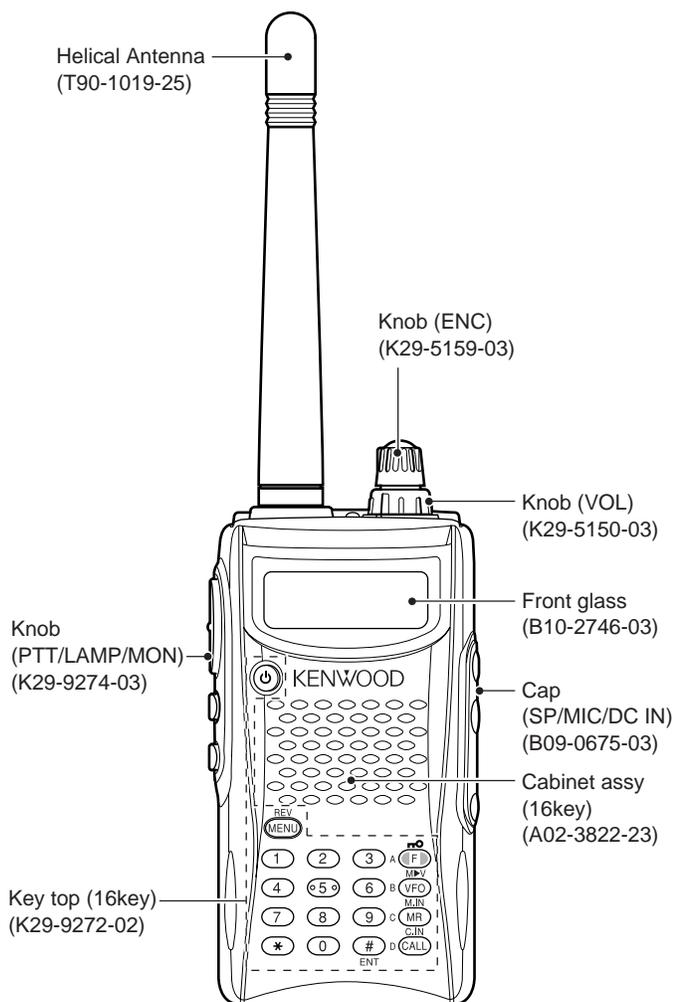
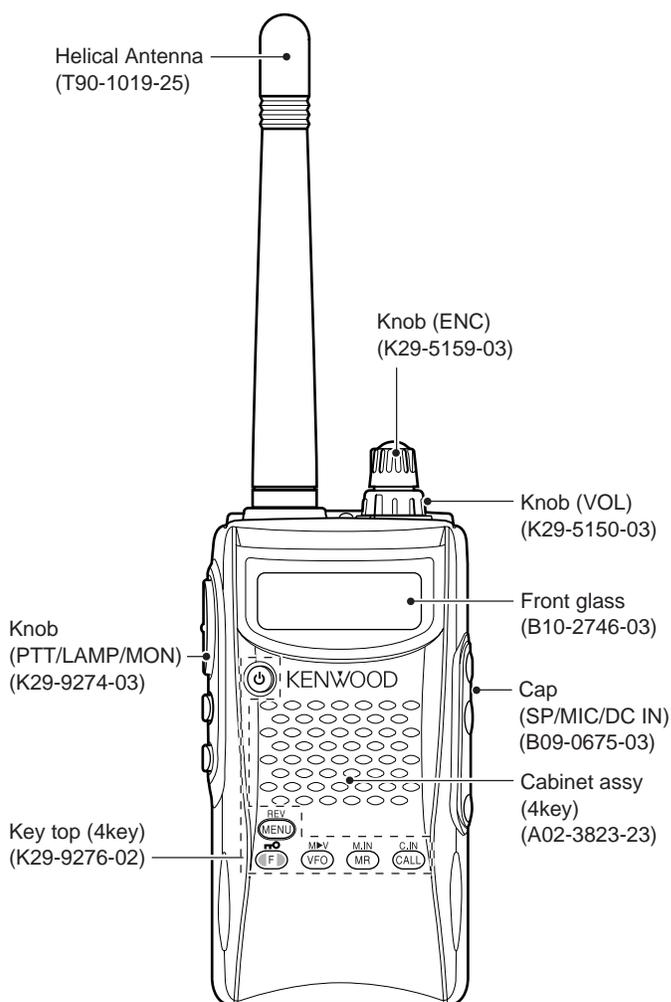


TH-K4AT/K4E

SERVICE MANUAL



TH-K4AT



TH-K4E

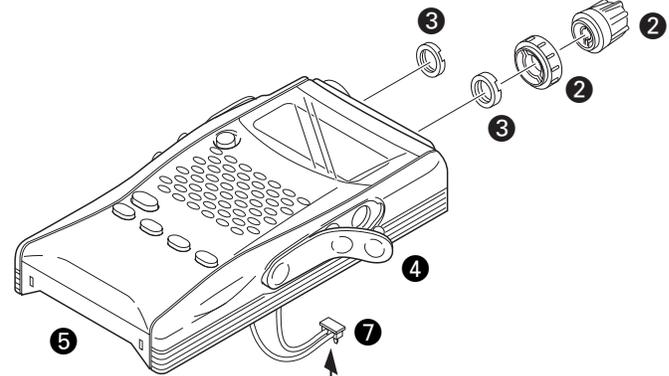
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DISASSEMBLY FOR REPAIR

How to remove the case assembly from the chassis

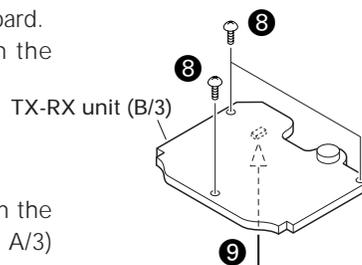
1. Remove two screws (1) holding the chassis.
2. Pull out two knobs (2) and remove two round nuts (3).
3. Pull out the SP and MIC parts of the cap from jacks (4).
4. Turn the unit over with the bottom of the chassis facing upwards, and remove the chassis (6) from the case assembly (5).
5. Remove the speaker lead (7) from the connector (CN2) of the TX-RX PC board (TX-RX unit A/3).



How to remove the PC board

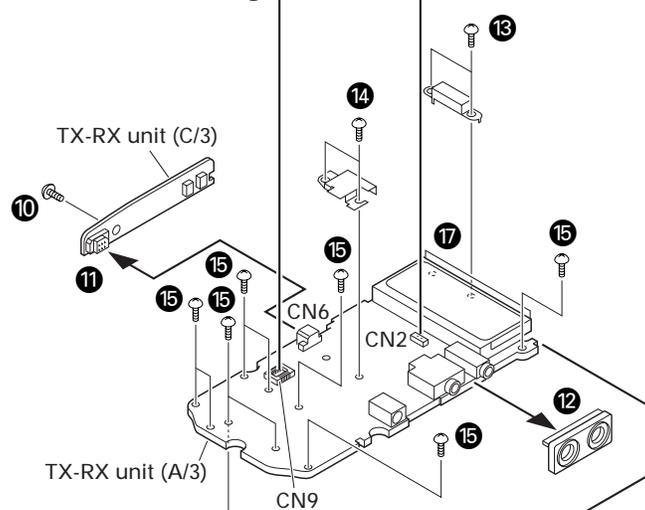
■ Numeric key PC board (TX-RX unit B/3)

1. Remove three screws (8) on the numeric key PC board.
2. Lift the numeric key PC board and remove it from the connector (CN9) of the TX-RX PC board (9).



■ PTT PC board (TX-RX unit C/3)

3. Remove one screw on the PTT PC board (10).
4. Pull the PTT PC board to the left and remove it from the connector (CN6) of the TX-RX PC board (TX-RX unit A/3) (11).

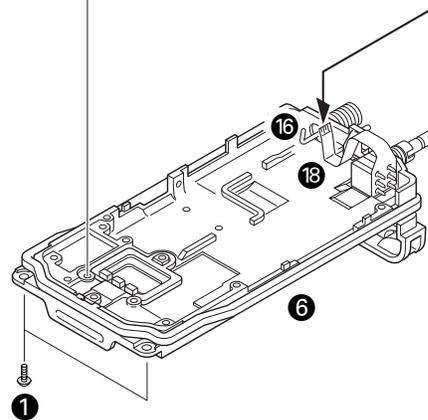


■ TX-RX PC board (TX-RX unit A/3)

5. Remove the SP/MIC jack cover (12).
6. Remove two screws (13) holding the shield cover (antenna terminal section).
7. Remove two screws (14) holding the shield cover (final amplifier section).
8. Remove eight screws (15) on the TX-RX PC board.
9. Absorb solder from the antenna terminal (16) with a solder absorber.

Note: Do not melt the shadow plate (17) when moving the tip of the solder absorber close to the antenna terminal.

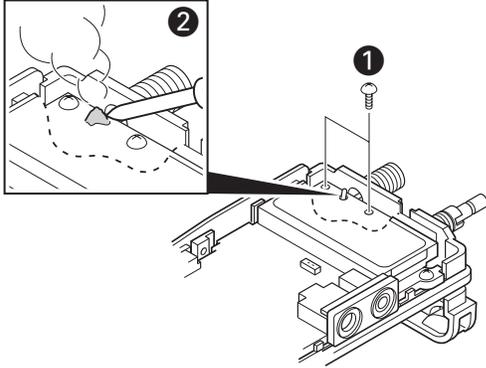
10. Remove the TX-RX PC board from the chassis, then remove the encoder volume FPC (18) from the flat cable connector of the TX-RX PC board.



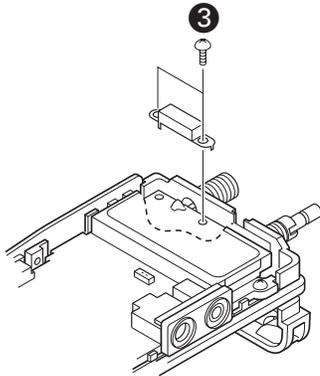
DISASSEMBLY FOR REPAIR

Soldering the antenna terminal

1. With the shield cover removed from the antenna terminal section, install two screws on the PC board and bring the PC board into contact with the chassis (1).
2. Solder the antenna terminal with a soldering iron (2).

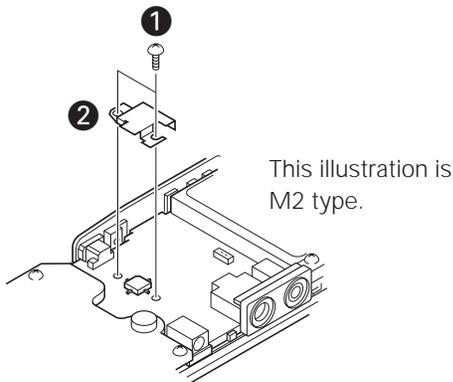


3. Remove the two screws installed in step 1 above, and install the two screws again on the PC board together with the shield cover (3).

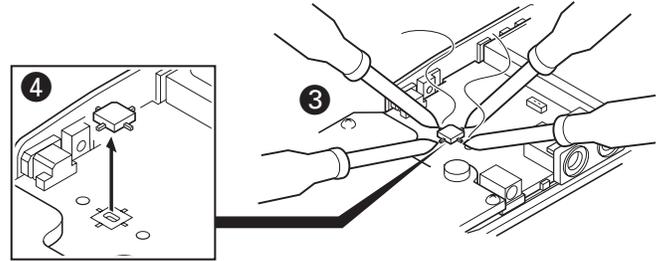


Replacing the final FET (Q12)

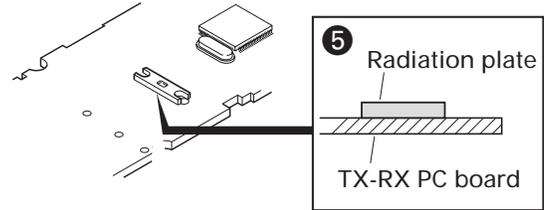
1. Remove the two screws holding the shield cover of the final FET section (1).
2. Remove solder from the shield cover completely with a solder absorber.
3. Remove the shield cover (2).



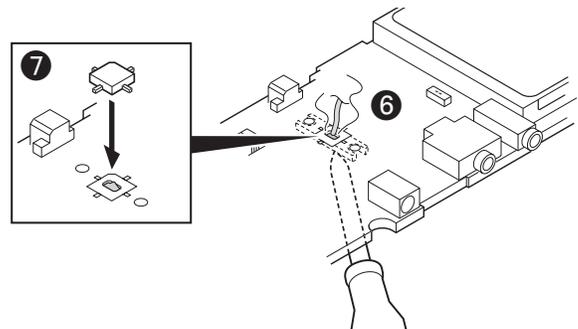
4. Apply the tips of soldering irons to all the four pins of the final FET at the same time (3), heat them sufficiently, and remove the final FET (4). (Two persons should be required to do this.)



5. Remove all PC boards from the chassis.
6. Confirm that there is no space between the radiation plate installed on the foil side of the TX-RX PC board (TX-RX unit A/3) and the PC board (5). If there is any space between the radiation plate and PC board, eliminate it by applying the tip of the soldering iron to the radiation plate.



7. Apply the tip of the soldering iron to the installation side of the radiation plate of the TX-RX PC board, put a little amount of solder to the radiation plate that is seen through a square hole in the final FET installation section and melt the solder (6).
8. When the solder in step 7 is melted, place the final FET on the PC board by aligning it with the silk of the final FET installation section of the PC board (7).



9. Release the soldering iron and confirm that the final FET and radiation plate have been soldered.
10. Solder the four pins of the final FET with the soldering iron.
11. Install all the PC boards.
12. Reinstall the shield cover removed in step 3 above in its original position and install two screws.
13. Solder the shield cover to the PC board.
14. Install the chassis on the case assembly and assemble them.
15. Readjust transmission power.

Note: Since the FET is sensitive to static electricity, always wear a grounding band. Use a highly insulated ceramic heater solder iron.

DISASSEMBLY FOR REPAIR

Special care and attention required for assembly

1. Gluing to the key top (MIC element section)

You must also glue on the speaker storage area and heap the glue up until weathy glued on the speaker storage area and the key top for waterproofing the MIC element side of the key top. (Fig. 1)

Heap the glue up until weathy glued on the speaker storage area and the key top (MIC element section).

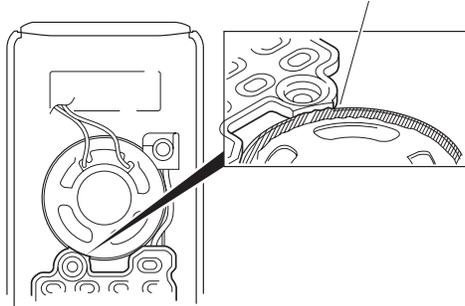


Fig. 1

2. Bending the LCD hardware fixture (J21-8456-03) tabs

(1) Insert the tabs of the LCD hardware fixture into four holes in the LCD installing position of the TX-RX PCB (TX-RX unit A/3). (Fig. 2)

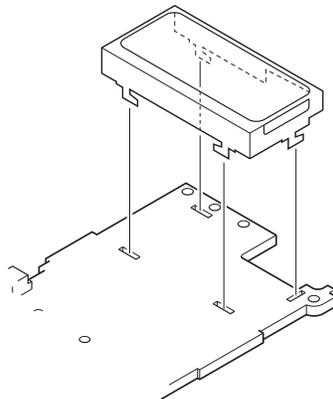


Fig. 2

(2) By pressing the LCD hardware fixture from the component side of the TX-RX PCB, you must bent all 4 tabs of the LCD hardware fixture being visible from the foil side until the bases of each tabs are folded at least 45 degrees (Fig. 3). If the bending angle of the tabs of the LCD hardware fixture is less than 45 degrees, a display error may occur.

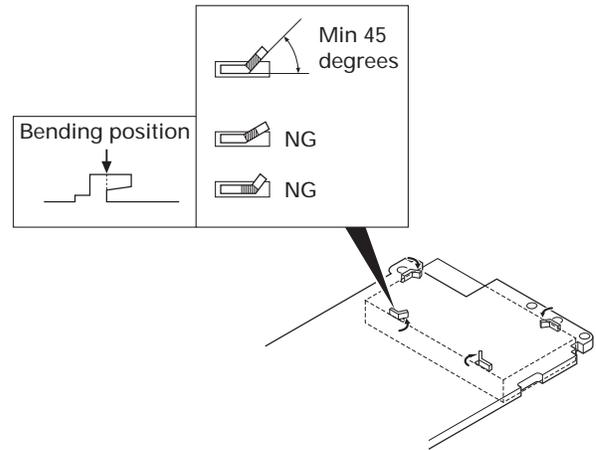


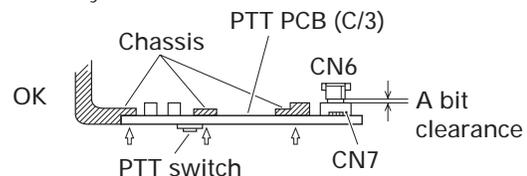
Fig. 3

3. PTT PCB (TX-RX unit C/3) installation procedure

Installing the PTT PCB on the TX-RX PCB and chassis are as follows:

- (1) Insert the PTT PCB connector (CN7) into the TX-RX PCB connector (CN6) lightly.
- (2) Push three parts of the PTT PCB to contact tightly with the chassis. There may be a small gap between the connectors. (Fig. 4)

Note: A double-side adhesive tape (J99-0376-04) is used behind the PTT switch. When reassembling the PTT PCB to the chassis, press the PTT PCB (under the PTT switch) so that the tape hold the PCB and chassis securely.



Push three parts of the PTT PCB to contact tightly with the chassis.

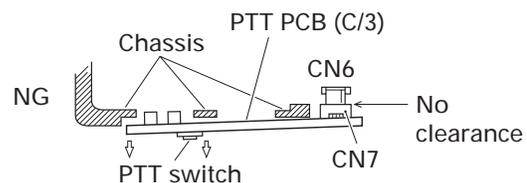


Fig. 4

(3) Tighten one screw in the PTT PCB.

DISASSEMBLY FOR REPAIR

4. Packing (G53-1572-02) TX/BUSY lamp installation procedure

- (1) To assure waterproofing, install the packing in the chassis groove as shown in Fig. 5. ❶
- (2) Install the packing TX/BUSY lamp section on the chassis. ❷

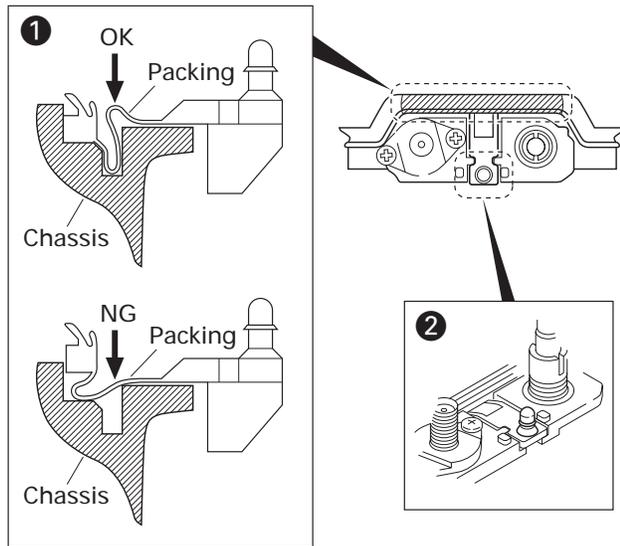
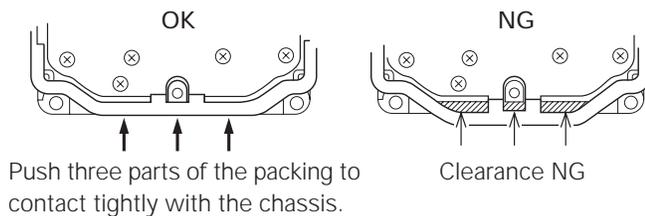


Fig. 5

5. Packing (G53-1572-02) bottom installation procedure

- (1) Before installing the numeric key PCB (TX-RX unit B/3) on the chassis, push three parts of the packing to contact tightly with the chassis as shown in Fig. 6. If the packing is not in contact with the chassis, there may be a gap between the transceiver bottom case assembly and the battery, and water may enter through the gap.

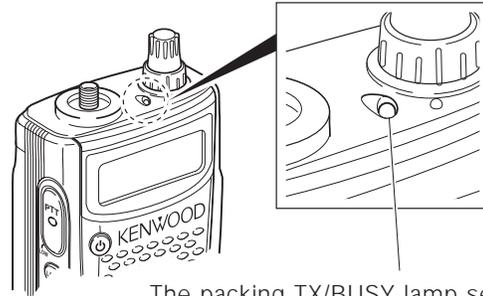


Push three parts of the packing to contact tightly with the chassis.

Fig. 6

6. Cautions for installing the chassis on the case assembly

- (1) Verify that the packing (G53-1572-02) TX/BUSY lamp section is has been past through the hole in the illumination guide section on the top of the case assembly. (Fig. 7)



The packing TX/BUSY lamp section is has been past through the hole in the illumination guide section on the top of the case assembly.

Fig. 7

- (2) Align the speaker lead as shown fig.8. Do not place the leads over the key top section, LCD section or SP/MIC/DC IN cap section.

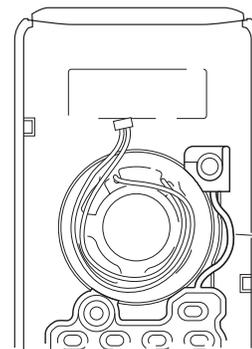


Fig. 8

7. Cautions for installing the key top on the case assembly

- (1) Install the key top keypad section and the power switch section on the rib of the case assembly.
- (2) Do not fix the part between the key top keypad section and the power switch section to the rib of the case assembly, but install it as shown in Fig. 8.

CIRCUIT DESCRIPTION

Transmitter System

Microphone Amplifier Circuit

The audio signal from the microphone passes through a high-pass filter (IC5) and enters a microphone amplifier (IC16).

The signal passes through a pre-emphasis circuit, limiter amplifier and splatter filter inside the microphone amplifier. The splatter filter will remove distortion outside the audio band.

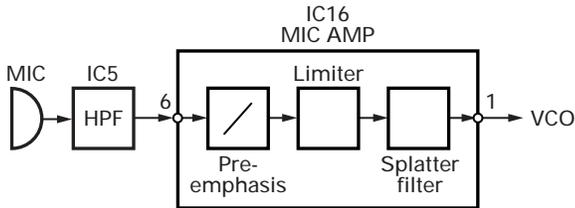


Fig. 5 Microphone amplifier circuit

Modulation Circuit

The audio signal amplified by the microphone amplifier (IC16) passes through a semi-fixed volume (VR5) for modulation adjustment, and goes to the VCO modulation varicap (D6) for variable reactance phase modulation.

Drive and Final Circuit

The output signal from VCO (Q1) passes through an RF amplifier (Q2, Q5, Q9) and drive amplifier (Q10, Q11), and is amplified by a power amplifier (Q12).

Transmission/Reception Switching Circuit

The signal amplified by the power amplifier (Q12) passes through a transmission/reception switching circuit and a low-pass filter, and is fed to the antenna.

The transmission/reception switching circuit consists of D10, D11, L19, D12 and D13. These diodes are turned ON in transmit mode and OFF in receive mode to switch signals.

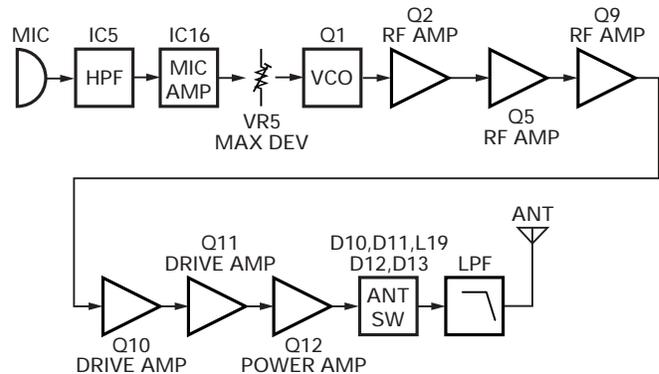


Fig. 6 Modulation, Drive, Final and Transmission/reception switching circuit

APC Circuit

The APC (Automatic Power Control) circuit is used to obtain a stable transmission power and controls transmission output by detecting the drain current of Q11 and Q12.

The transmission output can be changed in three levels: High, Mid, and Low.

The reference voltage is output from the BPF/APC terminal (pin 6) of the MPU (IC8) and the detection voltage generated by R70, R71 and R72 are fed to the APC differential amplifier (IC2).

The voltage in proportion to the difference between reference voltage and detection voltage is output from the BOUT terminal (pin 7) of IC2 as an APC voltage.

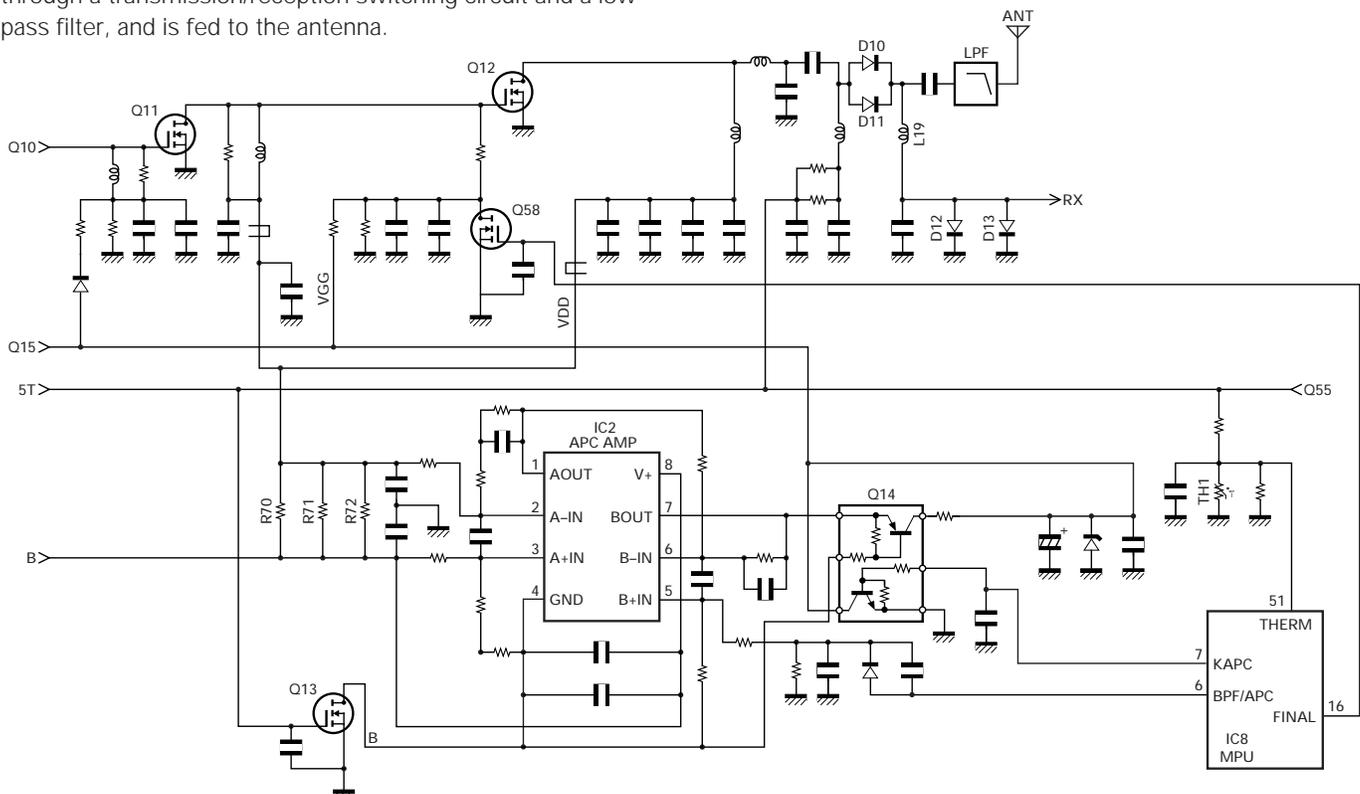


Fig. 7 APC and Temperature protection circuit

CIRCUIT DESCRIPTION

The APC voltage controls the gate voltage of Q11 and Q12, and keeps transmission output stable.

The MPU detects power supply voltage and controls Q58 by transmission power supply voltage and transmission power. For example, if the power supply voltage during transmission, is equal to or higher than approx. 10.5 V and if power is at Mid or Low level, the APC voltage level applied to Q12 is reduced by Q58.

Temperature Protection Circuit

To prevent thermal destruction of the power amplifier (Q12), this circuit reduces APC voltage when Q12 temperature rises.

The MPU (IC8) detects temperature with a thermistor (TH1) and controls reference voltage to the APC circuit.

PLL System

PLL Circuit

A reference frequency of 5 kHz or 6.25 kHz is produced by dividing the 12.8 MHz reference frequency of the TCXO (X1) with PLL IC (IC1). Comparison frequency is produced by

amplifying VCO output with an RF amplifier (Q6) and dividing it with the PLL IC.

The PLL synthesizer with 5 kHz and 6.25 kHz step is configured by comparing phases of the reference frequency and comparison frequency.

The phase difference between reference frequency and comparison frequency passes through a charge pump in the PLL IC, then ripples are removed with a loop filter with low-range passing characteristics to produce VCO control voltage (lock voltage).

VCO Circuit

The VCO produces a desired frequency directly with a Colpits oscillation circuit containing an oscillation transistor (Q1) used for both transmission and reception.

The VCO control voltage is applied to varicap (D1, D2, D3, D4) to produce a desired frequency.

The SHIFT terminal (pin 113) of the MPU (IC8) goes "H" during transmission, and the shift control switch (Q3) is turned ON to change oscillation frequency.

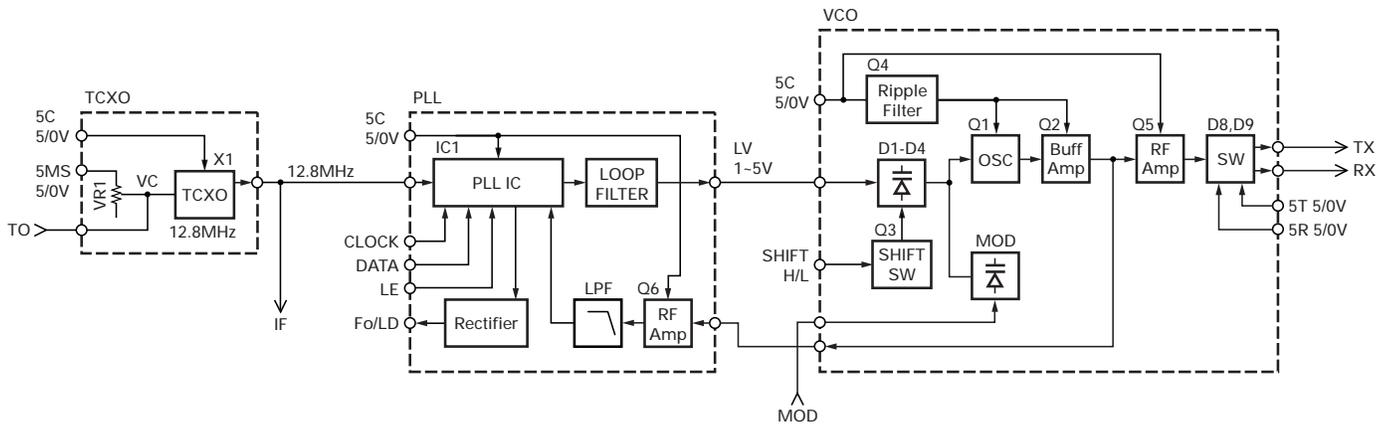


Fig. 8 PLL and VCO circuit

Unlock Detection Circuit

When the PLL is unlocked, the waveform of the pulse output from the Fo/LD terminal (pin 14) of the PLL IC (IC1) is rectified with R32, D16, R35 and C40, and the Fo/LD terminal is made "L" level. The voltage at the Fo/LD terminal is detected by the MPU to control transmission/reception switching timing.

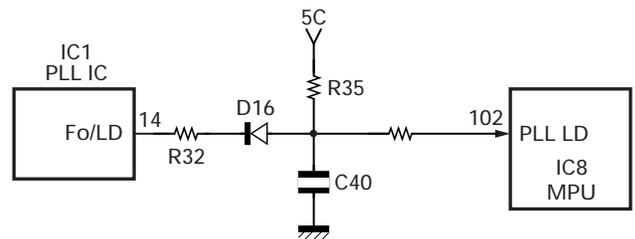


Fig. 9 Unlock detection circuit

CIRCUIT DESCRIPTION

Power Supply Circuit

■ Charging Circuit

When an external power supply is connected to the DC IN terminal, the constant-current circuit consisting of Q33 and D31 provides a constant current of approx. 110 mA to the Ni-MH battery.

If no external power supply is connected to the DC IN terminal, the constant-current circuit does not function.

■ Power Supply Switching Circuit

The voltage supplied through the battery terminal or DC IN terminal is branched in the power supply switching circuit as shown in Fig.10 and then supplied to the required components.

■ Battery Type Recognition Circuit

When the battery pack is attached to the transceiver, the battery type is recognized with the T terminal on the transceiver. This battery type recognition activates charging for the Ni-MH battery pack and displaying the battery meter.

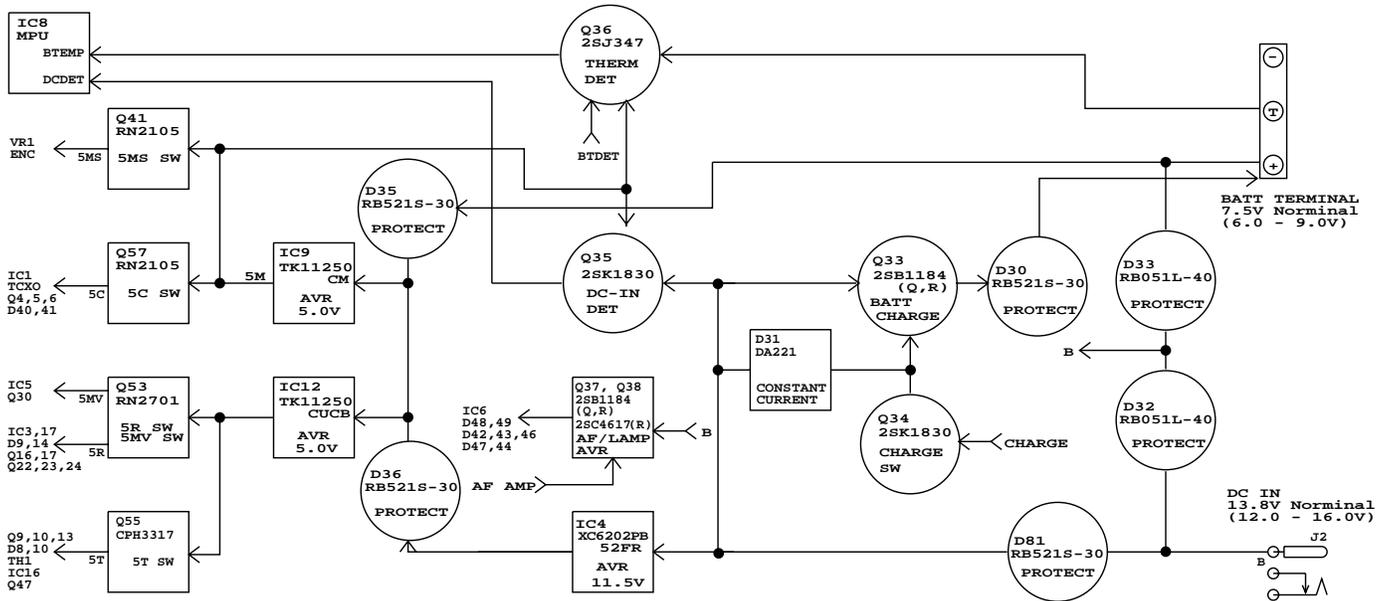


Fig. 10 Charging and Power supply switching circuit

Control System

■ Reset and Backup Circuit

When power is supplied to the transceiver, the 5M voltage goes "H" as C303 is charged.

A rising edge of the 5M voltage is detected by the voltage detection IC (IC10), the MPU detects it by an interrupt processing, backs up data in EEPROM (IC15) and turns the power off.

If the supplied voltage to the transceiver is reduced and the 5M voltage falls below the detection voltage of the voltage detection IC (IC10), the MPU detects it by an interrupt processing, backs up data in EEPROM (IC15) and turns the power off.

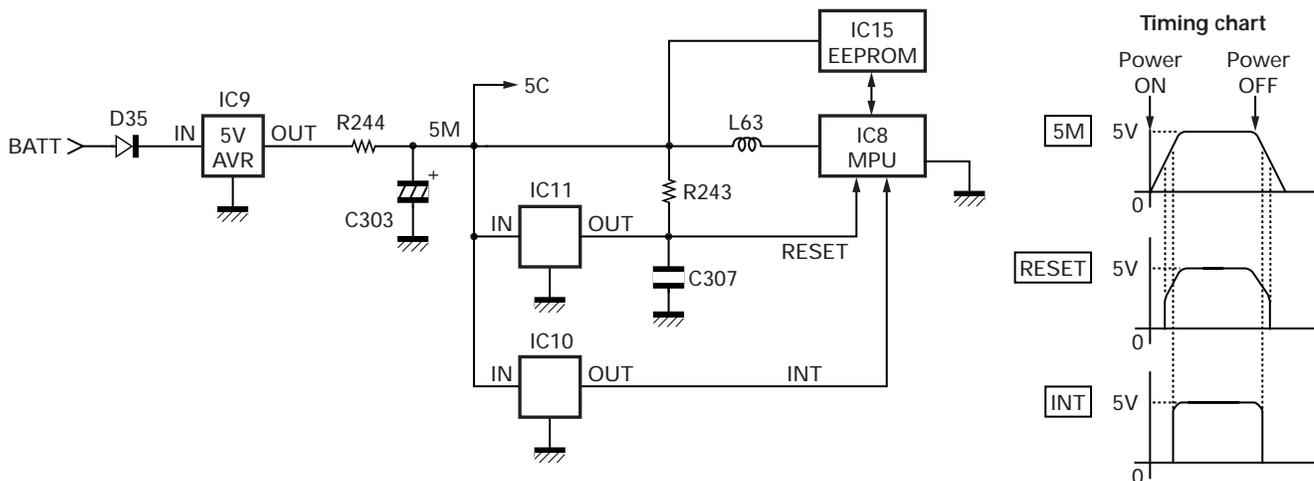


Fig. 11 Reset and Backup circuit

CIRCUIT DESCRIPTION

■ Voltage Detection Circuit

Various voltages are input to the A/D port of the MPU (IC8) for processing.

Battery voltage is divided with resistors (R240, R241) and enters the BATT terminal (pin 52) of the MPU.

Battery voltage is used for battery meter indication during transmission or for alert tone processing when an abnormal power supply voltage (approx. 16.5 V or higher) is applied.

Squelch voltage becomes DC voltage by detecting changes in noise voltage in the FM IC (IC3), and the signal is used for squelch control.

The S meter voltage is output from the RSSI pin of the FM IC to control S meter display.

Detection of thermistor voltage (temperature) in the Ni-MH battery during charging, detection of remote microphone key pressing and VOX voltage monitoring are performed through each A/D port of the MPU.

■ Battery Save Circuit

If there is no signal (squelch off, scan off or no key operation) for longer than 10 seconds, the transceiver will enter the battery save mode.

Battery save operation is performed by controlling Q57 with an output signal from the 5C (SAVE) terminal (pin 15) of the MPU.

The 5C ON/OFF cycle ratio during battery saving can be set from a transceiver menu.

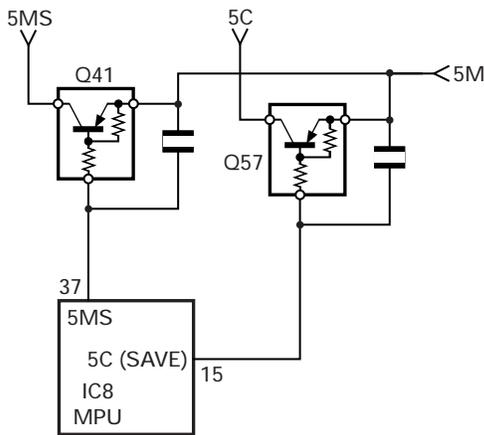


Fig. 12 Battery save circuit

■ LED Drive Circuit

The LCD and key illumination LEDs are lighted by controlling Q51 for the LCD and Q50 for keys according to the output voltage from the AF/LAMP AVR (Q37).

The BUSY and TX illumination LEDs are lighted by controlling Q47.

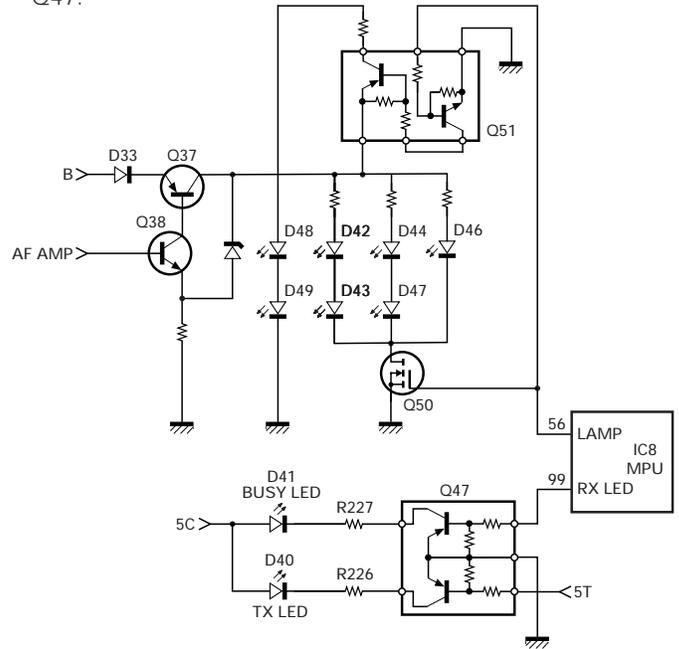


Fig. 13 LED drive circuit

CIRCUIT DESCRIPTION

■ Key and Encoder Input Circuit

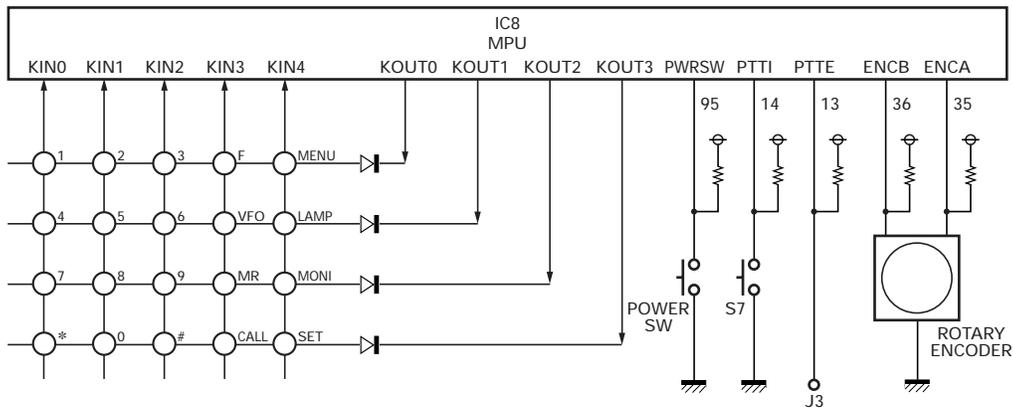
The POWER key is assigned to the interrupt port (pin 95) of the MPU.

The PTT key is assigned to the dedicated port (pins 13, 14) of the MPU.

Other keys composes a matrix and key presses are detected by scanning them by software.

The encoder reads data using the interrupt port (pins 35 and 36) of the MPU.

16 key (M2 type)



4 key (E type)

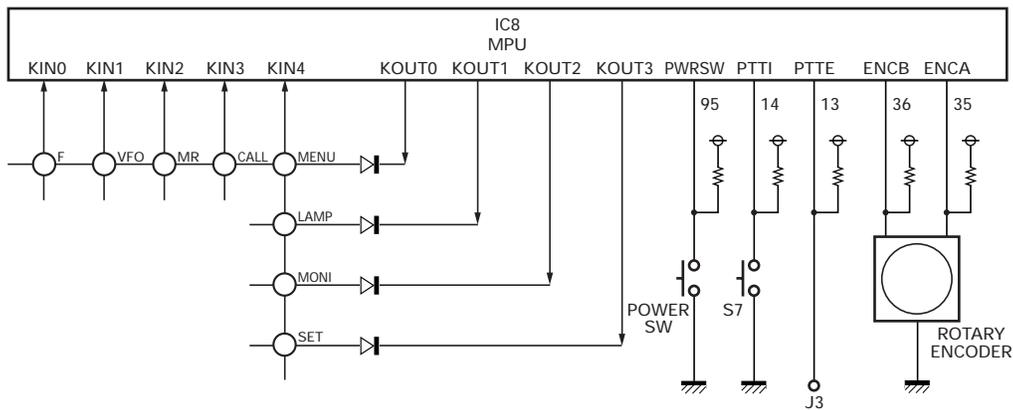


Fig. 14 Key and Encoder input circuit

CIRCUIT DESCRIPTION

■ CTCSS/DCS

The encode signal is generated by the MPU (IC8) and output from the TONE terminal (pin 41) of the MPU.

The unwanted high-frequency components of the encode signal output from the MPU are removed with a low-pass filter, and applied to VCO modulation input (MOD) and TCXO VC terminal for modulation.

The VCO and TCXO modulation levels are adjusted by VR6 to produce flat modulation characteristics in low and high ranges.

The decode signal is input to the SIGIN pin (pin 47) of the MPU after the waveform of the audio signal from the FM IC is rectified with a CTCSS/DCS filter (IC17). Then the set CTCSS tone frequency and DCS code are detected by digital signal processing in the MPU to control muting.

■ DTMF

The DTMF signal is generated by the MPU (IC8) and is output from the DTMF/BEEP terminal (pin 40) of the MPU.

The DTMF signal is mixed with an audio signal at the input side of the AF amplifier (IC6), and is output as a monitor tone.

The DTMF signal is mixed with a modulation signal at the input side of pre-emphasis in the microphone amplifier (IC16) and used as a transmit signal.

■ VOX

The IC5 and Q30 amplify the audio signal captured in the microphone, and then the signal is converted into the DC Voltage D24 rectifies.

The DC voltage activates the MPU (IC8), and the VOX starts.

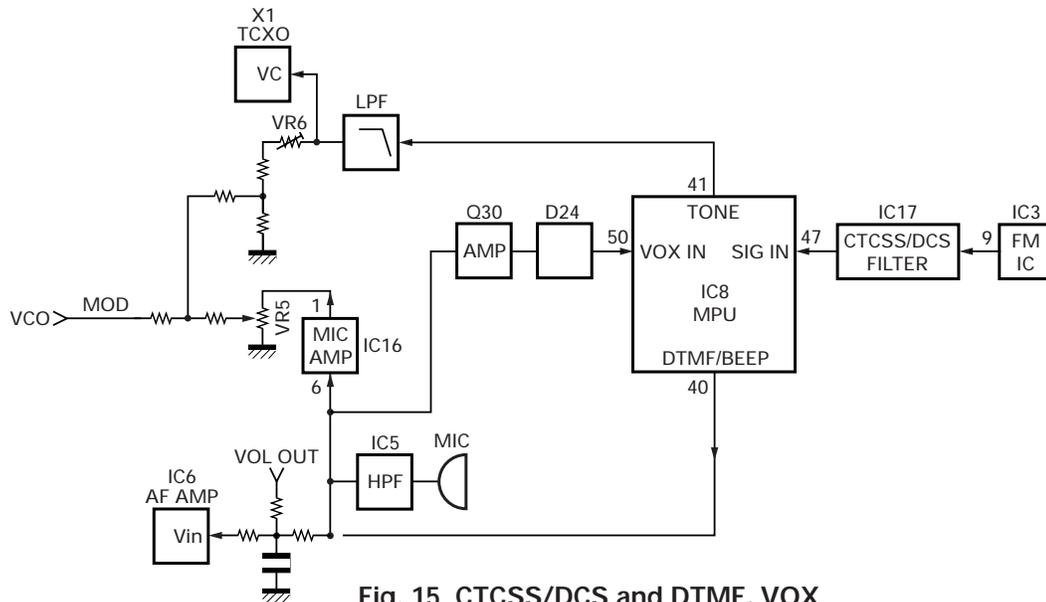


Fig. 15 CTCSS/DCS and DTMF, VOX

■ Serial Control

Serial control must be enabled from a transceiver menu so that the REM/TXD pin of the speaker jack (J4) and the PTT (RXD) pin of the microphone jack (J3) function as TXD and RXD, respectively, when communicating with a personal computer.

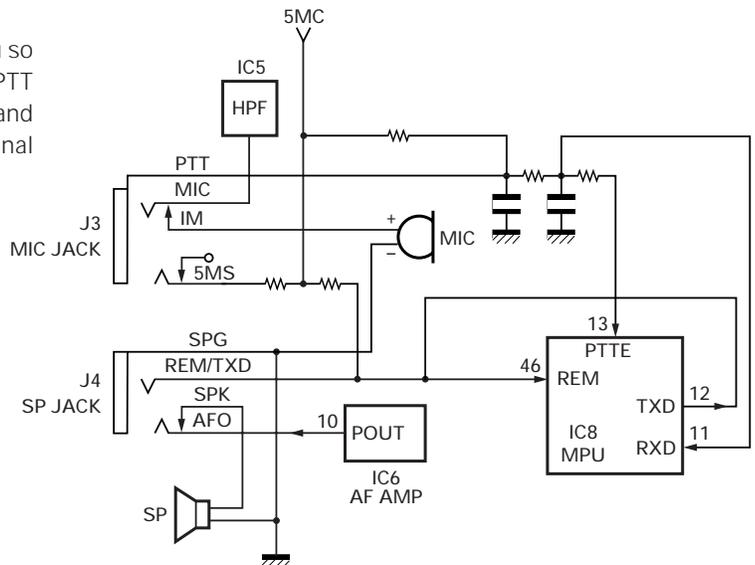


Fig. 16 Serial control

SEMICONDUCTOR DATA

MPU : 90522BPFFG139 (IC8)

■ Pin function

Pin No.	Pin Name	I/O	Function
1	CLOCK	O	Common serial clock output
2	DATA	O	Common serial data output
3	EEPDI	I	Data input from EEPROM
4	EEPCS	O	Chip select output to EEPROM
5	VOX	O	VOX power supply switch L:ON
6	BPF/APC	O	BPF tuning voltage output, APC voltage output (PWM)
7	KAPC	O	APC ON/OFF switch L:APC ON
8	VCC	-	Positive power supply
9	AFM	O	AF mute switch L:Mute
10	SPM	O	Speaker mute switch H:Mute
11	RXD	I	UART data input line from PC (9600bps)
12	TXD	O	UART data output line to PC (9600bps)
13	PTTE	I	External [PTT] key input L:ON
14	PTTI	I	[PTT] key input L:ON
15	5C(SAVE)	O	Save power supply switch L:ON
16	FINAL	O	Gate bias control of TX final amplifier L:Bias ON
17	SEG0	O	LCD segment output 0
18	SEG1	O	LCD segment output 1
19	SEG2	O	LCD segment output 2
20	SEG3	O	LCD segment output 3
21	SEG4	O	LCD segment output 4
22	SEG5	O	LCD segment output 5
23	SEG6	O	LCD segment output 6
24	SEG7	O	LCD segment output 7
25	SEG8	O	LCD segment output 8
26	SEG9	O	LCD segment output 9
27	SEG10	O	LCD segment output 10
28	SEG11	O	LCD segment output 11
29	SEG12	O	LCD segment output 12
30	SEG13	O	LCD segment output 13
31	SEG14	O	LCD segment output 14
32	SEG15	O	LCD segment output 15
33	VSS	-	GND
34	COR1	-	Power supply stabilization (Connected to VSS through 0.1uF)
35	ENCA	I	Encoder A side input
36	ENCB	I	Encoder B side input
37	5MS	O	5MS main power supply switch L:ON
38	DVCC	-	Reference voltage input for DAC
39	DVSS	-	Ground for DAC
40	DTMF/BEEP	O	Encode waveform output of DTMF/BEEP/1750Hz (D/A)
41	TONE	O	Encode waveform output of CTCSS/DCS (D/A)
42	AVCC	-	Positive power supply for ADC
43	AVRH	-	Reference voltage input for ADC
44	AVRL	-	Ground reference voltage input for ADC
45	AVSS	-	Ground for ADC
46	REM	I	Remote control microphone key voltage input (A/D)
47	SIGIN	I	Decode waveform input of CTCSS/DCS (A/D)

Pin No.	Pin Name	I/O	Function
48	SQ	I	Noise voltage input for squelch (A/D)
49	SM	I	RSSI voltage input for S-meter (A/D)
50	VOXIN	I	Microphone voltage input for VOX (A/D)
51	THERM	I	TX temperature compensation input(A/D)
52	BATT	I	Battery voltage input (A/D)
53	BTEMP	I	Detection of thermistor voltage (temperature) in the Ni-MH battery (A/D)
54	VCC	-	Positive power supply
55	CHARGE	O	Battery charge circuit power supply switch H:ON
56	LAMP	O	Lamp power supply switch H:ON
57	AFAMP	O	AF amplifier/Lamp AVR power supply switch H:ON
58	NAR	O	Wide/Narrow switching H:Narrow
59	COM0	O	LCD common output 0
60	COM1	O	LCD common output 1
61	COM2	O	LCD common output 2
62	COM3	O	LCD common output 3
63	VSS	-	GND
64	SEG16	O	LCD segment output 16
65	SEG17	O	LCD segment output 17
66	SEG18	O	LCD segment output 18
67	SEG19	O	LCD segment output 19
68	SEG20	O	LCD segment output 20
69	SEG21	O	LCD segment output 21
70	SEG22	O	LCD segment output 22
71	SEG23	O	LCD segment output 23
72	SEG24	O	LCD segment output 24
73	NC	-	Not used
74	NC	-	Not used
75	SEG25	O	LCD segment output 25
76	SEG26	O	LCD segment output 26
77	SEG27	O	LCD segment output 27
78	SEG28	O	LCD segment output 28
79	SEG29	O	LCD segment output 29
80	SEG30	O	LCD segment output 30
81	SEG31	O	LCD segment output 31
82	V0	-	Not used
83	V1	-	Not used
84	V2	-	Not used
85	V3	-	LCD drive power supply 3
86	HST(VCC)	I	Not used (VCC)
87	MD2	I	"L" fixed
88	MD1	I	"H" fixed
89	MD0	I	"H" fixed
90	RESET	I	Reset input L:Reset
91	VSS	-	GND
92	X0	I	System clock (7.9872MHz)
93	X1	O	System clock (7.9872MHz)
94	VCC	-	Positive power supply
95	PWRSW	I	Power switch interrupt input (↓)
96	INTUP	I	Power supply voltage interrupt input (↑)
97	INTDW	I	Power supply voltage interrupt input (↓)

SEMICONDUCTOR DATA / COMPONENTS DESCRIPTION

Pin No.	Pin Name	I/O	Function
98	DCDET	I	DC IN detection interrupt input (↓) L:DC IN connected
99	RXLED	O	Busy LED output H:ON
100	BSFT	O	Beat shift switching output H:ON
101	PLLEN	O	Serial enable output to PLL IC
102	PLLLD	I	Lock detection input from PLL IC H: Lock
103	KIN0	I	Key matrix input 0
104	KIN1	I	Key matrix input 1
105	KIN2	I	Key matrix input 2
106	KIN3	I	Key matrix input 3
107	KIN4	I	Key matrix input 4
108	TYPE	I	Market code bit input
109	VUKEY	I	Detection of VHF or UHF, 4 key or 16 key
110	MICM	O	Microphone mute switch H:Mute
111	NOAA	I	Not used
112	5R	O	RX power supply switch L:ON
113	SHIFT	O	VCO shift switch L:RX, H:TX
114	5T	O	TX power supply switch L:ON
115	KOUT0	O	Key matrix output 0
116	KOUT1	O	Key matrix output 1
117	KOUT2	O	Key matrix output 2
118	KOUT3	O	Key matrix output 3
119	VSS	-	GND
120	BTDET	O	Battery detection switch L:ON

COMPONENTS DESCRIPTION

TX-RX UNIT (X57-675X-XX)

Ref. No.	Use/Function	Operation/Condition/Compatibility
IC1	PLL IC	
IC2	APC differential amplifier	
IC3	FM IC	
IC4	11.5V AVR	
IC5	HPF	Active filter
IC6	AF amplifier	
IC8	MPU	
IC9	5.0V AVR	
IC10	4.4V voltage detection	MPU INT voltage detection
IC11	3.3V voltage detection	MPU Reset voltage detection
IC12	5.0V AVR	
IC15	EE PROM	
IC16	MIC amplifier	Limiter, splatter filter
IC17	CTCSS/DCS filter	Active filter
Q1	VCO	
Q2	RF amplifier	
Q3	VCO shift control switch	On TX
Q4	Ripple filter	
Q5,6,9	RF amplifier	
Q10,11	Drive amplifier	
Q12	Power amplifier	
Q13	APC circuit operation switch	On TX
Q14	APC output switch	On TX
Q15	Q10 operation switch	On TX
Q16	1st mixer	
Q17	RX 1st amplifier	
Q20	Audio mute switch	Audio mute when off
Q21	Audio filter	Active filter
Q22	Wide/narrow switching	On when wide is selected
Q23	Tripler	2nd local
Q24	IF amplifier	1st IF 38.85MHz
Q27	Wide/narrow switching	On when wide is selected
Q29	MIC mute switch	Mutes when ON
Q30	VOX detection amplifier	
Q31	Q56 operation switch	Off when the speaker outputs audio
Q33	Charge switch	

COMPONENTS DESCRIPTION

Ref. No.	Use/Function	Operation/Condition/Compatibility
Q34	Q33 operation switch	On when charging
Q35	DC IN detection	H: DC IN detection
Q36	Ni-MH temperature detection	On when temperature detection is activated
Q37	AF amplifier/ Lamp AVR	
Q38	Q37 operation switch	On when the speaker outputs the audio or lamp lights
Q41	5MS switch	On when 5MS is applied
Q47	TX/BUSY LED switch	
Q50	Key LED switch	On when the key LED lights
Q51	LCD LED switch	On when the LCD LED lights
Q52	Beat shift switch	
Q53	5R/5MV switch	On when 5R or 5MV is applied
Q55	5T switch	On when 5T is applied
Q56	Speaker mute switch	
Q57	5C switch	On when 5C is applied
Q58	Q12 gate voltage switch	Off when High power is selected
D1-4	VCO frequency control	
D5	Frequency shift	
D6	VCO modulation	
D7	Speed up	Ripple filter
D8	RF switch	On TX
D9	RF switch	On RX
D10-13	Antenna switch	On TX
D14	Reverse current prevention	APC reference voltage
D15	APC output voltage limiter	
D16	PLL lock detection	
D18-21	RX BPF tuning	
D22	MIC mute control	
D24	VOX detection rectification	
D25	Speaker mute speed up	
D26	C246 discharge	
D27	MIC ALC rectification	
D30	Reverse current prevention	Charge current
D31	Constant-current circuit	Constant-current charge
D32	Reverse current prevention	DC IN
D33	Reverse current prevention	Battery

Ref. No.	Use/Function	Operation/Condition/Compatibility
D34	AVR constant-voltage	
D35	Reverse current prevention	Battery
D36	Reverse current prevention	DC IN
D40	TX LED	Lights on TX
D41	BUSY LED	Lights on RX
D42-44 D46,47	Key illumination LED	Key backlight illumination
D48,49	LCD illumination LED	LCD backlight illumination
D60	Key type detection	
D61	UHF type detection	
D62-65	market code detection	
D69-72	Reverse current prevention	Key matrix
D73	Voltage drop	
D74	Over input protection	
D79,80	Limiter	
D81	Reverse current prevention	

PARTS LIST

* New Parts. Δ indicates safety critical components.
 Parts without **Parts No.** are not supplied.
 Les articles non mentionnés dans le **Parts No.** ne sont pas fournis.
 Teile ohne **Parts No.** werden nicht geliefert.

L: Scandinavia K: USA P: Canada
 Y: PX (Far East, Hawaii) T: England E: Europe
 Y: AAFES (Europe) X: Australia M: Other Areas

TH-K4AT/K4E (Y50-581X-XX)
TX-RX UNIT (X57-675X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
TH-K4AT/K4E					
1	3A,2G	*	A02-3817-02	CABINET ASSY(BATTERY CASE)	M2
2	1A	*	A02-3822-23	CABINET ASSY(16KEY)	M2
3	1C	*	A02-3823-23	CABINET ASSY(4KEY)	E
4	3A,3C	*	A10-4066-11	CHASSIS	
5	3B,3D	*	A82-0053-02	REAR PANEL	
6	1B,1D	*	B09-0675-03	CAP(SP/MIC/DC IN)	
7	1A,1C	*	B10-2746-03	FRONT GLASS	
8	1B,1D	*	B11-1805-03	ILLUMINATION GUIDE(LCD)	
9	2B,2D	*	B11-1806-04	FILTER(LCD)	
10	1B,1D	*	B38-0881-05	LCD	
11	1G	*	B62-1695-00	INSTRUCTION MANUAL(CHINESE)	M2
11	1E,1G	*	B62-1696-00	INSTRUCTION MANUAL(ENGLISH)	
11	1E	*	B62-1697-00	INSTRUCTION MANUAL(SPANISH)	E
11	1E	*	B62-1699-00	INSTRUCTION MANUAL(GERMAN)	E
11	1E	*	B62-1702-00	INSTRUCTION MANUAL(ITALIAN)	E
11	1E	*	B62-1757-00	INSTRUCTION MANUAL(FRENCH)	E
11	1E	*	B62-1758-00	INSTRUCTION MANUAL(DUTCH)	E
12	3A	*	B72-2131-04	MODEL NAME PLATE(TH-K4AT)	M2
12	3C	*	B72-2132-04	MODEL NAME PLATE(TH-K4E)	E
13	2B,2D	*	E04-0443-05	RF COAXIAL RECEPTACLE(SMA)	
14	2A,2C	*	E23-1234-04	TERMINAL(BATTERY)	
15	2B,2D	*	E29-1199-04	INTER CONNECTOR(LCD)	
16	1A,1C	*	E37-1106-05	LEAD WIRE WITH CONNECTOR(SP)	
17	2A	*	F10-2464-04	SHIELDING COVER(FINAL FET)	M2
18	2A,2C	*	F10-2465-04	SHIELDING COVER(ANT TERMINAL)	
19	2C	*	F10-2494-04	SHIELDING COVER(FINAL FET)	E
20	2B,2D	*	F15-1008-04	SHADOW PLATE(LCD)	
-		*	G10-1317-04	FIBROUS SHEET(SP NET)	
-		*	G11-4296-04	SHEET	
21	3B,3D	*	G53-1529-04	PACKING(VOL/ENC)	
22	2A,2C	*	G53-1572-12	PACKING(CASE)	
23	2B,2D	*	G53-1589-03	PACKING(SP/MIC)	
24	3E	*	H52-1964-02	ITEM CARTON CASE(TH-K4E)	E
25	2H	*	H52-1965-12	ITEM CARTON CASE(TH-K4AT)	M2
26	2F	*	H12-3146-01	PACKING FIXTURE	E
27	3G	*	H12-3147-03	PACKING FIXTURE	M2
28	2A,2C	*	J19-5451-03	HOLDER(TERMINAL)	
29	1B,1D	*	J21-8456-03	HARDWARE FIXTURE(LCD)	
30	2E,3G	*	J29-0709-04	BELTHOOK ASSY ACCESSORY	
31	2A,2C	*	J30-1284-04	SPACER(PTT KNOB)	
32	3E,2G	*	J69-0342-05	HANDSTRAP ACCESSORY	
33	2B,2D	*	J82-0076-05	FPC(VOL/ENC)	
44	3A,3C	*	J99-0376-04	ADHESIVE TAPE	
34	1B,1D	*	K29-5150-03	KNOB(VOL)	
35	1B,1D	*	K29-5159-03	KNOB(ENC)	
36	1A	*	K29-9272-02	KEY TOP(16KEY)	M2
37	1A,1C	*	K29-9274-03	KNOB(PTT/LAMP/MONI)	
38	1C	*	K29-9276-02	KEY TOP(4KEY)	E
A	2B,2D	*	N09-1492-05	PAN HEAD SCREW(SMA)	
B	1B,1D	*	N14-0569-04	CIRCULAR NUT(VOL/ENC)	
C	1B,1D	*	N14-0573-04	CIRCULAR NUT(SMA)	
D	1A,1C	*	N79-2035-46	PAN HEAD TAPTITE SCREW(PCB)	
E	2A,2C	*	N79-2040-45	PAN HEAD TAPTITE SCREW(HOLDER,R PANEL)	

Ref. No.	Address	New parts	Parts No.	Description	Destination
F	3A,3C	*	N82-2007-46	PAN HEAD TAPTITE SCREW(CASE)	
G	2A,2C	*	N09-2433-05	PAN HEAD TAPTITE SCREW(FINAL FET)	
39	2B,2D	*	R39-0602-05	VARIABLE RESISTOR	
40	1A,1C	*	T07-0341-15	SPEAKER	
41	2F,3G	*	T90-1019-25	HELICAL ANTENNA ACCESSORY	
42	2F	*	W08-0959-05	CHARGER(230V/13.8V) ACCESSORY	E
43	2E	*	W09-0991-05	BATTERY ASSY(7.2V/1100MAH) ACCESSORY	E
TX-RX UNIT (X54-675X-XX) 0-21 : M2 2-71 : E					
D40		*	B30-2156-05	LED(RED)	
D41		*	B30-2157-05	LED(YELLOW)	
D42-44		*	B30-2205-05	LED(YG)	M2
D42,43		*	B30-2205-05	LED(YG)	E
D46		*	B30-2205-05	LED(YG)	E
D46,47		*	B30-2205-05	LED(YG)	M2
D48,49		*	B30-2237-05	LED(YG)	
C1		*	CK73HB1C103K	CHIP C 0.010UF K	
C2		*	CC73HCH1H390G	CHIP C 39PF G	
C3		*	CC73HCH1H020B	CHIP C 2.0PF B	
C4		*	CK73HB1H471K	CHIP C 470PF K	
C5		*	CK73HB1A104K	CHIP C 0.10UF K	
C6		*	CK73HB1H471K	CHIP C 470PF K	
C7		*	CC73HCH1H0R5B	CHIP C 0.5PF B	
C8,9		*	CC73HCH1H050B	CHIP C 5.0PF B	
C10		*	CK73HB1C103K	CHIP C 0.010UF K	
C11		*	CK73HB1H471K	CHIP C 470PF K	
C13		*	CC73HCH1H0R5B	CHIP C 0.5PF B	
C14		*	CK73HB1H471K	CHIP C 470PF K	
C15		*	CC73HCH1H120J	CHIP C 12PF J	
C17,18		*	CK73HB1H471K	CHIP C 470PF K	
C19		*	CC73HCH1H080D	CHIP C 8.0PF D	
C20		*	CC73HCH1H050C	CHIP C 5.0PF C	
C21		*	CK73HB1H471K	CHIP C 470PF K	
C22		*	CC73HCH1H040C	CHIP C 4.0PF C	
C24-26		*	CK73HB1H471K	CHIP C 470PF K	
C27		*	C92-0628-05	CHIP-TAN 10UF 10WV	
C29		*	C92-0712-05	CHIP-TAN 22UF 6.3WV	
C30		*	CK73HB1H471K	CHIP C 470PF K	
C33		*	C92-0002-05	CHIP-TAN 0.22UF 35WV	
C34		*	C92-0656-05	TANTALUM C 2.2UF 6.3WV	
C35		*	C92-0001-05	CHIP-C 0.1UF 35WV	
C37		*	CK73HB1H471K	CHIP C 470PF K	
C38		*	CK73HB1C103K	CHIP C 0.010UF K	
C40		*	CK73HB1A104K	CHIP C 0.10UF K	
C41		*	C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C42		*	CK73HB1H471K	CHIP C 470PF K	
C43		*	CK73HB1C103K	CHIP C 0.010UF K	
C44-46		*	CC73HCH1H101J	CHIP C 100PF J	
C50		*	CC73HCH1H220J	CHIP C 22PF J	
C51		*	CC73GCH1H220J	CHIP C 22PF J	
C52		*	CC73HCH1H100D	CHIP C 10PF D	
C54		*	CK73HB1H471K	CHIP C 470PF K	
C55		*	CK73HB1C103K	CHIP C 0.010UF K	

PARTS LIST

TX-RX UNIT (X57-675X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C56			CK73HB1H471K	CHIP C 470PF K		C158			CC73HCH1H130G	CHIP C 13PF G	
C57			CC73HCH1H100D	CHIP C 10PF D		C159			CC73HCH1H030B	CHIP C 3.0PF B	
C61			CK73HB1H471K	CHIP C 470PF K		C160			CC73HCH1H130G	CHIP C 13PF G	
C64			CK73HB1H471K	CHIP C 470PF K		C161			CC73HCH1H030B	CHIP C 3.0PF B	
C65			CC73HCH1H100D	CHIP C 10PF D		C162-164			CK73HB1H471K	CHIP C 470PF K	
C66			CK73GB1C104K	CHIP C 0.10UF K		C165			CC73HCH1H030B	CHIP C 3.0PF B	
C67			CK73HB1H471K	CHIP C 470PF K		C166			CK73HB1C103K	CHIP C 0.010UF K	
C68			CC73HCH1H100D	CHIP C 10PF D		C167,168			CK73HB1A104K	CHIP C 0.10UF K	
C70			CK73GB0J105K	CHIP C 1.0UF K		C169,170			CK73HB1A683K	CHIP C 0.068UF K	
C71			CK73HB1H471K	CHIP C 470PF K		C171			CK73HB1H471K	CHIP C 470PF K	
C72			CK73GB1C104K	CHIP C 0.10UF K		C172			CK73HB1H182K	CHIP C 1800PF K	
C73			CK73HB1H471K	CHIP C 470PF K		C173,174	*		CC73HCH1H181J	CHIP C 180PF J	
C75			CK73HB1H471K	CHIP C 470PF K		C175			CC73HCH1H220J	CHIP C 22PF J	
C76			CC73GCH1H080D	CHIP C 8.0PF D		C176			CK73HB1A104K	CHIP C 0.10UF K	
C77			CC73GCH1H470J	CHIP C 47PF J		C177			C92-0628-05	CHIP-TAN 10UF 10WV	
C78			CK73HB1H471K	CHIP C 470PF K		C178			CK73HB1C103K	CHIP C 0.010UF K	
C82			CK73HB1H471K	CHIP C 470PF K		C179			CK73HB1A104K	CHIP C 0.10UF K	
C83			CK73HB1C103K	CHIP C 0.010UF K		C180			CC73HCH1H121J	CHIP C 120PF J	
C84			CK73HB1A104K	CHIP C 0.10UF K		C182,183			CK73HB1A104K	CHIP C 0.10UF K	
C86		*	C93-0766-05	CERAMIC C 56PF J		C186			CC73HCH1H240J	CHIP C 24PF J	
C87		*	C93-0754-05	CERAMIC C 18PF J		C187			CC73HCH1H020C	CHIP C 2.0PF C	
C88			CC73GCH1H200G	CHIP C 20PF G		C188			CC73HCH1H240J	CHIP C 24PF J	
C89			CC73GCH1H330J	CHIP C 33PF J		C189			CK73HB1H471K	CHIP C 470PF K	
C90,91			CK73HB1H471K	CHIP C 470PF K		C190-192			CK73HB1C103K	CHIP C 0.010UF K	
C93			CC73GCH1H030B	CHIP C 3.0PF B		C193			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C94			CK73GB1H471K	CHIP C 470PF K		C194			CK73HB1A104K	CHIP C 0.10UF K	
C95			CC73GCH1H020B	CHIP C 2.0PF B		C195			C92-0628-05	CHIP-TAN 10UF 10WV	
C96			CC73GCH1H010B	CHIP C 1.0PF B		C196,197			CK73GB1C273K	CHIP C 0.027UF K	
C97			CC73GCH1H040B	CHIP C 4.0PF B		C198			CK73EF1C105Z	CHIP C 1.0UF Z	
C98			CC73GCH1H020B	CHIP C 2.0PF B		C200			CK73HB1C103K	CHIP C 0.010UF K	
C99			CC73GCH1H050B	CHIP C 5.0PF B		C201			CK73HB1H122K	CHIP C 1200PF K	
C100			CC73GCH1H020B	CHIP C 2.0PF B		C202			CK73HB1H271K	CHIP C 270PF K	
C101			CC73GCH1H040B	CHIP C 4.0PF B		C203			CC73HCH1H121J	CHIP C 120PF J	
C102			CC73GCH1H030B	CHIP C 3.0PF B		C204			CK73HB1A333K	CHIP C 0.033UF K	
C105-107			CK73HB1H471K	CHIP C 470PF K		C205			CK73HB1A473K	CHIP C 0.047UF K	
C108			CC73HCH1H101J	CHIP C 100PF J		C206	*		CK73HB1C183K	CHIP C 0.018UF K	
C109-115			CK73HB1H471K	CHIP C 470PF K		C207			CK73HB1C223K	CHIP C 0.022UF K	
C116			C92-0544-05	CHIP-TAN 10UF 4WV		C208			CC73HCH1H820J	CHIP C 82PF J	
C117,118			CK73HB1H471K	CHIP C 470PF K		C209			CK73HB1H471K	CHIP C 470PF K	
C124			CK73HF1C104Z	CERAMIC C 0.1UF Z		C210			CK73HB1C103K	CHIP C 0.010UF K	
C125			CC73HCH1H1R5C	CHIP C 1.5PF C		C211			CK73HB1H222K	CHIP C 2200PF K	
C126			CC73HCH1H100D	CHIP C 10PF D		C212			CK73HB1C123K	CHIP C 0.012UF K	
C128			CK73HB1C103K	CHIP C 0.010UF K		C213			C92-0714-05	TANTALUM C 4.7UF 6.3WV	
C129			CC73HCH1H110J	CHIP C 11PF J		C219			CK73HB1A473K	CHIP C 0.047UF K	
C130			CK73HB1H471K	CHIP C 470PF K		C220			CK73HB1E472K	CHIP C 4700PF K	
C131-133			CK73HB1C103K	CHIP C 0.010UF K		C221,222			CK73HB1C103K	CHIP C 0.010UF K	
C134			CK73HB1H471K	CHIP C 470PF K		C223			CK73HB1H471K	CHIP C 470PF K	
C135,136			CC73HCH1H050C	CHIP C 5.0PF C		C224			CK73HB1A104K	CHIP C 0.10UF K	
C137			CC73HCH1H070D	CHIP C 7.0PF D		C225			CK73GB0J105K	CHIP C 1.0UF K	
C139			CK73HB1H471K	CHIP C 470PF K		C226			CK73HB1A104K	CHIP C 0.10UF K	
C140			CC73HCH1H040B	CHIP C 4.0PF B		C227			C92-0587-05	CHIP-TAN 2.2UF 4WV	
C141,142			CK73HB1H471K	CHIP C 470PF K		C228,229			CK73HB1A104K	CHIP C 0.10UF K	
C144		*	CC73HCH1H180G	CHIP C 18PF G		C230			CK73FB1C105K	CHIP C 1.0UF K	
C145			CC73HCH1H080B	CHIP C 8.0PF B		C231			CK73HB1H471K	CHIP C 470PF K	
C146			CC73HCH1H040B	CHIP C 4.0PF B		C235,236			CK73HB1C103K	CHIP C 0.010UF K	
C147			CK73HB1H471K	CHIP C 470PF K		C237			C92-0628-05	CHIP-TAN 10UF 10WV	
C148			CC73HCH1H060B	CHIP C 6.0PF B		C238-241			CK73HB1H471K	CHIP C 470PF K	
C152,153			CK73HB1H471K	CHIP C 470PF K		C242			CK73HB1C103K	CHIP C 0.010UF K	
C156			CK73HB1H471K	CHIP C 470PF K		C243			CK73HB1H471K	CHIP C 470PF K	
C157		*	CC73HCH1H180G	CHIP C 18PF G		C246			C92-1327-05	CHIP-TAN 100UF 10WV	

PARTS LIST

TX-RX UNIT (X57-675X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C247,248			CK73HB1A104K	CHIP C 0.10UF K		C512			CC73HCH1H101J	CHIP C 100PF J	E
C249			CK73HB1H471K	CHIP C 470PF K		CN1			E40-5915-05	FLAT CABLE CONNECTOR	
C250			CK73EF1C105Z	CHIP C 1.0UF Z		CN2			E40-5929-05	PIN ASSY	
C252			CC73HCH1H101J	CHIP C 100PF J		CN6	*		E40-6327-05	PIN ASSY	
C253			C92-0628-05	CHIP-TAN 10UF 10WV		CN7			E40-5630-05	PIN ASSY SOCKET	
C255			C92-0628-05	CHIP-TAN 10UF 10WV		CN8	*		E40-6308-05	PIN ASSY	
C256,257			CK73HB1H102K	CHIP C 1000PF K		CN9	*		E40-6309-05	PIN ASSY SOCKET	
C258			CK73HB1A104K	CHIP C 0.10UF K		CN15			E23-1081-05	TERMINAL	
C270-272			CK73HB1H471K	CHIP C 470PF K		CN17			E23-1081-05	TERMINAL	
C276			CK73HB1H471K	CHIP C 470PF K		J2			E03-0190-05	DC JACK	
C279-285			CK73HB1H471K	CHIP C 470PF K		J3			E11-0484-05	3.5D PHONE JACK(3.5D)	
C286			CK73FB1C105K	CHIP C 1.0UF K		J4			E11-0483-05	2.5D PHONE JACK(2.5D)	
C290,291			CK73HB1H471K	CHIP C 470PF K		CN10			F01-1032-05	RADIATION PLATE	
C293			CC73HCH1H470J	CHIP C 47PF J		F1			F53-0286-05	FUSE(2.5A/32V)	
C294,295			CC73HCH1H050C	CHIP C 5.0PF C		F3			F53-0287-05	FUSE(0.5A/32V)	
C297			CK73HB1A104K	CHIP C 0.10UF K		CD1			L79-1474-05	TUNING COIL	
C298			CK73HB1H471K	CHIP C 470PF K		CF1			L72-0968-05	CERAMIC FILTER	
C299			CK73FB1C105K	CHIP C 1.0UF K		L1,2			L40-2785-92	SMALL FIXED INDUCTOR(270NH)	
C300			CK73HB1H471K	CHIP C 470PF K		L3	*		L41-2278-14	SMALL FIXED INDUCTOR	
C302			CK73HB1H471K	CHIP C 470PF K		L4			L41-6868-14	SMALL FIXED INDUCTOR	
C303			C92-0605-05	TANTALUM C 150UF 6.3WV		L5,6			L40-2785-92	SMALL FIXED INDUCTOR(270NH)	
C304-306			CK73HB1H471K	CHIP C 470PF K		L8			L40-1875-71	SMALL FIXED INDUCTOR(18NH)	
C307			CK73HB1A104K	CHIP C 0.10UF K		L9			L40-2275-71	SMALL FIXED INDUCTOR(22NH)	
C308			CK73HB1H471K	CHIP C 470PF K		L10			L40-1875-71	SMALL FIXED INDUCTOR(18NH)	
C309			CK73FB1C105K	CHIP C 1.0UF K		L11			L40-1575-71	SMALL FIXED INDUCTOR(15NH)	
C310			CK73EF1C105Z	CHIP C 1.0UF Z		L13			L92-0149-05	FERRITE CHIP	
C311			CK73GB1C104K	CHIP C 0.10UF K		L14,15	*		L41-4763-14	SMALL FIXED INDUCTOR	
C312,313			CK73HB1A393K	CHIP C 0.039UF K		L16			L34-4577-05	AIR-CORE COIL	
C314			CK73HB1H471K	CHIP C 470PF K		L17			L34-4602-05	AIR-CORE COIL	
C316			CK73GB1C104K	CHIP C 0.10UF K		L18	*		L41-2285-14	SMALL FIXED INDUCTOR	
C317,318			CK73HB1H471K	CHIP C 470PF K		L19-22			L34-4564-05	AIR-CORE COIL	
C319			C92-0628-05	CHIP-TAN 10UF 10WV		L23			L40-1092-81	SMALL FIXED INDUCTOR	
C323,324			CK73HB1H471K	CHIP C 470PF K		L24			L40-2775-71	SMALL FIXED INDUCTOR(27NH)	
C326			CK73HB1H471K	CHIP C 470PF K		L25			L92-0149-05	FERRITE CHIP	
C327			CK73HB1A104K	CHIP C 0.10UF K		L26	*		L41-4785-14	SMALL FIXED INDUCTOR	
C328			CK73GB0J105K	CHIP C 1.0UF K		L27	*		L41-6885-14	SMALL FIXED INDUCTOR	
C329			CC73FCH1H120J	CHIP C 12PF J		L28			L40-1275-71	SMALL FIXED INDUCTOR(12NH)	
C330,331			CK73HB1H471K	CHIP C 470PF K		L29			L40-1575-71	SMALL FIXED INDUCTOR(15NH)	
C332			CK73HB1A104K	CHIP C 0.10UF K		L30			L34-4564-05	AIR-CORE COIL	
C335,336			CK73HB1A104K	CHIP C 0.10UF K		L32			L41-2778-14	SMALL FIXED INDUCTOR	
C338			CK73FB1C105K	CHIP C 1.0UF K		L34			L41-2778-14	SMALL FIXED INDUCTOR	
C339			CK73HB1A473K	CHIP C 0.047UF K		L35	*		L41-1585-14	SMALL FIXED INDUCTOR	
C344-348			CK73HB1H471K	CHIP C 470PF K		L36			L41-5678-14	SMALL FIXED INDUCTOR	
C349			CK73HB1A104K	CHIP C 0.10UF K		L38			L41-1278-14	SMALL FIXED INDUCTOR	
C351			CK73HB1C103K	CHIP C 0.010UF K		L40	*		L41-4763-14	SMALL FIXED INDUCTOR	
C352-354			CK73HB1H471K	CHIP C 470PF K		L41			L41-6868-14	SMALL FIXED INDUCTOR	
C355,356			CK73HB1C103K	CHIP C 0.010UF K		L45,46	*		L41-5685-14	SMALL FIXED INDUCTOR	
C357			CK73EF1C105Z	CHIP C 1.0UF Z		L49			L92-0131-05	FERRITE CHIP	
C358			CK73HB1A473K	CHIP C 0.047UF K		L50			L92-0137-05	FERRITE CHIP	
C359,360			CK73HB1A104K	CHIP C 0.10UF K		L53			L40-1275-71	SMALL FIXED INDUCTOR(12NH)	
C361			CK73HB1H471K	CHIP C 470PF K		L54			L40-4768-71	SMALL FIXED INDUCTOR(4.7NH)	
C363			CC73HCH1H100C	CHIP C 10PF C		L56			L41-6868-14	SMALL FIXED INDUCTOR	
C364			CC73FCH1H180J	CHIP C 18PF J		L58	*		L41-8285-14	SMALL FIXED INDUCTOR	
C365-367			CK73HB1H471K	CHIP C 470PF K		L63			L92-0140-05	FERRITE CHIP	
C368			CK73GB1H471K	CHIP C 470PF K		L64			L40-4795-85	SMALL FIXED INDUCTOR(4.7UH)	
C369-371			CK73HB1H471K	CHIP C 470PF K		L65			L40-2775-71	SMALL FIXED INDUCTOR(27NH)	
C372			CK73GB1H471K	CHIP C 470PF K		L67			L92-0161-05	BEADS CORE	
C374			CC73HCH1H101J	CHIP C 100PF J	E	L68			L92-0163-05	BEADS CORE	
C510			CK73HB1A473K	CHIP C 0.047UF K							
C511			CK73HB1H471K	CHIP C 470PF K							

PARTS LIST

TX-RX UNIT (X57-675X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
X1		*	L77-1931-05	TCXO(12.8MHZ)		R85			RK73GB1J561J	CHIP R	560 J 1/16W
X3		*	L77-1940-05	CRYSTAL RESONATOR(7.982MHZ)		R86			RK73HB1J562J	CHIP R	5.6K J 1/16W
XF1		*	L71-0619-05	MCF(38.85MHZ)		R88			RK73HB1J331J	CHIP R	330 J 1/16W
CP1		*	RK75HA1J272J	CHIP-COM 2.7K J 1/16W		R90			RK73HB1J331J	CHIP R	330 J 1/16W
CP2			RK75GB1J392J	CHIP-COM 3.9K J 1/16W		R91			RK73HB1J102J	CHIP R	1.0K J 1/16W
CP31			RK75GB1J392J	CHIP-COM 3.9K J 1/16W		R92			RK73HB1J332J	CHIP R	3.3K J 1/16W
CP32-35			RK75HA1J102J	CHIP-COM 1.0K J 1/16W		R93			RK73HB1J470J	CHIP R	47 J 1/16W
R4			RK73HB1J102J	CHIP R 1.0K J 1/16W		R94			RK73HB1J331J	CHIP R	330 J 1/16W
R5			RK73HB1J104J	CHIP R 100K J 1/16W		R95			RK73HB1J184J	CHIP R	180K J 1/16W
R6			RK73HB1J102J	CHIP R 1.0K J 1/16W		R96			RK73HB1J104J	CHIP R	100K J 1/16W
R7			RK73HB1J473J	CHIP R 47K J 1/16W		R97			RK73HB1J154J	CHIP R	150K J 1/16W
R8			RK73HB1J104J	CHIP R 100K J 1/16W		R98			RK73HB1J104J	CHIP R	100K J 1/16W
R9			RK73HB1J151J	CHIP R 150 J 1/16W		R99,100			RK73HB1J105J	CHIP R	1.0M J 1/16W
R10			RK73HB1J470J	CHIP R 47 J 1/16W		R101			RK73HB1J470J	CHIP R	47 J 1/16W
R11			RK73HB1J154J	CHIP R 150K J 1/16W		R103			RK73HB1J182J	CHIP R	1.8K J 1/16W
R12			RK73HB1J470J	CHIP R 47 J 1/16W		R104			RK73HB1J151J	CHIP R	150 J 1/16W
R14			RK73HB1J332J	CHIP R 3.3K J 1/16W		R107			RK73HB1J104J	CHIP R	100K J 1/16W
R15			RK73HB1J562J	CHIP R 5.6K J 1/16W		R108			RK73HB1J124J	CHIP R	120K J 1/16W
R16			RK73HB1J271J	CHIP R 270 J 1/16W		R109			RK73HB1J104J	CHIP R	100K J 1/16W
R17			RK73HB1J332J	CHIP R 3.3K J 1/16W		R110,111			RK73HB1J105J	CHIP R	1.0M J 1/16W
R18			RK73HB1J330J	CHIP R 33 J 1/16W		R115			RK73HB1J562J	CHIP R	5.6K J 1/16W
R19			RK73HB1J124J	CHIP R 120K J 1/16W		R116			RK73HB1J124J	CHIP R	120K J 1/16W
R20			RK73HB1J102J	CHIP R 1.0K J 1/16W		R117			RK73HH1J272D	RESISTOR	2.7K D 1/16W
R21			RK73HB1J472J	CHIP R 4.7K J 1/16W		R118			RK73HB1J273J	CHIP R	27K J 1/16W
R24			RK73HB1J122J	CHIP R 1.2K J 1/16W		R119			RK73HB1J182J	CHIP R	1.8K J 1/16W
R30			RK73HB1J102J	CHIP R 1.0K J 1/16W		R120			RK73HB1J272J	CHIP R	2.7K J 1/16W
R31			RK73HB1J222J	CHIP R 2.2K J 1/16W		R122			RK73HB1J272J	CHIP R	2.7K J 1/16W
R32			RK73HB1J102J	CHIP R 1.0K J 1/16W		R123			RK73HB1J182J	CHIP R	1.8K J 1/16W
R33			RK73HB1J220J	CHIP R 22 J 1/16W		R124			RK73HB1J332J	CHIP R	3.3K J 1/16W
R34			RK73HB1J332J	CHIP R 3.3K J 1/16W		R125			RK73HB1J561J	CHIP R	560 J 1/16W
R35			RK73HB1J124J	CHIP R 120K J 1/16W		R126			RK73HB1J273J	CHIP R	27K J 1/16W
R36			RK73HB1J100J	CHIP R 10 J 1/16W		R127			RK73HB1J470J	CHIP R	47 J 1/16W
R37,38			RK73HB1J273J	CHIP R 27K J 1/16W		R128			RK73HB1J332J	CHIP R	3.3K J 1/16W
R39			RK73HB1J271J	CHIP R 270 J 1/16W		R130			RK73HB1J101J	CHIP R	100 J 1/16W
R41			RK73HB1J271J	CHIP R 270 J 1/16W		R131			RK73HB1J334J	CHIP R	330K J 1/16W
R42			R92-1368-05	CHIP R 0 OHM		R132			RK73HB1J222J	CHIP R	2.2K J 1/16W
R45			RK73HB1J332J	CHIP R 3.3K J 1/16W		R133			RK73HB1J102J	CHIP R	1.0K J 1/16W
R46			RK73HB1J103J	CHIP R 10K J 1/16W		R134			RK73HB1J394J	CHIP R	390K J 1/16W
R47			RK73HB1J562J	CHIP R 5.6K J 1/16W		R135			RK73HB1J474J	CHIP R	470K J 1/16W
R49			RK73HB1J102J	CHIP R 1.0K J 1/16W		R137			RK73HB1J472J	CHIP R	4.7K J 1/16W
R50			RK73HB1J330J	CHIP R 33 J 1/16W		R139			RK73HB1J472J	CHIP R	4.7K J 1/16W
R51			RK73HB1J471J	CHIP R 470 J 1/16W		R140			RK73HB1J103J	CHIP R	10K J 1/16W
R52,53			RK73HB1J102J	CHIP R 1.0K J 1/16W		R141,142			RK73HB1J102J	CHIP R	1.0K J 1/16W
R54			RK73HB1J470J	CHIP R 47 J 1/16W		R143			RK73HB1J273J	CHIP R	27K J 1/16W
R55			RK73HB1J472J	CHIP R 4.7K J 1/16W		R144			R92-1368-05	CHIP R	0 OHM
R56			RK73HB1J103J	CHIP R 10K J 1/16W		R145,146			RK73HB1J472J	CHIP R	4.7K J 1/16W
R58			RK73HB1J470J	CHIP R 47 J 1/16W		R147			RK73HB1J103J	CHIP R	10K J 1/16W
R59			RK73HB1J123J	CHIP R 12K J 1/16W		R148			RK73HB1J562J	CHIP R	5.6K J 1/16W
R60			RK73HB1J563J	CHIP R 56K J 1/16W		R151			RK73HB1J122J	CHIP R	1.2K J 1/16W
R61,62			RK73HB1J271J	CHIP R 270 J 1/16W		R152			RK73HB1J222J	CHIP R	2.2K J 1/16W
R64			R92-1368-05	CHIP R 0 OHM		R153			RK73HB1J102J	CHIP R	1.0K J 1/16W
R70-72			RK73EB2ER39K	CHIP R 0.39 K 1/4W		R154			RK73HB1J472J	CHIP R	4.7K J 1/16W
R74,75			RK73HH1J104D	RESISTOR 100K D 1/16W		R155,156			RK73HB1J104J	CHIP R	100K J 1/16W
R76-79			RK73HH1J154D	RESISTOR 150K D 1/16W		R157,158			RK73HB1J334J	CHIP R	330K J 1/16W
R80			RK73HB1J103J	CHIP R 10K J 1/16W		R159			RK73HB1J124J	CHIP R	120K J 1/16W
R81			RK73HB1J394J	CHIP R 390K J 1/16W		R160			RK73HB1J472J	CHIP R	4.7K J 1/16W
R82			RK73HB1J273J	CHIP R 27K J 1/16W		R161			RK73HB1J182J	CHIP R	1.8K J 1/16W
R83			RK73HB1J563J	CHIP R 56K J 1/16W		R162			RK73HB1J274J	CHIP R	270K J 1/16W
R84			RK73HB1J104J	CHIP R 100K J 1/16W		R163			RK73HB1J474J	CHIP R	470K J 1/16W
						R164			RK73HB1J473J	CHIP R	47K J 1/16W

PARTS LIST

TX-RX UNIT (X57-675X-XX)

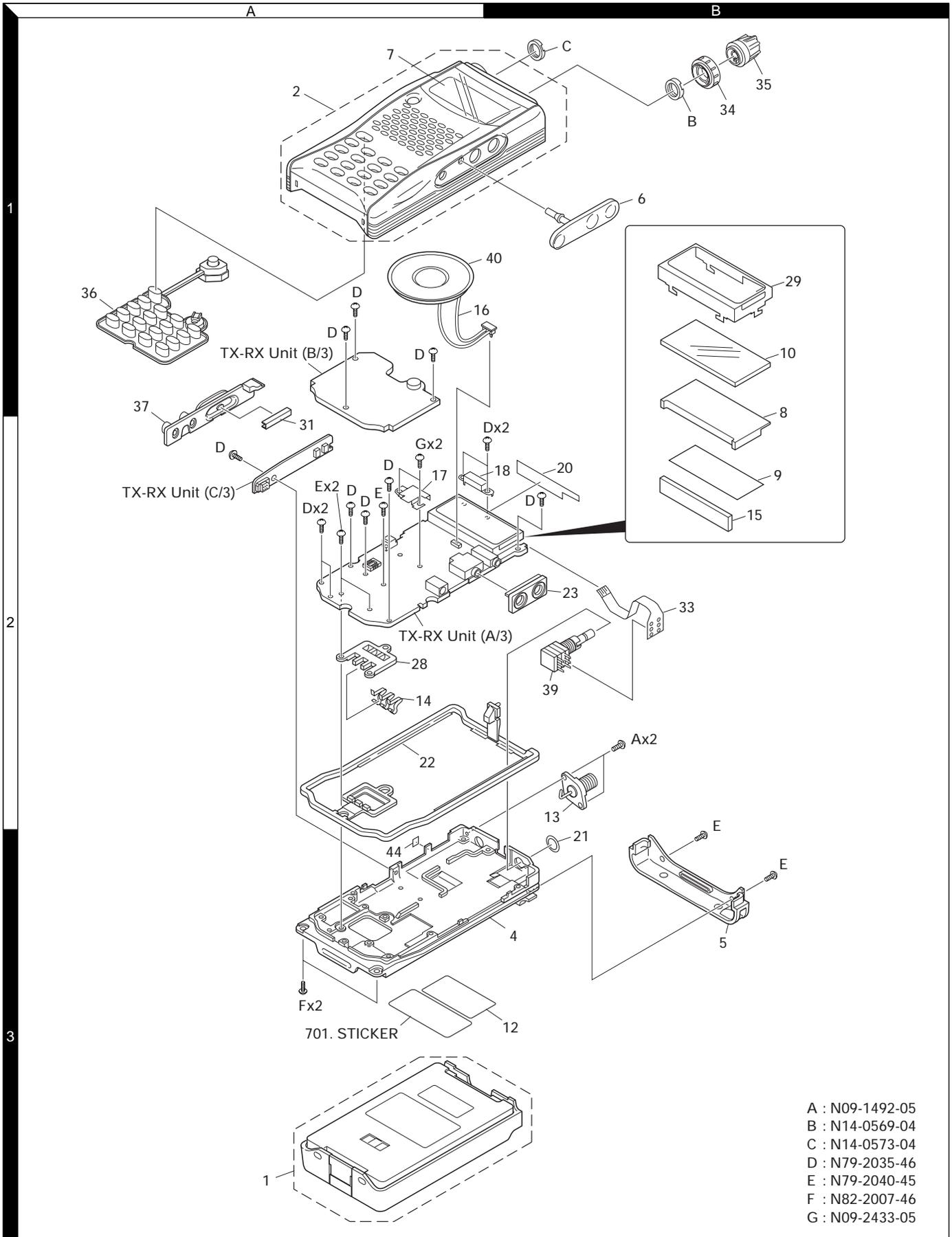
Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R165,166			RK73HB1J824J	CHIP R 820K J 1/16W		R246			RK73HB1J392J	CHIP R 3.9K J 1/16W	
R167,168			RK73HB1J184J	CHIP R 180K J 1/16W		R248			RK73HB1J392J	CHIP R 3.9K J 1/16W	
R170		*	RK73HH1J563D	RESISTOR 56K D 1/16W		R252			RK73HB1J104J	CHIP R 100K J 1/16W	
R171		*	RK73HH1J393D	RESISTOR 39K D 1/16W		R253,254			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R172			RK73HB1J103J	CHIP R 10K J 1/16W		R255			R92-1368-05	CHIP R 0 OHM	
R173			RK73HB1J153J	CHIP R 15K J 1/16W		R256			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R174			RK73HB1J564J	CHIP R 560K J 1/16W		R263			RK73HB1J103J	CHIP R 10K J 1/16W	
R175			RK73HB1J222J	CHIP R 2.2K J 1/16W		R271			RK73HB1J120J	CHIP R 12 J 1/16W	
R176			RK73HB1J824J	CHIP R 820K J 1/16W		R272			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R177			RK73HB1J103J	CHIP R 10K J 1/16W		R273			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R178			R92-1368-05	CHIP R 0 OHM		R275-277			RK73HB1J473J	CHIP R 47K J 1/16W	
R179			RK73HB1J224J	CHIP R 220K J 1/16W		R282,283			R92-1368-05	CHIP R 0 OHM	
R180			RK73HB1J393J	CHIP R 39K J 1/16W		R285,286			R92-1368-05	CHIP R 0 OHM	
R181			RK73HB1J471J	CHIP R 470 J 1/16W		R289			R92-1368-05	CHIP R 0 OHM	
R182			RK73HB1J102J	CHIP R 1.0K J 1/16W		R310			RK73HB1J392J	CHIP R 3.9K J 1/16W	
R183			RK73HB1J333J	CHIP R 33K J 1/16W		R312			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R185			RK73HB1J274J	CHIP R 270K J 1/16W		R313			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R186			RK73HB1J683J	CHIP R 68K J 1/16W		R318			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R188			RK73HB1J470J	CHIP R 47 J 1/16W		R323			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R189			R92-1368-05	CHIP R 0 OHM		R324,325			RK73HB1J473J	CHIP R 47K J 1/16W	
R190,191			RK73HB1J473J	CHIP R 47K J 1/16W		R326			R92-1368-05	CHIP R 0 OHM	
R192			RK73HB1J471J	CHIP R 470 J 1/16W		R328			RK73HB1J474J	CHIP R 470K J 1/16W	
R193			RK73HB1J182J	CHIP R 1.8K J 1/16W		R330			RK73HB1J471J	CHIP R 470 J 1/16W	
R194			RK73HB1J103J	CHIP R 10K J 1/16W		R332			RK73FB2A150J	CHIP R 15 J 1/10W	
R195			RK73HB1J101J	CHIP R 100 J 1/16W		R335			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R196			RK73HB1J103J	CHIP R 10K J 1/16W		R336			RK73HB1J221J	CHIP R 220 J 1/16W	
R197			RK73HB1J101J	CHIP R 100 J 1/16W		R337			RK73HB1J471J	CHIP R 470 J 1/16W	
R198			RK73HB1J103J	CHIP R 10K J 1/16W		R342,343			R92-1252-05	CHIP R 0 OHM J 1/16W	
R199			RK73HB1J102J	CHIP R 1.0K J 1/16W		R344			RK73HB1J470J	CHIP R 47 J 1/16W	
R200			RK73HB1J103J	CHIP R 10K J 1/16W		R346			RK73HB1J101J	CHIP R 100 J 1/16W	
R201			RK73HB1J472J	CHIP R 4.7K J 1/16W		R347			RK73HB1J151J	CHIP R 150 J 1/16W	
R202			RK73HB1J473J	CHIP R 47K J 1/16W		R348			RK73HB1J680J	CHIP R 68 J 1/16W	
R203			RK73HB1J474J	CHIP R 470K J 1/16W		R351			RK73HB1J221J	CHIP R 220 J 1/16W	
R204			RK73HB1J184J	CHIP R 180K J 1/16W		R352,353			R92-1368-05	CHIP R 0 OHM	
R205			RK73HB1J101J	CHIP R 100 J 1/16W		R354			RK73HB1J333J	CHIP R 33K J 1/16W	
R206			RK73HB1J150J	CHIP R 15 J 1/16W		R355			R92-1368-05	CHIP R 0 OHM	
R207			RK73HB1J102J	CHIP R 1.0K J 1/16W		VR1			R32-0658-05	SEMI FIXED VARIABLE RESISTOR(100K)	
R208			RK73HB1J100J	CHIP R 10 J 1/16W		VR5,6			R32-0668-05	SEMI FIXED VARIABLE RESISTOR(50K)	
R209			RK73HB1J104J	CHIP R 100K J 1/16W		S7	*		S70-0485-05	TACT SWITCH (PTT)	
R210			RK73FB2A120J	CHIP R 12 J 1/10W		MIC1			T91-0580-05	MIC ELEMENT	
R211			RK73HB1J474J	CHIP R 470K J 1/16W		D1-4			HVC376B	VARIABLE CAPACITANCE DIODE	
R212			RK73HB1J103J	CHIP R 10K J 1/16W		D5			HSC277	DIODE	
R213			RK73HB1J223J	CHIP R 22K J 1/16W		D6			1SV278	VARIABLE CAPACITANCE DIODE	
R214			RK73HB1J103J	CHIP R 10K J 1/16W		D7			MA2S111	DIODE	
R215			RK73HB1J474J	CHIP R 470K J 1/16W		D8,9			HSC277	DIODE	
R216			RK73HB1J103J	CHIP R 10K J 1/16W		D10-13			HVC131	DIODE	
R217			RK73HB1J821J	CHIP R 820 J 1/16W		D14			RB521-S30	DIODE	
R218			R92-1368-05	CHIP R 0 OHM		D15			MA8039	ZENER DIODE	
R223			RK73HB1J104J	CHIP R 100K J 1/16W		D16			MA2S111	DIODE	
R226			RK73HB1J221J	CHIP R 220 J 1/16W		D18-21			1SV305	VARIABLE CAPACITANCE DIODE	
R227			RK73HB1J101J	CHIP R 100 J 1/16W		D22			1SS361	DIODE	
R230			RK73HB1J221J	CHIP R 220 J 1/16W	M2	D24			MA742	DIODE	
R231			RK73HB1J151J	CHIP R 150 J 1/16W		D25			MA2S111	DIODE	
R234			RK73HB1J183J	CHIP R 18K J 1/16W		D26			1SS388	DIODE	
R235,236			RK73HB1J102J	CHIP R 1.0K J 1/16W		D27			RB706F-40	DIODE	
R237			RK73HB1J104J	CHIP R 100K J 1/16W		D30			RB521S-30	DIODE	
R238,239			RK73HB1J102J	CHIP R 1.0K J 1/16W		D31			DA221	DIODE	
R240			RK73HB1J104J	CHIP R 100K J 1/16W		D32,33			RB051L-40	DIODE	
R241-243			RK73HB1J334J	CHIP R 330K J 1/16W							
R244			R92-1252-05	CHIP R 0 OHM J 1/16W							

PARTS LIST

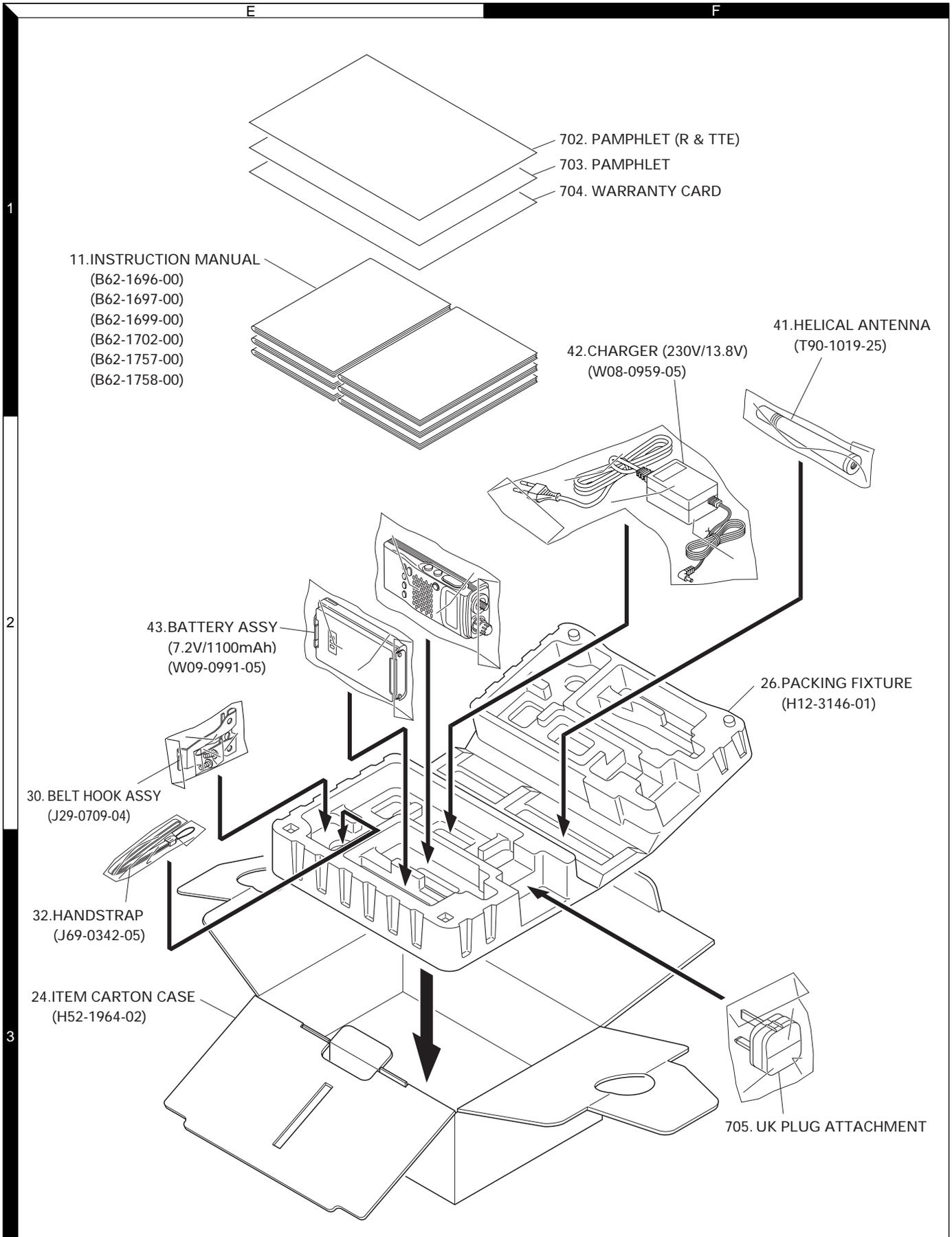
TX-RX UNIT (X57-675X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
D34		*	MAZS0270H	ZENER DIODE		TH1		*	B57331V2103J	THERMISTOR	
D35,36			RB521S-30	DIODE		TH2-4			B57331V2104J	THERMISTOR	
D60-62			MA2S111	DIODE	E						
D61			MA2S111	DIODE	M2						
D63-65			MA2S111	DIODE	M2						
D64,65			MA2S111	DIODE	E						
D69-73			MA2S111	DIODE							
D74			HSM88AS	DIODE							
D79,80			DA221	DIODE							
D81			RB521S-30	DIODE							
IC1			LMX2316TMX	MOS IC							
IC2			NJM2904V	MOS IC							
IC3			TA31136FN	MOS IC							
IC4		*	XC6202PB52FR	MOS IC							
IC5			NJM2107F	MOS IC							
IC6			TA7368F	MOS IC							
IC8		*	90522BPFFG139	MPU							
IC9		*	TK11250CM	MOS IC							
IC10		*	S-80844CNNBB85	MOS IC							
IC11		*	S-80930CNBGB80	MOS IC							
IC12		*	TK11250CUCB	MOS IC							
IC15			AT25160N10SI27	ROM IC							
IC16,17			NJM2904V	MOS IC							
Q1			2SK508NV(52K)	FET							
Q2		*	2SC5488	TRANSISTOR							
Q3			2SK1830	FET							
Q4			2SC4617(R)	TRANSISTOR							
Q5,6		*	2SC5488	TRANSISTOR							
Q9		*	2SC5488	TRANSISTOR							
Q10			2SC4926YD	TRANSISTOR							
Q11			2SK2596	FET							
Q12			2SK3476	FET							
Q13			2SK1830	FET							
Q14		*	RN4902	TRANSISTOR							
Q15			2SC4617(R)	TRANSISTOR							
Q16,17			3SK318	FET							
Q20			2SK1830	FET							
Q21			2SC4617(R)	TRANSISTOR							
Q22		*	RN2105	TRANSISTOR							
Q23			KTC4082	TRANSISTOR							
Q24		*	2SC5488	TRANSISTOR							
Q27			2SK1830	FET							
Q29			2SC4919	TRANSISTOR							
Q30			2SC4617(R)	TRANSISTOR							
Q31			2SK1830	FET							
Q33			2SB1184(O,R)	TRANSISTOR							
Q34,35			2SK1830	FET							
Q36			2SJ347	FET							
Q37			2SB1184(O,R)	TRANSISTOR							
Q38			2SC4617(R)	TRANSISTOR							
Q41		*	RN2105	TRANSISTOR							
Q47			RN1701	TRANSISTOR							
Q50			2SK1830	FET							
Q51		*	RN4902	TRANSISTOR							
Q52		*	RN1107	TRANSISTOR							
Q53			RN2701	TRANSISTOR							
Q55		*	CPH3317	FET							
Q56		*	CPH3417	FET							
Q57		*	RN2105	TRANSISTOR							
Q58			2SK1830	FET							

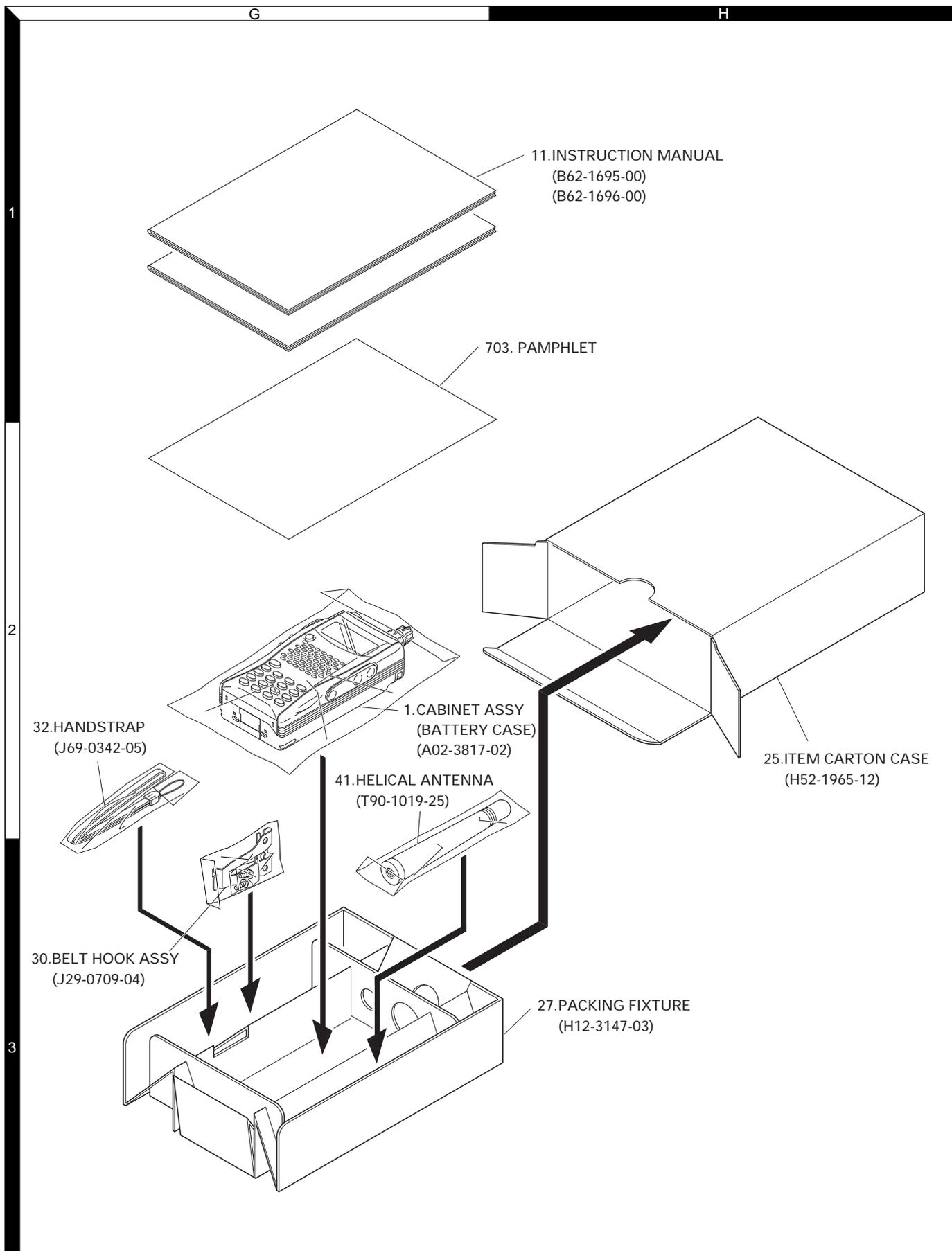
EXPLODED VIEW (TH-K4AT)



PACKING (TH-K4E)



PACKING (TH-K4AT)



ADJUSTMENT

Single Tone Mode

This mode is used to check the DTMF deviation.

Operation

■ 16key (M2 type)

1. Press the [PTT] key on the transceiver to switch to the transmission mode.
2. Press the [MONI] key to enter the single tone mode.
3. Press any key from [1] to [8] keys to transmit a single tone.
The single tone is consisting of eight frequencies.

- [1] 697Hz
- [2] 770Hz
- [3] 852Hz
- [4] 941Hz
- [5] 1209Hz
- [6] 1336Hz
- [7] 1477Hz
- [8] 1633Hz

4. When the [MONI] key is pressed again during the transmission, the transceiver switches to the reception mode, the single tone mode turns OFF.

■ 4key (E type)

1. Press the [PTT] key on the transceiver to switch to the transmission mode.
2. Press the [MONI] key to enter the single tone mode.
3. When the [VFO] key is pressed during the transmission, a DTMF "D" dual tone (combination of 1633 Hz and 941 Hz frequencies) is transmitted.
4. When the [MR] key is pressed during the transmission, single-tone 1633 Hz is transmitted.
5. When the [MONI] key is pressed again during the transmission, the transceiver switch to the reception mode, the single tone mode is turned OFF.

- The single tone mode can be enabled only during the transmission.
- When DTMF memory is transmitted in the single tone mode, the single tone mode turns OFF.

Adjustment Mode

This mode is used to replace or readjust the IC15 (EEPROM).

Adjust the following adjustment items after setting the transceiver to "Adjustment Mode".

■ Adjustment Items

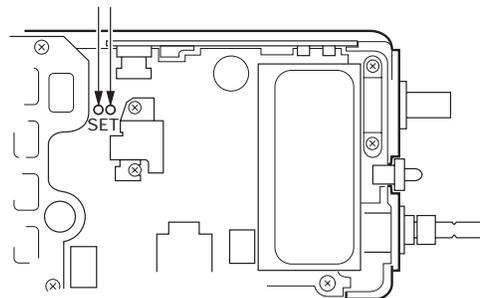
- A. Overvoltage warning reference voltage (14.8V [DC IN])
- B. Battery terminal reference voltage (7.5 V [Battery terminal])
- C. Squelch (SQL1, SQL2)
- D. S-meter (Two segments in S-meter light, all segments in S-meter light)
- E. RX BPF (Lower limit frequency, center frequency, upper limit frequency)
- F. 7.5V TX H power (Lower limit frequency, center frequency, upper limit frequency)

- G. 7.5V TX M power (Lower limit frequency, center frequency, upper limit frequency)
- H. 7.5V TX L power (Lower limit frequency, center frequency, upper limit frequency)
- I. 13.8V TX H power (Lower limit frequency, center frequency, upper limit frequency)
- J. 13.8V TX M power (Lower limit frequency, center frequency, upper limit frequency)
- K. 13.8V TX L power (Lower limit frequency, center frequency, upper limit frequency)
- L. DCS modulation balance
- M. Tone deviation (Lower limit frequency, center frequency, upper limit frequency)
- N. DCS deviation (Lower limit frequency, center frequency, upper limit frequency)
- O. VOX sensitivity (Level 1, level 9)

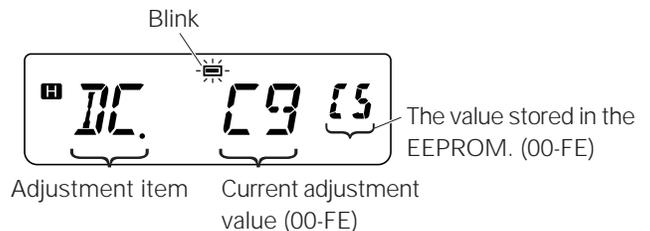
■ Operation in Adjustment Mode

1. Turn the transceiver ON.
2. Set the tone frequency to 151.4 Hz and the DCS code to 023 in Menu Mode to adjust tone and DCS modulation.
3. Set Adjustment Mode by shorting two lands (SET) on the component side of the TX-RX unit (A/3).

Short these two lands



4. When the Adjustment Mode is set, the "Overvoltage warning reference voltage (14.8V [DC IN])" adjustment item is displayed. (The "⚡" icon on the upper side of the LCD blinks while the transceiver is in the Adjustment Mode.)
The current adjustment value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



5. The functions of transceiver keys in Adjustment Mode are as follows:

ADJUSTMENT

Key name	[key]	[F] key → [key]
PTT	Transmit while this key is held down.	Selecting a TX power (High/Mid/Low)
LAMP	Changes adjustment items. (Forward) When this key is pressed on the frequency display, it switches to the adjustment display.	Lamp always ON
MONI	Changes adjustment items. (Back) When this key is pressed on the frequency display, it switches to the adjustment display.	Squelch level setting mode
MENU	Write adjustment values (adjustment display) Sound error tone (frequency display)	-
F	Function mode/MHz mode ON	Function mode/MHz mode OFF
VFO	VFO mode When this key is pressed on the adjustment display, it switches to the frequency display.	M→V (Memory shift)
MR	Memory mode When this key is pressed on the adjustment display, it switches to the frequency display.	M.IN (Memory registration)
CALL	Switch between frequency display and adjustment display. Each time this key is pressed, the LCD switches between the frequency display and adjustment display.	-
Encoder	Increase or decrease adjustment values (00 - FE). (adjustment display) Increase or decrease frequency and memory channel number. (frequency display)	Increase or decrease frequency (1MHz step). (frequency display)

6. To exit the Adjustment Mode, turn the transceiver OFF.

Note:

- When you press [LAMP] or [MONI] key, ensure the bosses of rubber keys align with the LAMP and MONI contacts of the PTT PCB (C/3).
- In the Adjustment Mode, Transmission and Reception frequencies becomes extensive.

A. Overvoltage warning reference voltage (14.8V [DC IN])

(1) Press the [LAMP] or [MONI] key on the transceiver to display "DC" on the LCD.

The current voltage value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



(2) Press the [MENU] key to write the current voltage value into the EEPROM.

B. Battery terminal reference voltage (7.5 V [Battery terminal])

(1) Press the [LAMP] or [MONI] key on the transceiver to display "BAT" on the LCD.

Press the [F] key and then the [PTT] key repeatedly to turn the "B" icon ON. The current voltage value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



(2) Press the [PTT] key to enable the transmit mode.

(3) Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 7.5V while the transceiver is transmitting.

(4) Press the [MENU] key to write the current voltage value into the EEPROM.

C. Squelch (SQL1, SQL2)

① Squelch (SQL1)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "SQ1" on the LCD.

The detected DC voltage value to the current noise level is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



(2) Press the [MENU] key to write the current noise level value into the EEPROM.

② Squelch (SQL2)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "SQ2" on the LCD.



(2) Press the [MENU] key to write the current noise level value into the EEPROM.

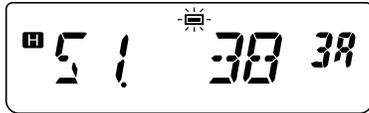
ADJUSTMENT

D. S-meter (Two segments in S-meter light, all segments in S-meter light)

①S-meter (Two segments in S-meter light)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "S1" on the LCD.

The current RSSI level value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [MENU] key to write the current RSSI level value into the EEPROM.

②S-meter (All segments in S-meter light)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "S9" on the LCD.



- (2) Press the [MENU] key to write the current RSSI level value into the EEPROM.

E. RX BPF (Lower limit frequency, center frequency, upper limit frequency)

①RX BPF (Lower limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "BPL" on the LCD.

The current BPF tuning value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the lower limit frequency on the LCD.
- (4) Press the [CALL] key to switch to the adjustment display.
- (5) Turn the encoder to change the current BPF tuning value and adjust RX BPF.
- (6) Press the [MENU] key to write the current BPF tuning value into the EEPROM.

②RX BPF (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "BPC" on the LCD.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the center frequency on the LCD.
- (4) Repeat steps (4) to (6) of "①RX BPF (Lower limit frequency)" described on page 29.

③RX BPF (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "BPH" on the LCD.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the upper frequency on the LCD.
- (4) Repeat steps (4) to (6) of "①RX BPF (Lower limit frequency)" described on page 29.

F. 7.5V TX H power (Lower limit frequency, center frequency, upper limit frequency)

①7.5V TX H power (Lower limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P7L" on the LCD.

In this case, the "H" icon appears.

The current APC value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the lower limit frequency on the LCD.
- (4) Press the [CALL] key to switch to the adjustment display.
- (5) Press the [PTT] key to enable the transmit mode.
- (6) Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 7.5V while the transceiver is transmitting.
- (7) Turn the encoder to change the current APC value and adjust the transmission power.

ADJUSTMENT

(8) Press the [MENU] key to write the current APC value into the EEPROM.

② 7.5V TX H power (Center frequency)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "P7C" on the LCD.

In this case, the "H" icon appears.



(2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.

(3) Turn the encoder to display the center frequency on the LCD.

(4) Repeat steps (4) to (8) of "① 7.5V TX H power (Lower limit frequency)" described on page 29.

③ 7.5V TX H power (Upper limit frequency)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "P7H" on the LCD.

In this case, the "H" icon appears.



(2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.

(3) Turn the encoder to display the upper limit frequency on the LCD.

(4) Repeat steps (4) to (8) of "① 7.5V TX H power (Lower limit frequency)" described on page 29.

G. 7.5V TX M power (Lower limit frequency, center frequency, upper limit frequency)

① 7.5V TX M power (Lower limit frequency)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "P7L" on the LCD.

In this case, the "M" icon appears.

The current APC value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



(2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.

(3) Turn the encoder to display the lower limit frequency on the LCD.

(4) Press the [CALL] key to switch to the adjustment display.

(5) Press the [PTT] key to enable the transmit mode.

(6) Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 7.5V while the transceiver is transmitting.

(7) Turn the encoder to change the current APC value and adjust the transmission power.

(8) Press the [MENU] key to write the current APC value into the EEPROM.

② 7.5V TX M power (Center frequency)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "P7C" on the LCD.

In this case, the "M" icon appears.



(2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.

(3) Turn the encoder to display the center frequency on the LCD.

(4) Repeat steps (4) to (8) of "① 7.5V TX M power (Lower limit frequency)" described on page 30.

③ 7.5V TX M power (Upper limit frequency)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "P7H" on the LCD.

In this case, the "M" icon appears.



(2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.

(3) Turn the encoder to display upper limit frequency on the LCD.

(4) Repeat steps (4) to (8) of "① 7.5V TX M power (Lower limit frequency)" described on page 30.

H. 7.5V TX L power (Lower limit frequency, center frequency, upper limit frequency)

① 7.5V TX L power (Lower limit frequency)

(1) Press the [LAMP] or [MONI] key on the transceiver to display "P7L" on the LCD.

In this case, the "L" icon appears.

The current APC value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



ADJUSTMENT

- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the lower limit frequency on the LCD.
- (4) Press the [CALL] key to switch to the adjustment display.
- (5) Press the [PTT] key to enable the transmit mode.
- (6) Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 7.5V while the transceiver is transmitting.
- (7) Turn the encoder to change the current APC value and adjust the transmission power.
- (8) Press the [MENU] key to write the current APC value into the EEPROM.

②7.5V TX L power (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P7C" on the LCD.

In this case, the "L" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the center frequency on the LCD.
- (4) Repeat steps (4) to (8) of "①7.5V TX L power (Lower limit frequency)" described on page 30.

③7.5V TX L power (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P7H" on the LCD.

In this case, the "H" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the upper limit frequency on the LCD.
- (4) Repeat steps (4) to (8) of "①7.5V TX L power (Lower limit frequency)" described on page 30.

I. 13.8V TX H power (Lower limit frequency, center frequency, upper limit frequency)

①13.8V TX H power (Lower limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13L" on the LCD.

In this case, the "L" icon appears.

The current APC value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the lower limit frequency on the LCD.
- (4) Press the [CALL] key to switch to the adjustment display.
- (5) Press the [PTT] key to enable the transmit mode.
- (6) Turn the encoder to change the current APC value and adjust the transmission power.
- (7) Press the [MENU] key to write the current APC value into the EEPROM.

②13.8V TX H power (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13C" on the LCD.

In this case, the "C" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display center frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①13.8V TX H power (Lower limit frequency)" described on page 31.

③13.8V TX H power (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13H" on the LCD.

In this case, the "H" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display upper limit frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①13.8V TX H power (Lower limit frequency)" described on page 31.

ADJUSTMENT

J. 13.8V TX M power (Lower limit frequency, center frequency, upper limit frequency)**① 13.8V TX M power (Lower limit frequency)**

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13L" on the LCD.

In this case, the "M" icon appears.

The current APC value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
 (3) Turn the encoder to display the lower limit frequency on the LCD.
 (4) Press the [CALL] key to switch to the adjustment display.
 (5) Press the [PTT] key to enable the transmit mode.
 (6) Turn the encoder to change the current APC value and adjust the transmission power.
 (7) Press the [MENU] key to write the current APC value into the EEPROM.

② 13.8V TX M power (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13C" on the LCD.

In this case, the "M" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
 (3) Turn the encoder to display the center frequency on the LCD.
 (4) Repeat steps (4) to (7) of "① 13.8V TX M power (Lower limit frequency)" described on page 32.

③ 13.8V TX M power (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13H" on the LCD.

In this case, the "M" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
 (3) Turn the encoder to display the upper limit frequency on the LCD.

- (4) Repeat steps (4) to (7) of "① 13.8V TX M power (Lower limit frequency)" described on page 32.

K. 13.8V TX L power (Lower limit frequency, center frequency, upper limit frequency)**① 13.8V TX L power (Lower limit frequency)**

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13L" on the LCD.

In this case, the "L" icon appears.

The current APC value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
 (3) Turn the encoder to display the lower limit frequency on the LCD.
 (4) Press the [CALL] key to switch to the adjustment display.
 (5) Press the [PTT] key to enable transmit mode.
 (6) Turn the encoder to change the current APC value and adjust transmission power.
 (7) Press the [MENU] key to write the current APC value into the EEPROM.

② 13.8V TX L power (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13C" on the LCD.

In this case, the "L" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
 (3) Turn the encoder to display the center frequency on the LCD.
 (4) Repeat steps (4) to (7) of "① 13.8V TX L power (Lower limit frequency)" described on page 32.

③ 13.8V TX L power (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "P13H" on the LCD.

In this case, the "L" icon appears.



ADJUSTMENT

- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the upper limit frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①13.8V TX L power (Lower limit frequency)" described on page 32.

L. DCS modulation balance

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DCS.BAL" on the LCD. Press the [F] key and then the [PTT] key repeatedly to turn the "L" icon ON.



- (2) When the [PTT] key is pressed to enable transmit mode, a 100Hz square waveform is internally generated and modulated.
- (3) While observing the waveforms on the oscilloscope, turn the semi-fixed volume (VR6) to adjust the DCS modulation waveform to a square waveform.
- (4) When the DCS modulation waveform becomes a square waveform, release the [PTT] key.

M. Tone deviation (Lower limit frequency, center frequency, upper limit frequency)

①Tone deviation (Lower limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DVL" on the LCD.

In this case, the "L" icon appears. Press the [F] key and then the [PTT] key repeatedly to turn the "L" icon ON.

The current adjustment value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the lower limit frequency on the LCD.
- (4) Press the [CALL] key to switch to the adjustment display.
- (5) When the [PTT] key is pressed to enable transmit mode, a preset tone frequency (151.4Hz) is internally generated and modulated.
- (6) Turn the encoder to change the current adjustment value and adjust tone deviation.
- (7) Press the [MENU] key to write the current adjustment value into the EEPROM.

②Tone deviation (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DVC" on the LCD.

In this case, the "L" icon appears. Press the [F] key and then the [PTT] key repeatedly to turn the "L" icon ON.

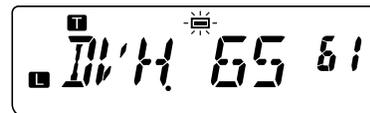


- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the center frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①Tone deviation (Lower limit frequency)" described on page 33.

③Tone deviation (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DVH" on the LCD.

In this case, the "L" icon appears. Press the [F] key and then the [PTT] key repeatedly to turn the "L" icon ON.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the upper limit frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①Tone deviation (Lower limit frequency)" described on page 33.

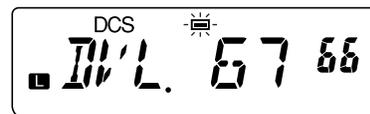
N. DCS deviation (Lower limit frequency, center frequency, upper limit frequency)

①DCS deviation (Lower limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DVL" on the LCD.

In this case, the "DCS" icon appears. Press the [F] key and then the [PTT] key repeatedly to turn the "L" icon ON.

The current adjustment value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the lower limit frequency on the LCD.

ADJUSTMENT

- (4) Press the [CALL] key to switch to the adjustment display.
- (5) When the [PTT] key is pressed to enable transmit mode, a preset DCS code (023) is internally generated and modulated.
- (6) Turn the encoder to change the current adjustment value and adjust DCS deviation.
- (7) Press the [MENU] key to write the current adjustment value into the EEPROM.

②DCS deviation (Center frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DVC" on the LCD.

In this case, the "DCS" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the center frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①DCS deviation (Lower limit frequency)" described on page 33.

③DCS deviation (Upper limit frequency)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "DVH" on the LCD.

In this case, the "DCS" icon appears.



- (2) Press the [VFO], [MR] or [CALL] key to switch to the frequency display.
- (3) Turn the encoder to display the upper limit frequency on the LCD.
- (4) Repeat steps (4) to (7) of "①DCS deviation (Lower limit frequency)" described on page 33.

0. VOX sensitivity (Level 1, level 9)

①VOX sensitivity (Level 1)

- (1) Press the [LAMP] or [MONI] key on the transceiver to display "VOX1" on the LCD.

Press the [F] key and then the [PTT] key repeatedly to turn the "■" icon ON.

The current microphone input level value is displayed at the lower digits of the frequency display, and the value stored in the EEPROM is displayed on the memory channel number display.



- (2) Input a specified AG signal to microphone input.
- (3) Press the [MENU] key to write the current microphone input level value into the EEPROM.

②VOX sensitivity (Level 9)

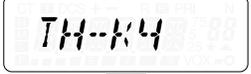
- (1) Press the [LAMP] or [MONI] key on the transceiver to display "VOX9" on the LCD.

- (2) Input a specified AG signal to microphone input.
- (3) Press the [MENU] key to write the current microphone input level value into the EEPROM.



ADJUSTMENT

Common Section

Item	Condition	Measurement			Adjustment			Specifications/ Remarks	
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. Setting and resetting	<p>Connect the optional PG-2W DC cable to the power supply. DC IN terminal voltage: 13.8V</p> <p>1) Total illumination display confirmation Turn the Transceiver Power ON by pressing the power switch while the [F] key is pressed. While the [F] key is pressed, all LCD segments light.</p> <p>2) Full-resetting After confirming that all LCD segments have lighted described in the Step 1 above, release the [F] key, and then press the [F] key twice while "FL.RST?" appears on the display.</p>	<p>LCD total illumination display</p> 			<p>Initial configuration displayed after the full-reset.</p>   				
2 VCO Lock voltage Check	<p>After removing 3 screws fixing the TX-RX unit (B/3), remove the TX-RX (B/3) unit from the CN9 connector of the TX-RX unit (A/3).</p> <p>1) Frequency: 400.000MHz 2) Frequency: 469.990MHz</p>	DVM	TX-RX (A/3)	LV			Check	0.7V or more	
RX								4.3V or less	
TX	TX power: Low								0.7V or more
	<p>1) Frequency: 400.000MHz PTT: ON</p> <p>2) Frequency: 469.990MHz PTT: ON</p> <p>After observing the VCO lock voltage, connect the TX-RX unit (B/3) to the original position.</p>								4.3V or less
3. TX frequency Adjust	<p>1) TX power: Low Frequency: 439.990MHz PTT: ON</p>	f. counter		ANT	TX-RX (A/3)	VR1	439.990MHz	±400Hz	
4. Overvoltage warning reference voltage Adjust/Check	<p>Switch to Adjustment mode and carry out the operations for adjustment item A. (Refer to page 28)</p> <p>1) LCD display: DC Frequency: 435.050MHz DC IN terminal voltage: 14.8V</p> <p>To exit from the Adjustment Mode, turn the transceiver power OFF and then ON.</p> <p>2) Frequency: 435.050MHz DC IN terminal voltage: 17.5V</p>	DC power supply				[MENU]	Write		
								Check	Alarm sound and display "DC ERR" message.

ADJUSTMENT

Receiver section

Item	Condition	Measurement			Adjustment			Specifications/ Remarks	
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. RX BPF Adjust	Squelch level: 0	SSG Oscilloscope Distortion meter AF V.M Dummy load	TX-RX (A/3)	ANT SP		VOL knob	Turn the VOL knob to obtain 0.63V AF output.	0.63V	
	1) Frequency: 435.050MHz SSG output: -53dBm (501 uV) SSG MOD: 1kHz SSG DEV: 3kHz								
	Switch to Adjustment mode and carry out the operations for adjustment item E. (Refer to page 29)								
	2) LCD display: BPL Frequency: 400.050MHz SSG: -119dBm (0.25 uV)					Encoder [MENU]	Write	Max Sensitivity	
	3) SSG: -110dBm (0.707 uV)						Check	12dB SINAD or more	
	4) LCD display: BPC Frequency: 435.050MHz SSG: -120dBm (0.22 uV)					Encoder [MENU]	Write	Max Sensitivity	
	5) SSG: -120dBm (0.22 uV)						Check	12dB SINAD or more	
	6) LCD display: BPH Frequency: 469.990MHz SSG: -121dBm (0.199 uV)					Encoder [MENU]	Write	Max Sensitivity	
7) SSG: -113dBm (0.501uV)			Check	12dB SINAD or more					
2. IF response Check	1) Frequency : 469.990MHz SSG Frequency: 450.565MHz SSG output: -53dBm (501uV) SSG MOD: 1kHz SSG DEV: 3kHz AF output: 0.63V/8Ω	SSG Oscilloscope Distortion meter					Check	12dB SINAD or less Note: If the specification is not satisfied, repeat the operations for "1. RX BPF Adjust".	
	2) Frequency : 400.050MHz SSG Frequency: 380.625MHz SSG output: -53dBm (501uV)								
	3) Frequency : 435.000MHz SSG Frequency: 415.575MHz SSG output: -53dBm (501uV)								
3. Squelch / S-meter Write	Switch to Adjustment mode and carry out the operations for adjustment item C. (Refer to page 28)	SSG		ANT				Note: In the Squelch adjustments, all 4 adjusting points including the S-meter must be adjusted.	
	1) LCD display: SQ1 Frequency: 435.050MHz SSG: -125dBm (0.126uV)				[MENU]	Write			
Squelch	2) LCD display: SQ2 Frequency: 435.050MHz SSG: -120dBm (0.22uV)				[MENU]	Write			

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method	
S-meter	Switch to Adjustment mode and carry out the operations for adjustment item D. (Refer to page 29) 3) LCD display: S1 Frequency: 435.050MHz SSG: -120dBm (0.22uV)	SSG	TX-RX (A/3)	ANT		[MENU]	Write	
	4) LCD display: S9 Frequency: 435.050MHz SSG: -105dBm (1.26uV)					[MENU]	Write	
4. Squelch Check	Squelch level: 1 1) Frequency: 435.050MHz SSG output: -123dBm (0.158uV) SSG MOD: 1kHz SSG DEV: 3kHz	SSG Oscilloscope Distortion meter					Check	Open Squelch
	2) SSG: OFF							Close Squelch
5. S-meter Check	1) Frequency: 435.050MHz SSG output: -120dBm (0.22uV)	SSG					Check	Two segments in S-meter light. ■■
	2) SSG output: -105dBm (1.26uV)							All segments in S-meter light. ■■■■■■■■■■
6. Hum and noise ratio Check	1) Frequency: 435.050MHz SSG output: -53dBm (501uV) SSG MOD: 1kHz SSG DEV: 3kHz AF Output: 0.63V/8Ω AF V.M = 0dB	SSG Oscilloscope Distortion meter AF V.M	TX-RX (A/3)	ANT SP				
	2) SSG DEV: OFF							-38dB or less
7. AF distortion Check	1) Frequency: 435.050MHz SSG output: -53dBm (501uV) SSG MOD: 1kHz SSG DEV: 3kHz AF Output: 0.63V/8Ω						Check	5% or less
8. AF output Check	1) Frequency: 435.050MHz SSG output: -53dBm (501uV) SSG MOD: 1kHz SSG DEV: 3kHz AF distortion: 10%						Check	400mW or more
9. Current Drain Check	Squelch level: 5 1) Frequency: 435.050MHz SSG output: OFF	SSG Am meter					Check	80mA or less
	2) Frequency: 435.050MHz SSG output: -53dBm (501uV) SSG MOD: 1kHz SSG DEV: 3kHz VOL knob: Max							400mA or less

ADJUSTMENT

Transmitter section

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method	
1. TX power Write (Battery terminal: 7.5V)	Battery terminal voltage: 7.5V Note: Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 7.5V while the transceiver is transmitting.	DC power supply DVM	TX-RX (A/3)	B GND				Note: Do not use the DC IN terminal.
High power	Switch to Adjustment mode and carry out the operations for adjustment item F. (Refer to page 29) 1) LCD display: P7L, H Frequency: 430.000MHz PTT: ON	Power meter Am meter		ANT		Encoder [MENU]	Write	4.8W ±0.05W 2.1A or less
	2) LCD display: P7C, H Frequency: 435.000MHz PTT: ON							
	3) LCD display: P7H, H Frequency: 439.995MHz PTT: ON							
Mid power	Switch to Adjustment mode and carry out the operations for adjustment item G. (Refer to page 30) 4) LCD display: P7L, M Frequency: 430.000MHz PTT: ON					Encoder [MENU]	Write	1.5W ±0.05W 1.4A or less
	5) LCD display: P7C, M Frequency: 435.000MHz PTT: ON							
	6) LCD display: P7H, M Frequency: 439.995MHz PTT: ON							
Low power	Switch to Adjustment mode and carry out the operations for adjustment item H. (Refer to page 30) 7) LCD display: P7L, L Frequency: 430.000MHz PTT: ON					Encoder [MENU]	Write	0.5W ±0.05W 0.8A or less
	8) LCD display: P7C, L Frequency: 435.000MHz PTT: ON							
	9) LCD display: P7H, L Frequency: 439.995MHz PTT: ON							

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/ Remarks	
		Test equipment	Unit	Terminal	Unit	Parts	Method		
2. TX power Write (DC IN terminal: 13.8V) High power Mid power Low power	Connect the optional PG-2W DC cable to the power supply. DC IN terminal voltage: 13.8V	DC power supply DVM	TX-RX (A/3)	DC IN					
	Switch to Adjustment mode and carry out the operations for adjustment item I. (Refer to page 31) 1) LCD display: P13L, H Frequency: 430.000MHz PTT: ON	Power meter Am meter		ANT		Encoder [MENU]	Write	5.0W - 5.1W 2.0A or less	
	2) LCD display: P13C, H Frequency: 435.000MHz PTT: ON				Encoder [MENU]	Write			
	3) LCD display: P13H, H Frequency: 439.995MHz PTT: ON				Encoder [MENU]	Write			
	Switch to Adjustment mode and carry out the operations for adjustment item J. (Refer to page 32) 4) LCD display: P13L, M Frequency: 430.000MHz PTT: ON					Encoder [MENU]	Write	1.5W ±0.05W 1.4A or less	
	5) LCD display: P13C, M Frequency: 435.000MHz PTT: ON					Encoder [MENU]	Write		
	6) LCD display: P13H, M Frequency: 439.995MHz PTT: ON					Encoder [MENU]	Write		
	Switch to Adjustment mode and carry out the operations for adjustment item K. (Refer to page 32) 7) LCD display: P13L, L Frequency: 430.000MHz PTT: ON						Encoder [MENU]	Write	0.5W ±0.05W 0.8A or less
	8) LCD display: P13C, L Frequency: 435.000MHz PTT: ON						Encoder [MENU]	Write	
9) LCD display: P13H, L Frequency: 439.995MHz PTT: ON					Encoder [MENU]	Write			
3. Battery terminal reference voltage Adjust/ Check	Switch to Adjustment mode and carry out the operations for adjustment item B. (Refer to page 28) TX power: Low 1) LCD display: BAT Frequency: 435.000MHz PTT: ON Battery terminal voltage: 7.5V (Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 7.5V while the transceiver is transmitting.)	DC power supply DVM				[MENU] LCD	Write Check	All segments are lighted. 	

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method	
	To exit from the Adjustment Mode, turn the transceiver power OFF and then ON. 2)Frequency: 435.000MHz PTT: ON Battery terminal voltage: 6.4V (Adjust the output voltage from DC power supply until the voltage at the battery terminal becomes 6.4V while the transceiver is transmitting.)	DC power supply DVM				LCD	Check	4 to 6 segments are lighted. 
4.DCS modulation balance	Switch to Adjustment mode and carry out the operations for adjustment item L. (Refer to page 33) Detector: +P, -P HPF: OFF LPF: 3kHz De-emphasis: OFF TX power: Low 1)LCD display: DCS.BAL Frequency: 435.000MHz PTT: ON	Linear detector Oscilloscope	TX-RX (A/3)	ANT		VR6	By tuning the VR6, adjust the modulation wave until it becomes the square wave.	
5.MAX DEV	To exit from the Adjustment Mode, turn the transceiver power OFF and then ON. MIC terminal input AG: 1kHz/80mV Detector: +P, -P HPF: OFF LPF: 15kHz De-emphasis: OFF TX power: Low 1)Frequency: 435.000MHz PTT: ON	Linear detector AG Oscilloscope		ANT MIC		VR5	4.2kHz According to the larger +, -.	±0.1kHz
6.MIC sensitivity Check	MIC terminal input AG: 1kHz Detector: P-P/2 HPF: OFF LPF: 15kHz De-emphasis: OFF TX power: Low 1)Frequency: 435.000MHz PTT: ON						Change the AG output level to obtain 3kHz deviation.	4mV - 12mV

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method	
7. Tone deviation	Switch to Adjustment mode and carry out the operations for adjustment item M. (Refer to page 33) Detector: P-P/2 HPF: OFF LPF: 3kHz De-emphasis: OFF TX power: Low 1) LCD display: DVL, T Frequency: 430.000MHz PTT: ON	Linear detector	TX-RX (A/3)	ANT		Encoder [MENU]	Write	0.8kHz ±50Hz
					Encoder [MENU]	Write		
					Encoder [MENU]	Write		
8. DCS deviation	Switch to Adjustment mode and carry out the operations for adjustment item N. (Refer to page 33) Detector: +P HOLD HPF: OFF LPF: 3kHz De-emphasis: OFF TX power: Low 1) LCD display: DVL, DCS Frequency: 430.000MHz PTT: ON					Encoder [MENU]	Write	0.8kHz ±50Hz
					Encoder [MENU]	Write		
					Encoder [MENU]	Write		
9. VOX Sensitivity Write	Switch to Adjustment mode and carry out the operations for adjustment item O. (Refer to page 34) TX power: Low 1) LCD display: VOX1 Frequency: 435.000MHz AG: 1kHz/80mV	AG		MIC		[MENU]	Write	
	2) LCD display: VOX9 Frequency: 435.000MHz AG: 1kHz/1.5mV					[MENU]	Write	

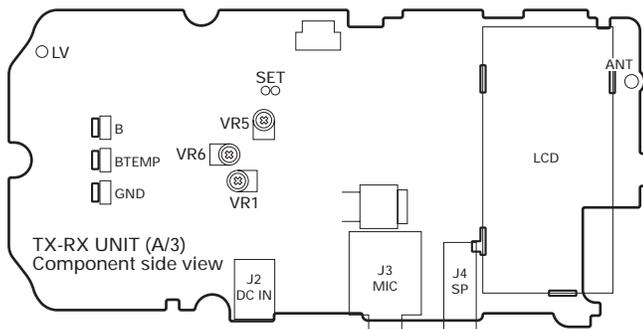
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method	
10. VOX Operation Check	To exit from the Adjustment Mode, turn the transceiver power OFF and then ON. 1)Frequency: 435.000MHz VOX Gain: 4 AG: OFF	AG	TX-RX (A/3)	MIC			Check	Does not transmit.
	2)AG: 1kHz/100mV							Transmits.
11. DTMF DEV Check	Detector: P-P/2 HPF: OFF LPF: 15kHz De-emphasis: OFF TX power: Low 1)Frequency: 435.000MHz Send DTMF code "D" Note: For details of sending DTMF code "D", refer to the "Single Tone Mode" on page 27.	Linear detector		ANT			Check	2.0kHz - 4.2kHz
	12. 1750Hz Tone DEV Check (E type only)							Detector: P-P/2 HPF: OFF LPF: 15kHz De-emphasis: OFF TX power: Low 1)Frequency: 435.000MHz Send 1750Hz Tone
13. Protection Check (DC IN terminal: 13.8V)	TX power: High 1)Frequency: 435.000MHz ANT: OPEN PTT: ON	Am meter					Check	2.4A or less

Adjustment points

TX-RX unit (A/3)

Component side view



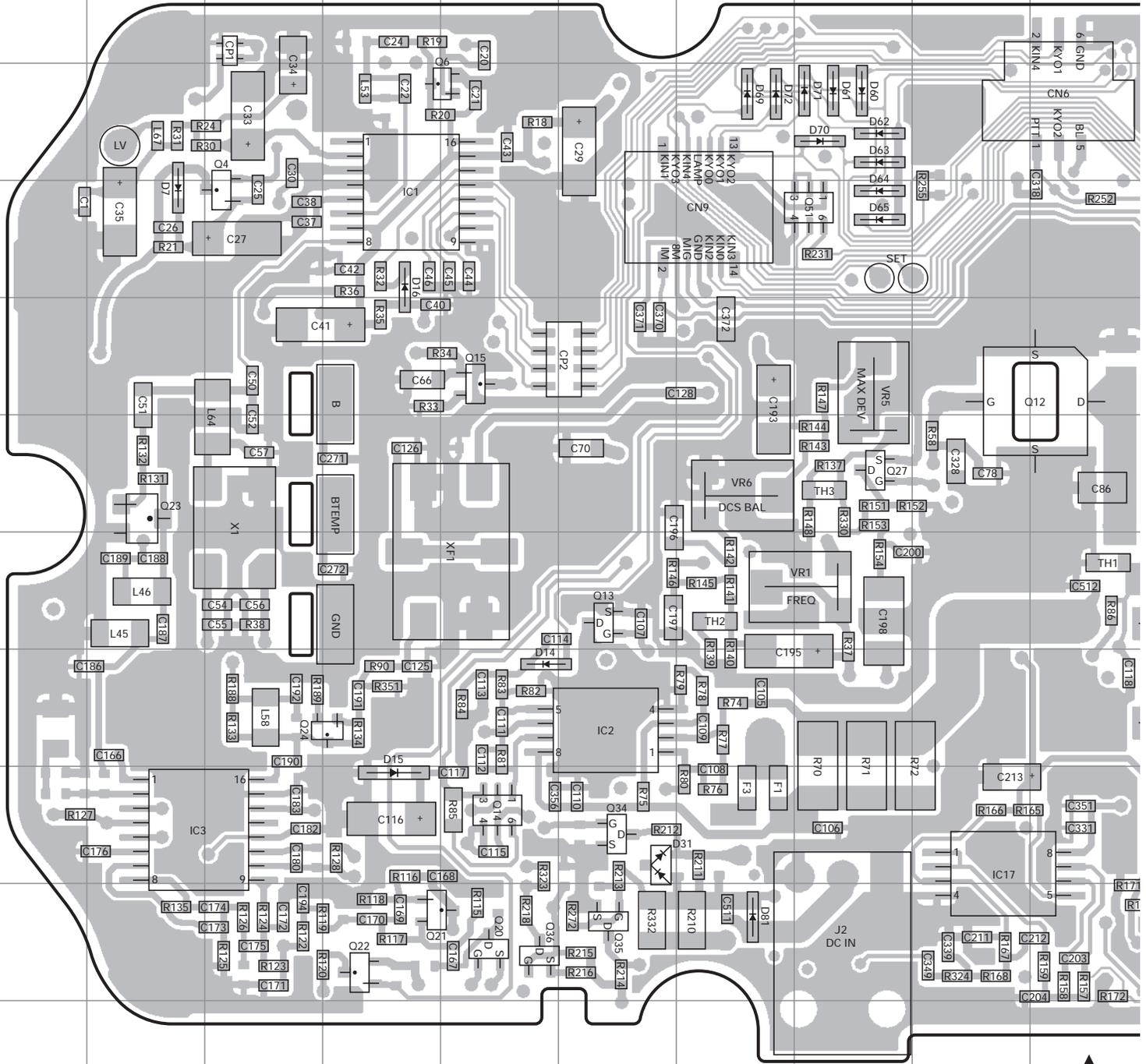
- VR1 : TX frequency
- VR5 : MAX DEV
- VR6 : DCS modulation valance
- LV : VCO lock voltage terminal

TERMINAL FUNCTION

CN No.	Pin No.	Pin Name	Function
TX-RX UNIT (A/3) : TX-RX↔VOL/ENC			
CN1	1	GND	GND
	2	Vol-OUT	RX audio volume output
	3	Vol-IN	RX audio volume input
	4	EN2	Encoder 2
	5	GND	GND
	6	EN1	Encoder 1
TX-RX UNIT (A/3) : TX-RX↔Internal speaker			
CN2	1	SPK	Internal speaker audio
	2	SPG	Audio ground
TX-RX UNIT (A/3) : TX-RX↔TX-RX UNIT (B/3) : 10KEY			
CN6, CN7	1	PTT	PTT
	2	KIN4	Key matrix input
	3	KYO2	Key matrix output (MONI key)
	4	KYO1	Key matrix output (LAMP key)
	5	BL	LCD backlight control
	6	GND	GND
TX-RX UNIT (A/3) : TX-RX↔TX-RX UNIT (C/3) : PTT			
CN8, CN9	1	KIN1	Key matrix input
	2	IM	Internal microphone
	3	KYO3	Key matrix output
	4	8M	8V power supply
	5	KIN4	Key matrix input
	6	MIG	Microphone ground
	7	LAMP	Key illumination control
	8	GND	GND
	9	KYO0	Key matrix output
	10	KIN2	Key matrix input
	11	KYO1	Key matrix output
	12	KIN0	Key matrix input
	13	KYO2	Key matrix output
	14	KIN3	Key matrix input

TH-K4AT/K4E PC BOARD

TX-RX UNIT (X57-675X-XX) (A/3) 0-21 : M2 2-71 : E
 Component side view (J72-0884-19 A/3)



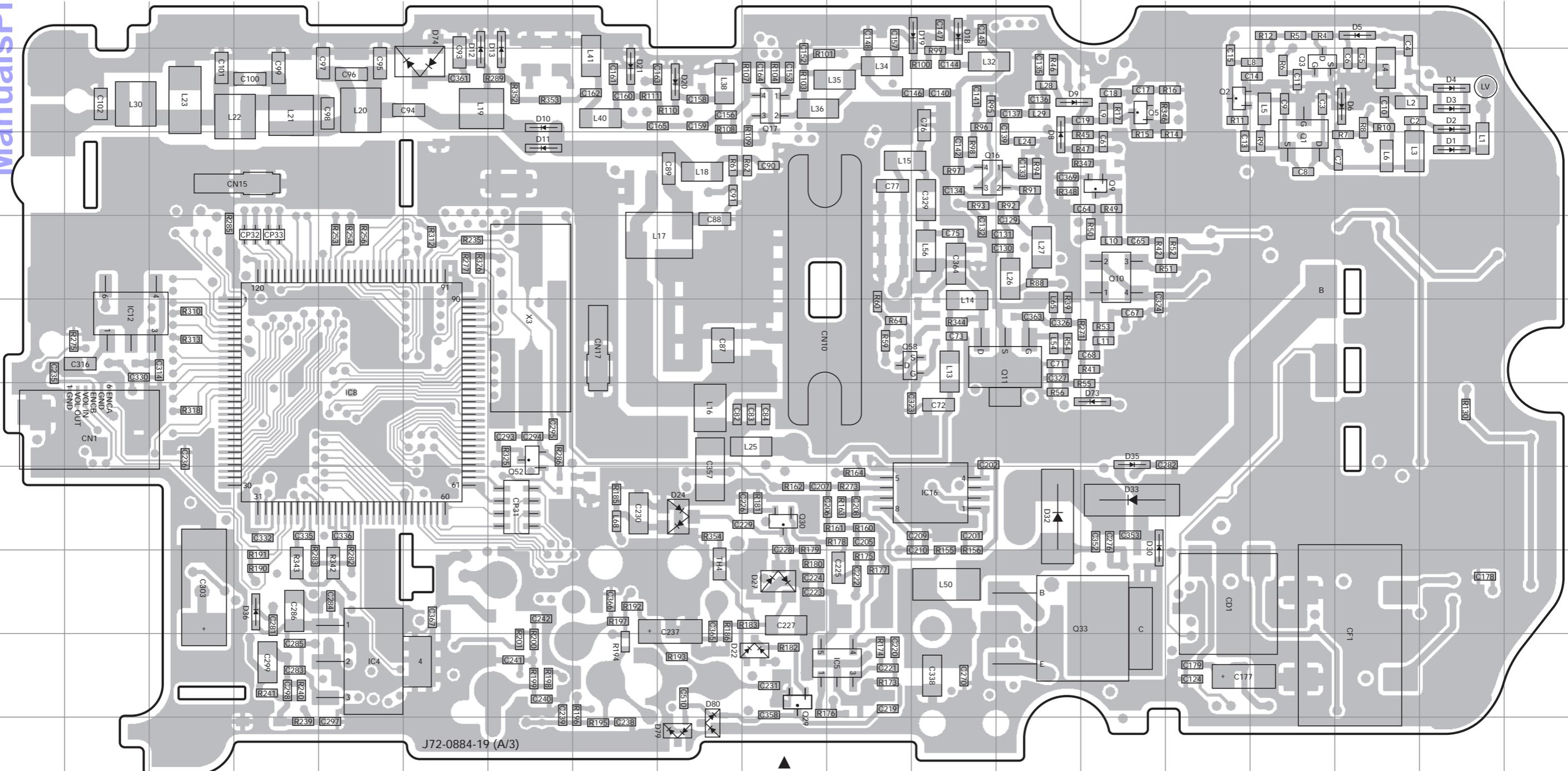
Ref. No.	Address												
IC1	4D	IC17	9I	Q21	10D	Q36	10E	Q56	7L	D31	9F	D64	4H
IC2	8F	Q4	4C	Q22	10D	Q37	8L	Q57	8Q	D34	7L	D65	4H
IC3	9B	Q6	3E	Q23	6B	Q38	7K	D7	4B	D40	7S	D69	3G
IC6	6M	Q12	5J	Q24	8D	Q41	9Q	D14	8E	D41	7S	D70	3H
IC9	9P	Q13	7F	Q27	6H	Q47	7S	D15	9D	D60	3H	D71	3H
IC10	6P	Q14	9E	Q31	6L	Q51	4H	D16	4D	D61	3H	D72	3G
IC11	6Q	Q15	5E	Q34	9F	Q53	9Q	D25	6K	D62	3H	D81	10G
IC15	7P	Q20	10E	Q35	10F	Q55	5P	D26	7L	D63	3H		

TH-K4AT/K4E PC BOARD

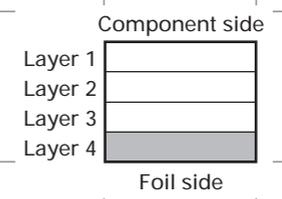
TX-RX UNIT (X57-675X-XX) (A/3) 0-21 : M2 2-71 : E
Foil side view (J72-0884-19 A/3)

PC BOARD TH-K4AT/K4E

TX-RX UNIT (X57-675X-XX) (A/3) 0-21 : M2 2-71 : E
Foil side view (J72-0884-19 A/3)

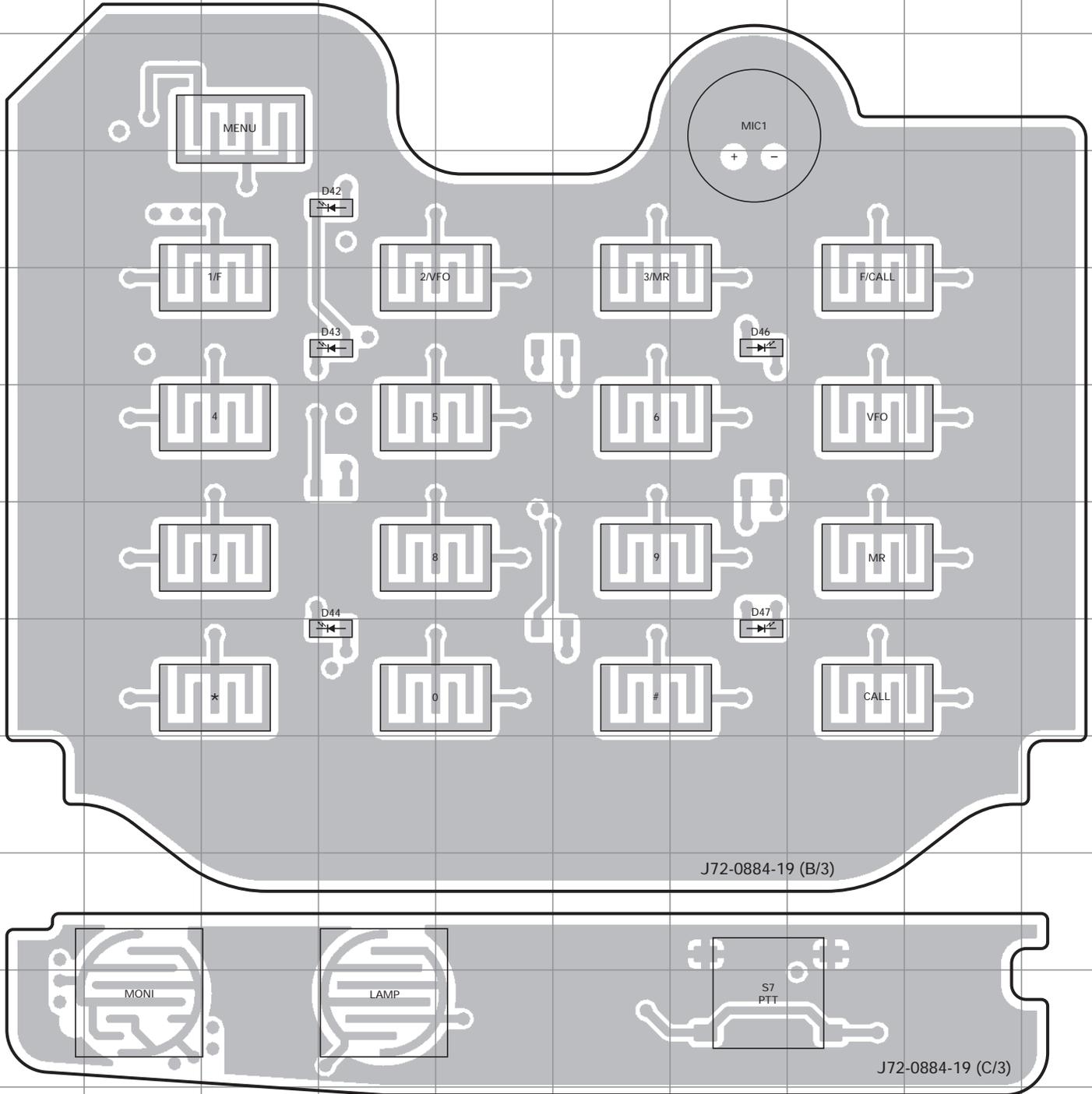


Ref. No.	Address										
IC4	10E	Q5	3N	Q33	9N	D6	3Q	D19	2L	D33	8N
IC5	10K	Q9	4N	Q52	7G	D8	4M	D20	3I	D35	7N
IC8	7E	Q10	5N	Q58	6K	D9	3M	D21	3H	D36	9D
IC12	6B	Q11	6M	D1	4R	D10	3G	D22	10J	D73	7N
IC16	8L	Q16	4L	D2	3R	D11	4G	D24	8I	D74	3F
Q1	4P	Q17	3J	D3	3R	D12	3F	D27	9J	D79	11I
Q2	3O	Q29	10J	D4	3R	D13	3G	D30	8N	D80	11I
Q3	3P	Q30	8J	D5	2Q	D18	2L	D32	8M		

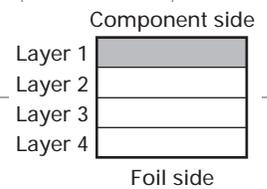


TH-K4AT/K4E PC BOARD

TX-RX UNIT (X57-675X-XX) (B,C/3) 0-21 : M2 2-71 : E
 Component side view (J72-0884-19 B,C/3)

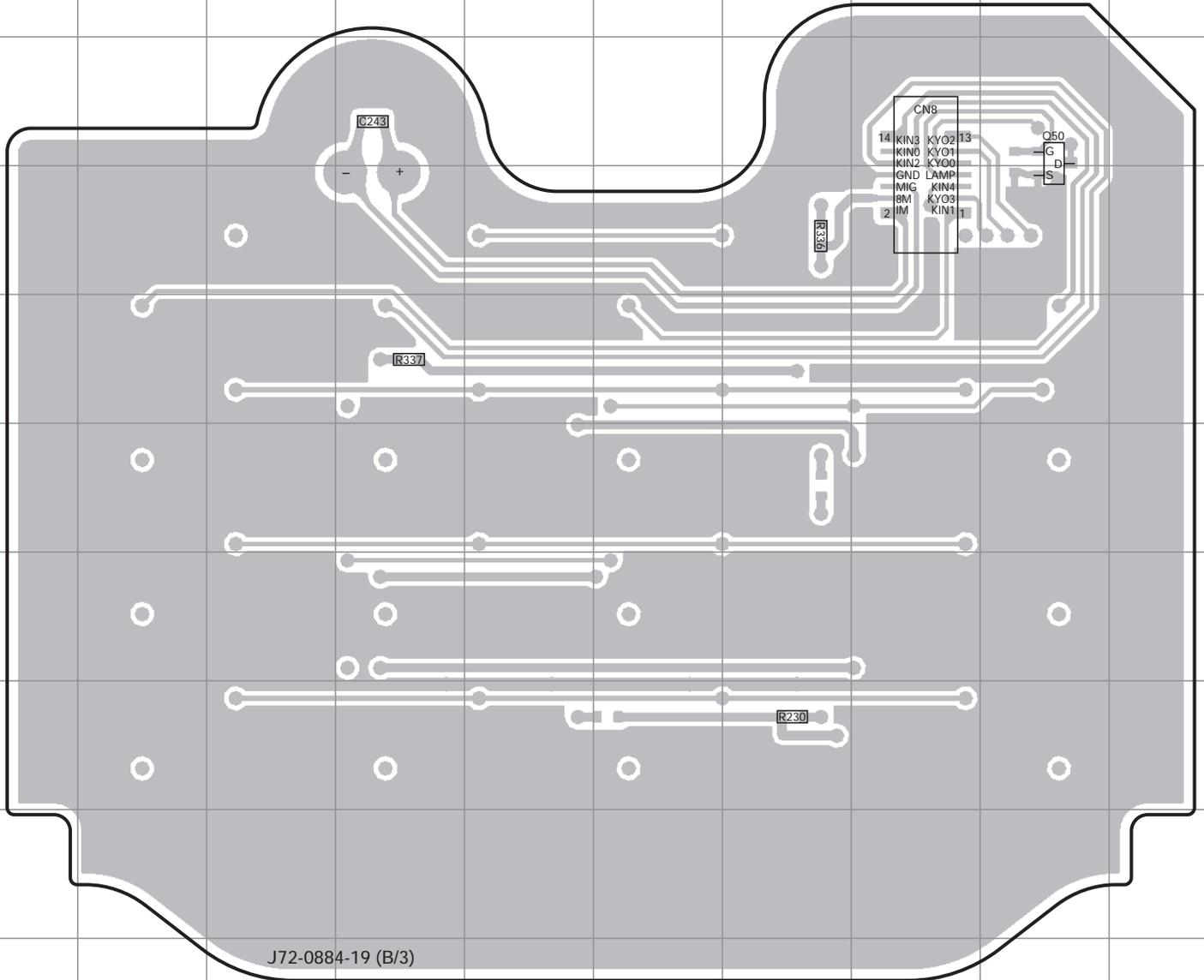


Ref. No.	Address
D42	4D
D43	5D
D44	8D
D46	5G
D47	8G

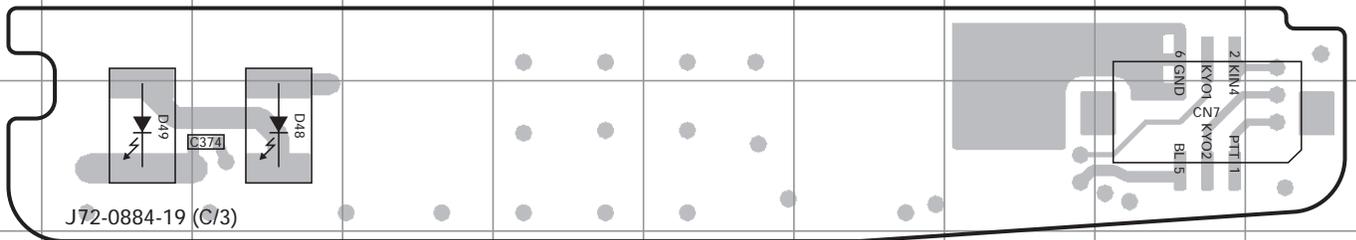


PC BOARD TH-K4AT/K4E

TX-RX UNIT (X57-675X-XX) (B,C/3) 0-21 : M2 2-71 : E
 Foil side view (J72-0884-19 B,C/3)

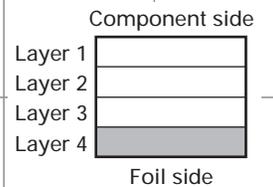


J72-0884-19 (B/3)



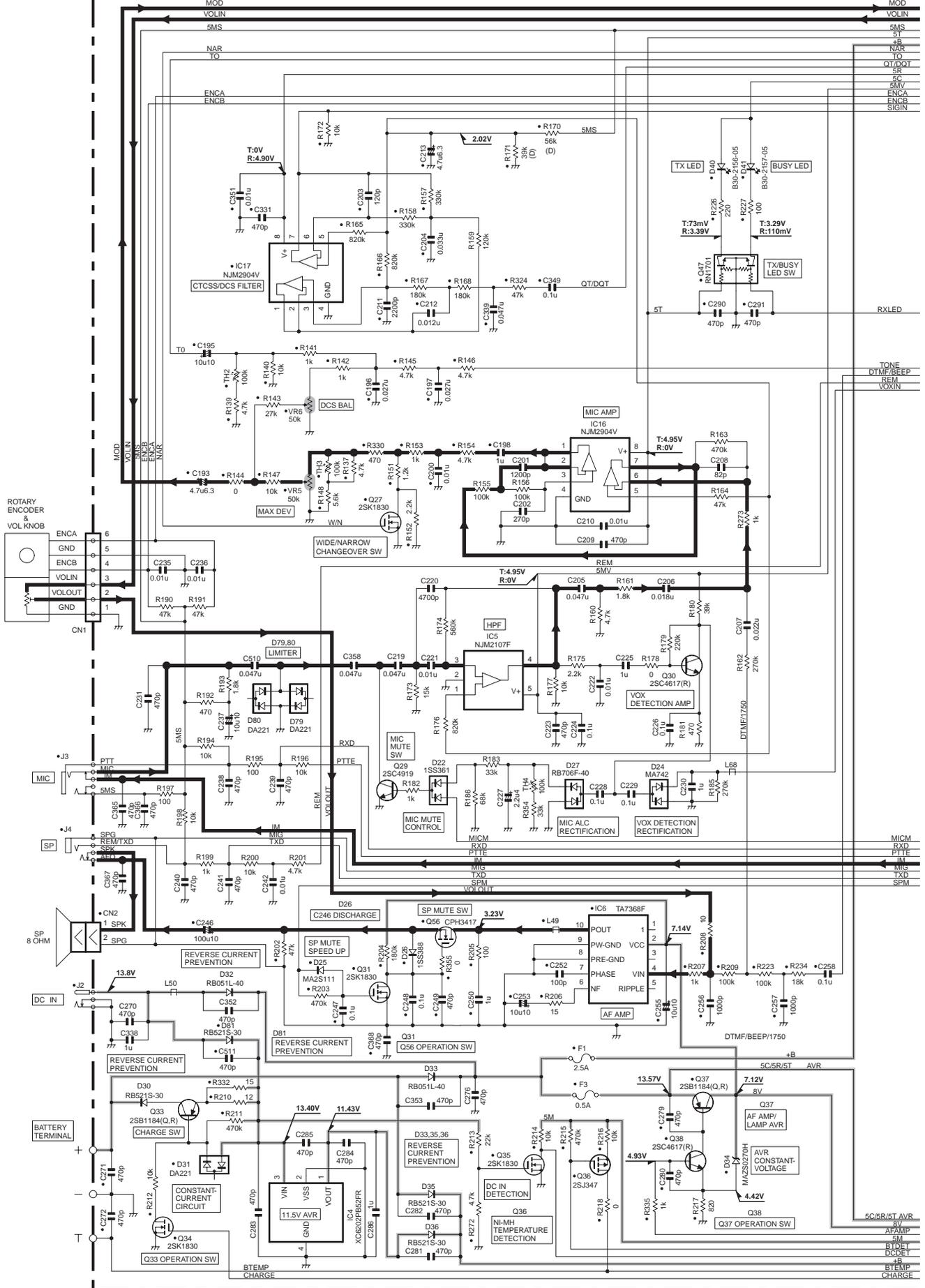
J72-0884-19 (C/3)

Ref. No.	Address
Q50	3I
D48	11C
D49	11B



TH-K4AT/K4E SCHEMATIC DIAGRAM

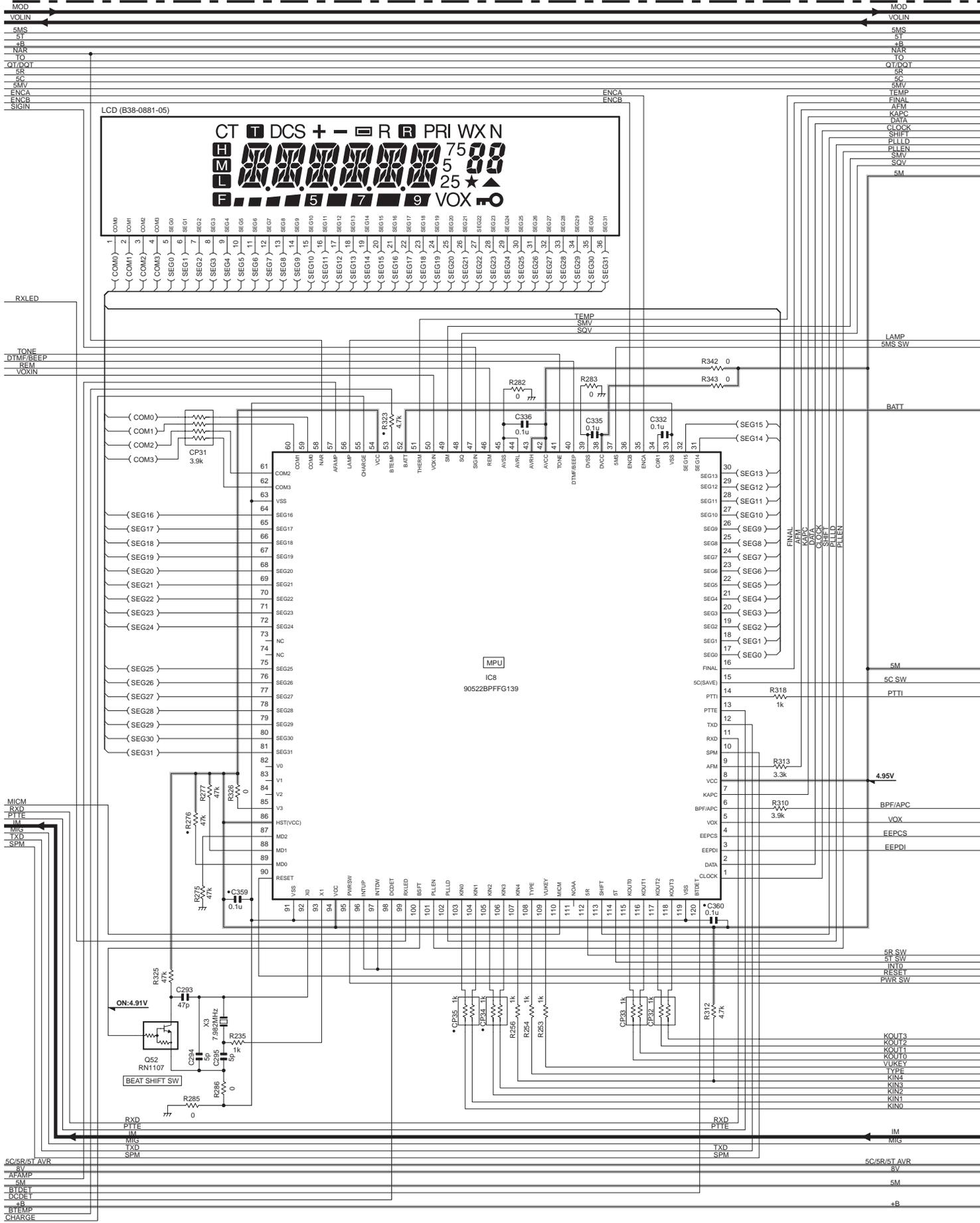
TX-RX UNIT (X57-675X-XX)(A/3)



SCHEMATIC DIAGRAM

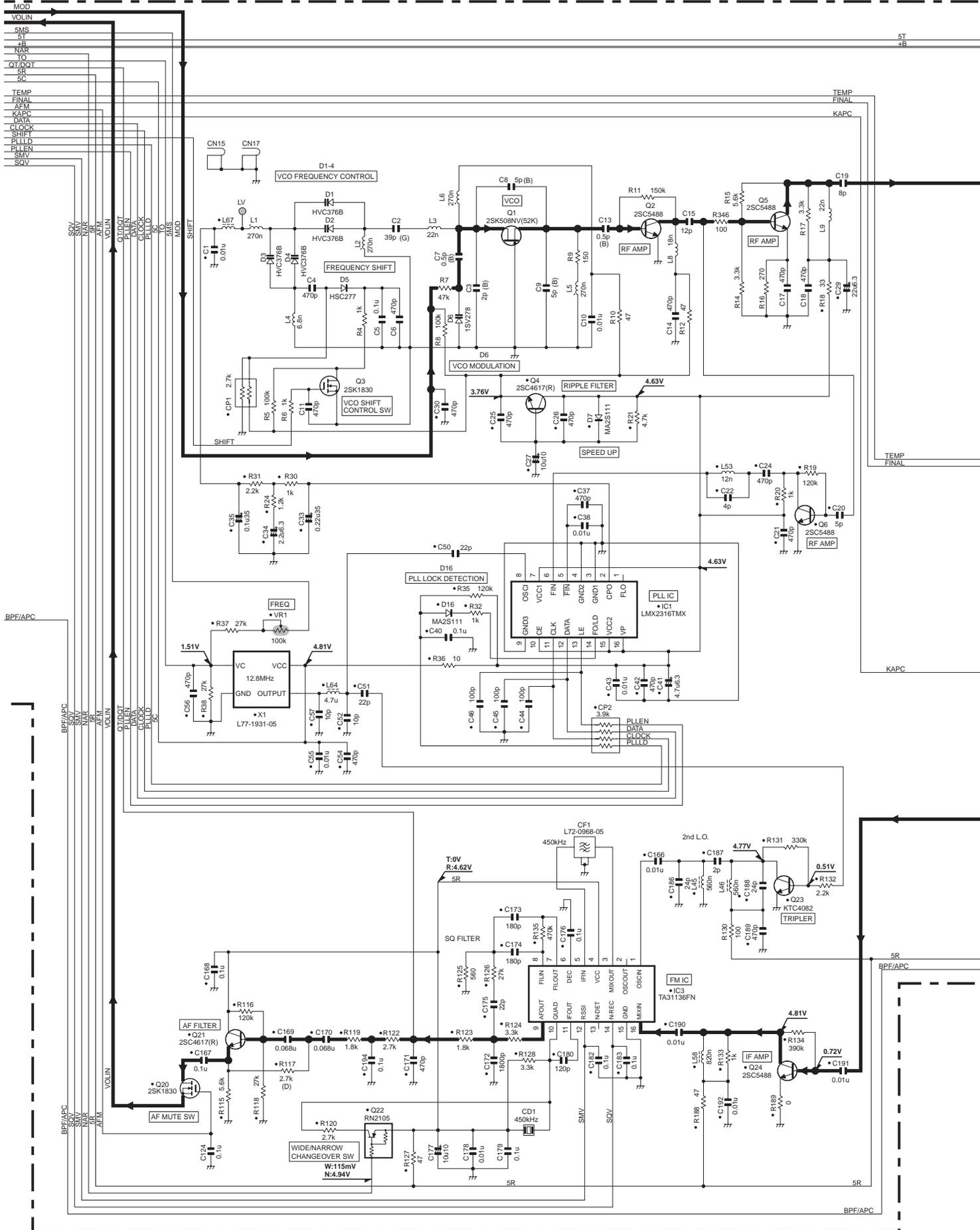
TH-K4AT/K4E

TX-RX UNIT (X57-675X-XX)(A/3)



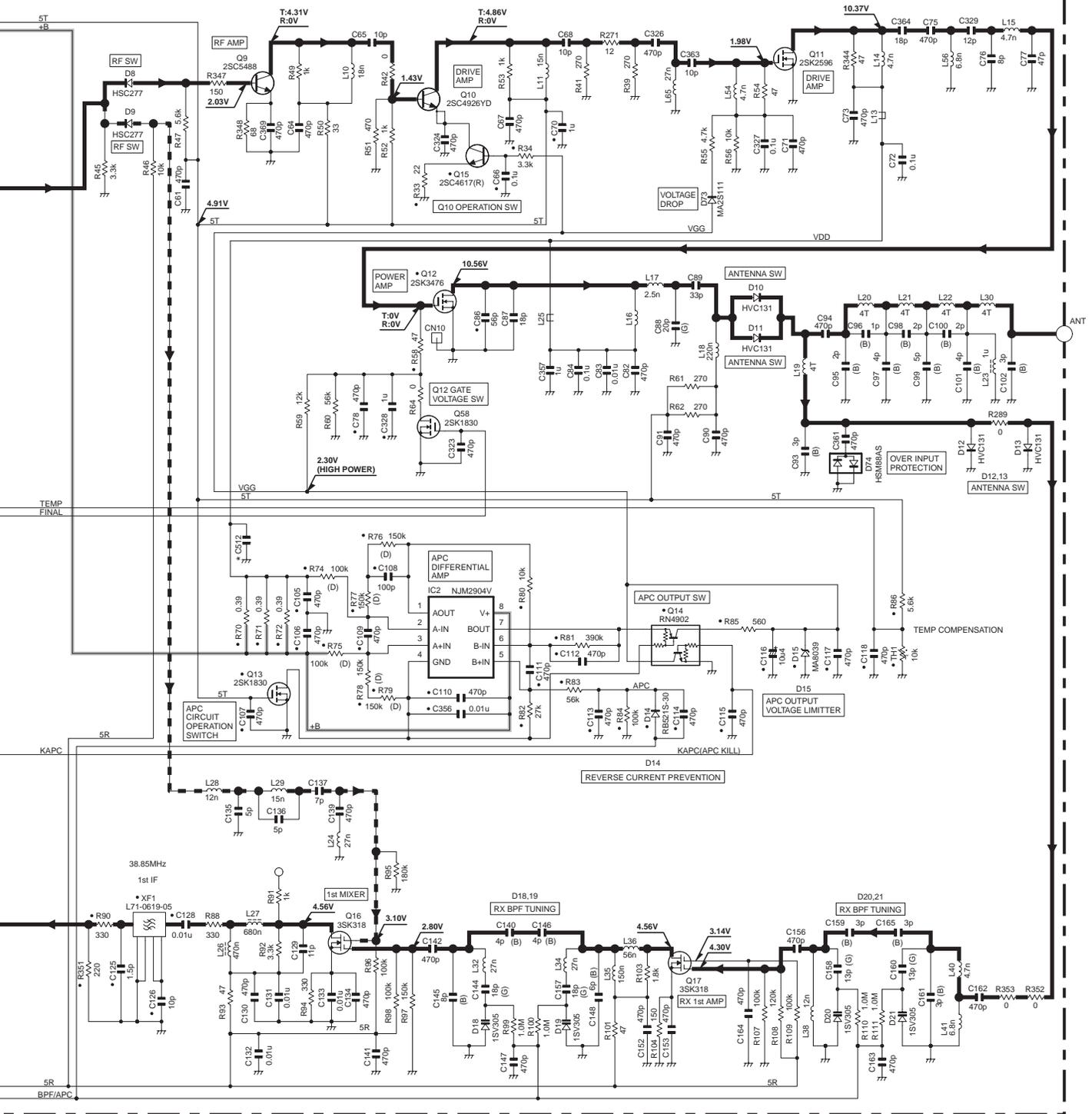
SCHEMATIC DIAGRAM TH-K4AT/K4E

TX-RX UNIT (X57-675X-XX)(A/3)



TH-K4AT/K4E SCHEMATIC DIAGRAM

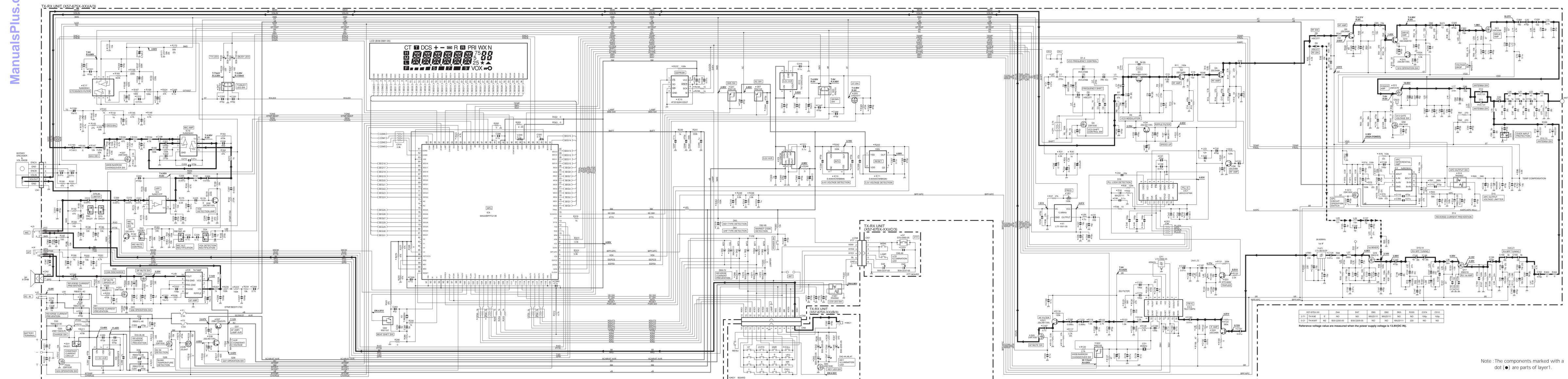
TX-RX UNIT (X57-675X-XX)(A/3)



X57-675X-XX	D44	D47	D60	D62	D63	R230	C374	C512
2-71 TH-K4E	E	NO	NO	MA2S111	MA2S111	NO	NO	100p
0-21 TH-K4AT	M2	B30-2205-05	B30-2205-05	NO	NO	MA2S111	220	NO

Reference voltage value are measured when the power supply voltage is 13.8V(DC IN).

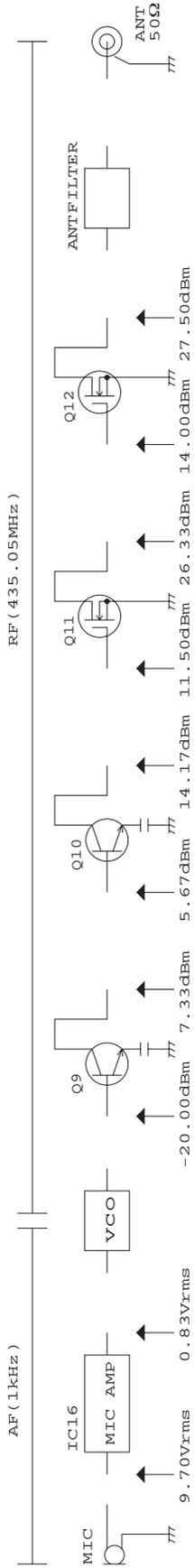
Note : The components marked with a dot (●) are parts of layer1.



Note : The components marked with a dot (●) are parts of layer 1.

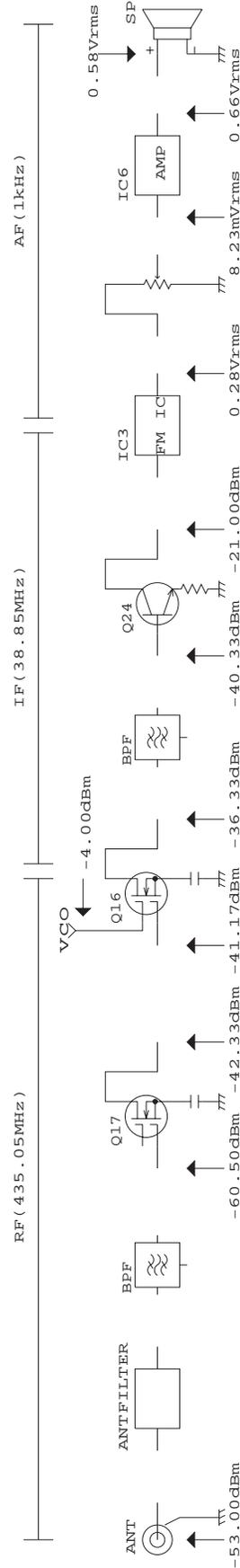
LEVEL DIAGRAM

Transmitter Section



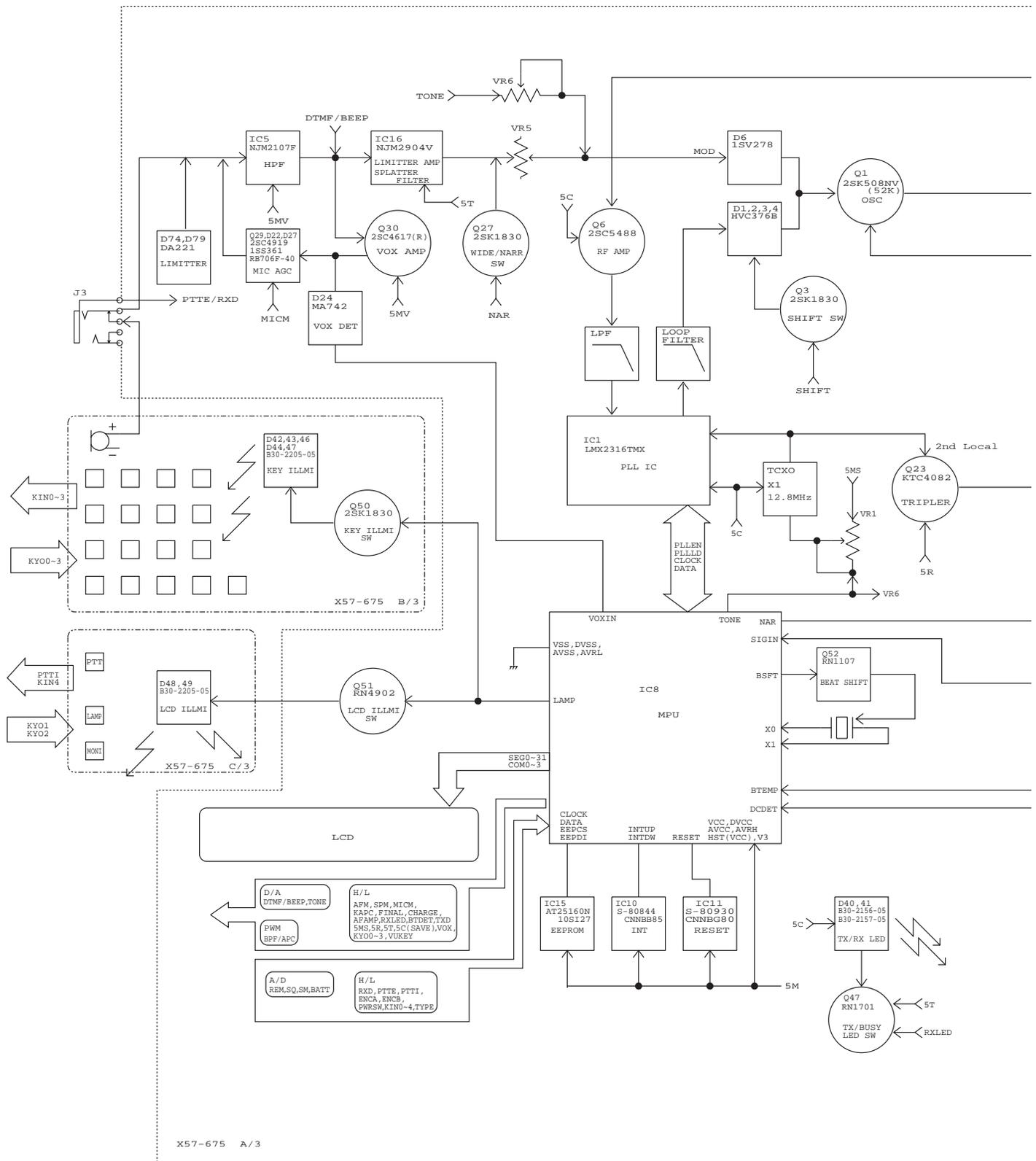
All voltage levels must be measured at High power transmission. The RF and IF sections are measured by using a spectrum analyzer. After setting the standard (1 kHz, 3 kHz Dev.) deviation, each voltage of the AF section is measured by using an AF VTVM or oscilloscope. The level for each point is measured without removing parts or cutting the pattern.

Receiver Section

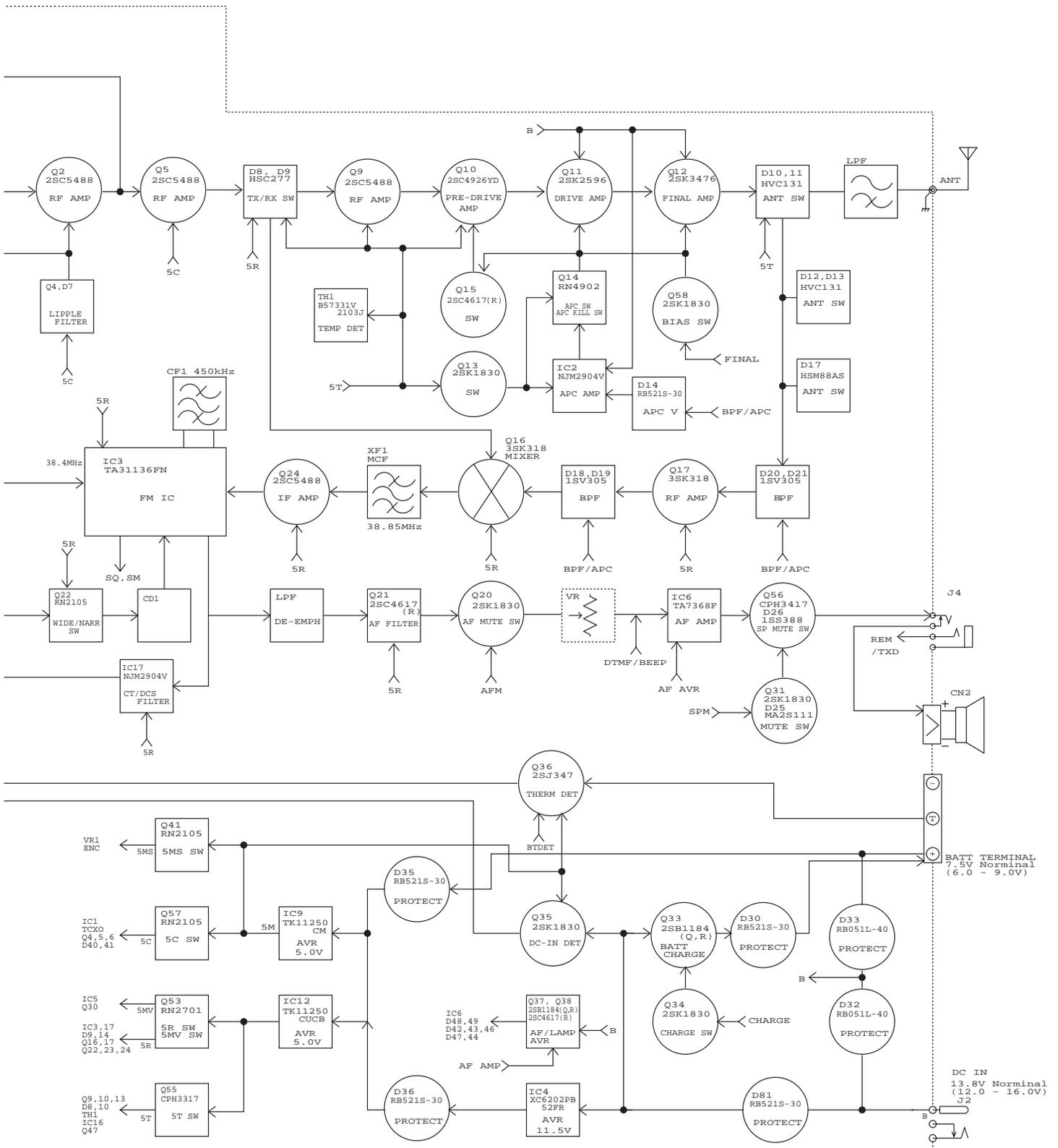


All voltage levels must be measured after setting the AF output voltage at 0.58V rms. The RF and IF sections are measured by using a spectrum analyzer. Each voltage of the AF section is measured by using an AF VTVM or oscilloscope. The level for each point is measured without removing parts or cutting the pattern.

BLOCK DIAGRAM



BLOCK DIAGRAM



BC-21 (WALL CHARGER) / PB-43N (Ni-MH BATTERY PACK)

BC-21 External View



Photo is K type.

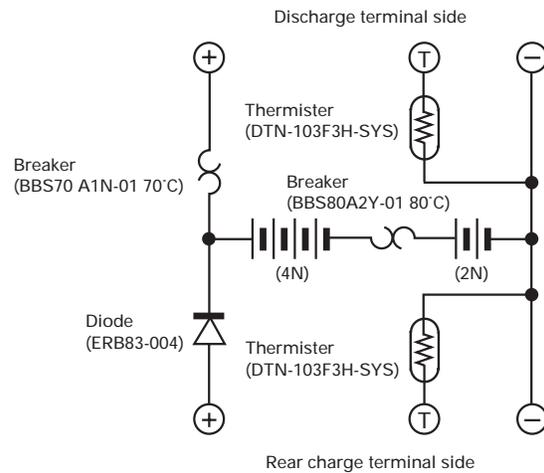
PB-43N External View



BC-21 Specifications

Rated output voltage DC 13.8V \pm 5%
 Rated output current 150mA
 Charging time Approx. 12 hours (PB-43N)

PB-43N Schematic diagram



PB-43N Specifications

Voltage 7.2V (1.2V x 6)
 Charging current 1100mAh
 Dimensions (Projections included) ... 58W x 100.8H x 16.8D (mm)
 Charger and charging time
 KSC-24 (Rapid charger) Approx. 60 minutes
 Weight 210g

BT-14 (BATTERY CASE) / PG-4Y (PROGRAMMING INTERFACE CABLE) / MCP-1A (MEMORY CONTROL PROGRAM)

BT-14 (6 AA/LR6)
External View



PG-4Y
External View



MCP-1A

- Available free for downloading from the Kenwood website:
<http://www.kenwood.com/i/products/info/amateur.html>

SPECIFICATIONS

General		TH-K4AT	TH-K4E
Market code		M2	E
Number of memory channels		100 (50) + 8 special function memories	
Antenna impedance (Connector type)		50 Ω (SMA)	
Operating Voltage	DC IN Jack	DC 12.0 ~ 16.0 V (13.8 V nominal)	
	Battery terminal	DC 6.0 ~ 9.0 V (7.2 V nominal)	
Grounding method		Negative ground	
Current	Transmit with H, 13.8 V (DC IN)	1.8 A or less	
	Transmit with H, 7.2 V (PB-43N)	2.0 A or less	
	Transmit with M, 7.2 V (PB-43N)	1.5 A or less	
	Transmit with L, 7.2 V (PB-43N)	0.8 A or less	
	Receive (no signal)	100 mA or less	
	Battery Saver ON (Average)	30 mA or less	
Usable temperature range		-20° C ~ 60° C (-4° F ~ 140° F) -10° C ~ 60° C (+14° F ~ 140° F) with PB-43N	
Frequency stability		Within ± 5 ppm (-20° C ~ 60° C)	
Dimensions (W x H x D Projections not included)		58 x 110 x 28.4 mm / 2 7/16" x 4 6/16" x 1 2/16" with PB-43N 58 x 110 x 29.6 mm / 2 7/16" x 4 6/16" x 1 5/32" with BT-14	
weight		Approx. 320 g / 11.3 oz with PB-43N Approx. 320 g / 11.3 oz with BT-14	
Transmitter			
Transmission Mode		F3E (FM) / F2D (FM)	
Frequency range		400 ~ 470 MHz	430 ~ 440 MHz
Output Power	DC-IN jack (13.8 V)	H: 5.0 W (approx.) M: 1.5 W (approx.) L: 0.5 W (approx.)	
	PB-43N (7.2 V)	H: 5.0 W (approx.) M: 1.5 W (approx.) L: 0.5 W (approx.)	
	BT-14 (9.0 V)	H: 3.5 W (approx.) M: 1.2 W (approx.) L: 0.3 W (approx.)	
Modulation		Reactance	
Maximum frequency deviation		± 5 kHz (FM) / ± 2.5 kHz (NFM)	
Squamous emissions		-60 dB or less (H and M power), -50 dB or less (L power)	
Microphone impedance		2 k Ω	
Receiver			
Reception Mode		F3E (FM) / F2D (FM)	
Frequency range		400 ~ 470 MHz	430 ~ 440 MHz
Intermediate Frequency (IF)		1st IF : 38.85 MHz 2nd IF : 450kHz	
Circuit type		Double super - heterodyne	
Sensitivity		FM (12 dB SINAD) 70 cm amateur radio band: 0.18 μ V or less	
Squelch Sensitivity		0.13 μ V or less (within 70 cm amateur radio band)	
Selectivity		-6 dB / 10 kHz or less -40 dB / 28 kHz or less (within 70 cm amateur radio band)	
Audio output (10% distortion)		400 mW or higher (7.2 V, 8 Ω load)	

Note: All specifications (General, Transmitter and Receiver) are guaranteed within the amateur radio band.

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