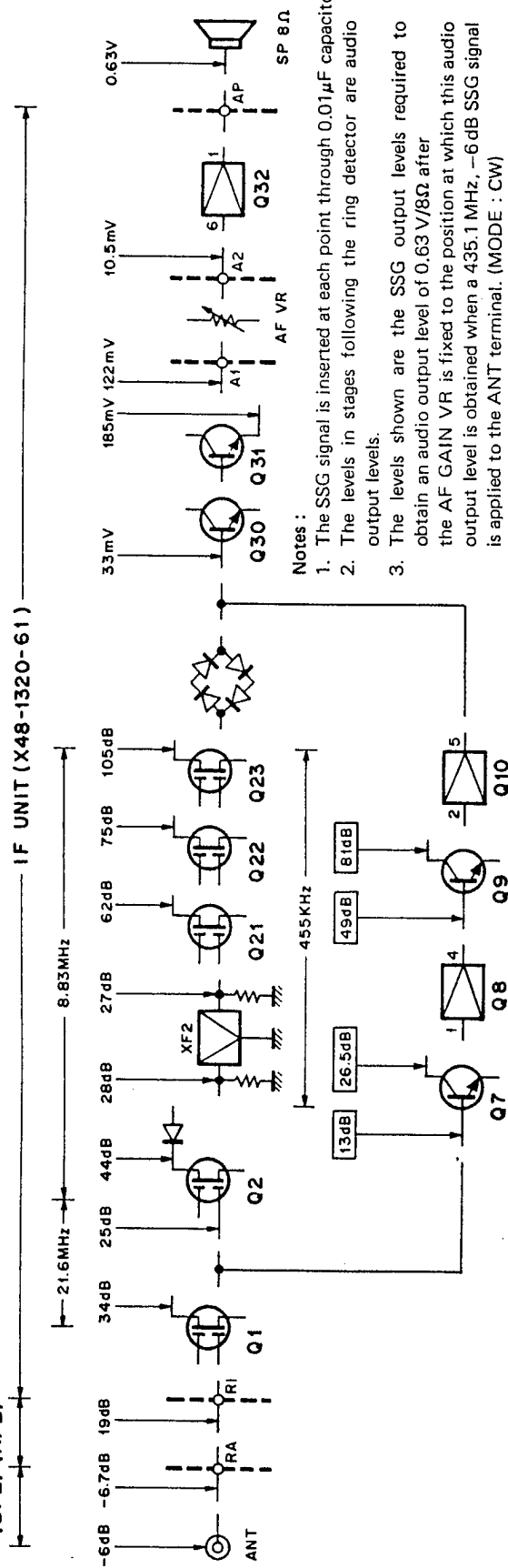
DISASSEMBLY



LEVEL DIAGRAMS

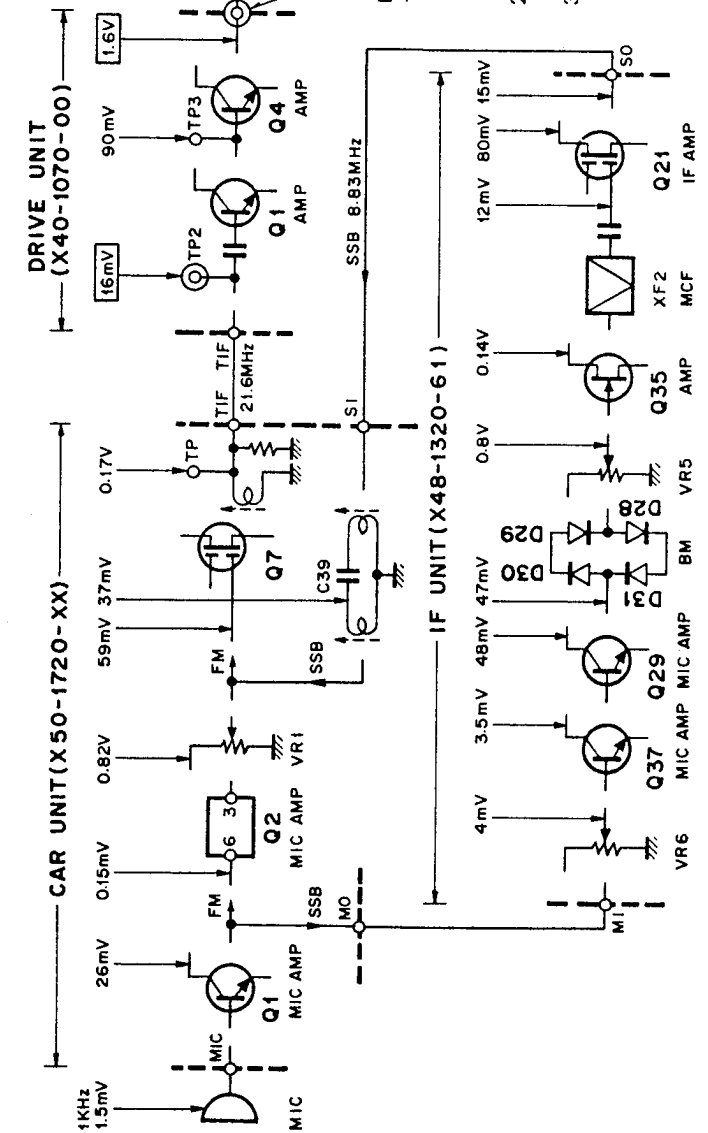
RECEIVER SECTION

RF UNIT
(X44-1430-61)
(B/2) (A/2)



TRANSMITTER SECTION

RF UNIT
(X44-1430-61)(B/2)



Notes :

1. The levels in stages before the DO terminal are measured with VR1 in the DRIVE unit (X47-1070-00) turned fully counter-clockwise and the DO terminal terminated with a 50Ω dummy load.
2. The levels of the MIC AMPs are measured with an audio VTVM ; all other levels are measured with an RF VTVM.
3. The levels enclosed in are measured when the ANT terminal is terminated with 50Ω.

ADJUSTMENTS

< Test Equipment >

1. **Tester**
 - Input: Sufficient
2. **RF VTVM (RF V.M.)**
 - Input impedance: 1 M Ω and less than 2 pF
 - Voltage range: F.S. = 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 Power Meter**
 - Dissipation: 3W, 20W
 - Impedance: 50 Ω
 - Frequency range: 450 MHz
6. **AF VTVM (AF V.M.)**
 - Input impedance: 1 M Ω or greater
 - Voltage range: F.S. = 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
 - Modulation: amplitude and frequency modulation
 - Output: -20 dB ~ 100 dB
12. **AF Dummy load**
 - 8 Ω , 5W (approx.)
13. **Sweep generator**
 - Frequency range: 450 MHz
14. **Field Strength Meter**
 - Frequency range: 450 MHz

< Preparation >

Unless otherwise specified, set the controls as follows.

POWER/VOL SW	ON
SEND/REC	REC
RF GAIN VOL	MAX (fully counterclockwise)
SQUELCH VOL	MIN
MODE SW	USB
VFO A/B SW	A
TONE SW	OFF
TX OFFSET SW	S
RIT VOL	Centered
RIT SW	OFF
NB SW	OFF
SCAN SW	OFF
D.STEP/SEARCH	OFF
MR	OFF
MS	OFF
MHz	OFF

Table 9

Notes:

- When adjusting the trimmers or coils, use a non-induced adjusting rod of bakelite, etc.
- When adjusting the RX section never transmit to prevent SSG damage.
- Connect MIC connector as shown in Fig. 11.

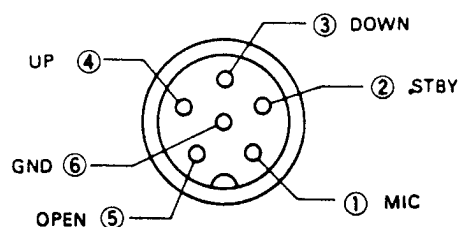


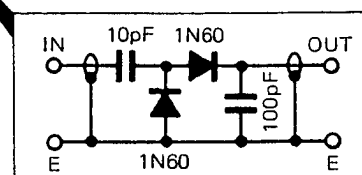
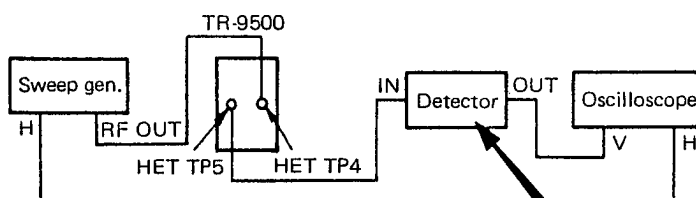
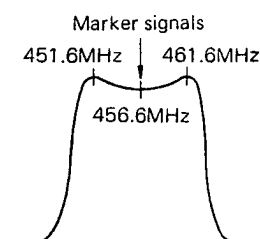
Fig. 11 MIC terminals
(view from front panel side)

- The output level of SSG is indicated as SSG's open circuit.

ADJUSTMENTS

TX/RX SECTION (COMMON)

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. Voltage check in RX mode	1) 8C	DC V.M	DRIVE	③ 8C				7.7~8.3V	Check
	2) 9T		DRIVE	② 9T				Less than 0.1V	
	3) 5C		HET	⑤ 5C				4.7~5.3V	
	4) 8R		CAR	③ 8R				8.0~8.6V	
	5) -6		CAR	③ -6				-5.8~-6.2V	
2. Voltage check in TX mode	1) -6 MODE : FM1, 2 Transmission mode	DC V.M	CAR	③ -6				0V	Check
	2) 8R		CAR	③ 8R				Less than 0.5V	
	3) 9T MODE : USB	DC A.M	DRIVE	② 9T	DRIVE	VR2	9.1V	+0.1V, -0V	
	4) Bias current		DRIVE	Shorting jumper	DRIVE	VR4	25mA	±2mA	
	5) DB	DC V.M	RF (B/2)	② DB				11.7~12.1V	Check
3. Back-up voltage check	1) RX mode POWER : OFF	DC V.M	Control	TP	Control	VR1	5.0V	±0.1V	
	2) POWER : ON								
4. PLL	1) MODE : USB MHz : ON f : 434.00 MHz	RF V.M	HET	TP1	HET	L4	Turn the core counterclockwise until the oscillating signal level becomes 0.5dB lower than its peak value.	(0.85V)	All parenthesized figures below are reference values.
				TP2	HET	L6, 7	MAX	(0.85V)	
	2) f : 435.00 MHz	RF V.M	HET	TP2	HET	L7	Adjust the core so that the same level is obtained as at 434.00 MHz.	(0.65V)	
		RF V.M	HET	TP3	HET	TC3,4 L35	MAX	(0.25V)	
				TP7	HET	L22,27,28	MAX Repeat adjustment	(0.65V)	
	3) f : 434.00 MHz	DC V.M	HET	TP8	HET	TC6	6V	±0.1V	
		RF V.M	HET	TP7	HET	L22,27,28	MAX	More than 0.5V	
		RF V.M	HET	TP6	HET	L20,21	MAX	(0.4V)	
	4) f : 432.00 MHz	RF V.M	HET	TP6	HET	L20,21	MAX	(0.4V)	
	5) f : 435.00 MHz The sweep generator is connected to TP4 of the HET unit (Input : 30 ~ 35 dBμ) The detector is connected to TP5 and TP7 is grounded with the clip. TC5 : Maximum position (see the figure below).	Oscilloscope	HET		HET	L36,37	Adjust the four cores of the helical block so that the waveform shown at right is obtained.		

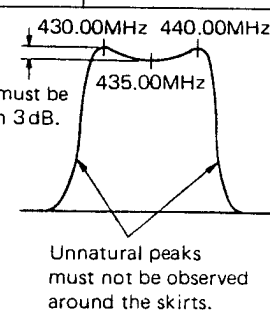
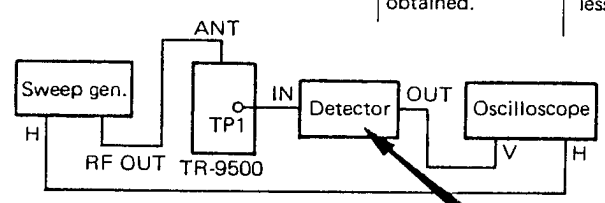
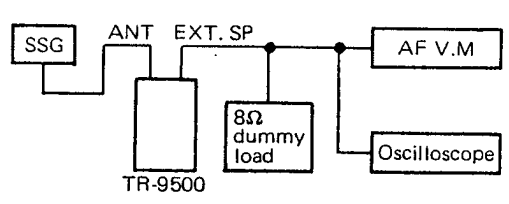
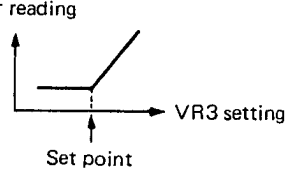


ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	6) Disconnect the test equipment and the grounding wire.	RF V.M	HET	TP5	HET	TC5	MAX	(0.5V)	
	7) Install the HET shielding cover.								
5. HET frequency adjustment	1) f : 435.00 MHz	F counter	HET	TP2	HET	TC2	111.53333 MHz	±10 Hz	
	2) f : 433.00 MHz			TP2	HET	TC1	109.86666 MHz	±10 Hz	
	3) MODE : USB MHz : OFF f : 432.9999 MHz			TP6	HET	TC7	124.99840 MHz	±10 Hz	
	4) f : 433.00 MHz MODE : LSB			TP6	HET	VR1	124.99850 MHz	±10 Hz	
	5) RIT VOL : Centered RIT SW : ON			TP6	HET	VR2	124.99850 MHz	±10 Hz	
	6) RIT VOL : fully clockwise (+direction) fully counter-clockwise (- direction)			TP6	HET			124.99980 MHz or higher 124.99770 MHz or lower	Check
	7) RIT SW : OFF RIT VOL : Centered MODE : USB								
6. SSB 2nd local oscillator	Set knobs as shown in Table 9.	RF V.M	IF	TP3	IF	L10	Turn the core a half turn out from the maximum.	(0.4V)	
	2)	F counter	IF	TP3	IF	TC1	30.4300 MHz	±10 Hz	
7. CAR	1) MODE : USB	RF V.M	IF	D27 cathode	CAR	L15	Turn the core a little to the left of the maximum reading position.	0.3V±0.02V	
	2)	F counter	IF	D27 cathode	CAR	TC2	8.8285 MHz	±50 Hz	
	3) MODE : CW							The same frequency as in paragraph 2) above	Check
	4) Transmission mode				CAR	TC3	8.8293 MHz	±50 Hz	
	5) Reception mode							The same frequency as in paragraph 2) above	Check
	6) MODE : LSB				CAR	TC4	8.8315 MHz	±50 Hz	
	7) MODE : USB								

ADJUSTMENTS

RX SECTION

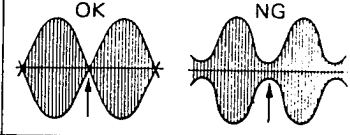
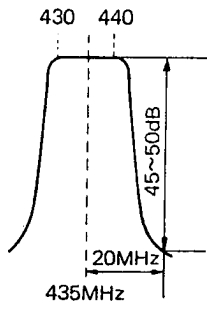
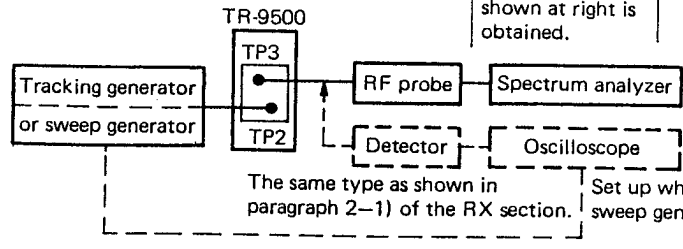
Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. RG1 voltage	1) RG1 voltage	DC V.M	DRIVE	③ RG1	DRIVE	VR3	4.0V	±0.1V	
2. Helical	1) Connect the sweep generator to the ANT terminal on the rear panel with its output level set to 30~40 dBμ.	Oscilloscope, Sweep generator	IF	TP1	RF (A/2)	L51~53	Adjust the 6 helical block cores so that the waveform shown at right is obtained.	 Ripple must be less than 3dB. Unnatural peaks must not be observed around the skirts.	
3. Sensitivity adjustment									
	1) Connect the AF VTVM to the EXT SP terminal on the rear panel with an 8Ω load connected. Connect the SSG to the ANT terminal on the rear panel.	SSG, Oscilloscope, AF V.M, 8Ω dummy load							
									
	2) Tune to the SSG signal (435.025 MHz, 6 dBμ) so that a beat signal of about 1.5 kHz is output.	AF V.M, S-meter		EXT.SP	IF	L4~9 L24~26	MAX Repeat adjustment		
	3) MODE : FM SSG : MOD 1 kHz DEV 3.5 kHz	S-meter			IF	L11	MAX Repeat adjustment		
	4) SSG output : 50 dBμ	AF V.M		EXT.SP	IF	L15	MAX		
4. S-meter reading in FM mode	5) SSG output : 100 dBμ	AF V.M		EXT.SP				Normal output should be obtained.	Check
	6) SSG output : -6 dBμ	AF V.M, Oscilloscope		EXT.SP	RF (A/2)	L51	Fine adjust the core so that the optimum waveform is obtained.	S/N must be more than 20 dB.	S/N measurement for FM mode
5. S-meter reading in the USB mode	1) SSG output : 26 dBμ	S-meter			IF	VR1	Adjust VR1 for a meter reading of "10" on a scale of 1-10.		
5. S-meter reading in the USB mode	1) MODE : USB SSG output : OFF	S-meter			IF	VR3	Turn VR3 counterclockwise so that the meter needle does not swing.		

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	2) SSG output : ON 0 dB μ Adjust the frequency so that the S-meter reading is maximized.	S-meter			IF	L25	Adjust the core for the maximum meter reading, then turn it counterclockwise until the meter reads "1" on a scale of 1—9.		
	3) SSG output : 20 dB μ				IF	VR2	Adjust VR2 so that the S-meter reads "9" on a scale of 1—9.		
6. SSB sensitivity adjustment	1) SSG output : —6 dB μ	AF V.M		EXT.SP				S/N must be more than 14 dB.	Check
	2) Set the VFO dial to 430.00 and 439.975 and perform measurements described in paragraphs 3—6) and 6—1) at each point.							FM S/N must be more than 20 dB. SSB S/N must be more than 14 dB.	Check
7. NB	1) SSG output : 10 dB μ	DC V.M	IF	TP5	IF	L19, 21	MIN Repeat adjustment		
	2) Pulsed noise is input.							Pulsed noise should be reduced.	
8. Side tone	1) MODE : CW Connect a key to the KEY terminal on the rear panel. AF VOL : Centered	AF V.M		EXT.SP	IF	VR4	0.5V/8 Ω		
9. Squelch	1) MODE : FM SQ VOL : Threshold							The SQ VOL position should be at 9~12 o'clock position.	Check
	2) SQ VOL : Threshold Tune to the SSG signal (any frequency within the band, —10 dB μ).	SSG						Squelch should open.	

ADJUSTMENTS

TX SECTION

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. FM carrier	1) Pull out the TIF  connector of the CAR unit. MODE : FM1 Transmit.	RF V.M	CAR	TP	CAR	L10,11	MAX	(1.2V)	
2. CW carrier level	1) MODE : CW Transmit.	F counter	CAR	TP	CAR	TC1	21.6000 MHz	±200 Hz	
		RF V.M	CAR	TP	IF	L18	MAX		
					CAR	L6	MAX		
					CAR	L7~10	MAX Repeat adjustment		
					IF	VR7	Adjust VR7 for 1.2V reading.	±0.05V	
3. Carrier point	1) MODE : USB Transmit,	Oscilloscope, RF V.M	CAR	TP	IF	TC2	MIN Repeat adjustment		
	2) Apply a two-tone signal (300 Hz, 1 mV and 2700 Hz, 1 mV) to the MIC terminal.	Oscilloscope			IF	VR6	Set VR6 to the 11 o'clock position.		
	3) Ditto				CAR	TC2	The waveform should be as shown at right.		
	4) MODE : LSB				CAR	TC4	Perform the same adjustment as in paragraph 3-3).		
3. Simplified carrier point adjustment	1) MODE : USB Adjust the AG output level so that a transmission power of 5W is obtained.	Power meter							
	2) AG : 300 Hz or 2700 Hz	Power meter			CAR	TC2	Alternate 300 Hz and 2700 Hz.	The output power should be the same at both frequencies.	
	3) MODE : LSB	Power meter			CAR	TC4	Alternate 300 Hz and 2700 Hz.	The output level should be the same at both frequencies.	
4. Helical	1) Drive unit VR1 : all the way to the left	Oscilloscope	DRIVE	TP3	DRIVE	TC1	Adjust TC1 so that the maximum level is obtained at 435.00 MHz.		
	TC2 : Centered (see the figure below). Connect a tracking generator or sweep generator to TP2 of the drive unit and connect the RF probe to TP3.	spectrum analyzer				L4~6	Adjust the 6 helical block cores so that the waveform shown at right is obtained.		
		 The same type as shown in paragraph 2-1) of the RX section. Set up when a sweep generator is used.							
2) Disconnect the test equipment. Connect the TIF  connector of the CAR unit.									

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
5. Drive adjustment	1) f : 435.00MHz MODE : FM1 Disconnect the DO cable from the drive unit and connect a 3 W power meter to the DO terminal. Transmit.	3 W power meter (RM V.M)	DRIVE	DO	DRIVE	TC1~3	MAX Repeat adjustment	More than 0.25W (more than 3 Vrms)	
	2) f : 430.00 MHz 439.975 MHz							More than 0.25 W (more than 3 Vrms)	Check
6. Power/RF meter adjustment	1) MODE : CW Disconnect the 3 W power meter and connect the DO cable to the DO terminal. f : 430.00, 435.00, 439.975 MHz	20 W power meter		ANT				More than 15 W	Check
	2) f : 435.00 MHz	DC V.M	FINAL	TP	FINAL	VR3	MIN		
	3) f : 430.00 MHz	Power meter		ANT	DRIVE	VR1	Adjust VR1 for a reading of 11 W.		
	4) Current consumption	DC A.M						The total current consumption should be less than 3.8A.	Check
	5) RF meter	RF meter			FINAL	VR1	Adjust the VR1 for a meter reading of "8" on a scale of 0-10.		
	6) f : 439.975 MHz	Power meter, DC A.M						More than 11 W, Less than 3.8A	Check
	7) If the specifications were not satisfied on adjustment in paragraphs 6-4) and 6), widen the pitch of L5 in the final unit and perform power adjustment again.								
7. Low power adjustment	1) MODE : FM1 f : 435 MHz HI/LOW : LOW Transmit.	Power meter		ANT	Carrier	VR2	Adjust VR2 for a reading of 1.2W.		
	2) MODE : FM, CW f : 431 MHz Transmit.							Less than 3 W	Check
	3) f : 439 MHz Transmit.							Less than 3 W	
8. Protection	1) MODE : FM1 f : 435 MHz AMT terminal : open Transmit.				FINAL	VR2	Set VR2 to the 7 o'clock position as viewed from the front.		
		DC A.M						Less than 2 A	Check
	2) Transmit when the meter reading is greater than 2 A.				FINAL	VR2	Adjust VR2 for a reading of 2 A.		
	3) Connect the power meter.							Normal output should be obtained.	Check

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
9. FM deviation	1) Connect the AG (1 kHz, 30 mV) to the MIC terminal, then transmit.	Linear detector			CAR	VR1	Adjust the VR1 for 5 kHz deviation.		
	2) Adjust the AG level so that the linear detector reading becomes 3.5 kHz.	Linear detector, AG		MIC terminal				The AG output level must be less than 5 mV.	Check
10. SSB MIC gain	1) MODE : USB f : 432 MHz Connect the AG (1.5 kHz, 1 mV) to the MIC terminal. Transmit.	Power meter		ANT	IF	VR6	5W	±0.5W	
	2) HI/LOW : HI → LOW → HI								
	3) Set the AG output to 1.5 kHz, 10 mV.						12.5W	±2.5W	Check
11. Carrier suppression	1) MODE : USB Transmit.	Field strength meter			IF	TC2 VR5	MIN Repeat adjustment	More than 50 dB (less than -10 dBm)	
12. Tone (W, T type)	1) TONE : ON Transmit.	Connect a F counter to the linear detector output.			CAR	VR101	1750 Hz	±10 Hz	
	2) T type only Transmit.				CAR	VR102	Adjust the tone burst interval to about 0.5 sec.		

Micro-processor operational check

Item	Condition	Specification	Item	Condition	Specification
1. Reset check	1) Pull the power connector out and reinsert it.	Display 3.000.0		3) D.S : ON Turn the VFO knob clockwise one click at a time until 3.10 is displayed, then turn it counterclockwise until 2.90 is displayed.	The display should vary in 5 kHz steps. (3 digit display)
	2) VFO A/B : B	Display 0.000.0		4) MODE : FM1 VFO A/B : B Turn the VFO knob clockwise one click at a time until the display which starts at 0.000 reaches 0.100, turn it counterclockwise until the display becomes 9.900 (0.100 → 0.000 → 9.900), then turn it clockwise until 0.000 is displayed.	
	3) VFO A/B : A MR : ON MEMORY : 1	Display 3.000.0		5) D.S : OFF Perform the same operation as in paragraph 2-4).	The display should vary in 25 kHz steps. (4 digit display)
	4) MEMORY : 2~6	Display 0.000.0			
	5) MR : OFF	Display 3.000.0			
2. Dial step and number of digits displayed	1) A/B : A MODE : USB, CW, LSB Turn the VFO knob clockwise one click at a time until the display becomes 3.001.0, then turn it counterclockwise until 2.999.0 is displayed.	The display should vary in 100 Hz steps. (5 digit display)			
	2) MODE : FM2	The display should vary in 1 kHz steps. (4 digit display)			

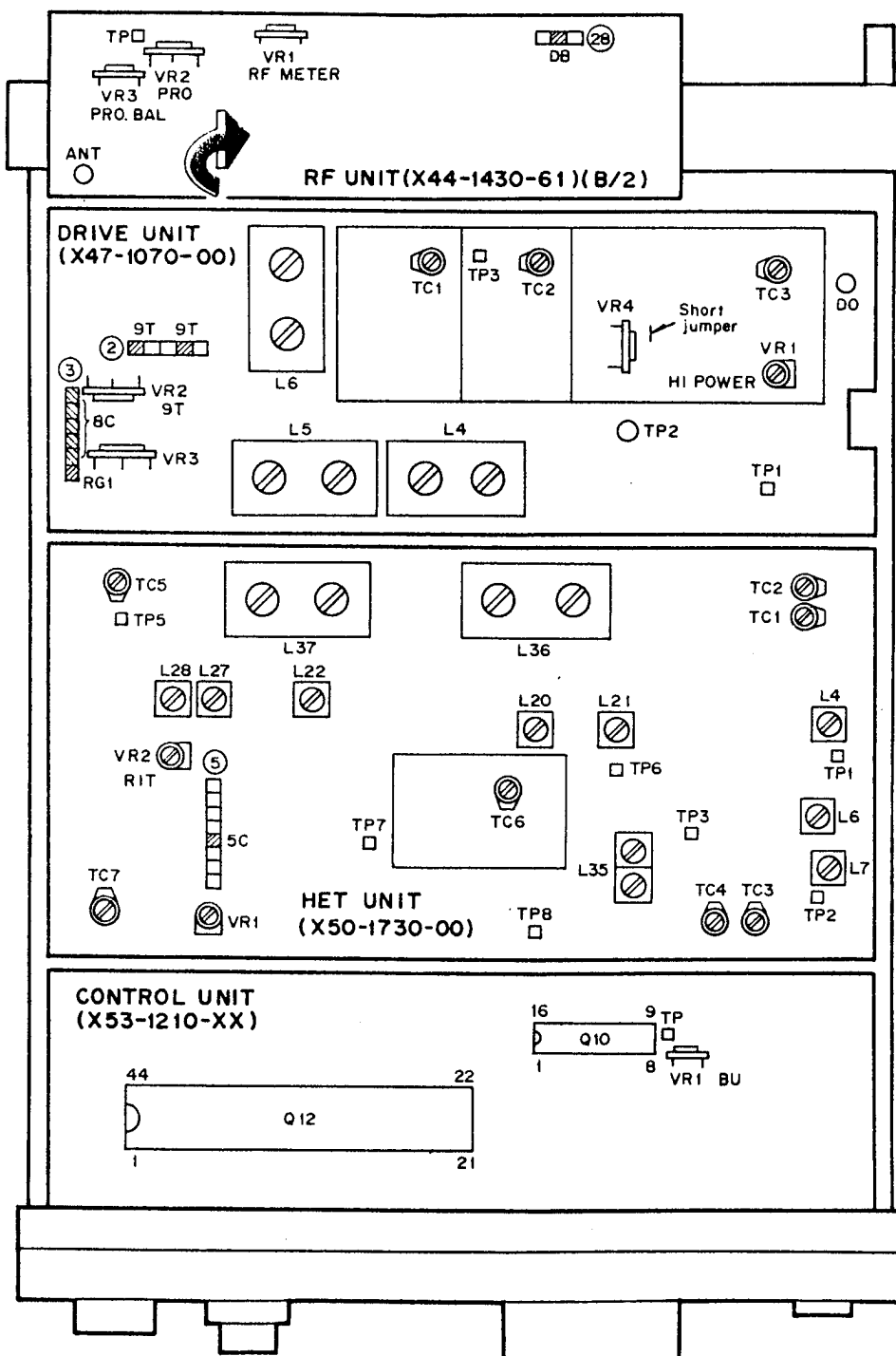
ADJUSTMENTS

Item	Condition	Specification
Search operation check	1) MODE : USB D.S : ON	The frequency range from 0 to 9.9 kHz must be searched in 100 Hz steps.
	2) VFO A/B : A Turn the MAIN knob.	The frequency should vary in 10 kHz steps.
	3) Transmit.	The ON AIR indicator (red) lights to indicate transmission.
	4) Receive. D.S : OFF	
4. MHz indication check	1) MHz : ON MODE : FM1 Turn the MAIN knob in both directions.	The display should vary in 1 MHz steps. The tone sounds everytime the display changes.
5. Memory write	1) f : 1.00 MEMORY : 1 M : ON	The tone sounds.
	2) f : 2.00 MEMORY : 2 M : ON	The tone sounds.
	3) f : 3.00 MEMORY : 3 M : ON	The tone sounds.
	4) f : 4.00 MEMORY : 4 M : ON	The tone sounds.
	5) f : 5.00 MEMORY : 5 M : ON	The tone sounds.
	6) f : 6.00 MEMORY : 6 M : ON	The intermittent tone sounds continuously.
	7) f : 7.00 M : ON	The intermittent tone stops.
Memory call	1) MR : ON	Display 5.000.0
	2) Transmit.	Display 7.000.0
	3) Receive.	Display 5.000.0
	4) MEMORY : 5 : 4 : 3 : 2 : 1	Display 5.000.0 4.000.0 3.000.0 2.000.0 1.000.0
	5) MR : OFF	Display 7.00
7. MEMORY SCAN check	1) SQL : all the way to the right	Display 1.000.0 ~ 6.000.0 The frequency changes repeatedly from 1.000.0 to 6.000.0. The MHz dot flickers.
	2) SQL : all the way to the left	The display stops. The dot flickers. The BUSY indicator lights.
	3) SCAN : ON	The next memory channel is displayed.

Item	Condition	Specification
8. SCAN check	4) Turn SQL clockwise.	Scan starts. The BUSY indicator goes off.
	5) HOLD : ON	The display stops changing. The dot flickers.
	6) SCAN : ON	Scan starts.
	7) Transmit.	Scan stops.
	8) Receive.	The dot flickers.
	9) MS : OFF	The dot lights continuously.
	1) SQL : all the way to the right SCAN : ON	The display frequency increases. The dot flickers.
	2) SQL : all the way to the left	The display stops changing. The BUSY indicator lights. The MHz dot flickers.
	3) Turn SQL clockwise.	The display frequency increases. The BUSY indicator goes off.
9. UP/DOWN check	4) HOLD : ON	The display stops changing. The MHz dot lights continuously.
	5) SCAN : ON	The display frequency increases. The MHz dot flickers.
	6) Transmit.	The display stops changing. The MHz dot lights continuously.
	7) Receive.	Scan stops.
	1) MODE : USB MHz : OFF Set the MAIN dial to 7.000.0.	Display 7.000.0
	2) Press the MIC UP switch once.	The tone sounds. Display 7.000.1
	3) MHz : ON Press the MIC UP switch once.	The tone sounds. Display 8.000.1
10. RIT	4) Hold down the MIC UP switch.	The intermittent tone sounds. The display frequency increases.
	5) Press the MIC DOWN switch once.	The tone sounds. The display frequency decreases 1 MHz.
	6) MHz : OFF Press the MIC DOWN switch once.	The tone sounds. The display frequency decreases 100 Hz.
	7) Hold down the MIC DOWN switch.	The intermittent tone sounds. The display frequency decreases.
	1) RIT : ON	The RIT indicator (red) lights.
	2) MODE : FM1, FM2	The RIT indicator (red) goes out.
	3) Transmit.	The RIT indicator (red) goes out. The ON AIR indicator (red) lights.
	4) Receive.	The RIT indicator (red) lights.

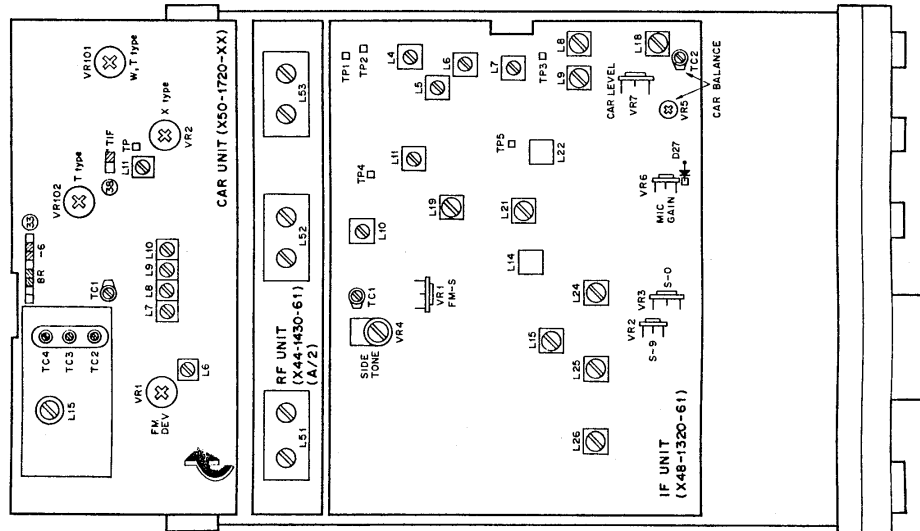
ADJUSTMENTS

TOP VIEW

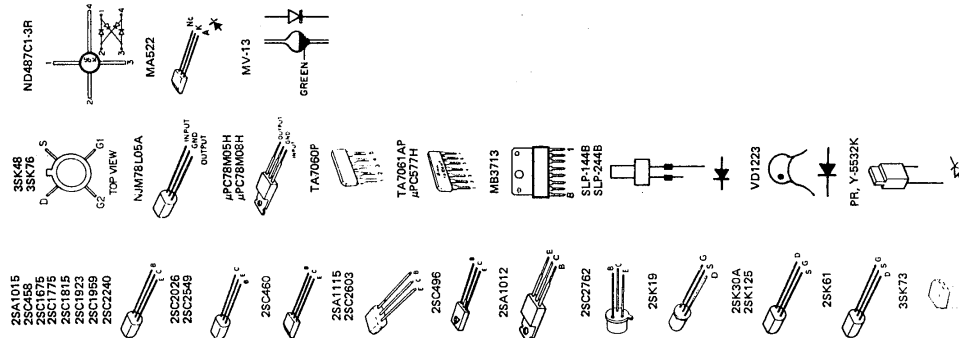


ADJUSTMENTS

BOTTOM VIEW



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Com- pon- ent No.	Termi- nal No.	Remarks	Unit/Switch	Con- nec- tor No.	Termi- nal No.
DRIVE UNIT (X47-1070-00)					
1	B	Switched B + 13.8 V	S/R meter	1	B
2	CB	Common B + 13.8 V	POW SW	2	CB
3	CB	Common B + 13.8 V	CAR UNIT	3	CB
4	9T	+9 V in TX	CAR UNIT	4	9T
5	9T	Stand by	MIC terminal	5	9T
6	9T	+9 V in TX	MODE SW. 3	6	9T
7	TL	On air light B +	SW UNIT	7	TL
8	RG1	RF GAIN control Top	RF GAIN VR	8	RG1
9	8C	RF UNIT	IF UNIT	9	8C
10	8C	HET UNIT	HET UNIT	10	8C
11	8C	MODE SW. 2	MODE SW. 2	11	8C
12	8C	CAR UNIT	CAR UNIT	12	8C
13	-6	-6 V in FX and SSB TX	CAR UNIT	13	-6
14	ALC	ALC	ALC	14	ALC
15	ALC	ALC	ALC	15	ALC
16	E	GND	CAR UNIT	16	E
17	TIF	IF signal for TX	CAR UNIT	17	TIF
18	DO	Drive output to final	RF UNIT B/2	18	DO
19	LT	TX reference signal	HET UNIT	19	LT
IF UNIT (X48-1320-61)					
1	CAR	Carrier	CAR UNIT	1	CAR
2	E	GND	CAR UNIT	2	E
3	-6	-6 V in RX and SSB TX	CAR UNIT	3	-6
4	RG2	RF GAIN CONTROL Arm	RF GAIN	4	RG2
5	AGC	AGC	AGC	5	AGC
6	E	GND	CAR UNIT	6	E
7	TC	Carrier for TX	IF UNIT	7	TC
8	BC	+8 V common	DRIVE UNIT	8	BC
9	SOC	+8 V common in SSB, CW	CAR UNIT	9	SOC
10	SOC	+8 V common in SSB, CW	IF UNIT	10	SOC
11	SOC	+8 V common in SSB	CAR UNIT	11	SOC
12	ALC	ALC	DRIVE UNIT	12	ALC
13	SO	1st IF output in SSB, CW TX	CAR UNIT	13	SO
14	SCR	+8 V in SSB, CW RX	SW UNIT	14	SCR
15	SSM	S-Meter in SSB, CW	S/R meter	15	SSM
16	TC	Carrier for TX	IF UNIT	16	TC
17	E	GND	CAR UNIT	17	E
18	MI	SSB MIC input from carrier unit	CAR UNIT	18	MI
19	SOC	+8 V common in SSB	IF UNIT	19	SOC
20	CCB	+8 V common in CW	MODE SW. 2	20	CCB
21	SCB	+8 V in SSB, CW TX	HET UNIT	21	SCB
22	SCB	+8 V in SSB, CW TX	MIC SW. 3	22	SCB
23	9TS	+9 V in SSB TX	MODE SW. 3	23	9TS
24	A1	AF GAIN CONTROL Top	AF GAIN VR	24	A1
25	E	GND	RF UNIT	25	E
26	BR	+8 V in RX	MODE SW. 4	26	BR
27	BR	+8 V in RX	CAR UNIT	27	BR
28	FMC	+8 V common in FM	MODE SW. 2	28	FMC
29	FMT	Not connected	—	29	FMT
30	SO	+9 V in FM TX	CAR UNIT	30	SO
31	BD	BUSS 112 ¹	SOL VP Arm	31	BD
32	SS	SCAN Stop	SW UNIT	32	SS
33	STS	SIDE TONE SW	CONTROL UNIT	33	STS
34	FSM	FMS Meter	KEY	34	FSM
35	KEY	KEY	S/R meter	35	KEY
36	SCC	+8 V common in SSB, CW	IF UNIT	36	SCC
37	FMR	+8 V in FM RX	MODE SW. 4	37	FMR

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TR-9500 SCHEMATIC ABBREVIATION (W) TYPE

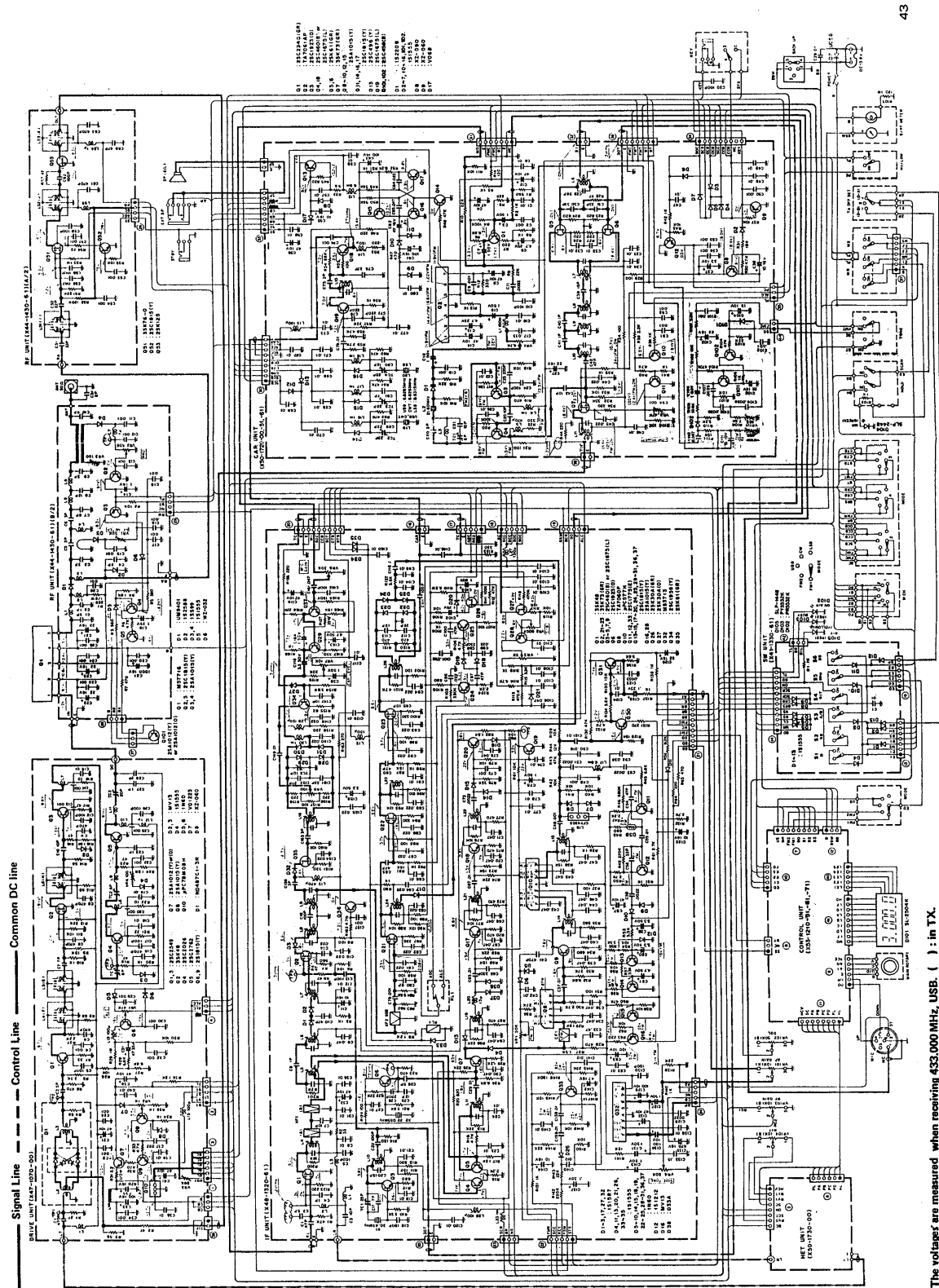
Con- nector No.	Termi- nal No.	Remarks	Destination Unit/Switch	Con- nector No.	Termi- nal No.
②	1	SCR	SW UNIT	③	9
	2	8R	CAR UNIT	④	4
	3	NS	SW UNIT	⑤	5
③	1	AP	EXT. SP	①	3
	2	CB	DRIVE UNIT	②	CB
	3	NC	—		
④	1	A2	AF GAIN VR	②	2
	2	E	CAR UNIT	③	7
	3	30T	30.43 MHz for TX		
⑤	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑥	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑦	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑧	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑨	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑩	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑪	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑫	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑬	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑭	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑮	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑯	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑰	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑱	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑲	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
⑳	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉑	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉒	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
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	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
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	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉕	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉖	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉗	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉘	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉙	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉚	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉛	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉜	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉝	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉞	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㉟	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊱	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊲	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊳	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊴	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊵	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊶	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊷	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊸	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊹	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊺	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊻	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊼	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊽	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊾	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		
㊿	1	30T	30.43 MHz for TX	③	7
	2	E	CAR UNIT	④	30T
	3	30T	30.43 MHz for TX		

Con- nector No.		Termi- nal	Remarks	Destination		
				Unit/Switch	Con- nector No.	Termi- nal
②	1	LE5	5 digit LED pin No. 1	D101 SL2504K		1
	2	LE4	5 digit LED pin No. 2			2
	3	LE3	5 digit LED pin No. 3			3
	4	LE2	5 digit LED pin No. 4			4
	5	LE1	5 digit LED pin No. 5			5
③	1	HO	5 digit LED pin No. 13	D101 SL2504K		13
	2	LG	5 digit LED pin No. 12			12
	3	LF	5 digit LED pin No. 9			9
	4	LA	5 digit LED pin No. 11			10
	5	LB	5 digit LED pin No. 10			11
④	6	LC	5 digit LED pin No. 8			8
	7	LD	5 digit LED pin No. 7			7
	8	LE	5 digit LED pin No. 6			6
	9	MD	5 digit LED pin No. 16			16
SWITCH UNIT (X41-1330-61)						
1	E1		μ-proc. E/output port M	CONTROL UNIT	①	E1
2	E1	MS	Memory scan	TX OFFSET	②	MS
3	B1	B1	μ-proc. B/output port M, MHz, MS	M, CH SW	③	B1
4	B3	B3	μ-proc. B/output port A/B, HOLD	M, CH SW	④	B3
5	B4	B4	HOLD SW	HOLD SW	⑤	B4
6	BH	BH	Repeat SW	TX OFFSET SW	⑥	BH
7	BR	BR	Repeat SW	TX OFFSET SW	⑦	BR
1	B0		μ-proc. B/output port	M, CH SW	⑧	B0
2	MR		Memory read	MR SW	⑨	MR
3	CL		Call	—	⑩	CL
4	BS		Scan	SCAN SW	⑪	BS
5	NS		Noise Blanker SW	IF UNIT	⑫	NS
6	BRS		+8 V in SSB RX	MODE SW, 4	⑬	BRS
7	CRB		+8 V in CW RX	IF UNIT	⑭	CRB
8	SCR		+8 V in SSB, CW RX	IF UNIT	⑮	SCR
9	SCR		RIT ON	HET UNIT	⑯	SCR
10	ND		Busy light	IF UNIT	⑰	ND
11	SD		Busy light	IF UNIT	⑱	SD
12	TL		On air light	DRIVE UNIT	⑲	TL
1	E0		μ-proc. E/output port	CONTROL UNIT	①	E0
2	E0		—	MODE SW, 1	②	E0
3	E3		μ-proc. B/output port	CONTROL UNIT	③	E3
4	E2		μ-proc. B/output port	M, CH SW	④	E2
5	B2		Repeat SW	TX OFFSET SW	⑤	B2
6	BP		Repeat SW	TX OFFSET SW	⑥	BP
1	TL		On air light	D102	⑦	TL
2	BD		Busy light	D103	⑧	BD
3	RIL		RIT light	D105	⑨	RIL
RF UNIT (X44-1430-61) (B/2)						
1	BA		Q101 Base	Q101 BASE		
2	DB		Q101 Collector	Q101 Collector		
3	B		Q101 Emitter	Q101 Emitter		
1	BA		Q101 Base	Q101 BASE		
2	DB		Q101 Collector	Q101 Collector		
3	B		Q101 Emitter	Q101 Emitter		
1	RM		RF METER	S/RF Meter		SSM
2	RC		No. 1000000	CAR UNIT	①	9T
3	PT		+9 V p.p. TX	MR/MS SW	②	PL
4	IN		Low power control	DRIVE UNIT	③	DO
	EN		Drive input	DRIVE UNIT		
	GND		—	—		
1	RA		RF ANT	RF UNIT (A/2)		RA
2	ANT		Antenna	Antenna		
3	B		Switched B + 13.8 V	S/RF meter		B
			POW. SW	POW. SW		

Terminal No.	Remarks	Unit/Switch	Destination Con- nector No.	Termi- nal No.
LE5	5 digit LED pin No. 1	D101 SL2504K	1	1
LE4	5 digit LED pin No. 2		2	2
LE3	5 digit LED pin No. 3		3	3
LE2	5 digit LED pin No. 4		4	4
LE1	5 digit LED pin No. 5		5	5
HD	5 digit LED pin No. 13	D101 SL2504K	13	13
LF	5 digit LED pin No. 12		12	12
LG	5 digit LED pin No. 9		9	9
LA	5 digit LED pin No. 11		11	11
LB	5 digit LED pin No. 10		10	10
LC	5 digit LED pin No. 8		8	8
LE	5 digit LED pin No. 7		7	7
LD	5 digit LED pin No. 6		6	6
MD	5 digit LED pin No. 16		16	16
SWITCH UNIT (X41-1330-61)				
E1	μ-proc. E-output port M	CONTROL UNIT	1	E1
MS	Memory scan	MS SW	2	MS
B1	μ-proc. B-input port M, MHz, MS	M, CH SW	7	B1
B3	μ-proc. B-input port A/B, HOLD	M, CH SW	3	B3
BH	Hold SW	HOLD SW	9	BH
BR	Repeater SW	TX OFFSET SW	2R	BR
BO	μ-proc. B-input port	M, CH SW	4	BO
MR	Memory read	MR SW	4	MR
CL	Call	—		BS
BS	Scan	SCAN SW	3	BS
NS	Noise Blanker SW	IF UNIT	3	NS
BRS	+8 V in SSB RX	MODE SW. 4	4	BRS
CRB	+8 V in CW RX	MODE SW. 4	4	CRB
SCR	+8 V in SSB, CW RX	IF UNIT	4	SCR
SCR	IF UNIT	IF UNIT	4	SCR
ON	RIT ON	HET UNIT	5	ON
BD	Busy light	IF UNIT	10	BD
TL	On air light	DRIVE UNIT	5	TL
EO	μ-proc. E-output port	CONTROL UNIT	1	EO
E3		MODE SW. 1	4	E3
B2	μ-proc. B-input port	CONTROL UNIT	4	B2
BP	Repeater SW	M, CH SW	4	BP
TL	On air light	TX OFFSET SW	4	TL
PD	Busy light	D102		PD
RIL	RIT light	D103		RIL
RF UNIT (X44-1430-61) (B/2)				
BA	Q101 Base	Q101 BASE		
DB	Q101 Collector	Q101 Collector		
B	Q101 Emitter	Q101 Emitter		
BA	Q101 Base	Q101 BASE		
DB	Q101 Collector	Q101 Collector		
B	Q101 Emitter	Q101 Emitter		
RM	RF METER	S/Rf Meter		SSM
NC	Not connected	—		
9T	+8 V in TX	CAR UNIT	1	9T
PL	Low power control	MR/MS SW		PL
IN	Drive input	DRIVE UNIT		DO
E	GND	—		
RA	RF UNIT (A/2)	RF UNIT (A/2)		RA
ANT	Antenna	Antenna		
B	Switched B + 13.8 V	S/Rf meter		B
		POW. SW		B

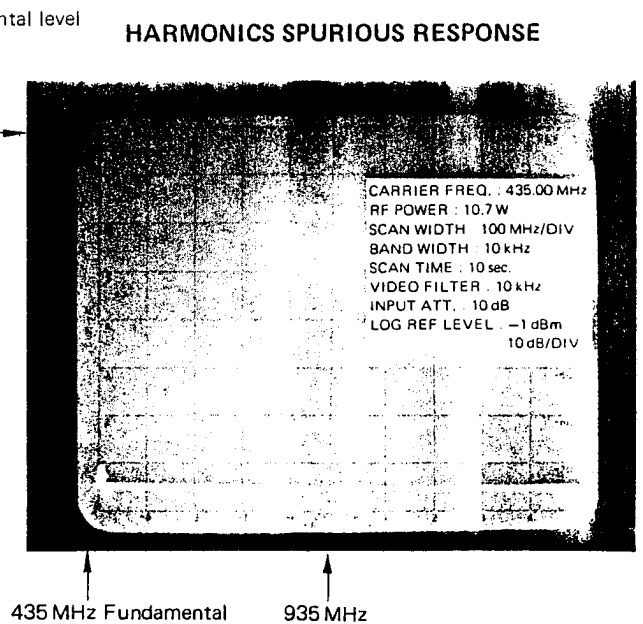
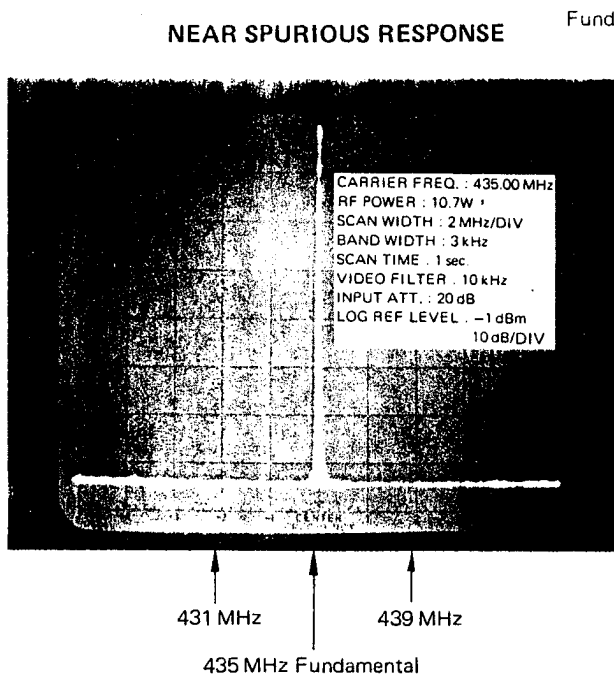
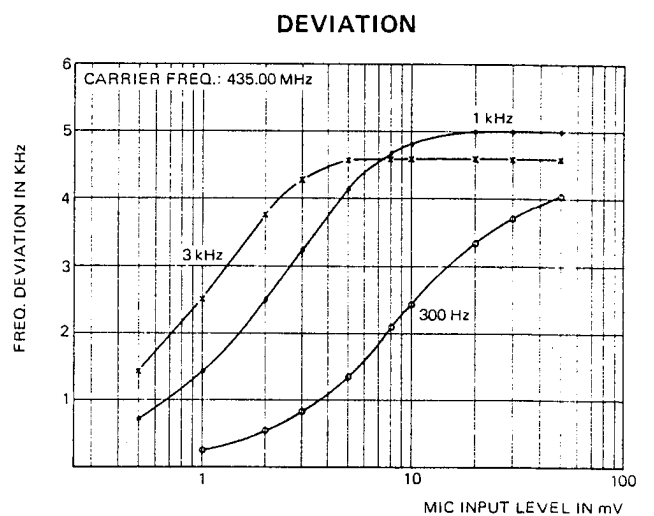
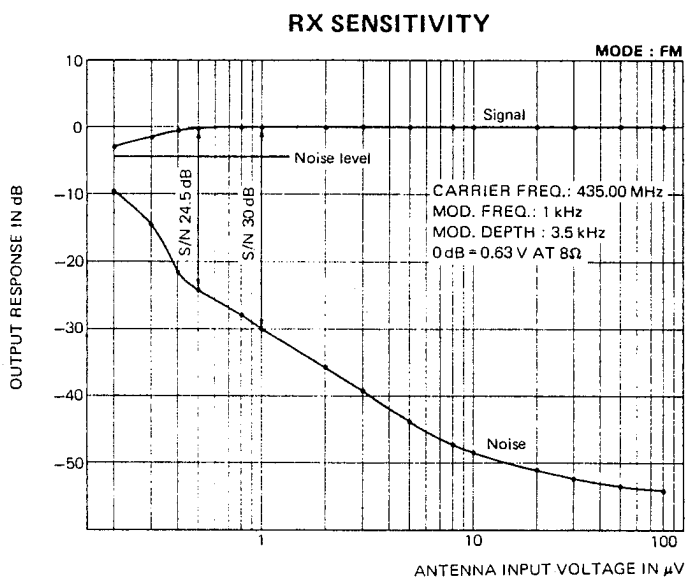
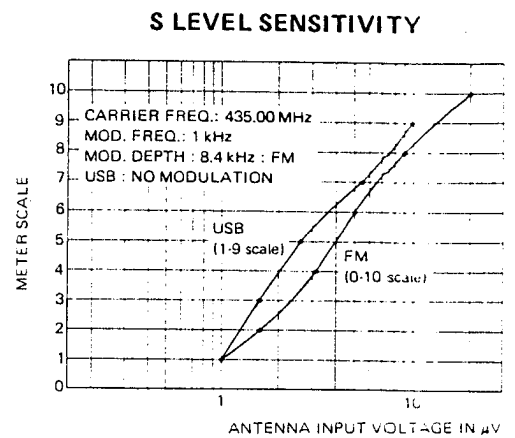
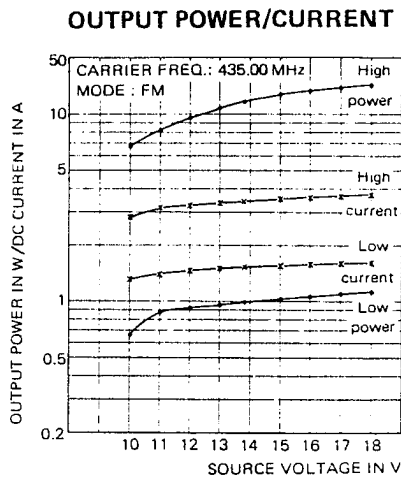
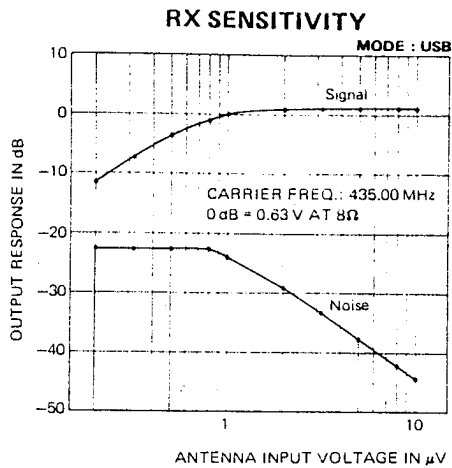
Con- nector No.	Termi- nal No.	Remarks	Unit/Switch	Destination Con- nector No.	Termi- nal No.
RF UNIT (X44-1430-61) (A/2)					
1	8R	+8 V in RX	IF UNIT	1	8R
2	8C	+8 V common	DRIVE UNIT	2	8C
3	AGC	AGC	IF UNIT	3	AGC
4	ST	STAND BY	STBY JACK		
	RA	RF ANT	IF UNIT (B/2)		RA
	OUT	RF AMP OUT	IF UNIT		RI
CAR UNIT (X50-1720-61)					
1	SCB	+8 V common in USB	CAR UNIT	1	SCB
2	SCB	+8 V in CW RX	MODE SW. 2	2	SCB
3	CRB	+8 V in CW TX	MODE SW. 4	3	CRB
4	CTB	+8 V common in LSB	MODE SW. 3	4	CTB
5	CCB	GND	CAR UNIT	5	CCB
6	SCC	+8 V common in SSB, CW	CAR UNIT	6	SCC
7	SCC	Carrier	IF UNIT	7	SCC
8	CCB	Carrier	IF UNIT	8	CCB
9	MC	MIC input	MIC terminal	9	MC
1	MC	GND	DRIVE UNIT	1	MC
2	8C	+8 V common	MODE SW. 2	2	8C
3	FMC	+8 V common in FM	CAR UNIT	3	FMC
4	FMC	GND	IF UNIT	4	FMC
5	MO	MIC Amp output	IF UNIT	5	MO
6	SI	1st IF signal in SSB, CW TX	IF UNIT	6	SI
7	E	GND	IF UNIT	7	E
8	SP	Speaker	EXT. SP JACK	8	SP
1	ST	STAND BY	STBY JACK	1	ST
2	BR	+8 V in RX	IF UNIT	2	BR
3	BR	+8 V in RX	IF UNIT	3	BR
4	CB	Common B + 13.8 V	DRIVE UNIT	4	CB
5	CB	+8 V in RX and SSB TX	IF UNIT	5	CB
6	-6		IF UNIT	6	-6
7	-6		IF UNIT	7	-6
8	SP	Speaker	EXT. SP JACK	8	SP
1	SCB	+8 V common in SSB	IF UNIT	1	SCB
2	SCB	+8 V common in USB	CAR UNIT	2	SCB
3	OCB	+8 V common in LSB	MODE SW. 2	3	OCB
4	OCB	+8 V common in SSB, CW	CAR UNIT	4	OCB
5	SCC	+8 V common in CW	MODE SW. 2	5	SCC
6	CCB	Not connected	KEY	6	CCB
7	CCB	Not connected	KEY	7	CCB
8	NC	KEY	KEY	8	NC
9	KEY	Low Power control	MR/MS SW	9	KEY
1	PL	Power control	DRIVE UNIT	1	PL
2	ALC	Power control	IF UNIT (B/2)	2	ALC
3	PC		IF UNIT (B/2)	3	PC
1	9T	+9 V in TX	DRIVE UNIT	1	9T
2	9T	+9 V in TX	DRIVE UNIT	2	9T
3	FMT	+9 V in FM TX	TONE SW	3	FMT
4	FMT	+9 V in FM TX	IF UNIT	4	FMT
5	FMT	MODE SW. 3	IF UNIT	5	FMT
6	E	GND	IF UNIT	6	E
7	30T	30.43 MHz for TX	IF UNIT	7	30T
1	TIF	TX IF signal	DRIVE UNIT	1	TIF
2	E	GND	DRIVE UNIT	2	E
3	SC	TONE SW	TONE SW	3	SC
4	FMC	CAR UNIT	CAR UNIT	4	FMC
S/Rf METER					
SSM	SSM	S/Rf Meter in SSB, CW	IF UNIT	SSM	SSM
		FM S-meter	IF UNIT (B/2)		FSM
B	B	Switched B + 13.8 V	POW. SW	1	RM
			MR/MS SW	1	B

Con- nector No.	Termi- nal No.	Remarks	Unit/Switch	Destination Con- nector No.	Termi- nal No.
M, CH SW					
M4	M4	Memory channel M4	CONTROL UNIT	2	M4
B0	B0		CONTROL UNIT	2	B0
B0	B0		SW UNIT	2	B0
B1	B1		CONTROL UNIT	2	B1
B1	B1		SW UNIT	2	B1
B2	B2		CONTROL UNIT	2	B2
B2	B2		SW UNIT	2	B2
B3	B3		CONTROL UNIT	2	B3
B3	B3		SW UNIT	2	B3
F0	F0	μ-proc. F-input port	CONTROL UNIT	2	F0
MODE SW. 2					
8C	8C	+8 V common	DRIVE UNIT	3	8C
FMC	FMC	+8 V common in FM	IF UNIT	3	FMC
SCB	SCB	+8 V common in USB	IF UNIT	3	SCB
CCB	CCB	+8 V common in CW	IF UNIT	3	CCB
OCB	OCB	+8 V common in LSB	CAR UNIT	3	OCB
MODE SW. 3					
9T	9T	+9 V in TX	DRIVE UNIT	3	9T
FMT	FMT	+9 V in FM TX	CAR UNIT	3	FMT
9TS	9TS	+9 V in SSB TX	IF UNIT	3	9TS
CTB	CTB	+9 V in CW TX	CAR UNIT	3	CTB
MODE SW. 4					
8R	8R	+8 V in RX	IF UNIT	4	8R
FMR	FMR	+8 V in FM RX	IF UNIT	4	FMR
8RS	8RS	+8 V in SSB RX	SW UNIT	4	8RS
CRB	CRB	+8 V in CW RX	SW UNIT	4	CRB
CRB	CRB	+8 V in CW RX	CAR UNIT	4	CRB
HOLD/SCAN SW					
BH	BH	Hold SW	SW UNIT	4	BH
BS	BS	Scan	SW UNIT	4	BS
E2	E2	μ-proc. E-output port	MR/MS SW	4	E2
MR/MS SW					
1	B	Switched B + 13.8 V	POW. SW		B
2	K	—	HOLD/SCAN SW		B
3	E1	μ-proc. E-output port M	SW UNIT	2	E1
4	MR	Memory read	SW UNIT	2	MR
5	E2	μ-proc. E-output port	CONTROL UNIT	3	E2
6	E2	SCAN SW	SCAN SW	3	E2
7	MS	Memory scan	SW UNIT	3	MS
PL	PL	Low power control	RF UNIT (B/2)	4	PL
PL	PL		CAR UNIT	4	PL
BACK UP TERMINAL					
BBM	BBM	INT. or EXT. Back-up voltage	CONTROL UNIT	2	BBM
KEY					
KEY	KEY	KEY	IF UNIT	3	KEY
STS	STS	SIDE TONE SW	IF UNIT	3	STS
TONE SW					
ST	ST	Stand by	MIC terminal	2	ST
FMT	FMT	+9 V in FM TX	CAR UNIT	3	FMT
SC	SC		CAR UNIT	1	SC
TX OFFSET SW					
2R	2R	Repeater SW	SW UNIT	7	BR
3R	3R	Repeater SW	SW UNIT	6	BP
E1	E1	μ-proc. E-output port	MR/MS SW	2	E1
E1	E1			3	E1



The voltages are measured when receiving 433.000 MHz, USB. () : in TX.

REFERENCE DATA



* The fundamental has been reduced in amplitude by the H.P.F.

SPECIFICATIONS

General

Semiconductors	ICs 12 FETs 17 Transistors 111 (W, T), 109 (X) Diodes 115 (W, T), 114 (X)
Frequency range	430.000.0 to 439.999.9 MHz
Frequency synthesizer	Digital control, phase locked VCO
Mode	SSB (A3J), FM (F3), CW (A1)
Antenna impedance	50 ohms
RPT. Tone Frequency	1,750 Hz
Power requirement	13.8 V DC $\pm$ 15%
Grounding	Negative
Operating temperature	-20°C to +50°C
Current drain	0.7A in receive mode with no input signal 3.8A in transmit mode (Approx.) 2.0 mA for memory back up
Dimensions	170 mm (6-11/16") wide 68 mm (2-11/16") high 241 mm (9-1/2") deep
Weight	2.7 kg (5.94 lbs)

Transmitter Section

RF output power (at 13.8 V DC, 50 Ω load)	10 W
Modulation	FM Variable reactance direct shift SSB Balanced modulation
Frequency tolerance	Less than $\pm 10 \times 10^{-6}$
Spurious radiation	Less than -60 dB
Carrier suppression	Better than 40 dB
Unwanted side band suppression	Better than 40 dB
Maximum frequency deviation (FM)	± 5 kHz
Microphone	Dynamic microphone with PTT switch, 500 Ω

Receiver Section

Circuitry	Double conversion superheterodyne
Intermediate frequency	1st IF 21.6 MHz 2nd IF (FM) 455 kHz, (SSB/CW) 8.83 MHz
Receiver sensitivity	FM Better than 0.5 μ V for 35 dB S/N Better than 0.25 μ V for 12 dB SINAD SSB, CW Better than 0.5 μ V for 20 dB S/N
Receiver selectivity	FM More than 14 kHz (-6 dB) Less than 20 kHz (-60 dB) SSB, CW More than 2.4 kHz (-6 dB) Less than 4.8 kHz (-60 dB)
Spurious interference	Better than 60 dB
Squelch sensitivity	0.2 μ V (Threshold)
Auto scan stop level	Less than 0.2 μ V (Threshold)
Audio output	More than 2.0 watts across 8 ohm load (10% dist.)

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

A product of
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