

# KENWOOD

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VHF FM TRANSCEIVER

# TK-2202L

## SERVICE MANUAL

# KENWOOD

Kenwood Corporation

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B51-8771-00 (S) 578

Refer to the TK-2202/2206 service manual (B51-8677-00) for any information which has not been covered in this TK-2202L service manual.

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This product uses Lead Free solder.

## GENERAL / SYSTEM SET-UP

### INTRODUCTION

#### SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication date. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

#### ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts, components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

Unit		TX-RX Unit	Frequency range	Remarks
Model & destination				
TK-2202L	K,M	X57-6870-21	136~174MHz	IF1 : 38.85MHz LOC : 38.4MHz

### PERSONAL SAFETY

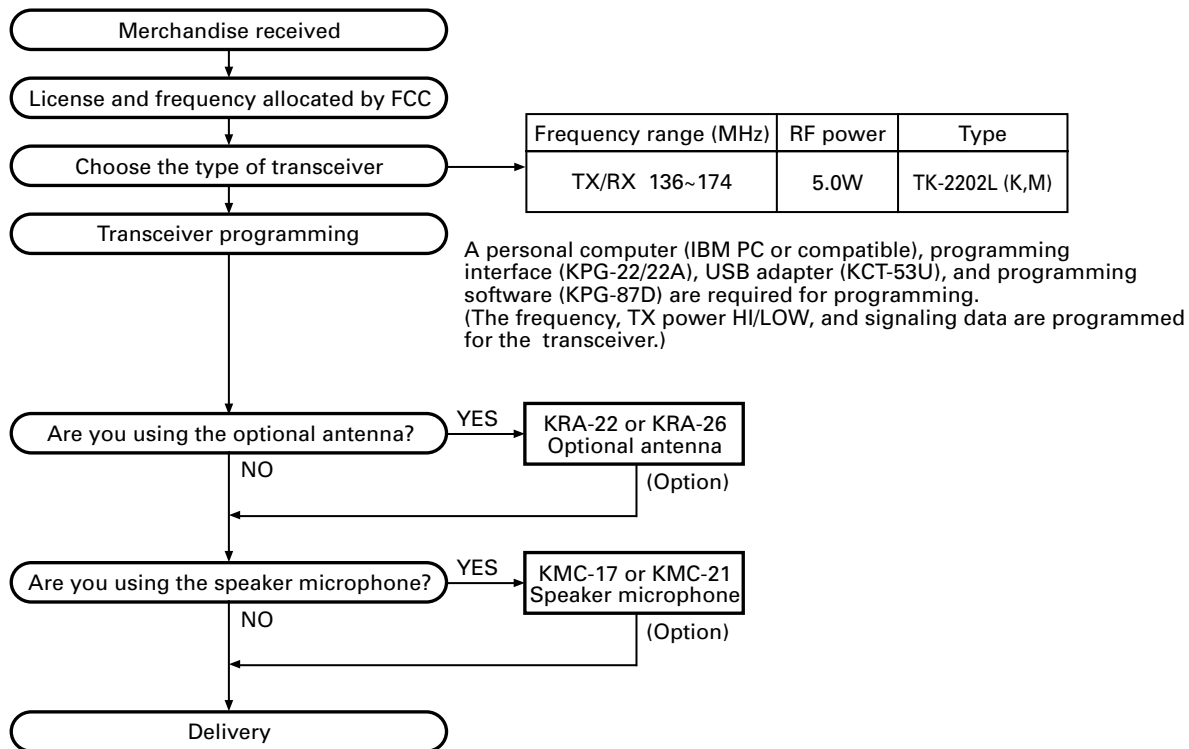
The following precautions are recommended for personal safety:

- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- This equipment should be serviced by a qualified technician only.

### SERVICE

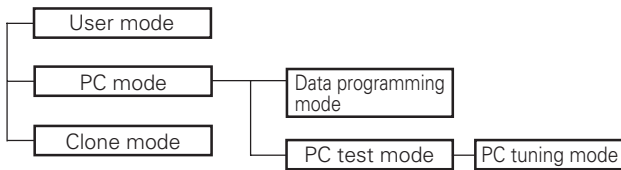
This transceiver is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained within.

### SYSTEM SET-UP



## REALIGNMENT

### 1. Modes



Mode	Function
User mode	For normal use.
PC mode	Used for communication between the transceiver and PC (IBM compatible).
Data programming mode	Used to read and write frequency data and other features to and from the transceiver.
PC test mode	Used to check the transceiver using the PC. This feature is included in the FPU.
Clone mode	Used to transfer programming data from one transceiver to another.

### 2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
PC mode	Received commands from PC
Clone mode	[PTT]+[Side2]+Power ON (Two seconds)

### 3. PC Mode

#### 3-1. Preface

The transceiver is programmed using a personal computer, a programming interface (KPG-22/22A), USB adapter (KCT-53U) and programming software (KPG-87D).

The programming software can be used with an IBM PC or compatible. Figure 1 shows the setup of an IBM PC for programming.

#### 3-2. Connection procedure

1. Connect the transceiver to the personal computer with the interface cable and USB adapter (When the interface cable is KPG-22A, the KCT-53U can be used.).

#### Notes:

- You must install the KCT-53U driver in the computer to use the USB adapter (KCT-53U).
  - When using the USB adapter (KCT-53U) for the first time, plug the KCT-53U into a USB port on the computer with the computer power ON.
2. When the POWER is switched on, user mode can be entered immediately. When the PC sends a command, the transceiver enters PC mode.  
When data is transmitting from the transceiver, the red LED lights.  
When data is received by the transceiver, the green LED lights.

#### Notes:

- The data stored in the computer must match the model type when it is written into the EEPROM.
- Change the transceiver to PC mode, then attach the interface cable.

#### 3-3. KPG-22/KPG-22A description (PC programming interface cable: Option)

The KPG-22/22A is required to interface the transceiver with the computer. It has a circuit in its D-sub connector (KPG-22 : 25-pin, KPG-22A : 9-pin) case that converts the RS-232C logic level to the TTL level.

The KPG-22/22A connects the SP/MIC connector of the transceiver to the RS-232C serial port of the computer.

#### 3-4. KCT-53U description (USB adapter : Option)

The KCT-53U is a cable which connects the KPG-22A to a USB port on a computer.

When using the KCT-53U, install the supplied CD-ROM (with driver software) in the computer. The KCT-53U driver runs under Windows 2000 or XP.

#### 3-5. Programming software KPG-87D description

KPG-87D is the programming software for the transceiver supplied on a CD-ROM. This software runs under Windows 98, ME, Windows 2000 or XP on an IBM-PC or compatible machine.

The data can be input to or read from the transceiver and edited on the screen. The programmed or edited data can be printed out. It is also possible to tune the transceiver.

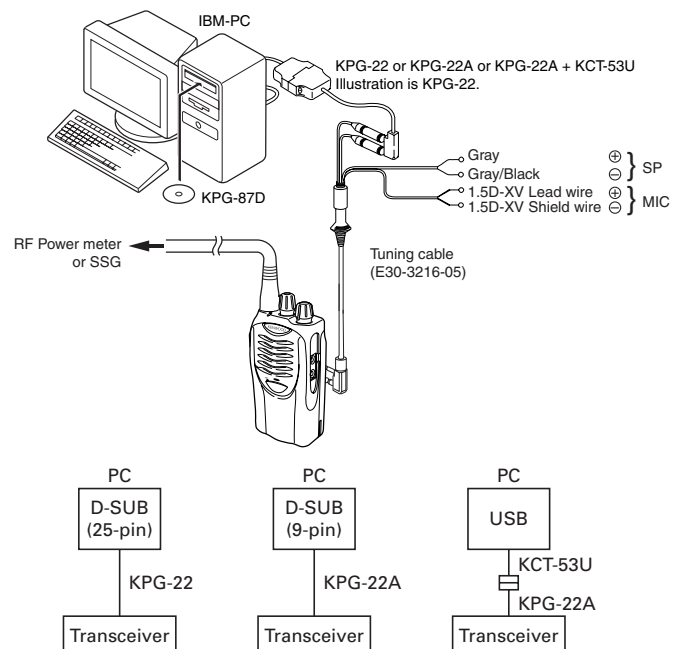


Fig. 1

## REALIGNMENT

### 4. Clone Mode

#### 4-1. Outline

"Clone Mode" copies the transceiver data to another transceiver.

The dealer can copy the transceiver data to another transceiver even without the use of a personal computer.

#### 4-2. Example

The transceiver can copy the programming data to one or more transceivers via RF communication.

The clone source and clone target/s must be in Clone mode.

#### 4-3. Operation

- To switch the clone target/s to Clone mode, press and hold the [PTT] and [Side2] keys while turning the transceiver power ON.
- Wait for 2 seconds. The LED will light orange and the transceiver will announce "Clone".
- Select a channel table number using Side1(increment channel table) and Side2(decrement channel table) keys.
- To switch the clone source to Clone mode, press and hold the [PTT] and [Side2] keys while turning the transceiver power ON.
- Wait for 2 seconds. The LED will light orange and the transceiver will announce "Clone".
- Select the same channel table number as the clone target/s.
- Press [PTT] on the clone source to begin data transmission. When the clone target starts to receive data, the LED will light green.  
When the clone source finishes sending data, a "confirmation" tone will sound.  
If data transmission fails while cloning, an "error" tone will sound from the Target unit.
- If the cloning fails, no data will be available in the Target unit when it is returned to User mode.
- When the cloning is successful, the Target unit's "Scan" and "Key lock" functions will return to their default values (Scan = OFF, Key lock = OFF).

#### Notes:

- The dealer can clone data to two or more transceivers by repeating the above procedures.
- If the transceivers Clone Mode is configured as "Disabled", the transceiver cannot enter Clone mode.
- The table shown below will cover the frequency tables used for wireless cloning.
- Clone mode cannot be entered in battery low state.
- A unit cannot be a "Source Unit" if it is unprogrammed. If [PTT] is pressed, an "error" tone will sound.
- The language used in cloning depends on the FPU setting.
- Once a unit is set to be the Source, it cannot be a target after the data has been transmitted. This protects the data in the Source unit.
- Electronic interface may cause a failure in data transfer during Wireless Clone, such as when waveforms or electromagnetics are being performed at the workbench.

- Clone mode can be used ONLY by the authorized service personnel.
- The Clone mode setting must be configured as "Disable" before being delivered to the end-user.
- To clone, replace the antenna from both the source transceiver and the target transceiver with a dummy load.
- The transmit output power is automatically set to Low in Clone mode.

**Clone Frequency Table**

Clone Frequency Table	Operating Frequency (MHz)	136~174
1		136.000
2		138.000
3		140.000
4		142.000
5		144.000
6		146.000
7		148.000
8		150.000
9		152.000
10		154.000
11		156.000
12		158.000
13		160.000
14		162.000
15		164.000
16		166.000
17		168.000
18		170.000
19		172.000
20		174.000

## CIRCUIT DESCRIPTION

### 1. Control Circuit

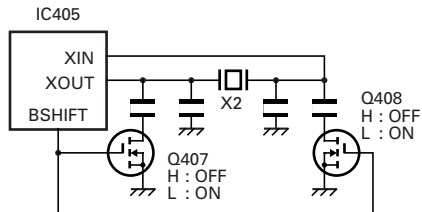
The control circuit consists of a microprocessor (IC405) and its peripheral circuits. It controls the TX-RX unit. IC405 mainly performs the following:

- (1) Switching between transmission and reception by the PTT signal input.
- (2) Reading system, group, frequency, and program data from the memory circuit.
- (3) Sending frequency program data to the PLL.
- (4) Controlling squelch on/off by the DC voltage from the squelch circuit.
- (5) Controlling the audio mute circuit by the decode data input.
- (6) Transmitting tone and encode data.

#### 1) Frequency Shift Circuit

The microprocessor (IC405) operates at a clock of 7.3728MHz. This oscillator has a circuit that shifts the frequency by BEAT SHIFT SW (Q407,Q408).

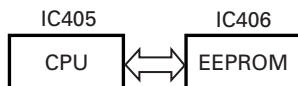
A beat sound may be able to be evaded from generation if "Beat Shift" is set to ON when it is generated in the internal spurious transmission modulated sound of a transceiver.



**Fig. 1 Frequency shift circuit**

#### 2) Memory Circuit

Memory circuit consists of the CPU (IC405) and an EEPROM (IC406). An EEPROM has a capacity of 8k bits that contains the transceiver control program for the CPU and data such as transceiver channels and operating features.



**Fig. 2 Memory circuit**

#### 3) Low Battery Warning

The battery voltage is checked using by the microprocessor. The transceiver generates a warning tone when the battery voltage falls below the warning voltage (2) shown in the table.

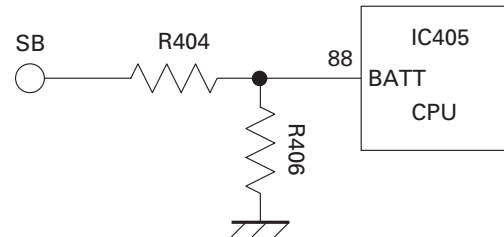
- (1) The red LED blinks when the battery voltage falls below the voltage (1) shown in the table during transmission.

**Note:**

During reception, transceiver constantly checks the battery level. When the battery level drops near to 5.9V, the red LED blinks and low battery warning tone is generated.

- (2) The transceiver immediately stops transmission when the battery voltage falls below the voltage (2) shown in the table. The warning tone sounds while the PTT switch is pressed.

	Ni-Cd Battery	Ni-MH Battery	Li-ion Battery
(1)	6.2V	6.2V	6.2V
(2)	5.9V	5.9V	5.9V



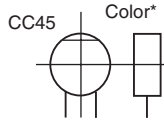
**Fig. 3 Low battery warning**

## PARTS LIST

### CAPACITORS

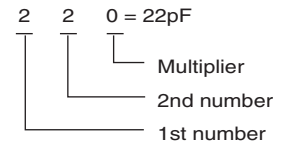
CC 45 TH 1H 220 J  
 1 2 3 4 5 6

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



#### Capacitor value

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



#### Temperature coefficient

1st Word	C	L	P	R	S	T	U
Color*	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/°C	0	-80	-150	-220	-330	-470	-750

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

Example : CC45TH = -470 ± 60ppm/°C

#### Tolerance (More than 10pF)

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

#### (Less than 10pF)

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

#### Voltage rating

2nd word \ 1st word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	-
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	-
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	-

#### Chip capacitors

(EX) C C 7 3 F S L 1 H 0 0 0 J  
 1 2 3 4 5 6 7

(Chip)(CH,RH,UJ,SL)

(EX) C K 7 3 F F 1 H 0 0 0 Z  
 1 2 3 4 5 6 7

(Chip)(B,F)

- Refer to the table above.
- 1 = Type
  - 2 = Shape
  - 3 = Dimension
  - 4 = Temp. coefficient
  - 5 = Voltage rating
  - 6 = Value
  - 7 = Tolerance

#### Dimension (Chip capacitors)

Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
A	4.5 ± 0.5	3.2 ± 0.4	Less than 2.0
B	4.5 ± 0.5	2.0 ± 0.3	Less than 2.0
C	4.5 ± 0.5	1.25 ± 0.2	Less than 1.25
D	3.2 ± 0.4	2.5 ± 0.3	Less than 1.5
E	3.0 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25
G	1.6 ± 0.2	0.8 ± 0.2	Less than 1.0
H	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05

### RESISTORS

#### Chip resistor (Carbon)

(EX) R D 7 3 E B 2 B 0 0 0 J  
 1 2 3 4 5 6 7

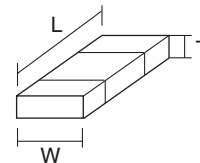
(Chip)(B,F)

#### Carbon resistor (Normal type)

(EX) R D 1 4 B B 2 C 0 0 0 J  
 1 2 3 4 5 6 7

- 1 = Type
- 2 = Shape
- 3 = Dimension
- 4 = Temp. coefficient
- 5 = Rating wattage
- 6 = Value
- 7 = Tolerance

#### Dimension



#### Dimension (Chip resistor)

Dimension code	L	W	T
E	3.2 ± 0.2	1.6 ± 0.2	1.0
F	2.0 ± 0.3	1.25 ± 0.2	1.0
G	1.6 ± 0.2	0.8 ± 0.2	0.5 ± 0.1
H	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05

#### Rating wattage

Code	Wattage	Code	Wattage	Code	Wattage
1J	1/16W	2C	1/6W	3A	1W
2A	1/10W	2E	1/4W	3D	2W
2B	1/8W	2H	1/2W		

## PARTS LIST

\* New Parts.  $\Delta$  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

### TK-2202L (Y50-6170-XX) TX-RX UNIT (X57-6870-21)

Ref. No.	Address	New parts	Parts No.	Description	Destination
<b>TK-2202L</b>					
1	1A	*	A02-3883-23	PLASTIC CABINET	
2	1A	*	A02-3971-03	PLASTIC CABINET ASSY(16CH)	
3	3A		A10-4078-31	CHASSIS	
4	1B		A21-1644-23	DRESSING PANEL(16CH)	
5	2C		B09-0680-03	CAP(SP/MIC)      ACCESSORY	
6	2B		B11-1817-04	ILLUMINATION GUIDE	
7	1B		B43-1156-04	BADGE(KENWOOD)	
8	1A	*	B43-1196-04	BADGE(TK-2202L)	
9	1C	*	B62-1971-00	INSTRUCTION MANUAL	
11	1A		D10-0649-03	LEVER	
12	1A		D21-0863-04	SHAFT	
13	1A		D32-0441-03	STOPPER	
14	2A		E04-0465-05	RF COAXIAL RECEPTACLE(SMA)	
15	3B		E23-1253-04	TERMINAL(BATT-)	
16	2B		E37-1175-05	PROCESSED LEAD WIRE(BROWN:SP+)	
17	2B		E37-1176-05	PROCESSED LEAD WIRE(GREEN:SP-)	
18	3A		F20-3353-14	INSULATING SHEET(CHASSIS BATT+)	
19	2A		G01-4542-04	COIL SPRING(LEVER)	
20	1A		G01-4543-04	COIL SPRING(STOPPER)	
21	2B		G10-1330-04	FIBROUS SHEET(IC302:AUDIO IC)	
22	3A		G11-4283-04	RUBBER SHEET(Q103:FINAL FET)	
23	2A		G11-4313-04	SHEET(MIC ELEMENT)	
24	3B		G13-2009-04	CUSHION(CHASSIS)	
29	3B		G13-2033-04	CUSHION(TERMINAL BATT-)	
30	3A		G13-2034-14	CUSHION(TERMINAL BATT-)	
31	3A		G13-2038-24	CUSHION(CHASSIS-CERAMIC FILTER)	
32	2A		G13-2039-14	CUSHION(PCB-CERAMIC FILTER)	
33	2B		G13-2088-04	CUSHION(CHASSIS VOL/CH)	
35	3A		G53-1604-03	PACKING(CHASSIS)	
36	3A		G53-1605-03	PACKING(TERMINAL BATT+)	
37	2B		G53-1606-13	PACKING(VOL/CH/LED)	
38	1B		G53-1607-03	PACKING(SP/MIC)	
39	2B		G53-1608-03	PACKING(SP)	
40	2A		G53-1609-14	PACKING(MIC ELEMENT)	
41	2B		G53-1610-04	PACKING(SMA)	
43	2D	*	H12-4221-05	PACKING FIXTURE	
45	1C		H25-0085-04	PROTECTION BAG (100/200/0.07)	
46	3D	*	H52-2159-02	ITEM CARTON CASE	
48	2C		J19-5472-03	HOLDER(SP/MIC)      ACCESSORY	
49	2A		J19-5473-03	HOLDER ASSY(TERMINAL BATT+)	
50	2B		J21-8478-04	MOUNTING HARDWARE(SP/MIC)	
51	2B		J21-8525-03	MOUNTING HARDWARE(VOL/CH)	
52	2D	*	J29-0734-05	BELT CLIP      ACCESSORY	
54	2B		J82-0092-05	FPC	
57	1A		K29-9308-23	BUTTON KNOB(PTT)	
58	1B		K29-9309-03	KNOB(VOL)	
59	1B		K29-9318-03	KNOB(CH)	
60	1A		K29-9364-03	BUTTON KNOB(SIDE1/SIDE2)	
A	2B		N14-0819-04	CIRCULAR NUT(VOL KNOB)	
B	2B		N14-0832-04	CIRCULAR NUT(CH KNOB)	
C	2A,2B		N30-2604-48	PAN HEAD MACHINE SCREW(SMA)	
D	3A		N30-2606-48	PAN HEAD MACHINE SCREW(CHASSIS)	
E	2A,2B,3B		N83-2005-48	PAN HEAD TAPTITE SCREW(PCB)	
<b>TX-RX UNIT (X57-6870-21)</b>					
61	2C		N99-2046-05	SCREW SET      ACCESSORY	
62	2B		R31-0661-05	VARIABLE RESISTOR(POWER SW/VOL)	
63	2B		S60-0434-05	ROTARY SWITCH(16CH)	
64	1B		T07-0369-15	SPEAKER	
65	3C		T90-1036-05	HELICAL ANTENNA      ACCESSORY	
66	1D		W08-0988-05	CHARGER      ACCESSORY	
67	1D		W08-0989-05	AC ADAPTER(AC120V)      ACCESSORY	K
67	1D		W08-0992-05	AC ADAPTER(AC220-240V)      ACCESSORY	M
D403			B30-2156-05	LED(RED)	
D404			B30-2157-05	LED(YELLOW)	
C1			CK73HB1H332K	CHIP C      3300PF      K	
C2			CK73HB1C682K	CHIP C      6800PF      K	
C3			CK73GB1A105K	CHIP C      1.0UF      K	
C4			CK73HB1C103K	CHIP C      0.010UF      K	
C5			CK73HB1H102K	CHIP C      1000PF      K	
C6			CK73HB1A104K	CHIP C      0.10UF      K	
C7 ,8			CC73HCH1H101J	CHIP C      100PF      J	
C9			CC73HCH1H100D	CHIP C      10PF      D	
C10			CS77CPOJ100M	CHIP TNL      10UF      6.3WV	
C11			CC73HCH1H101J	CHIP C      100PF      J	
C12			CK73HB1H102K	CHIP C      1000PF      K	
C13			CK73HB1A104K	CHIP C      0.10UF      K	
C14			CK73HB1C103K	CHIP C      0.010UF      K	
C15			CC73HCH1H100D	CHIP C      10PF      D	
C16			CK73HB1H102K	CHIP C      1000PF      K	
C17			CC73HCH1H470J	CHIP C      47PF      J	
C18			CC73HCH1H180J	CHIP C      18PF      J	
C19			CK73HB1A104K	CHIP C      0.10UF      K	
C21			CS77CPOJ100M	CHIP TNL      10UF      6.3WV	
C22			CS77AA1VR33M	CHIP TNL      0.33UF      35WV	
C24			CK73HB1H102K	CHIP C      1000PF      K	
C25			CC73HCH1H020B	CHIP C      2.0PF      B	
C26			CC73HCH1H300J	CHIP C      30PF      J	
C27			CS77CA1C3R3M	CHIP TNL      3.3UF      16WV	
C29 ,30			CK73HB1H471K	CHIP C      470PF      K	
C32			CS77CA1V0R1M	CHIP TNL      0.1UF      35WV	
C33 ,34			CK73HB1H102K	CHIP C      1000PF      K	
C35			CC73HCH1H270J	CHIP C      27PF      J	
C38			CC73HCH1H060B	CHIP C      6.0PF      B	
C39			CK73GB1H332K	CHIP C      3300PF      K	
C40			CC73HCH1H040B	CHIP C      4.0PF      B	
C41			CK73GB1H682K	CHIP C      6800PF      K	
C42			CC73HCH1H060B	CHIP C      6.0PF      B	
C43			CC73HCH1H150J	CHIP C      15PF      J	
C44			CK73HB1H471K	CHIP C      470PF      K	
C45			CK73GB1A105K	CHIP C      1.0UF      K	
C47			CC73HCH1H101J	CHIP C      100PF      J	
C48			CK73HB1H471K	CHIP C      470PF      K	
C49			CC73HCH1H101J	CHIP C      100PF      J	
C50			CC73HCH1H100D	CHIP C      10PF      D	
C51			CK73HB1H102K	CHIP C      1000PF      K	
C52			CC73HCH1H181J	CHIP C      180PF      J	



## PARTS LIST

## TX-RX UNIT (X57-6870-21)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C53			CC73HCH1H0R5B	CHIP C 0.5PF B		C147			CK73HB1H102K	CHIP C 1000PF K	
C54			CC73HCH1H040B	CHIP C 4.0PF B		C148			CK73GB1H102K	CHIP C 1000PF K	
C55			CC73HCH1H121J	CHIP C 120PF J		C149			CC73GCH1H220G	CHIP C 22PF G	
C57			CC73HCH1H1R5B	CHIP C 1.5PF B		C150			CC73GCH1H220J	CHIP C 22PF J	
C58			CC73HCH1H060B	CHIP C 6.0PF B		C151			CK73GB1H102K	CHIP C 1000PF K	
C59			CC73HCH1H1R5B	CHIP C 1.5PF B		C153			CC73GCH1H100C	CHIP C 10PF C	
C60			CC73HCH1H010B	CHIP C 1.0PF B		C154			CC73GCH1H100D	CHIP C 10PF D	
C61			CC73HCH1H040B	CHIP C 4.0PF B		C155			CC73GCH1H180J	CHIP C 18PF J	
C62			CC73HCH1H050B	CHIP C 5.0PF B		C156			CC73GCH1H120J	CHIP C 12PF J	
C63			CC73HCH1H101J	CHIP C 100PF J		C157			CC73GCH1H150J	CHIP C 15PF J	
C64			CC73HCH1H040B	CHIP C 4.0PF B		C158			CC73GCH1H220J	CHIP C 22PF J	
C65-67			CC73HCH1H050B	CHIP C 5.0PF B		C159			CC73GCH1H070D	CHIP C 7.0PF D	
C68-70			CK73HB1H471K	CHIP C 470PF K		C160			CC73GCH1H330J	CHIP C 33PF J	
C71,72			CK73HB1A104K	CHIP C 0.10UF K		C201			CK73GB1A224K	CHIP C 0.22UF K	
C73,74			CC73HCH1H0R5B	CHIP C 0.5PF B		C206			CK73HB1H102K	CHIP C 1000PF K	
C75,76			CK73HB1H102K	CHIP C 1000PF K		C207			CK73HB1H182K	CHIP C 1800PF K	
C77			CK73HB1H471K	CHIP C 470PF K		C208			CK73HB1H471K	CHIP C 470PF K	
C78			CC73HCH1H330J	CHIP C 33PF J		C209			CS77CP0J100M	CHIP TNL 10UF 6.3WV	
C79			CS77CP0J100M	CHIP TNL 10UF 6.3WV		C210			CK73HB1H471K	CHIP C 470PF K	
C80			CK73HB1H471K	CHIP C 470PF K		C211			CK73HB1C103K	CHIP C 0.010UF K	
C81			CC73HCH1H150J	CHIP C 15PF J		C213			CK73HB1A104K	CHIP C 0.10UF K	
C82-86			CK73HB1H102K	CHIP C 1000PF K		C214			CC73HCH1H680J	CHIP C 68PF J	
C87			CC73HCH1H100D	CHIP C 10PF D		C215			CK73HB1H102K	CHIP C 1000PF K	
C90			CK73HB1H102K	CHIP C 1000PF K		C216			CK73GB1C104K	CHIP C 0.10UF K	
C101			CK73HB1H102K	CHIP C 1000PF K		C217			CK73HB1A104K	CHIP C 0.10UF K	
C104			CC73GCH1H390J	CHIP C 39PF J		C218			CK73GB1C104K	CHIP C 0.10UF K	
C105			CK73HB1H102K	CHIP C 1000PF K		C219			CC73HCH1H330J	CHIP C 33PF J	
C107			CK73HB1H102K	CHIP C 1000PF K		C220			CK73HB1H102K	CHIP C 1000PF K	
C108			CC73GCH1H390J	CHIP C 39PF J		C221			CK73GB1C104K	CHIP C 0.10UF K	
C109			CK73GB1C104K	CHIP C 0.10UF K		C222			CK73HB1H102K	CHIP C 1000PF K	
C110,111			CK73HB1H102K	CHIP C 1000PF K		C224,225			CK73HB1C103K	CHIP C 0.010UF K	
C112			CC73HCH1H470J	CHIP C 47PF J		C227			CK73HB1H102K	CHIP C 1000PF K	
C115			CK73HB1H102K	CHIP C 1000PF K		C228			CC73GCH1H100C	CHIP C 10PF C	
C116			CC73GCH1H220J	CHIP C 22PF J		C230			CC73HCH1H080B	CHIP C 8.0PF B	
C117			CC73GCH1H100D	CHIP C 10PF D		C231,232			CK73GB1H103K	CHIP C 0.010UF K	
C118			CC73GCH1H101J	CHIP C 100PF J		C233			CC73HCH1H020B	CHIP C 2.0PF B	
C119			CC73GCH1H270J	CHIP C 27PF J		C234			CK73HB1C103K	CHIP C 0.010UF K	
C120			CK73GB1H102K	CHIP C 1000PF K		C235			CC73HCH1H090B	CHIP C 9.0PF B	
C121			CC73GCH1H100D	CHIP C 10PF D		C236			CK73GB1H102K	CHIP C 1000PF K	
C123			CK73GB1A105K	CHIP C 1.0UF K		C237			CC73HCH1H050B	CHIP C 5.0PF B	
C124,125			CK73HB1H102K	CHIP C 1000PF K		C238			CC73GCH1H120J	CHIP C 12PF J	
C126			CS77AA1A6R8M	CHIP TNL 6.8UF 10WV		C239			CC73HCH1H060B	CHIP C 6.0PF B	
C128			CK73HB1H102K	CHIP C 1000PF K		C241			CK73HB1H102K	CHIP C 1000PF K	
C130			CC73GCH1H100D	CHIP C 10PF D		C242			CK73GB1C104K	CHIP C 0.10UF K	
C132			CK73HB1H102K	CHIP C 1000PF K		C243			CK73HB1H102K	CHIP C 1000PF K	
C133			CK73GB1H103K	CHIP C 0.010UF K		C244			CC73HCH1H040B	CHIP C 4.0PF B	
C134			CK73GB1C104K	CHIP C 0.10UF K		C245			CK73HB1H471K	CHIP C 470PF K	
C135			CK73GB1A105K	CHIP C 1.0UF K		C247			CC73GCH1H040B	CHIP C 4.0PF B	
C136			CC73GCH1H270J	CHIP C 27PF J		C248			CC73GCH1H270J	CHIP C 27PF J	
C137			CK73GB1H103K	CHIP C 0.010UF K		C249			CK73HB1H102K	CHIP C 1000PF K	
C138			CK73GB1H102K	CHIP C 1000PF K		C250			CC73GCH1H040B	CHIP C 4.0PF B	
C139			CC73GCH1H680J	CHIP C 68PF J		C251			CS77CP0J4R7M	CHIP TNL 4.7UF 6.3WV	
C140			CC73GCH1H101J	CHIP C 100PF J		C252			CK73HB1H102K	CHIP C 1000PF K	
C141			CC73GCH1H220J	CHIP C 22PF J		C253			CC73GCH1H4R5B	CHIP C 4.5PF B	
C142			CC73GCH1H150J	CHIP C 15PF J		C254			CC73GCH1H270J	CHIP C 27PF J	
C143			CC73GCH1H100D	CHIP C 10PF D		C255			CC73GCH1H4R5B	CHIP C 4.5PF B	
C144			CC73GCH1H820J	CHIP C 82PF J		C256			CK73HB1H102K	CHIP C 1000PF K	
C145			CC73GCH1H070B	CHIP C 7.0PF B		C258			CK73HB1H102K	CHIP C 1000PF K	
C146			CK73GB1H102K	CHIP C 1000PF K		C260			CK73HB1H102K	CHIP C 1000PF K	

## PARTS LIST

TX-RX UNIT (X57-6870-21)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C262			CK73HB1H102K	CHIP C 1000PF K		C417			CK73GB1A105K	CHIP C 1.0UF K	
C263			CC73GCH1H100C	CHIP C 10PF C		C418			CK73HB1E562K	CHIP C 5600PF K	
C264			CC73GCH1H040B	CHIP C 4.0PF B		C419			CK73HB1H102K	CHIP C 1000PF K	
C265			CC73GCH1H330J	CHIP C 33PF J		C421			CK73GB1A105K	CHIP C 1.0UF K	
C266			CK73HB1H102K	CHIP C 1000PF K		C426,427			CK73GB1A105K	CHIP C 1.0UF K	
C267,268			CC73GCH1H030B	CHIP C 3.0PF B		C428,429			CK73HB1H102K	CHIP C 1000PF K	
C269			CC73GCH1H330J	CHIP C 33PF J		C430			CK73GB1H103K	CHIP C 0.010UF K	
C270			CC73GCH1H040B	CHIP C 4.0PF B		C431			CK73HB1C103K	CHIP C 0.010UF K	
C271			CC73GCH1H110J	CHIP C 11PF J		C432			CC73HCH1H050B	CHIP C 5.0PF B	
C280			CK73HB1H102K	CHIP C 1000PF K		C433,434			CC73HCH1H030B	CHIP C 3.0PF B	
C302			CK73HB1C103K	CHIP C 0.010UF K		C435			CC73HCH1H050B	CHIP C 5.0PF B	
C304			CK73GB1A224K	CHIP C 0.22UF K		C440			CC73GCH1H1R5B	CHIP C 1.5PF B	
C306			CS77CP0J4R7M	CHIP TNL 4.7UF 6.3WV		C443			CK73GB1A474K	CHIP C 0.47UF K	
C307,308			CK73HB1A104K	CHIP C 0.10UF K		C452			CK73HB1H102K	CHIP C 1000PF K	
C309			CC73GCH1H820J	CHIP C 82PF J		C901,902			CK73GB1A105K	CHIP C 1.0UF K	
C310			CK73HB1A683K	CHIP C 0.068UF K		TC1,2			C05-0384-05	CERAMIC TRIMMER CAPACITOR(10PF)	
C311			CK73GB1A105K	CHIP C 1.0UF K		CN201			E23-1278-05	TERMINAL	
C312			CC73GCH1H120J	CHIP C 12PF J		CN401			E40-6573-05	FLAT CABLE CONNECTOR	
C313			CC73GCH1H121J	CHIP C 120PF J		J301			E11-0707-05	PHONE JACK(2.5/3.5)	
C314			CK73HB1A104K	CHIP C 0.10UF K		F401			F53-0324-05	FUSE(2.5A)	
C315			CK73GB1A105K	CHIP C 1.0UF K		101	2A		J30-1282-14	SPACER(MIC ELEMENT)	
C316			CK73GB1C104K	CHIP C 0.10UF K		CD201			L79-1582-05	TUNING COIL	
C317			CK73HB1A104K	CHIP C 0.10UF K		<b>CF201</b>	2A		L72-0973-05	CERAMIC FILTER	
C318			CS77CP0J4R7M	CHIP TNL 4.7UF 6.3WV		L1			L40-4791-37	SMALL FIXED INDUCTOR(4.700UH)	
C319			CC73GCH1H271J	CHIP C 270PF J		L3			L40-5681-86	SMALL FIXED INDUCTOR(0.56UH)	
C320			CK73HB1C103K	CHIP C 0.010UF K		L5			L40-5681-86	SMALL FIXED INDUCTOR(0.56UH)	
C321			CK73GB1A105K	CHIP C 1.0UF K		L6,7			L92-0138-05	CHIP FERRITE	
C322			CK73HB1C153K	CHIP C 0.015UF K		L8			L40-1875-92	SMALL FIXED INDUCTOR(18NH)	
C323			CC73GCH1H820J	CHIP C 82PF J		L9			L40-3375-92	SMALL FIXED INDUCTOR(33NH)	
C324			CC73HCH1H820J	CHIP C 82PF J		L10			L40-1885-92	SMALL FIXED INDUCTOR(180NH)	
C325			CK73HB1A104K	CHIP C 0.10UF K		L11			L40-1085-92	SMALL FIXED INDUCTOR(100NH)	
C326			CK73HB1H102K	CHIP C 1000PF K		L12			L92-0138-05	CHIP FERRITE	
C327			CC73HCH1H101J	CHIP C 100PF J		L13,14			L40-2285-92	SMALL FIXED INDUCTOR(220NH)	
C328			CK73HB1H391K	CHIP C 390PF K		L16			L40-3978-67	SMALL FIXED INDUCTOR(39NH)	
C329,330			CK73GB1A105K	CHIP C 1.0UF K		L17			L40-2778-67	SMALL FIXED INDUCTOR(27NH)	
C331			CK73HB1A104K	CHIP C 0.10UF K		L18,19			L41-2285-03	SMALL FIXED INDUCTOR(220NH)	
C332			CK73HB1H471K	CHIP C 470PF K		L20,21			L40-3391-86	SMALL FIXED INDUCTOR(3.3UH)	
C333,334			CK73GB1C104K	CHIP C 0.10UF K		L22			L92-0138-05	CHIP FERRITE	
C335			CC73GCH1H221J	CHIP C 220PF J		L23			L40-3975-92	SMALL FIXED INDUCTOR(39NH)	
C336			CK73FB1C474K	CHIP C 0.47UF K		L24			L92-0470-05	CHIP FERRITE	
C338			CC73GCH1H101J	CHIP C 100PF J		L25			L40-8275-92	SMALL FIXED INDUCTOR(82NH)	
C339			CS77AA0J100M	CHIP TNL 10UF 6.3WV		L50			L92-0138-05	CHIP FERRITE	
C340			CK73GB1C104K	CHIP C 0.10UF K		L102			L40-1085-92	SMALL FIXED INDUCTOR(100NH)	
C341			CK73GB1C473K	CHIP C 0.047UF K		L103			L92-0138-05	CHIP FERRITE	
C342			CS77AA0J100M	CHIP TNL 10UF 6.3WV		L104			L40-2775-92	SMALL FIXED INDUCTOR(27NH)	
C343			CK73GB1C473K	CHIP C 0.047UF K		L105			L40-1585-54	SMALL FIXED INDUCTOR(150NH)	
C344			CC73GCH1H221J	CHIP C 220PF J		L106			L92-0149-05	CHIP FERRITE	
C345			CS77CC0J101M	CHIP TNL 100UF 6.3WV		L107			L40-2775-54	SMALL FIXED INDUCTOR(27NH)	
C346			CK73GB1H102K	CHIP C 1000PF K		L108			L92-0149-05	CHIP FERRITE	
C348			CK73HB1H471K	CHIP C 470PF K		L109			L41-2295-39	SMALL FIXED INDUCTOR(2.2UH)	
C351,352			CK73HB1C103K	CHIP C 0.010UF K		L110			L40-5675-92	SMALL FIXED INDUCTOR(56NH)	
C354			CK73HB1A104K	CHIP C 0.10UF K		L111			L41-1092-44	SMALL FIXED INDUCTOR(1UH)	
C401			CC73GCH1H471J	CHIP C 470PF J		L112			L34-4577-05	AIR-CORE COIL	
C402			CK73HB1H102K	CHIP C 1000PF K		L113			L34-4563-05	AIR-CORE COIL	
C403			CK73GB1C104K	CHIP C 0.10UF K		L114,115			L34-4573-05	AIR-CORE COIL	
C405			CC73GCH1H101J	CHIP C 100PF J							
C407			CK73HB1H102K	CHIP C 1000PF K							
C409,410			CK73GB1A105K	CHIP C 1.0UF K							
C411			CK73HB1H102K	CHIP C 1000PF K							
C415			CK73HB1H471K	CHIP C 470PF K							

If a part reference number is listed in a shaded box, that part does not come with the PCB.

## PARTS LIST

### TX-RX UNIT (X57-6870-21)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
L116			L34-4576-05	AIR-CORE COIL		R40			RK73HB1J101J	CHIP R 100 J 1/16W	
L117			L34-4575-05	AIR-CORE COIL		R41			RK73HB1J154J	CHIP R 150K J 1/16W	
L118			L34-4567-05	AIR-CORE COIL		R42			RK73HB1J472J	CHIP R 4.7K J 1/16W	
L119			L34-4566-05	AIR-CORE COIL		R43			RK73HB1J101J	CHIP R 100 J 1/16W	
L201			L40-1091-37	SMALL FIXED INDUCTOR(1.000UH)		R44			RK73HB1J102J	CHIP R 1.0K J 1/16W	
L202			L40-3975-92	SMALL FIXED INDUCTOR(39NH)		R45, 46			RK73HB1J332J	CHIP R 3.3K J 1/16W	
L203			L92-0138-05	CHIP FERRITE		R47			RK73HB1J470J	CHIP R 47 J 1/16W	
L204			L41-5685-39	SMALL FIXED INDUCTOR(0.56UH)		R48			RK73HB1J331J	CHIP R 330 J 1/16W	
L205			L40-6875-92	SMALL FIXED INDUCTOR(68NH)		R49			RK73HB1J222J	CHIP R 2.2K J 1/16W	
L206			L40-1885-92	SMALL FIXED INDUCTOR(180NH)		R50			RK73HB1J472J	CHIP R 4.7K J 1/16W	
L207			L40-1585-92	SMALL FIXED INDUCTOR(150NH)		R51			RK73HB1J100J	CHIP R 10 J 1/16W	
L209			L41-5678-14	SMALL FIXED INDUCTOR(56NH)		R101			RK73HB1J123J	CHIP R 12K J 1/16W	
L210			L92-0138-05	CHIP FERRITE		R103			RK73GB2A000JX	CHIP R 0.0 J 1/10W	
L211			L41-5678-14	SMALL FIXED INDUCTOR(56NH)		R107			RK73GB2A561J	CHIP R 560 J 1/10W	
L213			L41-5678-14	SMALL FIXED INDUCTOR(56NH)		R108			RK73GB2A152J	CHIP R 1.5K J 1/10W	
L214			L41-4778-14	SMALL FIXED INDUCTOR(47NH)		R109			RK73GB2A150J	CHIP R 15 J 1/10W	
L301			L92-0140-05	CHIP FERRITE		R110, 111			RK73GB2A331J	CHIP R 330 J 1/10W	
L302			L92-0149-05	CHIP FERRITE		R112			RK73GB2A180J	CHIP R 18 J 1/10W	
L401			L92-0149-05	CHIP FERRITE		R113			RK73GB2A331J	CHIP R 330 J 1/10W	
L402-404			L92-0138-05	CHIP FERRITE		R114			RK73GB2A333J	CHIP R 33K J 1/10W	
X1			L77-1931-05	TCXO(12.8MHZ)		R115			RK73GB2A103J	CHIP R 10K J 1/10W	
X2			L78-1414-05	RESONATOR(7.37MHZ)		R116			RK73GB2A150J	CHIP R 15 J 1/10W	
XF201			L71-0619-05	MCF(38.85MHZ)		R117			RK73GB2A683J	CHIP R 68K J 1/10W	
CP404			RK75HA1J473J	CHIP-COM 47K J 1/16W		R119			RK73GB2A331J	CHIP R 330 J 1/10W	
CP405			RK75HA1J102J	CHIP-COM 1.0K J 1/16W		R120			RK73GB2A000JX	CHIP R 0.0 J 1/10W	
R1			RK73HB1J223J	CHIP R 22K J 1/16W		R121			RK73GB2A561J	CHIP R 560 J 1/10W	
R2			RK73HB1J103J	CHIP R 10K J 1/16W		R122			RK73GB2A473J	CHIP R 47K J 1/10W	
R3			RK73HB1J333J	CHIP R 33K J 1/16W		R123			RK73GB2A820J	CHIP R 82 J 1/10W	
R4			RK73HB1J563J	CHIP R 56K J 1/16W		R124			RK73GB2A562J	CHIP R 5.6K J 1/10W	
R5			RK73HB1J104J	CHIP R 100K J 1/16W		R126			RK73GB2A222J	CHIP R 2.2K J 1/10W	
R6			RK73HB1J823J	CHIP R 82K J 1/16W		R127-129			RK73EB2ER39K	CHIP R 0.39 K 1/4W	
R7			RK73HB1J101J	CHIP R 100 J 1/16W		R130-135			RK73GH2A154D	CHIP R 150K D 1/10W	
R8 -11			RK73HB1J000J	CHIP R 0.0 J 1/16W		R136, 137			RK73GB2A271J	CHIP R 270 J 1/10W	
R12			RK73HB1J222J	CHIP R 2.2K J 1/16W		R138			RK73GB2A105J	CHIP R 1.0M J 1/10W	
R13			RK73GB2A000JX	CHIP R 0.0 J 1/10W		R139			RK73GB2A473J	CHIP R 47K J 1/10W	
R14			RK73HB1J334J	CHIP R 330K J 1/16W		R140			RK73GB2A563J	CHIP R 56K J 1/10W	
R15			RK73GB2A221J	CHIP R 220 J 1/10W		R141			RK73GB2A104J	CHIP R 100K J 1/10W	
R16			RK73GB2A561J	CHIP R 560 J 1/10W		R142			RK73GB2A000JX	CHIP R 0.0 J 1/10W	
R17			RK73HB1J101J	CHIP R 100 J 1/16W		R143			RK73GB2A104J	CHIP R 100K J 1/10W	
R18			RK73GB2A000JX	CHIP R 0.0 J 1/10W		R203			RK73HB1J184J	CHIP R 180K J 1/16W	
R19			RK73GB2A152J	CHIP R 1.5K J 1/10W		R206			RK73GB2A100J	CHIP R 10 J 1/10W	
R20			RK73HB1J100J	CHIP R 10 J 1/16W		R207			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R21			RK73GB2A681J	CHIP R 680 J 1/10W		R208			RK73HB1J823J	CHIP R 82K J 1/16W	
R22			RK73GB2A000JX	CHIP R 0.0 J 1/10W		R209			RK73HB1J272J	CHIP R 2.7K J 1/16W	
R23			RK73GB2A103J	CHIP R 10K J 1/10W		R210, 211			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R25			RK73HB1J223J	CHIP R 22K J 1/16W		R212			RK73HB1J823J	CHIP R 82K J 1/16W	
R26			RK73HB1J103J	CHIP R 10K J 1/16W		R213			RK73HB1J392J	CHIP R 3.9K J 1/16W	
R27			RK73HB1J220J	CHIP R 22 J 1/16W		R215			RK73HB1J101J	CHIP R 100 J 1/16W	
R30			RK73HB1J123J	CHIP R 12K J 1/16W		R216			RK73HB1J124J	CHIP R 120K J 1/16W	
R31			RK73HB1J564J	CHIP R 560K J 1/16W		R217			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R32			RK73HB1J102J	CHIP R 1.0K J 1/16W		R218			RK73HB1J561J	CHIP R 560 J 1/16W	
R33			RK73HB1J154J	CHIP R 150K J 1/16W		R219, 220			RK73GB2A561J	CHIP R 560 J 1/10W	
R34			RK73HB1J472J	CHIP R 4.7K J 1/16W		R221			RK73GB2A102J	CHIP R 1.0K J 1/10W	
R35, 36			RK73HB1J274J	CHIP R 270K J 1/16W		R222			RK73GB2A221J	CHIP R 220 J 1/10W	
R37			RK73HB1J101J	CHIP R 100 J 1/16W		R223-226			RK73HB1J823J	CHIP R 82K J 1/16W	
R38			RK73HB1J181J	CHIP R 180 J 1/16W		R227			RK73GB2A000JX	CHIP R 0.0 J 1/10W	
R39			RK73HB1J151J	CHIP R 150 J 1/16W		R228, 229			RK73HB1J105J	CHIP R 1.0M J 1/16W	
						R230			RK73GB2A222J	CHIP R 2.2K J 1/10W	
						R231			RK73GB2A470J	CHIP R 47 J 1/10W	

## PARTS LIST

TX-RX UNIT (X57-6870-21)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R233			RK73GB2A221J	CHIP R 220 J 1/10W		R406			RK73HH1J474D	CHIP R 470K D 1/16W	
R234			RK73GB2A104J	CHIP R 100K J 1/10W		R407			RK73HB1J334J	CHIP R 330K J 1/16W	
R237			RK73GB2A184J	CHIP R 180K J 1/10W		R408-412			RK73HB1J473J	CHIP R 47K J 1/16W	
R238			RK73GB2A104J	CHIP R 100K J 1/10W		R413,414			RK73GB2A331J	CHIP R 330 J 1/10W	
						R415,416			RK73GB2A473J	CHIP R 47K J 1/10W	
R239			RK73GB2A470J	CHIP R 47 J 1/10W							
R240			RK73GB2A000JX	CHIP R 0.0 J 1/10W		R417-420			RK73HB1J473J	CHIP R 47K J 1/16W	
R241,242			RK73HB1J105J	CHIP R 1.0M J 1/16W		R421,422			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R243			RK73FB2B000JX	CHIP R 0.0 J 1/8W		R423			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R291			RK73GB2A000JX	CHIP R 0.0 J 1/10W		R424,425			RK73HB1J473J	CHIP R 47K J 1/16W	
						R426			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R301			RK73HB1J473J	CHIP R 47K J 1/16W							
R304			RK73HB1J564J	CHIP R 560K J 1/16W		R435			RK73HB1J473J	CHIP R 47K J 1/16W	
R305			RK73HB1J104J	CHIP R 100K J 1/16W		R436			RK73GB2A000JX	CHIP R 0.0 J 1/10W	
R306			RK73HB1J102J	CHIP R 1.0K J 1/16W		R437,438			RK73HB1J473J	CHIP R 47K J 1/16W	
R307,308			RK73HB1J000J	CHIP R 0.0 J 1/16W		R445,446			RK73GB2A000JX	CHIP R 0.0 J 1/10W	
						R447			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R310			RK73GB2A394J	CHIP R 390K J 1/10W							
R311			RK73HB1J123J	CHIP R 12K J 1/16W		R901,902			RK73GB2A472J	CHIP R 4.7K J 1/10W	
R312			RK73GB2A334J	CHIP R 330K J 1/10W							
R313			RK73GB2A104J	CHIP R 100K J 1/10W		VR1		R32-0736-05		SEMI FIXED VARIABLE RESISTOR(68K)	
R314			RK73GB2A103J	CHIP R 10K J 1/10W							
R315			RK73GB2A334J	CHIP R 330K J 1/10W		S1 -3		S70-0414-05		TACT SWITCH	
R316			RK73GB2A124J	CHIP R 120K J 1/10W		MIC301	2A	T91-0649-15		MIC ELEMENT	
R317			RK73GB2A474J	CHIP R 470K J 1/10W							
R318			RK73GB2A122J	CHIP R 1.2K J 1/10W		D1		MA2S111-F		DIODE	
R319			RK73HB1J563J	CHIP R 56K J 1/16W		D4 .5		1SV325F		VARIABLE CAPACITANCE DIODE	
						D7		1SV325F		VARIABLE CAPACITANCE DIODE	
R320			RK73HB1J332J	CHIP R 3.3K J 1/16W		D9		1SV325F		VARIABLE CAPACITANCE DIODE	
R321			RK73HB1J224J	CHIP R 220K J 1/16W		D10		1SV278F		VARIABLE CAPACITANCE DIODE	
R322			RK73HB1J184J	CHIP R 180K J 1/16W							
R323			RK73HB1J563J	CHIP R 56K J 1/16W		D11		MA2S111-F		DIODE	
R324,325			RK73GB2A104J	CHIP R 100K J 1/10W		D101		HSC277		DIODE	
						D102		HZU5CLL		ZENER DIODE	
R326			RK73GB2A000JX	CHIP R 0.0 J 1/10W		D103-106		HVC131		DIODE	
R327			RK73GB2A184J	CHIP R 180K J 1/10W		D202		HSC277		DIODE	
R328			RK73GB2A103J	CHIP R 10K J 1/10W							
R329			RK73GB2A823J	CHIP R 82K J 1/10W		D203-206		1SV305F		VARIABLE CAPACITANCE DIODE	
R330			RK73HB1J332J	CHIP R 3.3K J 1/16W		D301,302		RB706F-40		DIODE	
						D303		DAN222		DIODE	
R331			RK73GB2A393J	CHIP R 39K J 1/10W		D401		RB521S-30		DIODE	
R332			RK73GB2A153J	CHIP R 15K J 1/10W		D402		1SR154-400		DIODE	
R334			RK73GB2A473J	CHIP R 47K J 1/10W							
R335			RK73GB2A222J	CHIP R 2.2K J 1/10W		IC1		MB15A02PFV2E1		MOS-IC	
R336			RK73GB2A102J	CHIP R 1.0K J 1/10W		IC2		UPB1509GV		BI-POLAR IC	
						IC101		TA75W01FUJ		MOS-IC	
R337			RK73GB2A101J	CHIP R 100 J 1/10W		IC201		TA31136FNG		MOS-IC	
R338			RK73GB2A222J	CHIP R 2.2K J 1/10W		IC301		AQUA-L		MOS-IC	
R339			RK73GB2A471J	CHIP R 470 J 1/10W							
R340			RK73GB2A182J	CHIP R 1.8K J 1/10W		IC302		TA7368FG		MOS-IC	
R341			RK73GB2A103J	CHIP R 10K J 1/10W		IC401,402		XC6204B502MR		MOS-IC	
						IC403		BD4840FVE		MOS-IC	
R342			RK73GB2A100J	CHIP R 10 J 1/10W		IC404		BD4845FVE		MOS-IC	
R343			RK73GB2A474J	CHIP R 470K J 1/10W		IC405	*	30622MCAC02GU		MICROCONTROLLER IC	
R344			RK73GB2A102J	CHIP R 1.0K J 1/10W							
R345,346			RK73GB2A101J	CHIP R 100 J 1/10W		IC406		BR24L08F-W		ROM IC	
R347			RK73GB2A104J	CHIP R 100K J 1/10W							
						Q1		KTC4082		TRANSISTOR	
R348			RK73GB2A563J	CHIP R 56K J 1/10W		Q2		2SC5108(Y)F		TRANSISTOR	
R349			RK73GB2A333J	CHIP R 33K J 1/10W		Q3 .4		2SK508NV(K52)		FET	
R350			RK73HB1J000J	CHIP R 0.0 J 1/16W		Q5		DTA143TE		DIGITAL TRANSISTOR	
R354,355			RK73HB1J103J	CHIP R 10K J 1/16W		Q6		2SC5108(Y)F		TRANSISTOR	
R357			RK73HB1J000J	CHIP R 0.0 J 1/16W							
						Q7		DTA143TE		DIGITAL TRANSISTOR	
R360			RK73HB1J000J	CHIP R 0.0 J 1/16W		Q8		2SC4617(S)		TRANSISTOR	
R365			RK73HB1J473J	CHIP R 47K J 1/16W		Q9		2SC5108(Y)F		TRANSISTOR	
R403			RK73GB2A101J	CHIP R 100 J 1/10W		Q102		2SC4926YD		TRANSISTOR	
R404			RK73HH1J474D	CHIP R 470K D 1/16W		Q103		2SK2596		FET	
R405			RK73GB2A334J	CHIP R 330K J 1/10W							
						Q104		DTC114EE		DIGITAL TRANSISTOR	

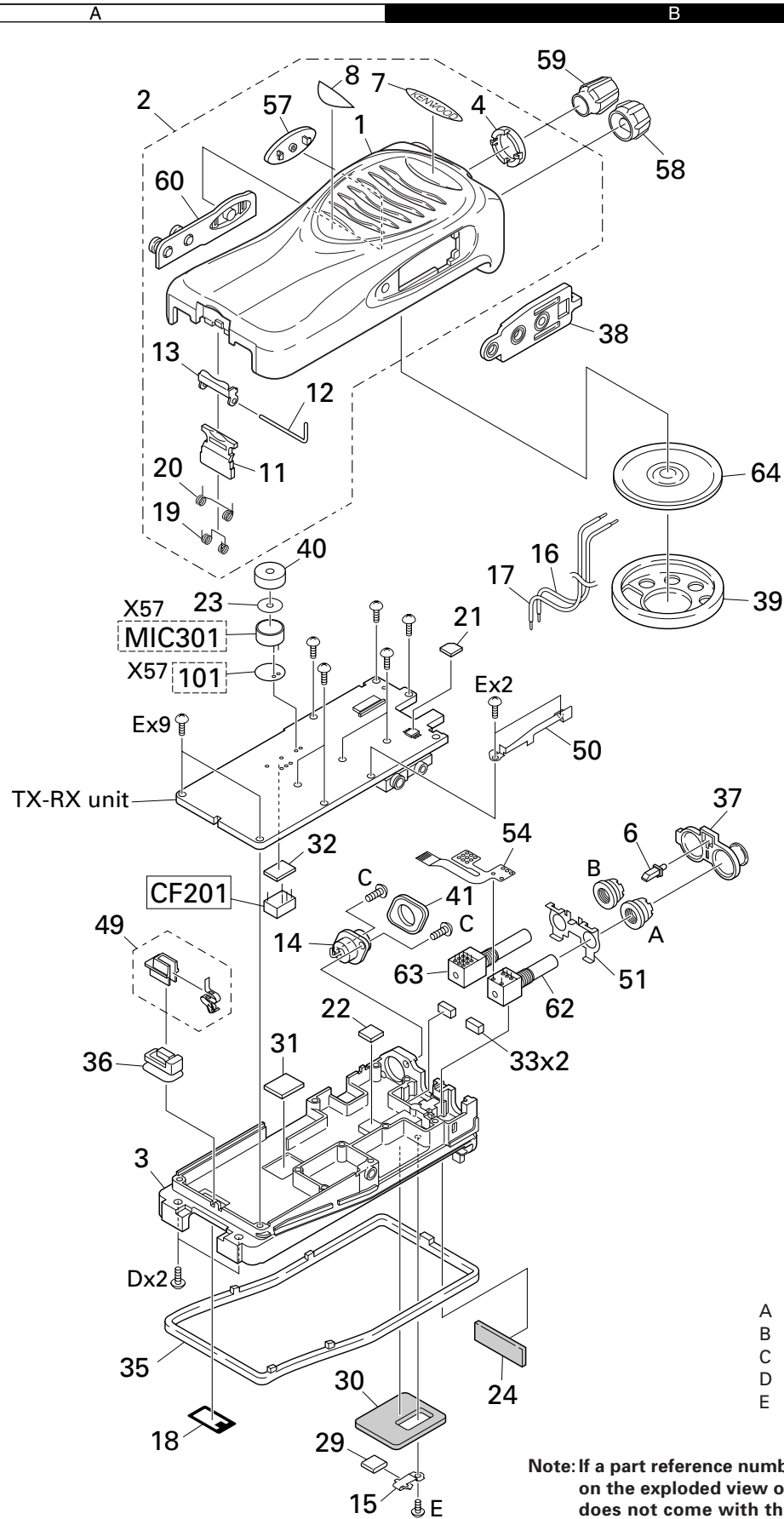
# TK-2202L

## PARTS LIST

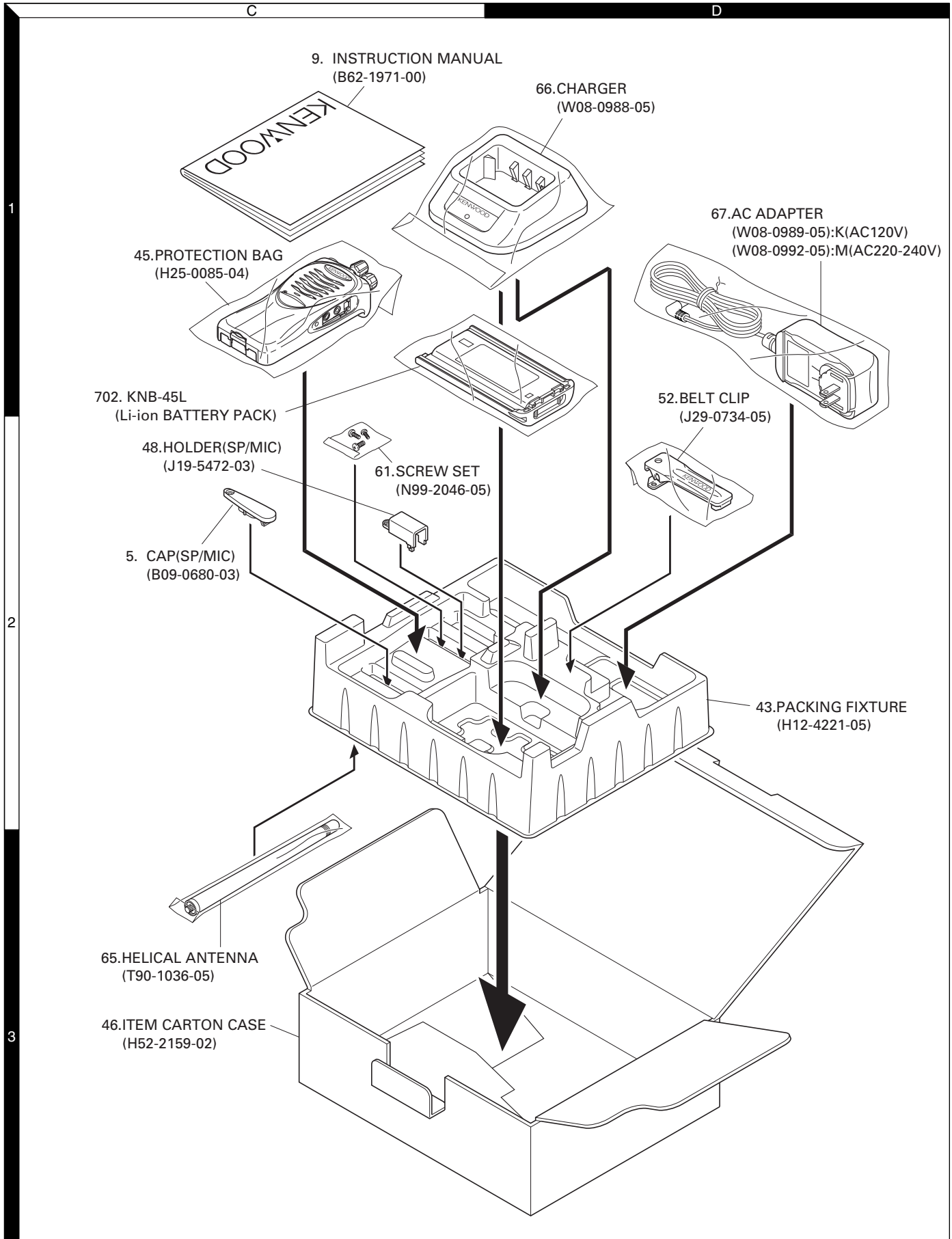
### TX-RX UNIT (X57-6870-21)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
Q105			2SK879(Y)F	FET							
Q106			2SK2595-E	FET							
Q107			DTC114EE	DIGITAL TRANSISTOR							
Q108			2SK1824-A	FET							
Q109			DTA144EE	DIGITAL TRANSISTOR							
Q202			DTA144EE	DIGITAL TRANSISTOR							
Q203			2SC4649(N,P)	TRANSISTOR							
Q204,205			3SK318	FET							
Q301			DTA114EE	DIGITAL TRANSISTOR							
Q302			2SC4919	TRANSISTOR							
Q303			DTC144EE	DIGITAL TRANSISTOR							
Q304			2SA1362-F(GR)	TRANSISTOR							
Q305			DTC144EE	DIGITAL TRANSISTOR							
Q306			2SK3577-A	FET							
Q316			2SK3577-A	FET							
Q401,402			DTC114EE	DIGITAL TRANSISTOR							
Q403,404			CPH3317	FET							
Q405			DTA123JE	DIGITAL TRANSISTOR							
Q407,408			2SK1830F	FET							
Q901			2SK1824-A	FET							
TH101			157-104-65001	THERMISTOR							
TH203			157-104-65001	THERMISTOR							

## EXPLODED VIEW



## PACKING





## ADJUSTMENT

### Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range Modulation Output	136 to 174MHz Frequency modulation and external modulation -127dBm/0.1μV to greater than -47dBm/1mV
2. Power Meter	Input Impedance Operation Frequency Measurement Range	50Ω 136 to 174MHz Vicinity of 10W
3. Deviation Meter	Frequency Range	136 to 174MHz
4. Digital Volt Meter (DVM)	Measuring Range Input Impedance	10mV to 10V DC High input impedance for minimum circuit loading
5. Oscilloscope		DC through 30MHz
6. High Sensitivity Frequency Counter	Frequency Range Frequency Stability	10Hz to 1000MHz 0.2ppm or less
7. Ammeter		5A
8. AF Volt Meter (AF VTVM)	Frequency Range Voltage Range	50Hz to 10kHz 1mV to 10V
9. Audio Generator (AG)	Frequency Range Output	50Hz to 5kHz or more 0 to 1V
10. Distortion Meter	Capability Input Level	3% or less at 1kHz 50mV to 10Vrms
11. Spectrum Analyzer	Measuring Range	DC to 1GHz or more
12. Tracking Generator	Center frequency Output Voltage	50kHz to 600MHz 100mV or more
13. 8Ω Dummy Load		Approx. 8Ω, 3W
14. Regulated Power Supply		5V to 10V, approx. 3A Useful if ammeter equipped

### ■ The following parts are required for adjustment

#### 1. Antenna connector adapter

The antenna connector of this transceiver uses an SMA terminal.

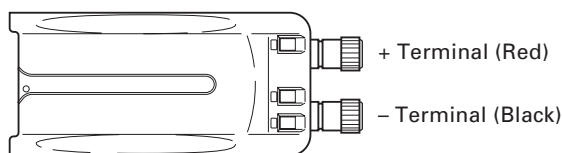
Use an antenna connector adapter [SMA(f) – BNC(f) or SMA(f) – N(f)] for adjustment. (The adapter is not provided as an option, so buy a commercially-available one.)

#### 2. Repair Jig (Chassis)

Use jig (part No.: A10-4086-03) for repairing the transceiver. Place the TX-RX unit on the jig and fit it with screws.

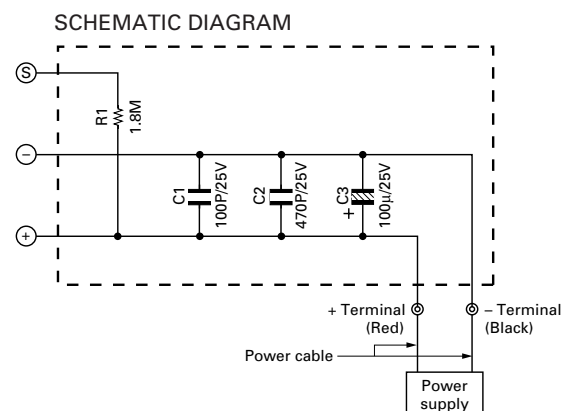
The jig facilitates the voltage check and protects the final amplifier FET when the voltage on the flow side of the TX-RX unit is checked during repairs.

#### 3. Battery Jig (W05-1011-00)



Connect the power cable properly between the battery jig installed in the transceiver and the power supply, and be sure output voltage and the power supply polarity prior to switching the power supply ON, otherwise over voltage and reverse connection may damage the transceiver, or the power supply or both.

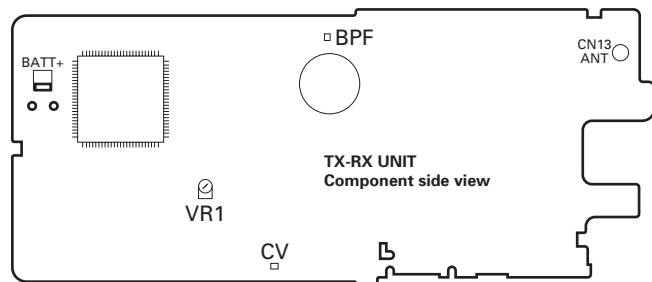
**Note:** When using the battery jig, you must measure the voltage at the terminals of the battery jig. Otherwise, a slight voltage drop may occur within the power cable, between the power supply and the battery jig, especially while the transceiver transmits.



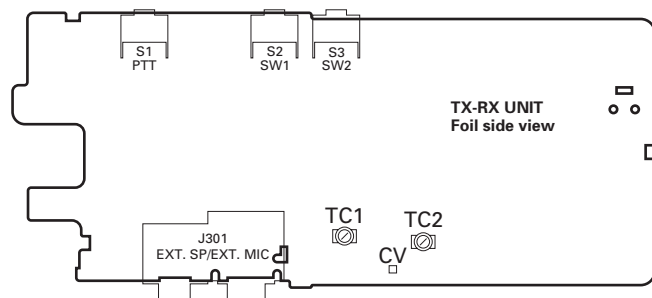


## ADJUSTMENT

### Adjustment points



VR1 : Frequency adjustment  
 BPF : Band-pass wave form test point  
 CV : Lock voltage adjustment terminal



TC1 : Transmit lock voltage adjustment  
 TC2 : Receive lock voltage adjustment  
 CV : Lock voltage adjustment terminal

### ■ Frequency and signaling

The transceiver has been adjusted for the frequencies shown in the following table. When required, readjust them following the adjustment procedure to obtain the frequencies you want in actual operation.

#### Frequency (MHz)

Channel No.	RX Frequency	TX Frequency
1	155.050	155.100
2	136.050	136.100
3	173.950	173.900
4	155.000	155.000
5	155.200	155.200
6	155.400	155.400
7~16	—	—

#### Signaling

Signaling No.	RX	TX
1	None	None
2	None	100Hz Square Wave
3	QT 67.0Hz	QT 67.0Hz
4	QT 151.4Hz	QT 151.4Hz
5	QT 250.3Hz	QT 250.3Hz
6	DQT D023N	DQT D023N
7	DQT D754I	DQT D754I
8	DTMF 159D	DTMF 159D
9	None	DTMF tone 9

### • Preparations for tuning the transceiver

Before attempting to tune the transceiver, connect the unit to a suitable power supply.

Whenever the transmitter is tuned, the unit must be connected to a suitable dummy load (i.e. power meter).

The speaker output connector must be terminated with a 8Ω dummy load and connected to an AC voltmeter and an audio distortion meter or a SINAD measurement meter at all times during tuning.

#### Adjustment Frequency


TEST CH	RX	TX
Low	136.050MHz	136.000MHz
Low'	145.550MHz	145.600MHz
Center	155.050MHz	155.100MHz
High'	164.550MHz	164.600MHz
High	173.950MHz	173.900MHz

## ADJUSTMENT

## Common Section

Item	Condition	Measurement		Adjustment		Specifications/ Remark
		Test equipment	Terminal	Parts	Method	
1.Setting	1) BATT terminal voltage:7.5V 2) SSG standard modulation [Wide] MOD:1kHz,DEV:3kHz [Narrow] MOD:1kHz,DEV:1.5kHz					
2.VCO lock voltage RX	1) CH:High	Power meter DVM	ANT CV	TC2	4.0V	±0.1V
	2) CH:Low				Check	0.6V or more
3.VCO lock voltage TX	3) CH:High PTT:ON			TC1	4.2V	±0.1V
	4) CH:Low PTT:ON				Check	0.6V or more

## Transmitter Section

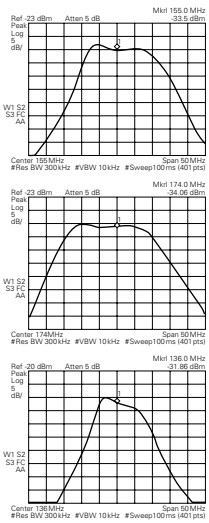
Item	Condition	Measurement		Adjustment		Specifications/ Remark
		Test equipment	Terminal	Parts	Method	
1.Frequency Adjust	1) CH:High 2) PTT:ON	Frequency counter	ANT	VR1	High frequency ±50Hz	<b>Note:</b> After replacing the TCXO (X1) align frequency.
2.High power Adjust	TEST CH:Low Low' Center High' High (5 points) BATT terminal voltage:7.5V PTT:ON	Power meter Ammeter		Programming Software:KPG-87D	5.0W	±0.1W 2.0 A or less
					1.05W	±0.1W 1.0 A or less
3.Low power Adjust	TEST CH:Low Low' Center High' High (5 points) BATT terminal voltage:7.5V PTT:ON					
4.DQT balance Adjust [Wide]	TEST CH:Center Low High (3 points) LPF:3kHz HPF:OFF PTT:ON	Power meter Deviation meter Oscilloscope AG AF VTVM			Make the demodulation wave into square waves.	
	[Narrow] TEST CH:Center PTT:ON					

## ADJUSTMENT

Item	Condition	Measurement		Adjustment		Specifications/ Remark
		Test equipment	Terminal	Parts	Method	
5. Max deviation Adjust [Wide]	TEST CH: Center Low High (3 points) AG:1kHz/150mV Deviation meter filter LPF:15kHz HPF:OFF PTT:ON	Power meter Deviation meter Oscilloscope AG AF VTVM	ANT SP/MIC connector	Programming Software:KPG-87D	4.2kHz (According to the larger +,-)	±80Hz
	[Narrow]				TEST CH:Center PTT:ON	
6. VOX 1 Writing	TEST CH:Center AG:1KHz/45mV					
7. QT deviation Adjust [Wide]	TEST CH: Center Low High (3 points) LPF:3kHz HPF:OFF PTT:ON		ANT	Programming Software:KPG-87D	0.75kHz	±40Hz
	[Narrow]	TEST CH: Center PTT:ON			0.38kHz	
8. DQT deviation Adjust [Wide]	TEST CH: Center Low High (3 points) LPF:3kHz HPF:OFF PTT:ON				0.75kHz	±40Hz
	[Narrow]	TEST CH:Center PTT:ON			0.38kHz	
9. DTMF deviation Adjust [Wide]	TEST CH:Center LPF:15kHz HPF:OFF PTT:ON				3.0kHz	±100Hz
	[Narrow]	TEST CH:Center PTT:ON			1.5kHz	
10. MSK deviation Adjust [Wide]	TEST CH: Center Low High (3 points) LPF:15kHz HPF:OFF PTT:ON				3.1kHz	±100Hz
	[Narrow]	TEST CH:Center PTT:ON			1.5kHz	

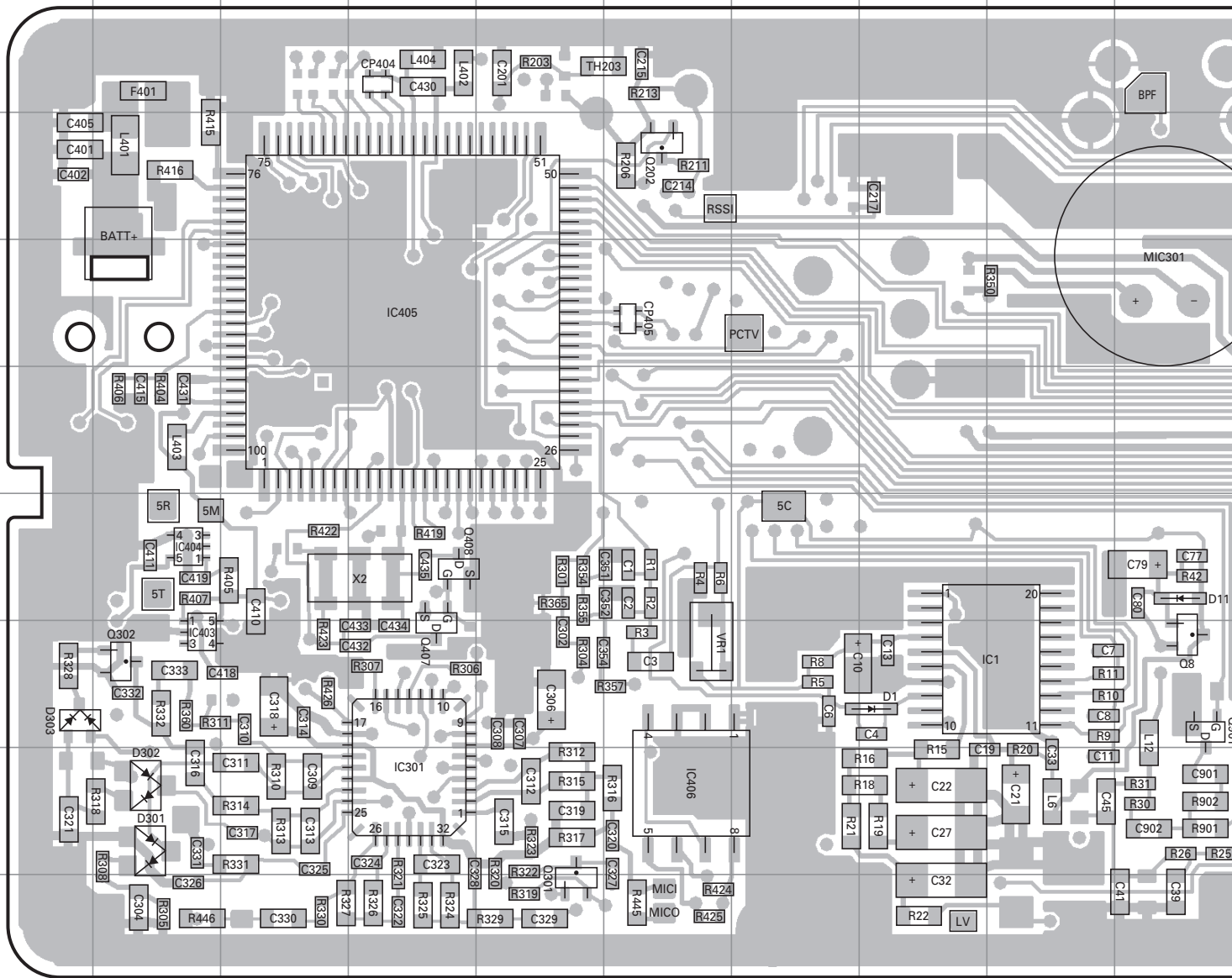
## ADJUSTMENT

### Receiver Section

Item	Condition	Measurement		Adjustment		Specifications/ Remark
		Test equipment	Terminal	Parts	Method	
1.BPF Wave Adjust	(1)Center frequency Spectrum analyzer setting Center-f : 155MHz Span : 50MHz RBW : 300kHz VBW : 10kHz ATT : 5dB (2)High-edge frequency Spectrum analyzer setting Center-f : 174MHz (3)Low-edge frequency Spectrum analyzer setting Center-f : 136MHz	Spectrum analyzer	ANT BPF	Programming Software: KPG-87D	Adjust the waveform as shown to the right.	
2.Sensitivity Check [Wide]	TEST CH: Low Center High SSG output:-117 dBm(0.3μV) SSG MOD:3.0kHz	SSG DVM Oscilloscope AF VTVM	ANT		Check	12dB SINAD or more
[Narrow]	TEST CH: Center SSG output:-115 dBm(0.4μV) SSG MOD:1.5kHz					
3.SQL1 (Threshold) Writing [Wide]	TEST CH: Center Low High SSG output:-123 dBm(0.16μV) SSG MOD:3.0kHz			Programming Software: KPG-87D	Write	Squelch open
[Narrow]	TEST CH: Center SSG output:-122 dBm(0.18μV) SSG MOD:1.5kHz					
4.SQL9 (Tight) Writing [Wide]	TEST CH: Center Low High SSG output:-117 dBm(0.3μV) SSG MOD:3.0kHz					
[Narrow]	TEST CH: Center SSG output:-116 dBm(0.35μV) SSG MOD:1.5kHz					
5.BATT detection Writing	BATT terminal voltage:5.9V	DVM	ANT BATT terminal		Write	BATT terminal voltage:5.9V

# TK-2202L PC BOARD

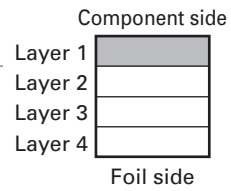
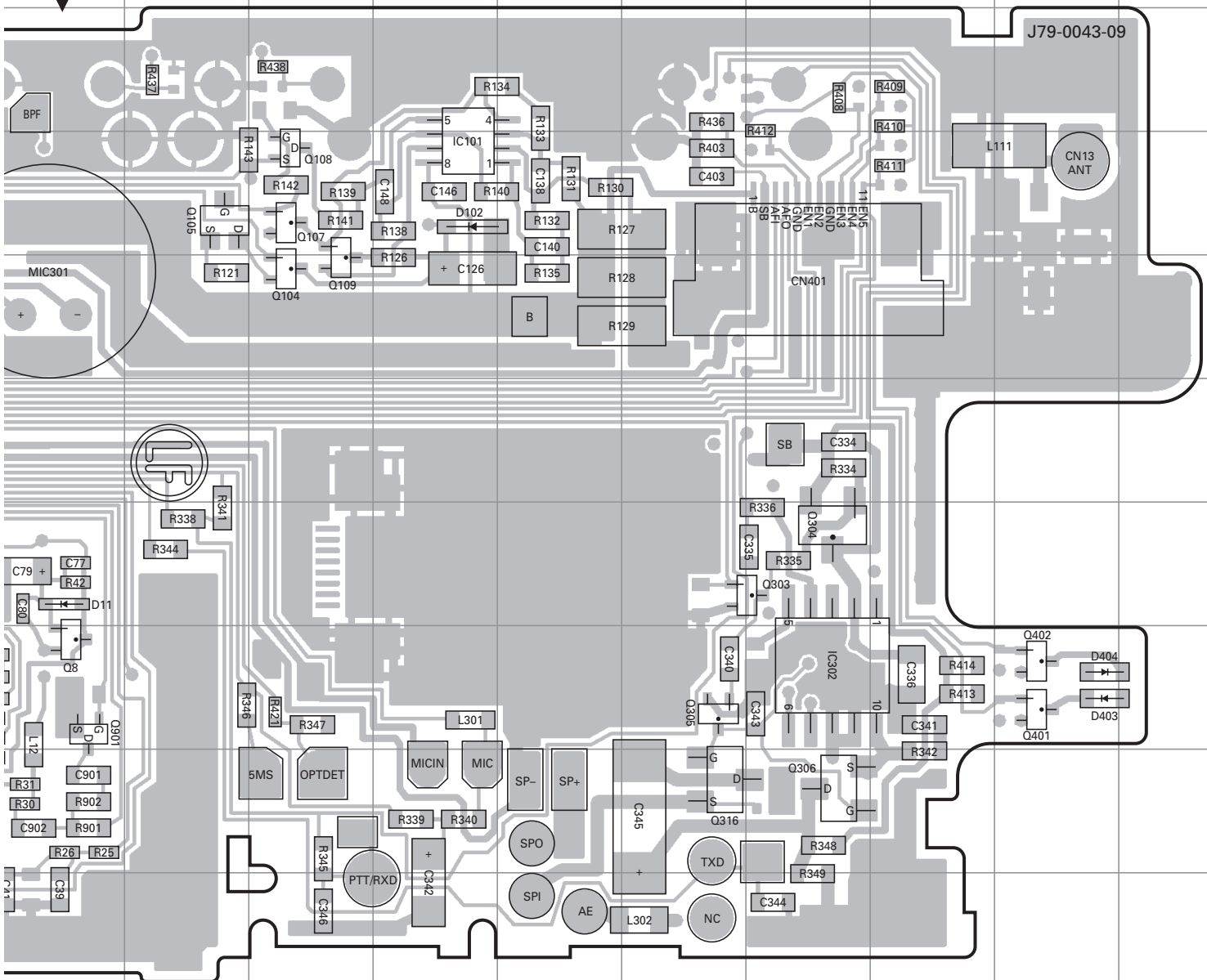
## TX-RX UNIT (X57-6870-21) Component side view (J79-0043-09)



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC1	8I	Q104	5L	Q304	7P	D1	8H
IC101	4M	Q105	4K	Q305	8O	D11	7J
IC301	9D	Q107	4L	Q306	9P	D102	4M
IC302	8P	Q108	4L	Q316	9O	D301	9B
IC403	8B	Q109	5L	Q401	8R	D302	9B
IC404	7B	Q202	4F	Q402	8R	D303	8A
IC405	5D	Q301	10E	Q407	8D	D403	8R
IC406	9F	Q302	8B	Q408	7D	D404	8R
Q8	8J	Q303	7P	Q901	8J		

# PC BOARD TK-2202L

## TX-RX UNIT (X57-6870-21) Component side view (J79-0043-09)

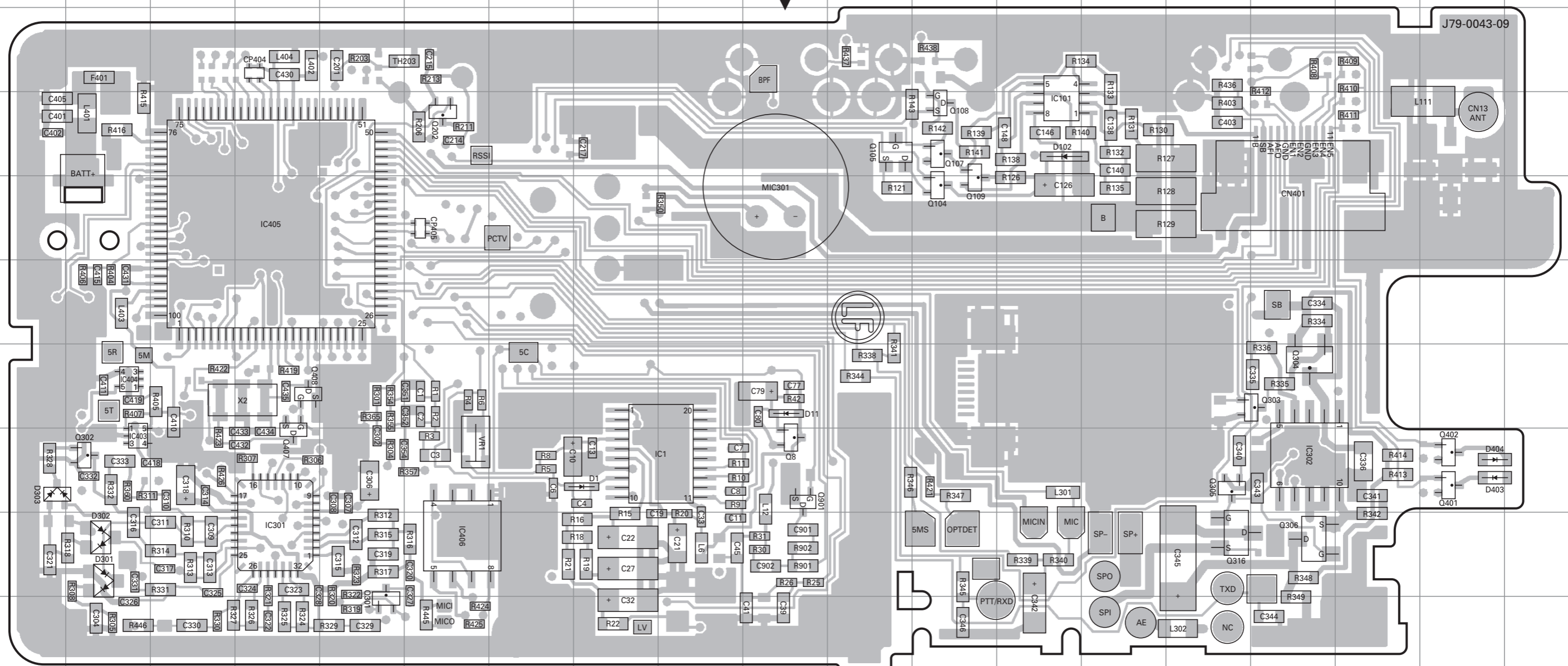


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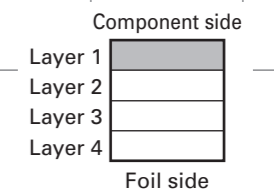
# PC BOARD TK-2202L

TX-RX UNIT (X57-6870-21) Component side view (J79-0043-09)

TX-RX UNIT (X57-6870-21) Component side view (J79-0043-09)

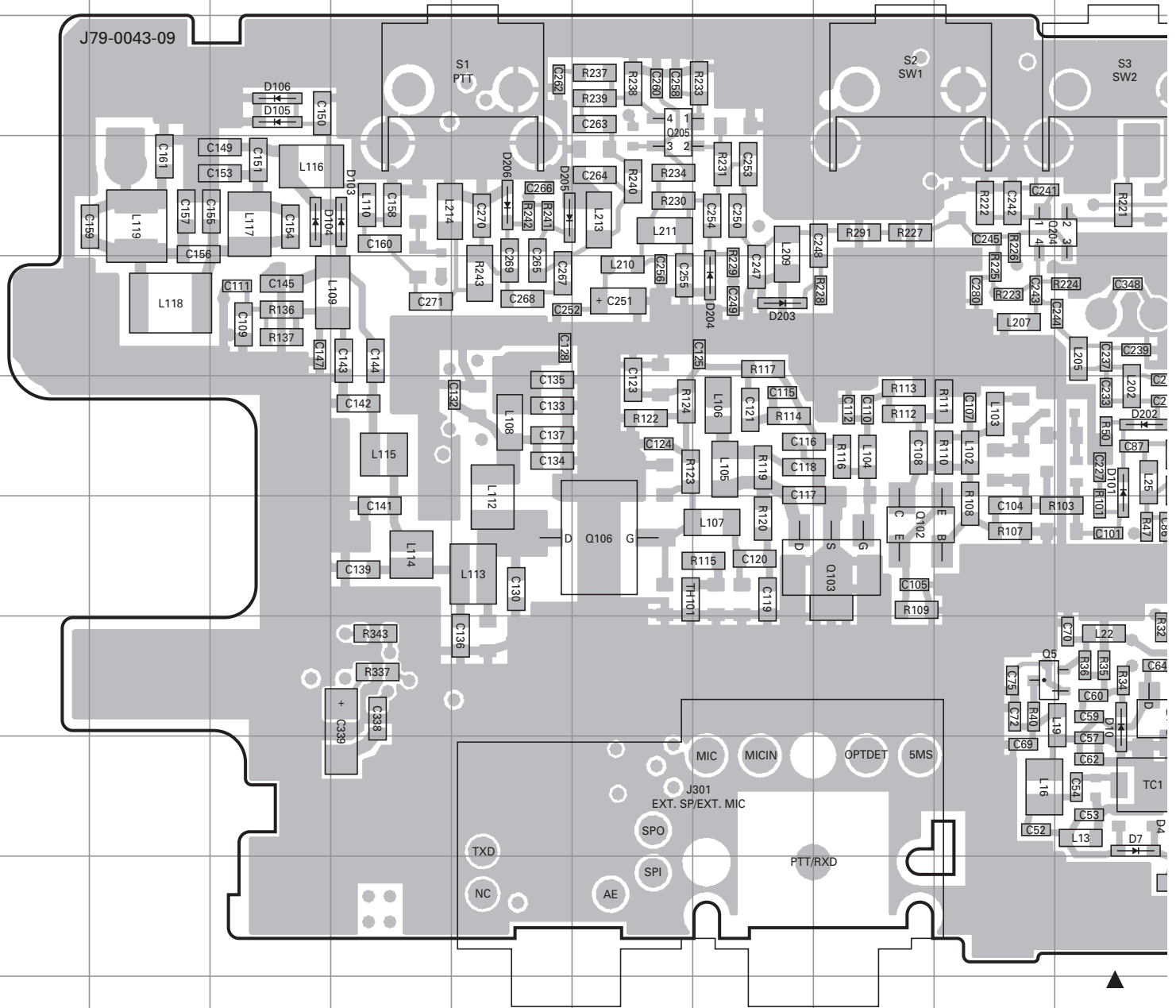


Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC1	8I	Q104	5L	Q304	7P	D1	8H
IC101	4M	Q105	4K	Q305	8O	D11	7J
IC301	9D	Q107	4L	Q306	9P	D102	4M
IC302	8P	Q108	4L	Q316	9O	D301	9B
IC403	8B	Q109	5L	Q401	8R	D302	9B
IC404	7B	Q202	4F	Q402	8R	D303	8A
IC405	5D	Q301	10E	Q407	8D	D403	8R
IC406	9F	Q302	8B	Q408	7D	D404	8R
Q8	8J	Q303	7P	Q901	8J		



# TK-2202L PC BOARD

## TX-RX UNIT (X57-6870-21) Foil side view (J79-0043-09)

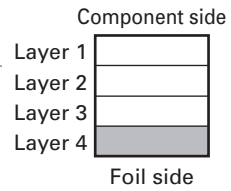
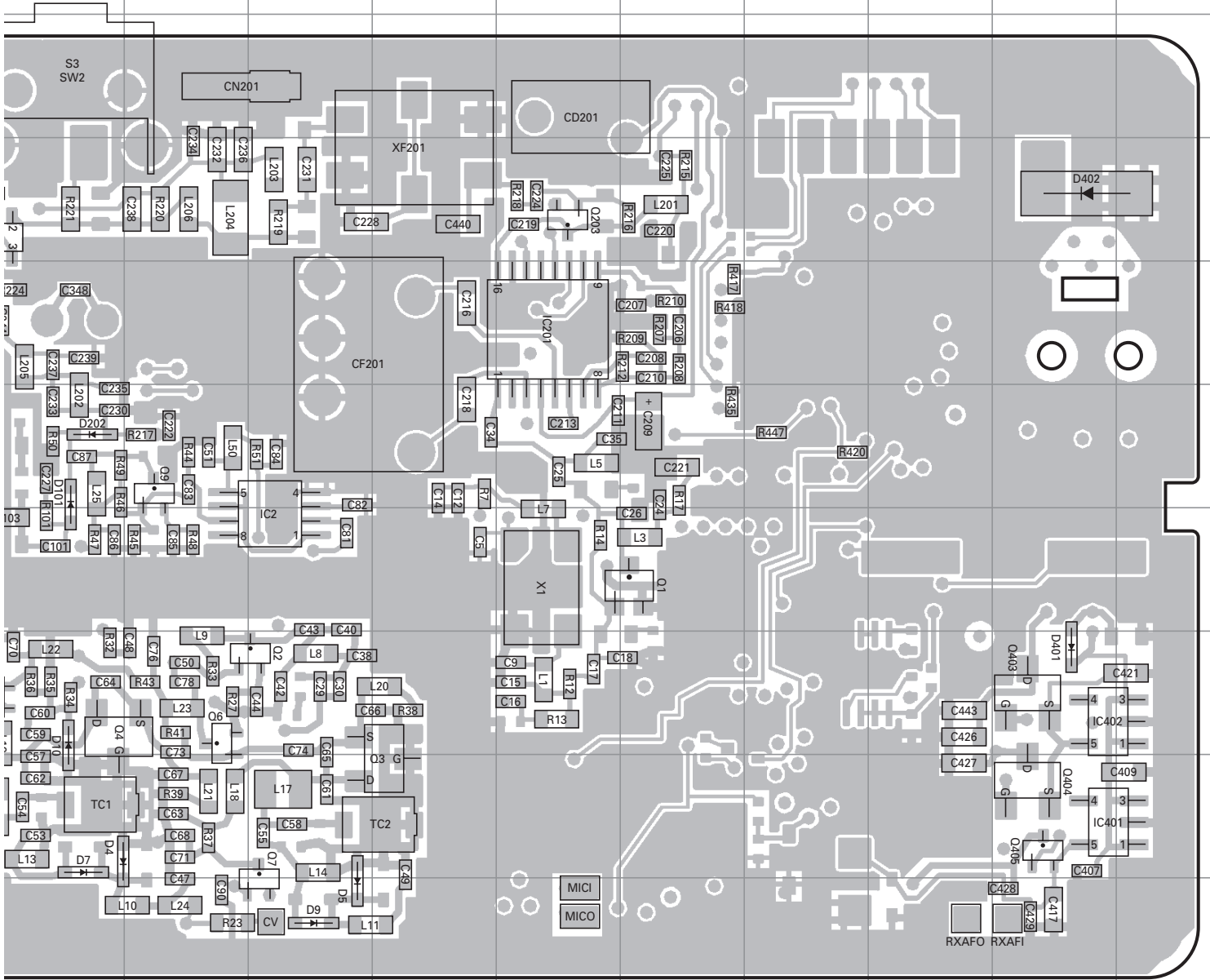


Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC2	7L	Q5	8I	Q204	4I	D9	10L	D203	5G
IC201	5N	Q6	8K	Q205	3F	D10	8J	D204	5G
IC401	9R	Q7	9L	Q403	8R	D101	6J	D205	4E
IC402	8R	Q9	6K	Q404	9R	D103	4D	D206	4E
Q1	7O	Q102	7H	Q405	9R	D104	4C	D401	8R
Q2	8L	Q103	7H	D4	9J	D105	3C	D402	4R
Q3	9M	Q106	7F	D5	10L	D106	3C		
Q4	8J	Q203	4N	D7	9J	D202	6J		



# PC BOARD TK-2202L

## TX-RX UNIT (X57-6870-21) Foil side view (J79-0043-09)

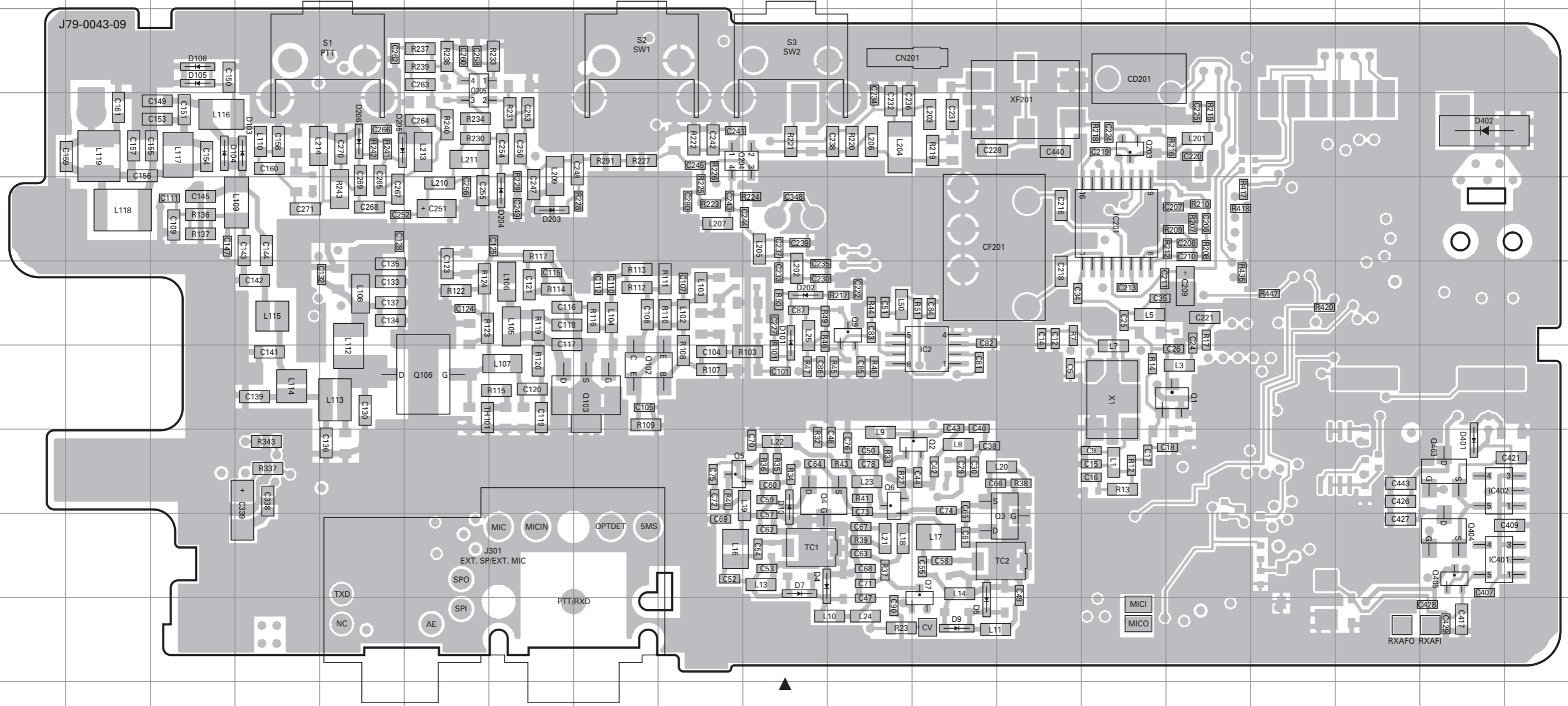


# TK-2202L PC BOARD

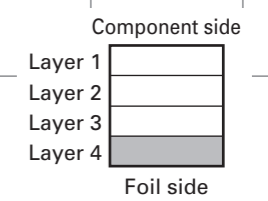
# PC BOARD TK-2202L

TX-RX UNIT (X57-6870-21) Foil side view (J79-0043-09)

TX-RX UNIT (X57-6870-21) Foil side view (J79-0043-09)

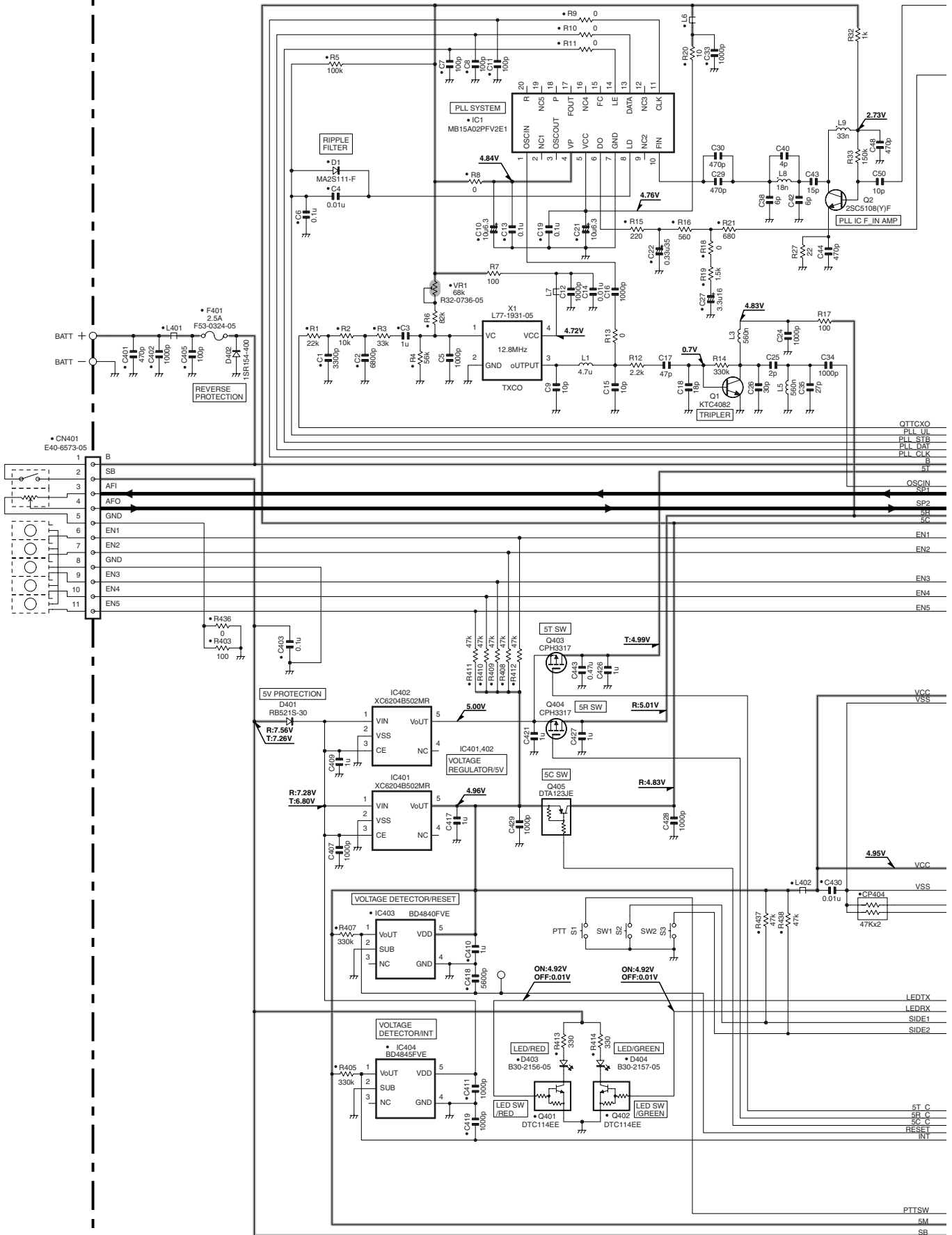


Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC2	7L	Q5	8I	Q204	4I	D9	10L	D203	5G
IC201	5N	Q6	8K	Q205	3F	D10	8J	D204	5G
IC401	9R	Q7	9L	Q403	8R	D101	6J	D205	4E
IC402	8R	Q9	6K	Q404	9R	D103	4D	D206	4E
Q1	7O	Q102	7H	Q405	9R	D104	4C	D401	8R
Q2	8L	Q103	7H	D4	9J	D105	3C	D402	4R
Q3	9M	Q106	7F	D5	10L	D106	3C		
Q4	8J	Q203	4N	D7	9J	D202	6J		



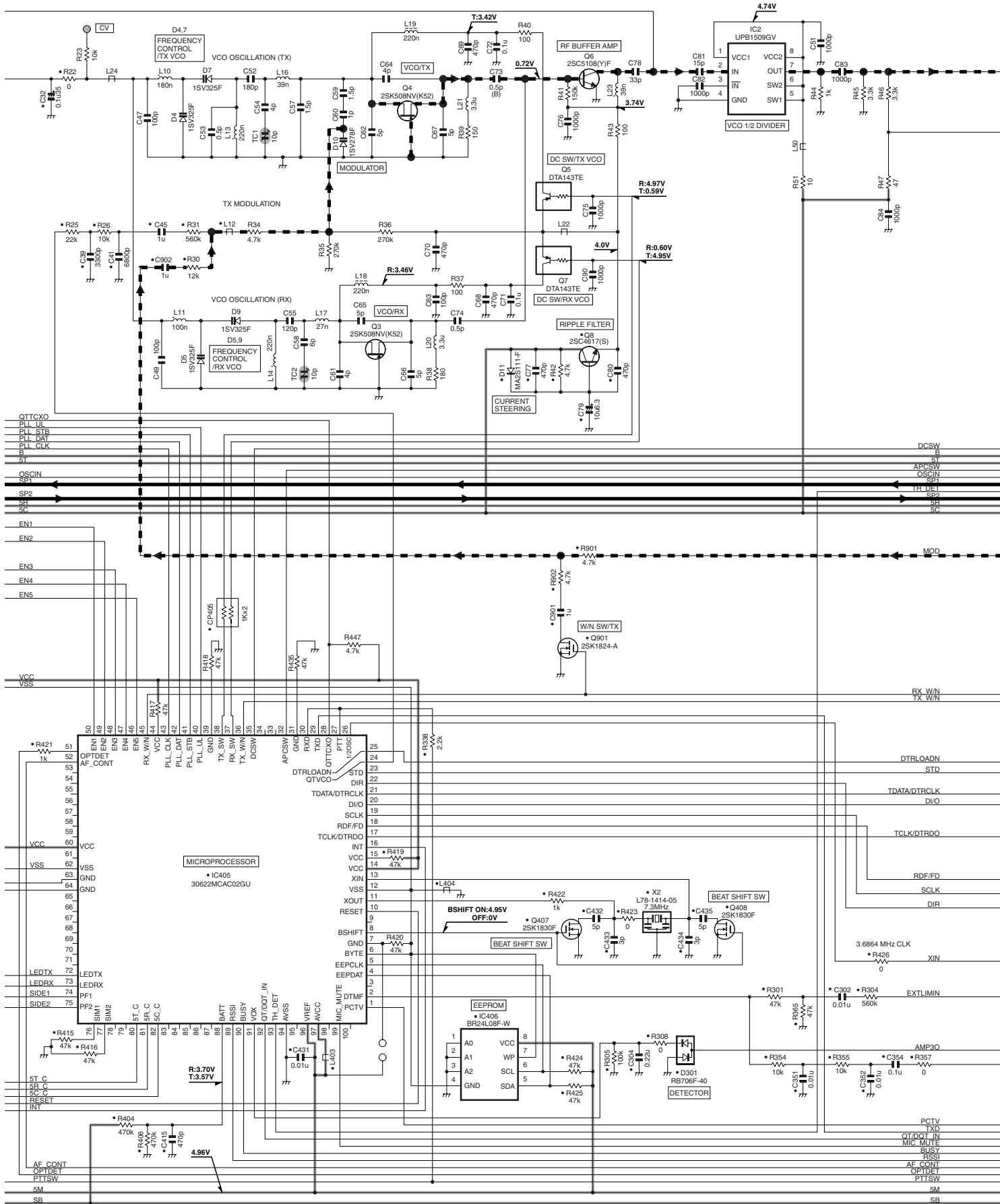
# TK-2202L SCHEMATIC DIAGRAM

TX-RX UNIT (X57-6870-21)



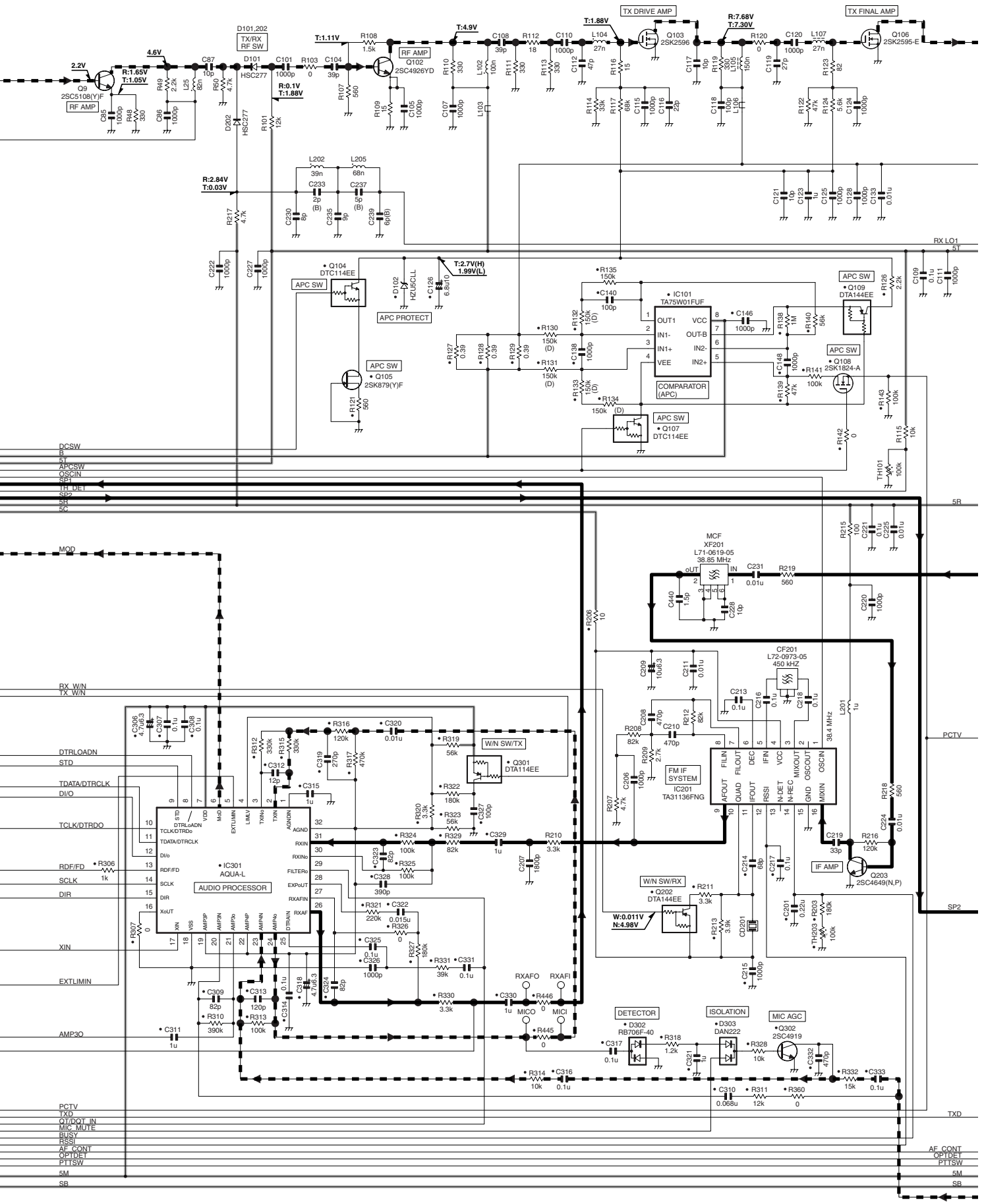
# SCHEMATIC DIAGRAM TK-2202L

TX-RX UNIT (X57-6870-21)



# TK-2202L SCHEMATIC DIAGRAM

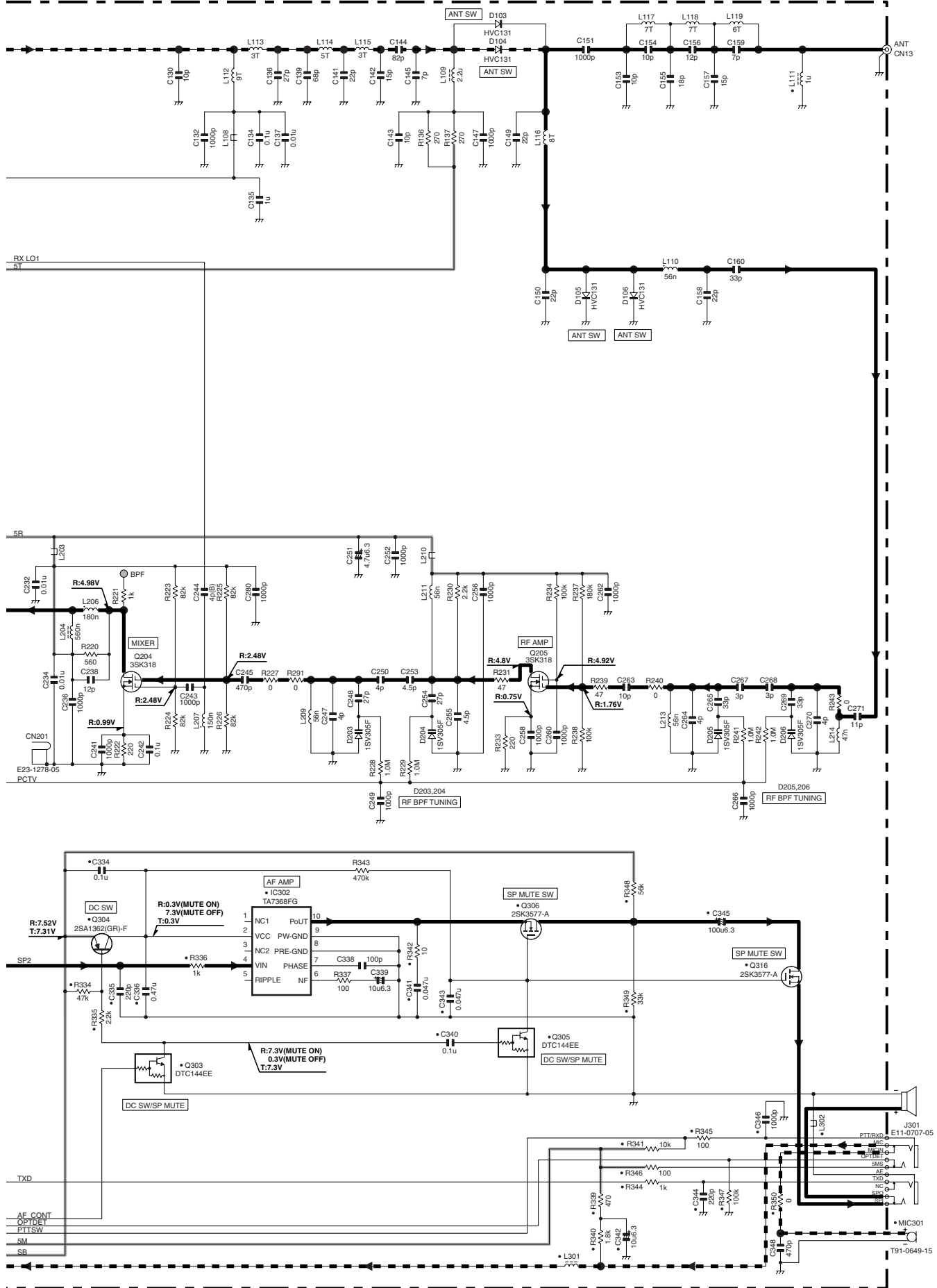
TX-RX UNIT (X57-6870-21)



# SCHEMATIC DIAGRAM TK-2202L

TX-RX UNIT (X57-6870-21)

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

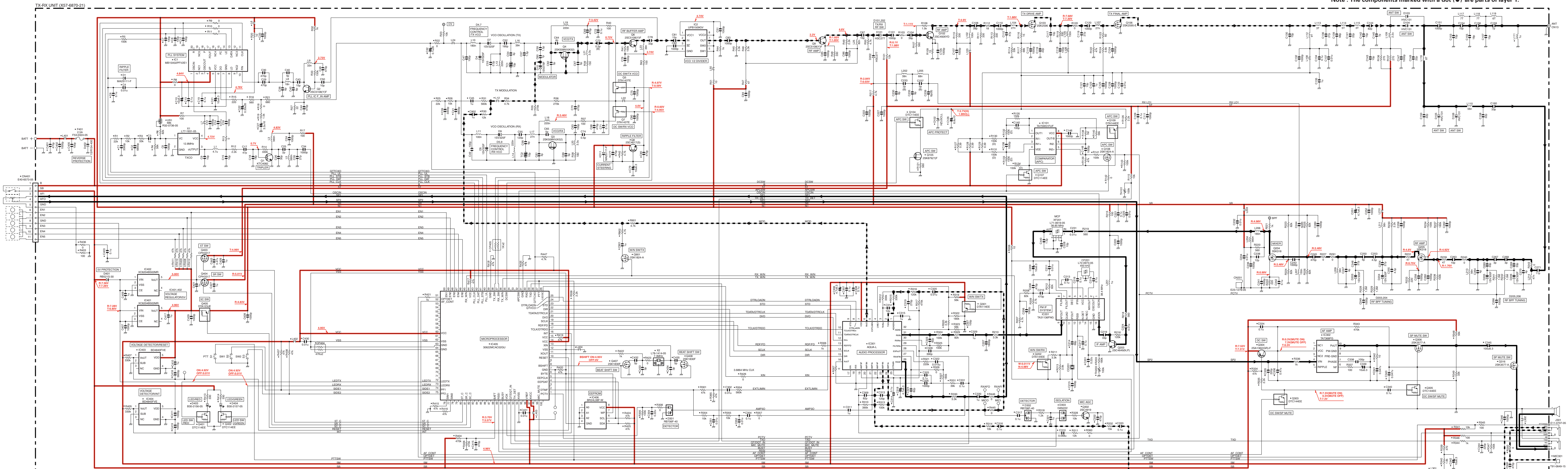


1  
2  
3  
4  
5  
6  
7

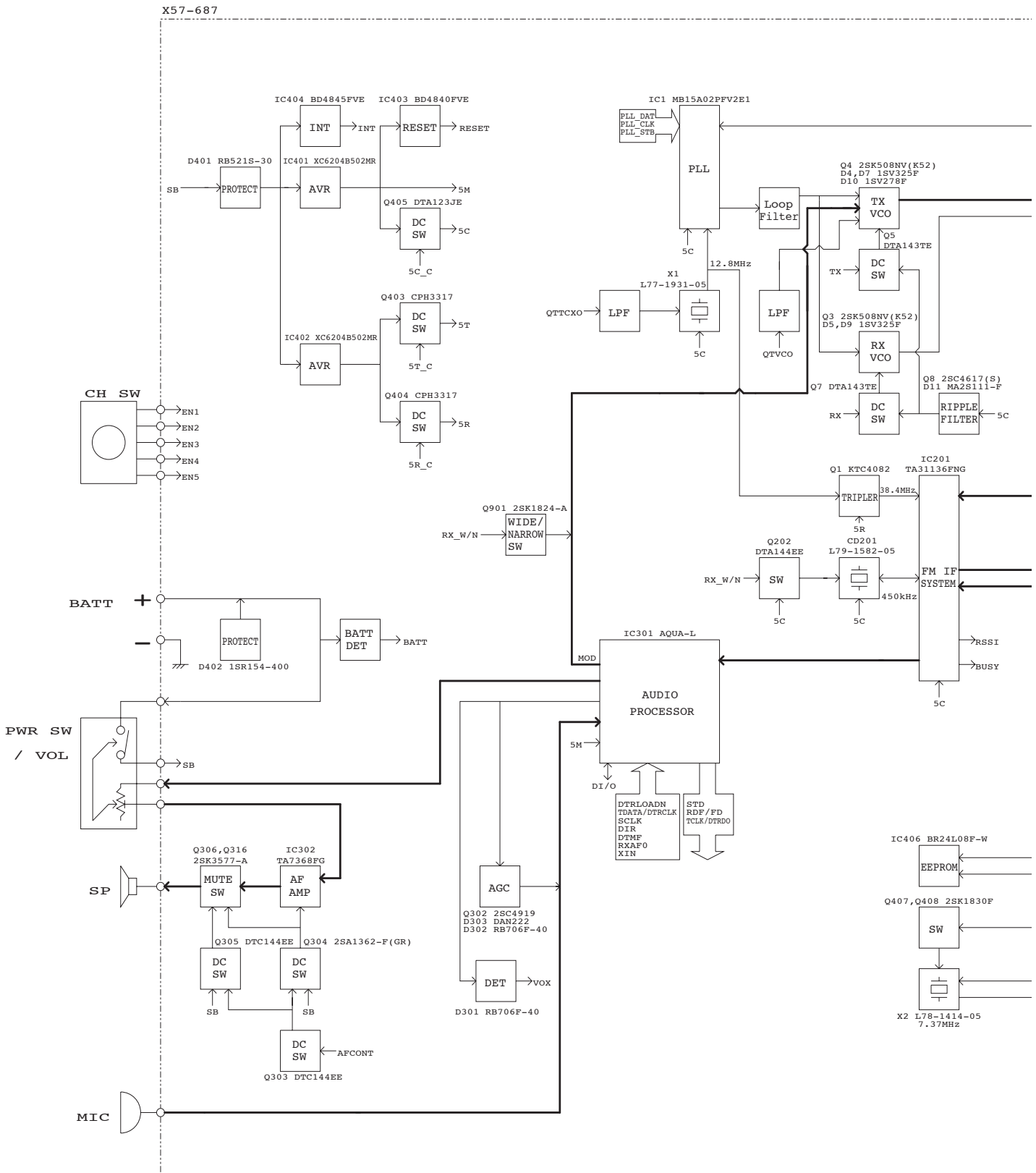


# TK-2202L SCHEMATIC DIAGRAM

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

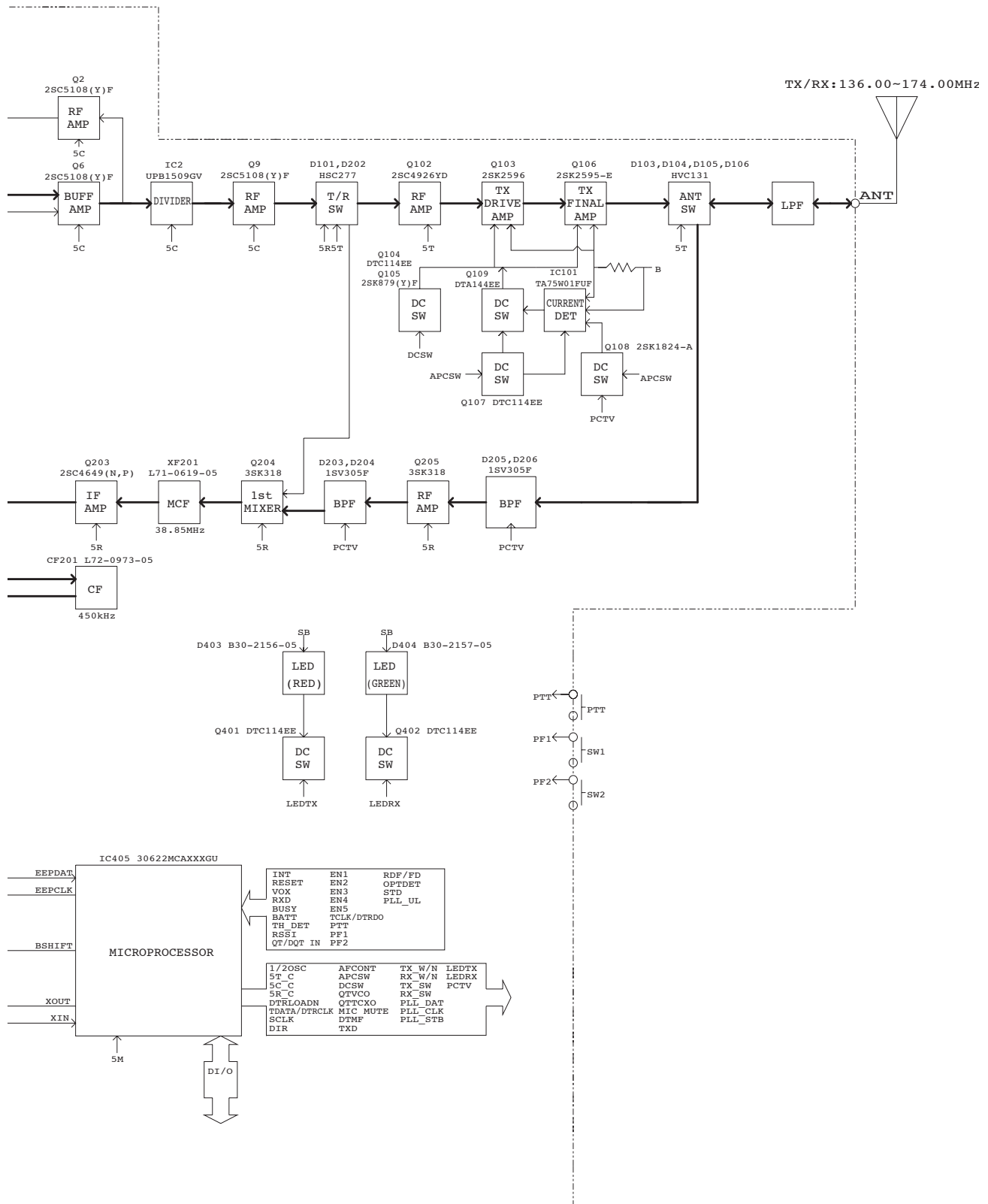


## BLOCK DIAGRAM

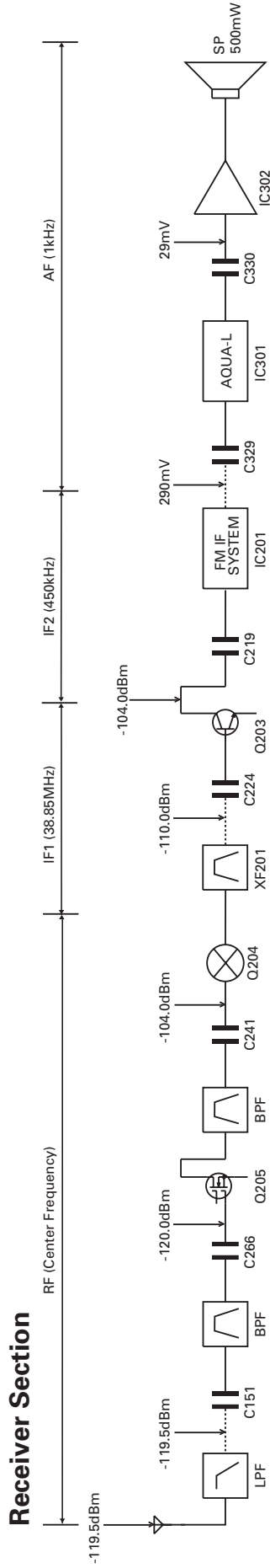




## BLOCK DIAGRAM

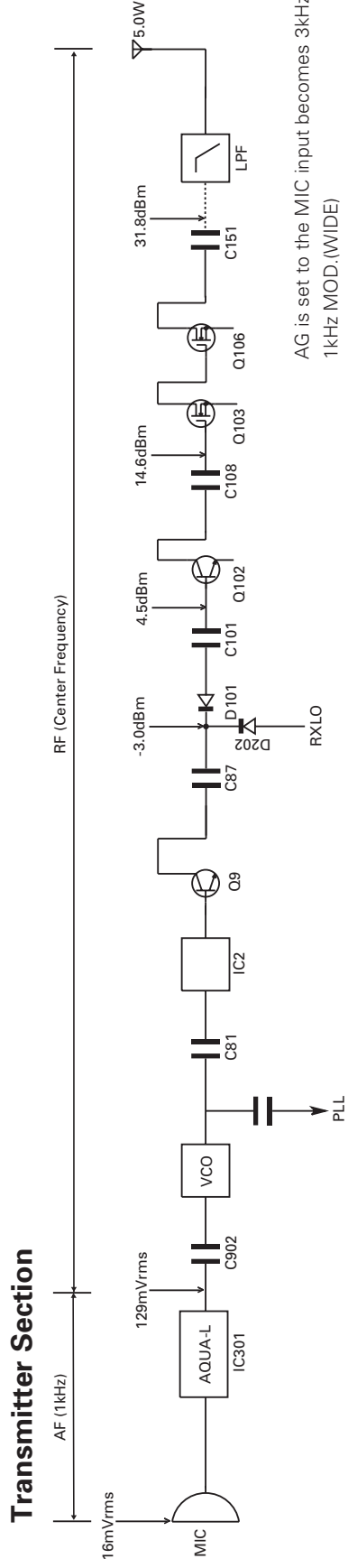


## LEVEL DIAGRAM



To make measurements in the AF section, connect the AC level meter. (ANT input: -53dBm, 1kHz FM, 3kHz DEV (WIDE).)

In the RF section, use 1000pF coupling capacitor. (The display shows the SSG input value required to obtain 12dB SINAD without local level.)



AG is set to the MIC input becomes 3kHz DEV at 1kHz MOD.(WIDE)

To make measurements in the AF section, connect the AC level meter.

In the RF section, use 1000pF coupling capacitor.

## OPTIONAL ACCESSORIES

### KSC-35 (RAPID CHARGER)

#### ■ External View



#### ■ Specifications

Charging time ..... KNB-45L : Approx. 180 minutes  
 Dimensions (Charger only) .... 86.3W x 43.2H x 100.0D (mm)  
 3-3/8W x 1-45/64 x 4D (inches)  
 Weight (Charger only) ..... Approx. 90g / 0.2 lbs

### KNB-45L (Li-ion BATTERY PACK)

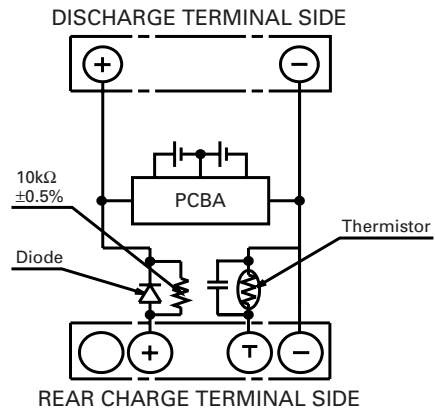
#### ■ External View



#### ■ Specifications

Voltage ..... 7.4V (3.7V x 2)  
 Battery capacity ... 2000mAh

#### ■ Schematic Diagram



## SPECIFICATIONS

### General

Frequency Range .....	136~174MHz
Number of Channels .....	Max. 16
Channel Spacing .....	25kHz, 30kHz (Wide) 12.5kHz, 15kHz (Narrow)
PLL Channel Stepping .....	2.5kHz, 5kHz, 6.25kHz, 7.5kHz
Operating Voltage .....	7.5 V DC±20%
Battery Life (5-5-90 duty cycle with battery saver on)	
With KNB-45L (2000mAh battery) .....	Approx. 18 hours
Operating Temperature Range .....	-30°C to +60°C (-22 °F to +140 °F)
Frequency Stability .....	±2.5ppm (-30°C to +60°C)
Channel Frequency Spread .....	38MHz
Dimensions and Weight	
(Dimensions not including protrusions)	
Radio Only .....	54 (2-1/8) W x 122 (4-13/16) H x 21.1 (13/16) D mm (inches)
	160g (0.35lbs)
With KNB-45L (2000mAh battery) .....	54 (2-1/8) W x 122 (4-13/16) H x 33 (1-5/16) D mm (inches)
	280g (0.62lbs)

### Receiver (Measurements made per TIA/EIA-603)

Sensitivity	
EIA 12dB SINAD .....	0.25µV (Wide)/0.28µV (Narrow)
Selectivity .....	70dB (Wide)/60dB (Narrow)
Intermodulation .....	65dB (Wide)/60dB (Narrow)
Spurious Response .....	65dB
Audio Power Output .....	500mW at 8Ω less than 10% distortion

### Transmitter (Measurements made per TIA/EIA-603)

RF Power Output .....	5W/1W
Spurious and Harmonics .....	65dB
Modulation .....	16K0F3E (Wide)/11K0F3E (Narrow)
FM Noise .....	45dB (Wide)/40dB (Narrow)
Audio Distortion .....	Less than 5%

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