VHF DIGITAL TRANSCEIVER

NX-220

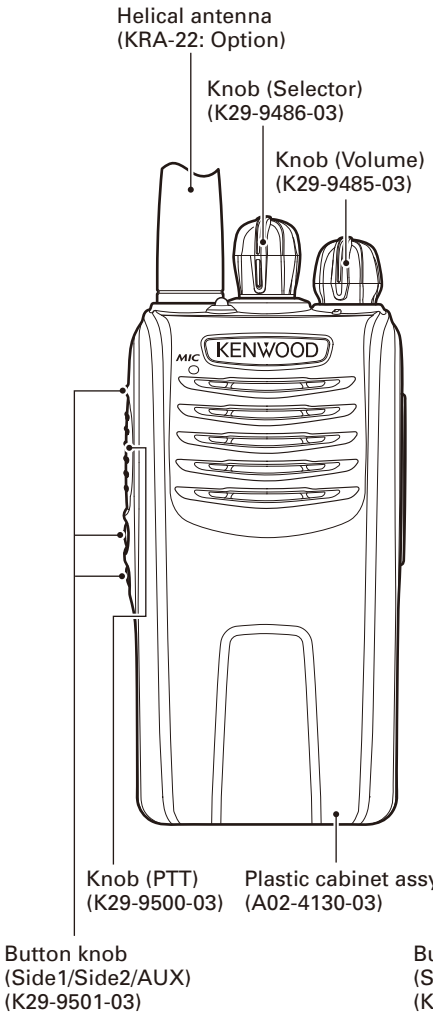
SERVICE MANUAL

KENWOOD

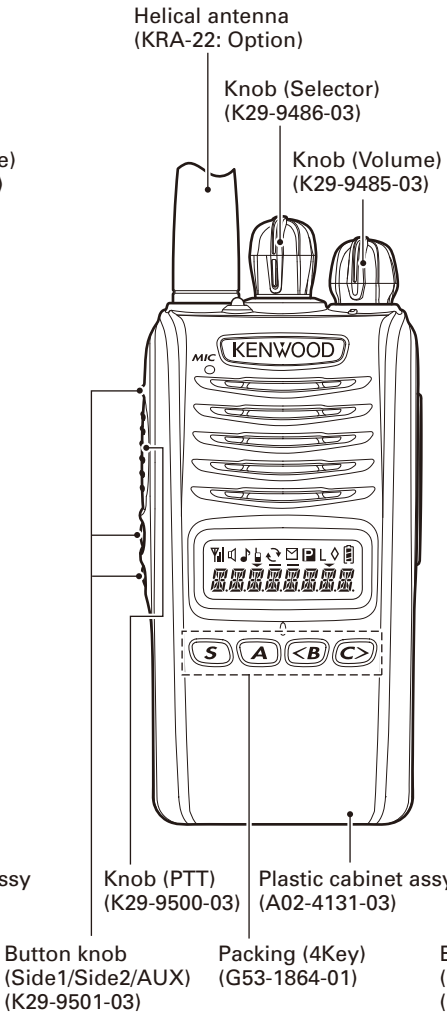
Kenwood Corporation

B51-8962-00 (N) 405

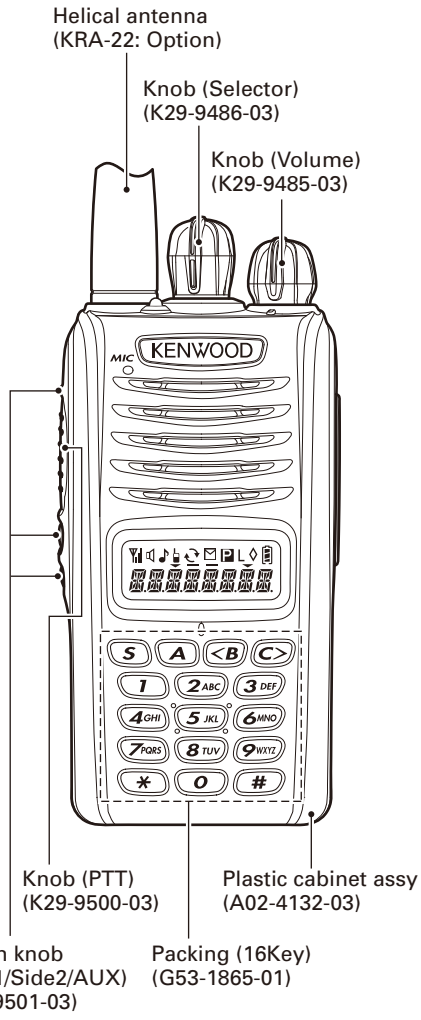
NX-220 K,E3



NX-220 K2,E2



NX-220 K3,E



Does not come with antenna.
Antenna is available as an option.

This product complies with the **RoHS** directive for the European market.

LF

This product uses Lead Free solder.

CONTENTS

Disclaimer

While every precaution has been taken in the preparation of this manual, Kenwood assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein. Kenwood reserves the right to make changes to any products herein at any time for improvement purposes.

GENERAL

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.

PERSONAL SAFETY

The following precautions are recommended for personal safety:

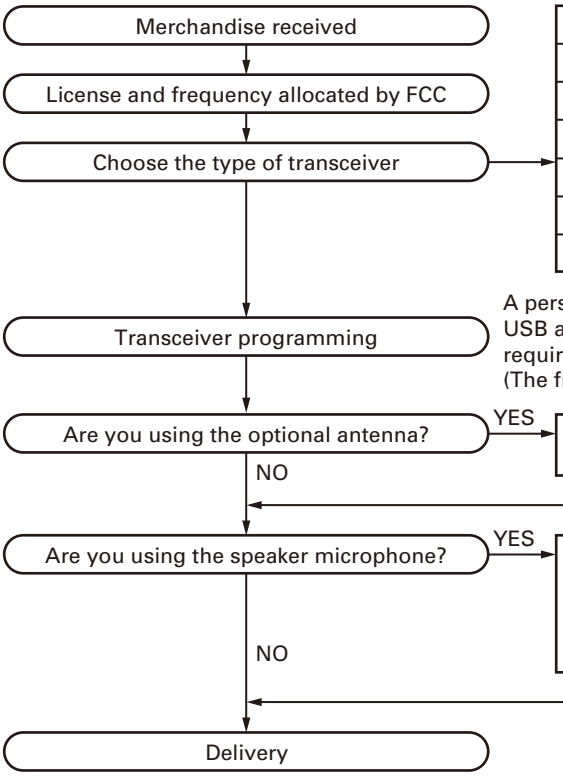
- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- This equipment should be serviced by a qualified technician only.

SERVICE

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

Model & Destination (Market code)		Display unit X54-376X-XX			TX-RX unit X57-8040-10	Frequency range	Remarks	LCD	4-key	DTMF keypad
		0-10	0-11	0-12						
NX-220	K			✓	✓	136~ 174MHz	1st IF: 49.95MHz LOC: 50.4MHz	–	–	–
	K2		✓		✓			✓	✓	–
	K3	✓			✓			✓	✓	✓
	E	✓			✓			✓	✓	✓
	E2		✓		✓			✓	✓	–
	E3			✓	✓			–	–	–

SYSTEM SET-UP



Type	Frequency range (MHz)	RF power	LCD	4-key	DTMF keypad
NX-220 K	TX/RX 136~174	5W	No	No	No
NX-220 K2	TX/RX 136~174	5W	Yes	Yes	No
NX-220 K3	TX/RX 136~174	5W	Yes	Yes	Yes
NX-220 E	TX/RX 136~174	5W	Yes	Yes	Yes
NX-220 E2	TX/RX 136~174	5W	Yes	Yes	No
NX-220 E3	TX/RX 136~174	5W	No	No	No

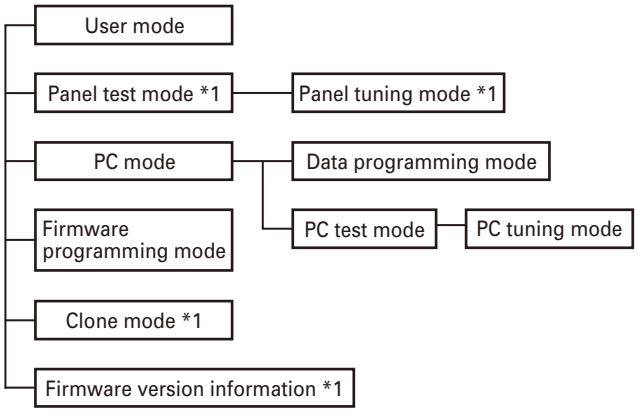
A personal computer, programming interface (KPG-22A/22U), USB adapter (KCT-53U), and programming software (KPG-141D) are required for programming.
(The frequency, and signaling data are programmed for the transceiver.)

KRA-22 or KRA-26
Optional antenna
(Option)

KMC-21/KMC-45
Speaker microphone
or
KMC-48GPS
GPS speaker microphone
(Option)

REALIGNMENT

1. Modes



Mode	Function
User mode	For normal use.
Panel test mode *1	Used by the dealer to check the fundamental characteristics.
Panel tuning mode *1	Used by the dealer to tune the transceiver.
PC mode	Used for communication between the transceiver and PC.
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.
Firmware programming mode	Used when changing the main program of the flash memory.
Clone mode *1	Used to transfer programming data from one transceiver to another.
Firmware version information *1	Used to confirm the internal firmware version.

*1: K2,K3,E and E2 models only

2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
Panel test mode *2	[***A***] + Power ON
PC mode	Received commands from PC
Panel tuning mode *2	[Panel test mode] + [***S***]
Firmware programming mode	[Side1] + Power ON
Clone mode *2	[<***B***] + Power ON
Firmware version information *2	[***S***] + Power ON

*2: K2,K3,E and E2 models only

3. Panel Test Mode

(K2,K3,E and E2 models only)

Setting method refer to ADJUSTMENT.

4. Panel Tuning Mode

(K2,K3,E and E2 models only)

Setting method refer to ADJUSTMENT.

5. PC Mode

5-1. Preface

The transceiver is programmed by using a personal computer, programming interface (KPG-22A/22U), USB adapter (KCT-53U) and programming software (KPG-141D).

The programming software can be used with a PC. Figure 1 shows the setup of a PC for programming.

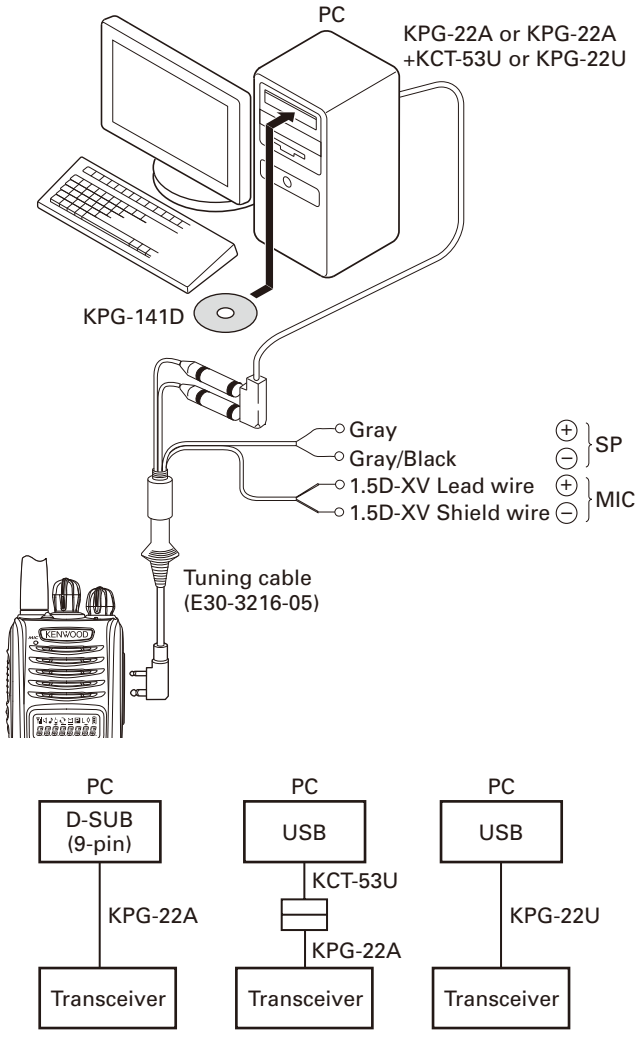


Fig. 1

5-2. Connection procedure

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

Note:

- You must install the KPG-22U driver in the computer to use the USB programming interface cable (KPG-22U).
- 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, you can immediately enter user mode. When the PC sends a command, the transceiver enters PC mode, and "PROGRAM" is displayed on the LCD.
   When data is transmitting from the transceiver, the red LED lights.
   When data is receiving by the transceiver, the green LED lights.

Note:
The data stored in the computer must match the "Model Name" when it is written into the flash memory.

5-3. KPG-22A description (PC programming interface cable: Option)

The KPG-22A is required to interface the transceiver to the computer. It has a circuit in its D-sub connector case that converts the RS-232C logic level to the TTL level.

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

5-4. KPG-22U description (USB programming interface cable: Option)

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

When using the KPG-22U, install the supplied CD-ROM (with driver software) in the computer. The KPG-22U driver runs under Windows XP, Vista or 7.

5-5. 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, XP or Vista (32-bit).

5-6. Programming software KPG-141D description

The KPG-141D is the programming software for the transceiver supplied on a CD-ROM. This software runs under Windows XP, Vista or 7 on a PC.

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.

6. Firmware Programming Mode

6-1. Preface

Flash memory is mounted on the transceiver. This allows the transceiver to be upgraded when new features are released in the future. (For details on how to obtain the firmware, contact Customer Service.)

6-2. Connection procedure

Connect the transceiver to the personal computer using the interface cable (KPG-22A/22U) and USB adapter (KCT-53U: when the interface cable is KPG-22A, the KCT-53U can be used.). (Connection is the same as in the PC Mode.)

6-3. Programming

1. Start up the firmware programming software (Fpro.exe (ver. 6.0 or later)). The Fpro.exe exists in the KPG-141D installed holder.
2. Set the communications speed (normally, 115200 bps) and communications port in the configuration item.
3. Set the firmware to be updated by File name item.
4. Press and hold the [Side1] key while turning the transceiver power ON. Then, the orange LED on the transceiver lights and "FIRM PRG" is displayed.
5. Check the connection between the transceiver and the personal computer, and make sure that the transceiver is in the Program mode.
6. Press "write" button in the window. When the transceiver starts to receive data, the [LOADING] display lights.
7. If writing ends successfully, the checksum is calculated and a result is displayed.
8. If you want to continue programming other transceivers, repeat steps 4 to 7.

6-4. Function

If you press the [Side1] key while "FIRM PRG" is displayed, the checksum is calculated, and a result is displayed. If you press the [Side1] key again while the checksum is displayed, "FIRM PRG" is redisplayed.

Note:
- This mode cannot be entered if the Firmware Programming mode is set to Disable in the Programming software.
- Normally, write in the high-speed mode.
- The text message are displayed for K2,K3,E and E2 models only.

7. Clone Mode (K2,K3,E and E2 models only)

Programming data can be transferred from one transceiver to another by connecting them via their external SP/MIC connectors. The operation is as follows (the transmit transceiver is the source and the receive transceiver is a target).

The following data cannot be cloned.
- Tuning data
- Embedded message with password
- Model name data
- ESN (Electronic Serial Number) data

Note:
The following data can be cloned.
- Fleet (own)/ID (own) for FleetSync
- Unit ID (own) for NXDN
- ID (own) for MDC-1200
- My ID for 5-tone (E,E2 models only)

1. Press and hold the [<***B***] key while turning the transceiver power ON. If the Read authorization password is set to the transceiver, the transceiver displays "CLN LOCK".

REALIGNMENT

If the password is not set, the transceiver displays "CLONE".

2. When you enter the correct password, and "CLONE" is displayed, the transceiver can be used as the cloning source. The following describes how to enter the password.
3.

• How to enter the password using the keypad (K3 and E models only);
If one of keys 0 to 9 is pressed while the "CLN LOCK" is displayed, the pressed number is displayed on the LCD. Each press of the key shifts the display in order to the left.
When you enter the password and press the [***S***] or [*] key, "CLONE" is displayed if the entered password is correct. If the password is incorrect, "CLN LOCK" is redisplayed.

• How to enter the password using the Selector (K2,K3, E and E2 models only);
If the Selector is rotated while "CLN LOCK" is displayed, the Read authorization password input screen is displayed.
If the Selector is rotated while the Read authorization password input screen is displayed, the number (0 to 9) blinks on the LCD. When you press the [***S***] key, the currently selected number is determined. If you press the [***S***] key after entering the password in this procedure, "CLONE" is displayed if the entered password is correct. If the password is incorrect, "CLN LOCK" is redisplayed.

4. Power ON the target transceiver.
5. Connect the cloning cable (part No. E30-3410-05) to the SP/MIC connectors on the source and target.
6. Press the [***S***] key on the source while the source displays "CLONE". The data of the source is sent to the target. While the target is receiving the data, "PROGRAM" is displayed. When cloning of data is completed, the source displays "END", and the target automatically operates in the User mode. The target can then be operated by the same program as the source.
7. The other target can be continuously cloned. When the [***S***] key on the source is pressed while the source displays "END", the source displays "CLONE". Carry out the operation in step 4 to 6.

Note:
- Cannot be cloned if the password (overwrite password) is programmed to the target.
- "Model Name" must be same to clone the transceiver.

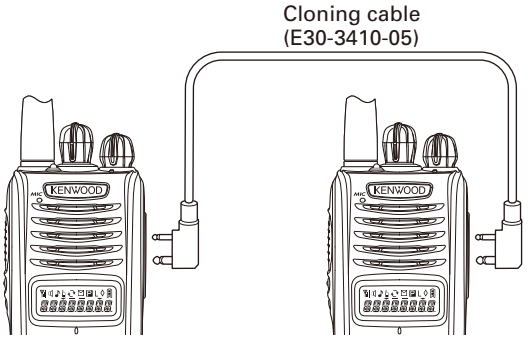


Fig. 2

8. Firmware Version Information (K2,K3,E and E2 models only)

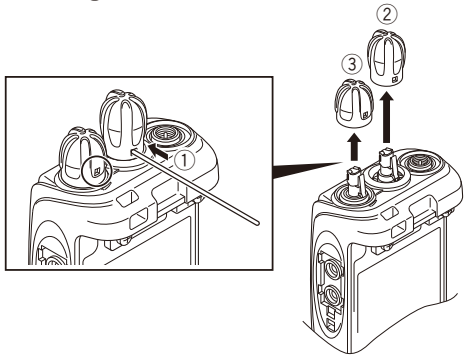
Press and hold the [***S***] key while turning the transceiver power ON and then keep pressing and holding the [***S***] key, the firmware version information appears on the LCD.

DISASSEMBLY FOR REPAIR

1. Precautions for Disassembly

■ Removing the selector knob and volume knob

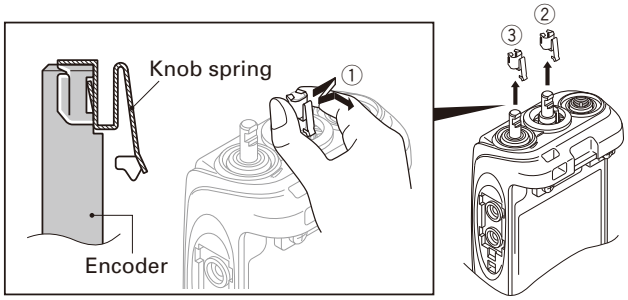
1. Using a thin tool, insert it in the hole on the selector knob side and push the knob spring. ①
   Note: When you push the knob spring, take care not to damage the resin of the knob.
2. Lift and remove the selector knob ② while pushing the knob spring.
3. Repeat steps 1 and 2 for the volume knob, to remove the volume knob ③.



Note:
Perform the following procedures when installing the selector knob and volume knob.
1) Match the direction for the hole of the knob and the knob spring.
2) Push the knob onto the knob spring until a click sounds.

■ Removing the selector knob spring and volume knob spring

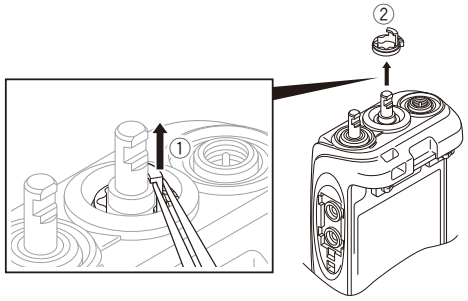
1. Lightly grasp the left and right sides of the selector knob spring, then shift the knob spring to the left and right, little by little, as shown in the figure. ①
   Note: Do not grasp the knob spring tightly.
2. Remove the selector knob spring ②.
   Note: Do not bring your fingers into contact with the flat spring of the knob spring as much as possible.
3. Repeat steps 1 and 2 for the volume knob spring, to remove the volume knob spring ③.



Note:
Perform the following procedures when installing the selector knob spring and volume knob spring.
1) Match the direction for the knob spring and the encoder.
2) Insert the encoder onto the knob spring until a click sounds.

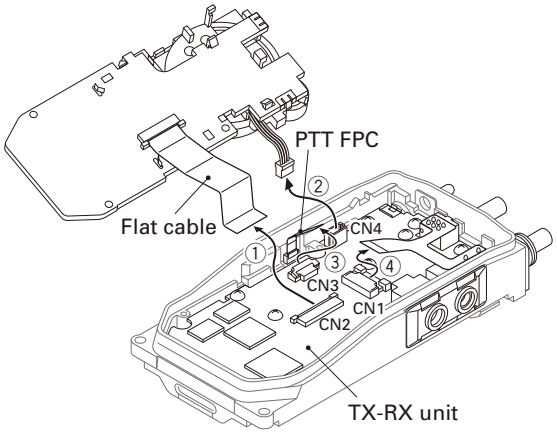
■ Removing the mechanical stopper (without LCD models only)

1. Pick up and lift the tab of a mechanical stopper using a pair of tweezers. ①
   Note: Take care not to damage the packing.
2. Remove the mechanical stopper ②.

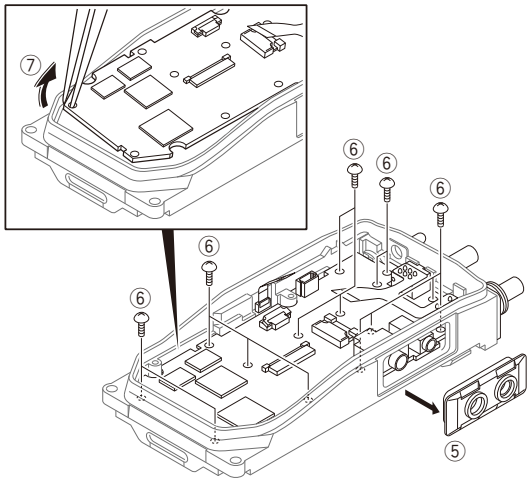


■ Removing the TX-RX unit from the chassis

1. Remove the flat cable from the connector (CN2). ①
2. Remove the Speaker lead wire from the connector (CN4). ②
3. Remove the PTT FPC from the connector (CN3). ③
4. Remove the VOL/SEL FPC from the connector (CN1). ④



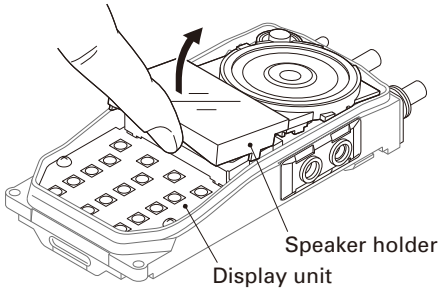
5. Remove the packing ⑤ from the SP/MIC jack.
6. Remove the 14 screws ⑥.
7. Anchor the screw hole of the TX-RX unit using the tip of a pair of tweezers as shown in the figure. Then lift the TX-RX unit to remove it from the chassis. ⑦



DISASSEMBLY FOR REPAIR

■ Removing the speaker holder

There is a space of approximately 1mm (0.04 inch) between the center part of the front glass of the speaker holder and the surface of the Display unit. Set your finger on the space in the center part of the front glass, then lift and remove it.

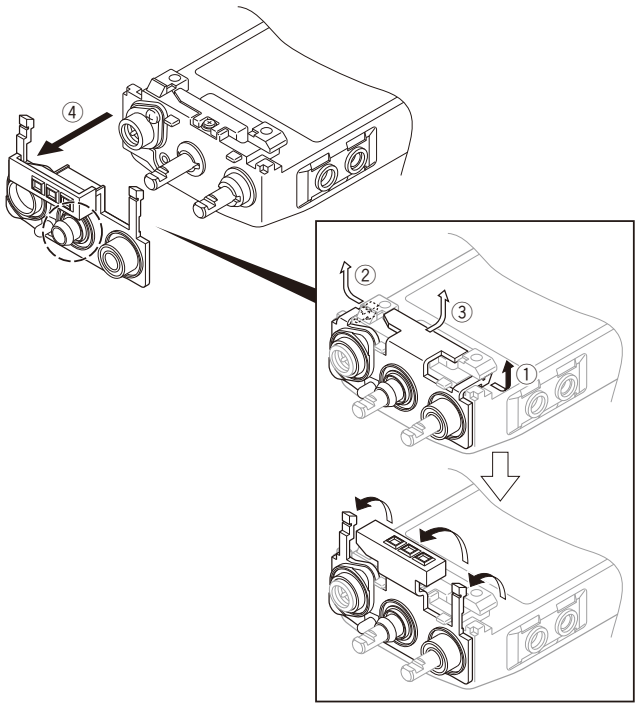


■ Removing the TOP packing

1. Pull the TOP packing to the left to remove the packing that is fit into the left groove of the chassis. ①
2. Pull the TOP packing to the right to remove the packing that is fit into the right groove of the chassis. ②
3. Pull the TOP packing to the center to remove the packing that is fit into the center groove of the chassis. ③
4. Remove the TOP packing. ④

Note:

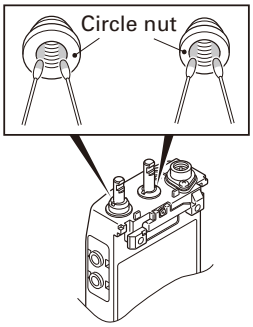
Remove the packing slowly, as the packing of the selector part might overset when the TOP packing is removed. If the packing is turned over, return it to the normal position using a soft tipped item (e.g., your finger).



2. Precautions for Reassembly

■ Apply the bond to the inside of the selector circle nut and volume circle nut

Apply the bond (W05-0019-00) or "THREE BOND 1401B" at two points inside of the circle nut before tightening the circle nut.



■ Mounting the chassis onto the case

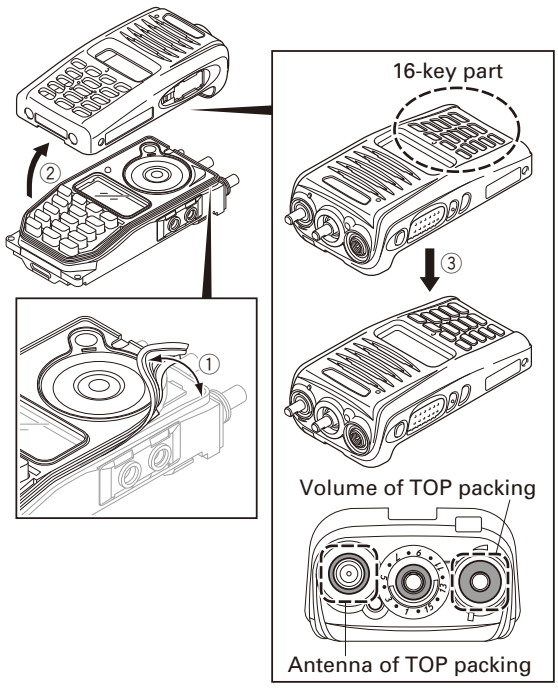
1. Place the key top on the chassis. Then, fit the chassis tightly into the groove of the key top. ①

   Note:

   Confirm that the entire groove of the key top fits to the chassis tightly.
2. Mount the chassis onto the case. ②

   Note:

   - After mounting the chassis onto the case, if the 16-key part on the key top gets stuck inside the case as shown in the figure, return it to the normal position using a soft tipped item (e.g., your finger). ③
     Prying it with a pointed metal tool such as forceps, may damage the key top or packing.
   - Confirm that the TOP packing is not caught in the Antenna or Volume holes of the case.

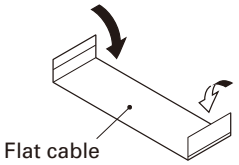


DISASSEMBLY FOR REPAIR

■ Forming the flat cable

Form the right and left end of the flat cable as shown in the figure. (Bend the terminal surface of the flat cable on the inside.)

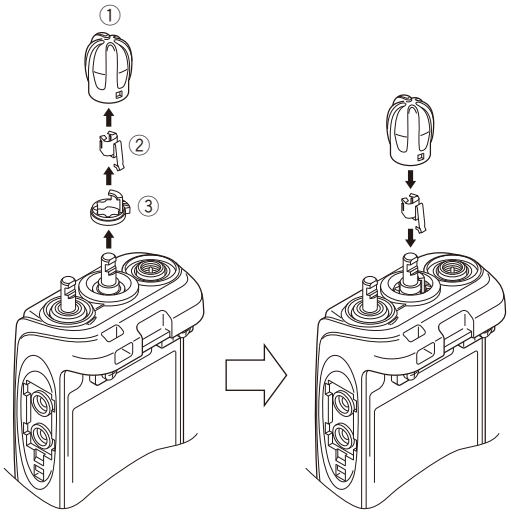
Note: When bending the flat cable, bend it squarely. There is a possibility of disconnecting when the flat cable is bent too much.



■ Changing the channel selector from 16-channel operation to free (without LCD models only)

1. Remove the channel selector knob ①. (Refer to page 8 for how to remove the channel selector knob.)
2. Remove the knob spring ②. (Refer to page 8 for how to remove the knob spring.)
3. Remove the mechanical stopper ③. (Refer to page 8 for how to remove the mechanical stopper.)
4. Reassemble the channel selector knob and knob spring that were removed in steps 1 and 2, in their original positions.

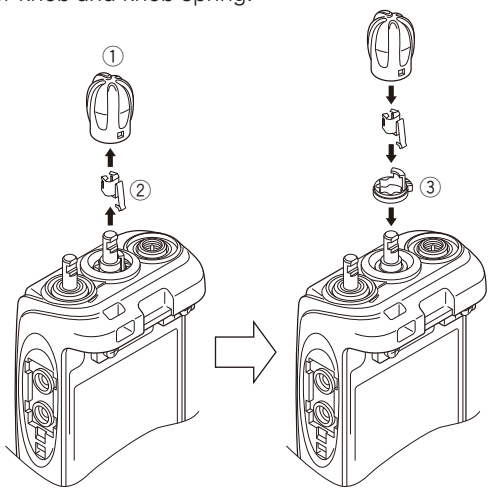
   Note: Refer to page 8 for how to install the channel selector knob and knob spring.



■ Changing the channel selector from free operation to 16-channel (with LCD models only)

1. Remove the channel selector knob ①. (Refer to page 8 for how to remove the channel selector knob.)
2. Remove the knob spring ②. (Refer to page 8 for how to remove the knob spring.)
3. Pinch the supplied mechanical stopper ③ using your fingers, then install it into the groove of the selector part on the case.
4. Reassemble the channel selector knob and knob spring that were removed in steps 1 and 2, in their original positions.

   Note: Refer to page 8 for how to install the channel selector knob and knob spring.

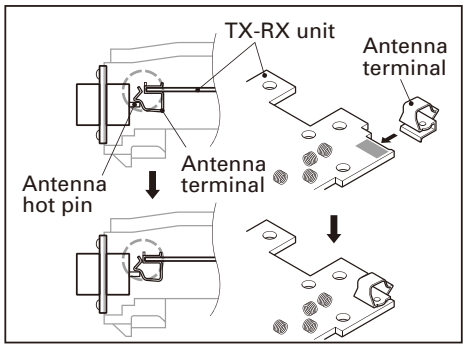


■ Connection place of the antenna hot pin and antenna terminal

An antenna hot pin is connected with the antenna terminal at the position shown in the figure.

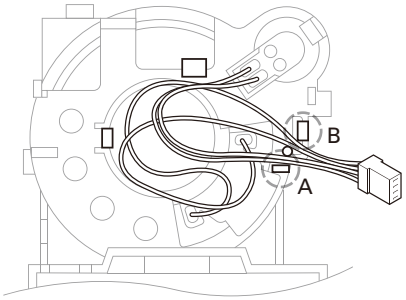
Confirm that the antenna hot pin has firmly come in contact with the terminal when the TX-RX unit is tightened with the screw.

Additionally, refer to the following figures for the connection place of the antenna terminal and the TX-RX unit.



■ Align the SP/MIC lead wire

Align the SP/MIC lead wire as shown in the figure. It is possible to fix temporarily by interweaving the two lead wires between the tabs (tab A and tab B) and boss of the speaker holder.



DISASSEMBLY FOR REPAIR

■ Assembly information (Sheet/Cushion)

When "Main Parts" is changed (ordered), "Assembled Sheet/Cushion" should also be changed (ordered) together.
The Sticker and Sheet etc are non-reusable parts. It requires the new one to get the radio's performance after repairs.
For example, when "Plastic Cabinet Assy (A02-4130-03 (without key)/A02-4131-03 (4-key)/A02-4132-03 (16-key))" is changed, "Sticker (B42-7417-04)" and "Fibrous Sheet (G10-1827-04)" should be ordered and changed together because Sticker (B42-7417-04) and Fibrous Sheet (G10-1827-04) are non-reusable.

Main Parts		Assembled Sheet/ Cushion		
Part Name	**Part Number**	**Part Name**	**Part Number**	**Remark**
Plastic Cabinet Assy (without key)	A02-4130-03	Sticker	B42-7417-04	"NEXEDGE" is printed.
Plastic Cabinet Assy (4-key)	A02-4131-03	Fibrous Sheet (SP)	G10-1827-04	
Plastic Cabinet Assy (16-key)	A02-4132-03			
Speaker	T07-0787-05	Rubber Cushion (SP)	G11-4272-14	
		Sheet (SP)	G11-4527-04	
Chassis	A10-4148-01	Sheet (PTT)	G11-4543-04	
		Rubber Sheet (FET)	G11-4315-14	Used for stabilizing the radiation performance of the FET.
		Sheet (Air)	G11-4500-04	This sheet is put on the air vent hole. This sheet lets air through, but does not let water through.
		Cushion	G13-2249-04	
MIC Element	T91-0673-05	Sheet (ECM)	G11-4558-04	

CIRCUIT DESCRIPTION

1. Overview

The NX-220 is a VHF portable transceiver designed to operate in the frequency range of 136 to 174MHz. The unit consists of a receiver, transmitter, phase-locked loop (PLL) frequency synthesizer, baseband parts, power supply, and control circuits.

2. Frequency Configuration

The receiver is a double-conversion superheterodyne using the first intermediate frequency (IF) of 49.95MHz and the second IF of 450kHz. Incoming signals from the antenna are mixed with the local signal from the PLL circuit to produce the first IF of 49.95MHz. This is then mixed with the 50.4MHz second local oscillator output to produce the 450kHz second IF. The transmit signal frequency is generated by the PLL VCO, and modulated by the signal from the DSP. It is then amplified and fed to the antenna.

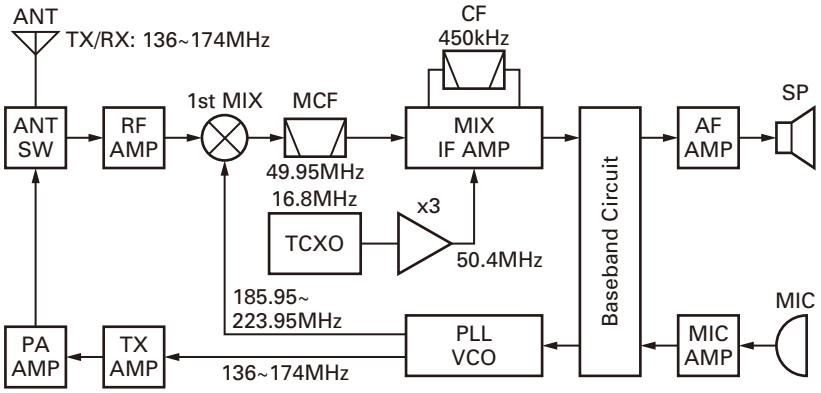


Fig. 1 Frequency configuration

3. Receiver System

3-1. RF circuit

An incoming RF signal from the antenna terminal is passed through the antenna switch (D102, D103, D105 and D106) and then the band-pass filter (L212, L213). The band-pass filter is adjusted by a variable capacitor. The input voltage to the variable capacitor is regulated by the voltage output from the D/A converter (IC4). The signal is amplified by an RF amplifier (Q202), and passed through the band-pass filter (L207, L208 and L211). The resulting signal is applied to the first mixer (Q201), where it is mixed with the first local oscillator signal output from the frequency synthesizer to produce the first IF (49.95MHz).

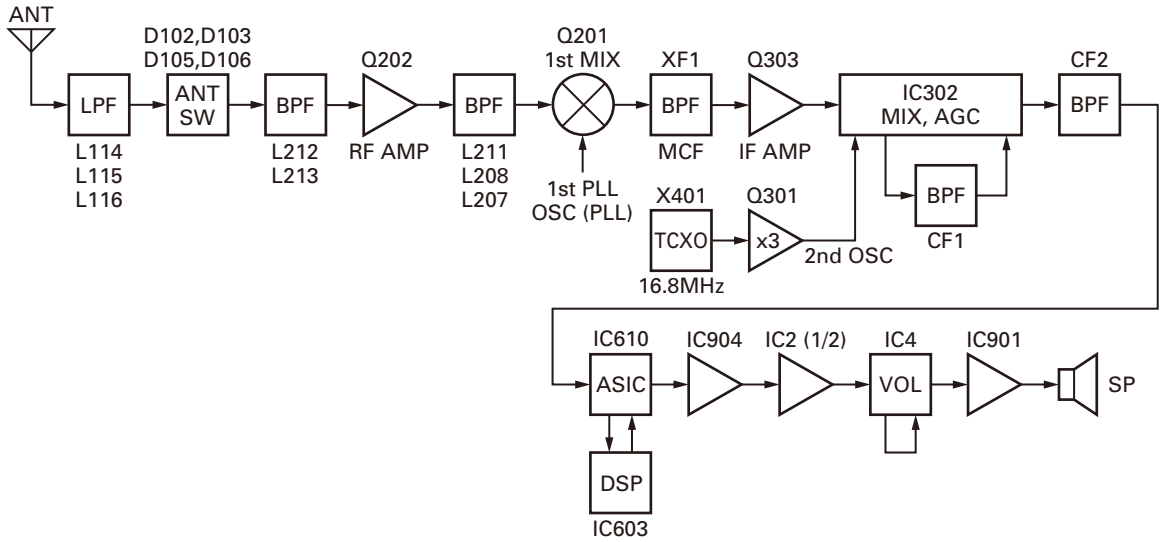


Fig. 2 RF and IF circuit

CIRCUIT DESCRIPTION

3-2. IF circuit

The first IF signal is passed through a four-pole monolithic crystal filter (XF1) to reject adjacent channel signals. The filtered first IF signal is amplified by the first IF amplifier (Q303) and then applied to the IF system IC (IC302). The IF system IC provides a second mixer, AGC amplifier, and RSSI (Received Signal Strength Indicator).

The second mixer mixes the first IF signal with the 50.4MHz of the second local oscillator output and produces the second IF signal of 450kHz.

The second IF signal is passed through the ceramic filter (CF1) to reject the adjacent channel signal. The filtered second IF signal is amplified by the AGC amplifier.

The signal from the AGC amplifier is input to the ASIC (IC610) through the ceramic filter (CF2).

3-3. Audio amplifier circuit

Audio processing (high-pass filter, low-pass filter, de-emphasized and so on) at FM mode and decoding at NXDN mode are processed by the DSP. The audio signal from IC610 and IC603 goes through the amplifier (IC904). The signal then goes through an electronic volume control (IC4), and AF amplifier (IC901).

While AFSW is High, the power supply of audio power amplifier (IC901) is activated, and the output to the speaker turns ON.

3-4. Squelch circuit

It amplifies the demodulated noise signal from IC610 after filtering through the LPF and HPF circuit. The amplified signal is then converted to a DC signal by the detection circuit. The converted signal is fed back to IC610.

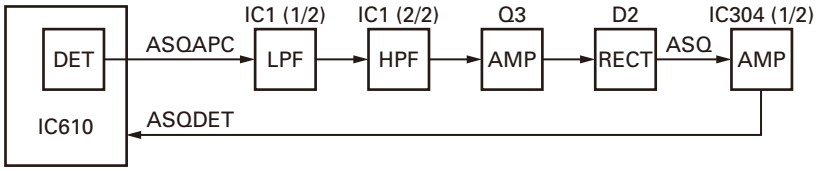


Fig. 3 Squelch circuit

4. Transmitter System

4-1. Audio band circuit

The signal from the microphone is amplified by IC2 (2/2) and limited by the AGC circuit which is composed of D3, D4, Q4 and Q5. IC2 works as an anti-aliasing LPF filter.

4-2. Baseband circuit

The audio signal output from the baseband circuit is converted to digital data with a sampling frequency of 48kHz. This digital data is sent to the DSP (IC603), and voice signals of 300Hz or lower and frequencies of 3kHz or higher are cut off and the audio range of 300Hz to 3kHz is extracted. The audio signal is then pre-emphasized in FM mode and synthesized with the signals, such as QT and DQT, as required, and is then output from IC610. In Digital mode, the audio signal is converted to the 4-Level FSK baseband signal and output from IC610. The DTMF and MSK baseband signals are also generated by the DSP and output by IC610

The LPF (IC6) works as a smoothing filter. The level output according to the transmit carrier is fine-adjusted according to each modulation method.

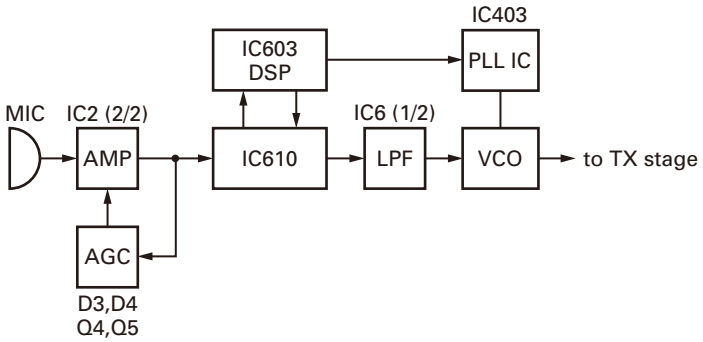


Fig. 4 Audio band and Baseband circuit

CIRCUIT DESCRIPTION

4-3. VOX

The DSP detects the audio level. If the detected level becomes higher than the threshold level, the VOX starts.

4-4. Drive and Final amplifier

The signal from the T/R switch (D413 is on) is amplified by the pre-drive amplifier (Q102) to 16~17dBm. It makes it possible to spoil input to the drive amplifier by controlling the power supply of the pre-drive amplifier with the PD switch (Q110). The output of the pre-drive amplifier is amplified by the drive and final amplifiers (Q103, Q104) to 5.0W (1.0W when the power is low). Q103 and Q104 are MOS FETs. The output of the final amplifier is then passed through the harmonic filter (LPF) and antenna switch (D102, D103 are on) and applied to the antenna terminal.

4-5. APC circuit

The APC circuit always monitors the current flowing through the RF power amplifier (Q104) and keeps a constant current. The voltage drop at R153, R154 and R155 is caused by the current flowing through the RF power amplifier and this voltage is applied to the differential amplifier (IC101 1/2). IC101 (2/2) compares the output voltage of IC101 (1/2) with the reference voltage from IC610, and the output of IC101 (2/2) controls the VGG of Q103 and Q104 to make the both current constant. The change of power high/low is carried out by the change of the reference voltage. Q106, Q107 and Q108 are turned on and Q105 and Q109 are turned off during transmission and the APC circuit is active.

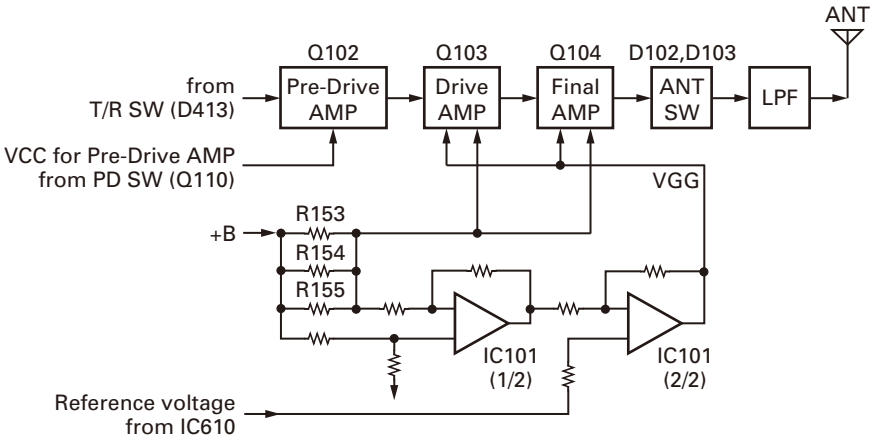


Fig. 5 Drive and final amplifier and APC circuit

5. PLL Frequency Synthesizer

5-1. TCXO (X401)

The TCXO (X401) generates a reference frequency of 16.8MHz for the PLL frequency synthesizer. This reference frequency is applied to pin 9 of the PLL IC (IC403) and is connected to the IF circuit as a 2nd local signal through the Tripler (Q301).

The frequency adjustment is achieved by switching the ratio of dividing frequency. The resolution of the adjusting frequency is approximately 4Hz.

5-2. VCO

There is a RX VCO and a TX VCO.

The TX VCO (Q402) generates a transmit carrier and the RX VCO (Q401) generates a 1st local signal. For the VCO oscillation frequency, the transmit carrier is 136 to 174MHz and the 1st local receive signal is 185.95 to 223.95MHz.

The VCO oscillation frequency is determined by one system of operation switching terminal "T/R" and two systems of voltage control terminals "CV" and "ASSIST".

The operation switching terminal, "T/R", is controlled by the control line (/T_R) output from the ASIC (IC610). When the /T_R logic is low, the VCO outputs the transmit carrier and when it is high, it outputs a 1st local receive signal.

The voltage control terminals, "CV" and "ASSIST", are controlled by the PLL IC (IC403) and ASIC (IC610) and the output frequency changes continuously according to the applied voltage. For the modulation input terminal, "VCO_MOD", the output frequency changes according to the applied voltage. This is used to modulate the VCO output. "VCO_MOD" works only when "/T_R" is low.

5-3. PLL IC (IC403)

The PLL IC compares the differences in phases of the VCO oscillation frequency and the TCXO reference frequency, returns the difference to the VCO CV terminal and realizes the "Phase Locked Loop" for the return control. This allows the VCO oscillation frequency to accurately match (lock) the desired frequency.

CIRCUIT DESCRIPTION

When the frequency is controlled by the PLL, the frequency convergence time increases as the frequency difference increases when the set frequency is changed. To supplement this, the ASIC is used before control by the PLL IC to bring the VCO oscillation frequency close to the desired frequency. As a result, the VCO CV voltage does not change and is always stable at approximately 2.5V.

The desired frequency is set for the PLL IC by the ASIC (IC610) through the 3-line "SDO1", "PCK_RF", "/PCS_RF" serial bus. Whether the PLL IC is locked or not is monitored by the ASIC through the "PLD" signal line. If the VCO is not the desired frequency (unlocked), the "PLD" logic is low.

The modulation signal of the Low-speed data is applied to pin 23 of the PLL IC (IC403).

The modulation signal is digital data of a sampling frequency of 96kHz set for the PLL IC by the DSP (IC603) through the "PLLMOD" line.

5-4. Local switch (D412, D413)

The connection destination of the signal output from the buffer amplifier (Q408) is changed with the diode switch (D413) that is controlled by the transmission power supply, 50T, and the diode switch (D412) that is controlled by the receive power supply, 50R. If the 50T logic is high, it is connected to a send-side pre-drive (Q102). If the 50T logic is low, it is connected to a receive-side mixer (Q201).

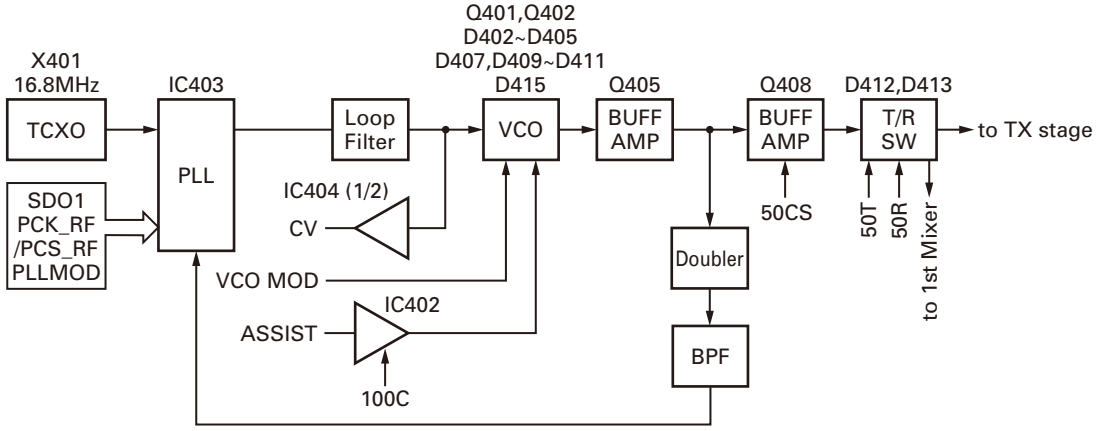


Fig. 6 PLL block diagram

6. Control Circuit

The control circuit consists of the ASIC (IC610) and its peripheral circuits. IC610 mainly performs the following:

1) Switching between transmission and reception by PTT signal input.
2) Reading system, zone, 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 decode data input.

6-1. ASIC

The ASIC (IC610) is a 32-bit RISC processor, equipped with peripheral function and ADC/DAC.

This ASIC operates at 18.432MHz clock and 3.3V/1.5V DC. It controls the flash memory, SRAM, DSP, the receive circuit, the transmitter circuit, the control circuit, and the display circuit and transfers data to or from an external device.

6-2. Memory circuit

The memory circuit consists of the ASIC (IC610), the SRAM (IC605), and the flash memory (IC601). The flash memory has a capacity of 32M-bit that contains the transceiver control program for the ASIC and stores the data. It also stores the data for transceiver channels and operating parameters that are written by the FPU. This program can be easily written from external devices. The SRAM has a capacity of 1M-bit that contains work area and data area.

■ Flash memory

Note: The flash memory stores the data that is written by the FPU (KPG-141D), tuning data (Deviation, Squelch, etc.), and firmware program (User mode, Test mode, Tuning mode, etc.).

■ SRAM (Static memory)

Note: The SRAM has a temporary data area and work area.

CIRCUIT DESCRIPTION

6-3. LCD

The LCD is controlled using the 4 serial lines (SDI0, / LCDCS, SCK0, SDO0) from the ASIC (IC610).

6-4. Key detection circuit

Keys are detected using the LCD controller driver IC (IC8). If a pressed key is detected by IC8, it is informed to IC610 through the serial line.

6-5. Low battery warning

The battery voltage is divided using R514 and R515 and is detected by the ASIC (IC610). When the battery voltage falls below the voltage set by the Low battery warning adjustment, the red LED blinks to notify the operator that it is time to replace the battery. If the battery voltage falls even more (approx. 5.8V), a beep sounds and transmission stops.

Low battery warning	Battery condition
The red LED blinks during transmission.	The battery voltage is low but the transceiver is still usable.
The red LED blinks and the warning tone beeps while the PTT switch is pressed.	The battery voltage is low and the transceiver is not usable to make calls.

6-6. DSP

The DSP circuit consists of a DSP (IC603) and processes the baseband signal. The DSP operates on an external clock of 18.432MHz (the same as the IC610), the I/O section operates at 3.3V and the core section operates at 1.5V. The DSP carries out the following processes:

- 4 Level FSK processing
- Analog FM pre-emphasis/de-emphasis
- Vocoder processing between audio codec and modulation/demodulation
- CAI processing, such as error correction encoding
- QT/DQT encoding/decoding
- LTR encoding/decoding
- DTMF encoding/decoding
- MSK encoding/decoding
- 2-tone encoding/decoding
- 5-tone encoding/decoding
- Compressor/expander processing
- Voice scrambler processing
- Transmit/receive audio filtering processing
- Microphone amplifier AGC processing
- Audio mute processing
- Modulation level processing

7. Power Supply Circuit

The battery voltage (+B) is provided from the battery terminal on the TX-RX unit (X57). The battery voltage passes through the 2.5A fuse (F1), and goes to the RF final amplifier, AVR ICs (IC504, IC902), DC/DC converter (IC506), and voltage detector IC (IC507). The voltage detector watches the battery voltage. If the battery voltage is 5.6V or higher, the detector outputs High.

When the VOL SW is turned on, SB1 becomes high (battery voltage). DC/DC (IC506) operates if both SB1 and the output of the detector are high. IC506 outputs 3.8V and activates IC502 (33M), IC503 (15M), IC501 (33A) and IC505 (33C). As a result, the ASIC and DSP operate.

The SBC signal becomes High after the ASIC operates, IC504 (50C), IC902 (50V) and Q501 (SB2) are turned on.

When the /SAVE signal becomes High, Q512 (50C) operates. Switches (Q503, Q505) are controlled by the ASIC. Q505 (50T) is turned on in transmit mode. Q503 (50R) is turned on in receive mode.

When the VOL SW is turned off, the /PSW signal becomes Low. After detecting the /PSW signal, the ASIC changes the SBC signal to Low.

50C is fed to IC509 (100C). IC509, D511 and D512 consist of a voltage doubler. C543 is charged to 5V by 50C and switched to C545 by the "DDCLK" control signal. The 100C circuit then outputs approximately +10VDC.

8. Signaling Circuit

8-1. Encode (QT/DQT/LTR/DTMF/2-tone/5-tone/MSK)

Each signaling data signal of QT, DQT, LTR, DTMF, 2-tone/5-tone and MSK is generated by the DSP circuit, superimposed on a modulation signal and output from IC610. Each deviation of the TX QT, DQT, LTR, DTMF, 2-tone/5-tone and MSK tone is adjusted by changing the output level of IC603 and the resulting signal is routed to the VCO and PLL.

8-2. Decode (QT/DQT/LTR/DTMF/2-tone/5-tone/MSK)

The audio signal is removed from the FM detection signal sent to the DSP circuit and the resulting signal is decoded.

9. Compander Circuit

The term "compander" means compressor and expander. The compander reduces noise by utilizing a compressor and an expander. The transceiver contains a DSP (IC603) to perform this operation. The transceiver compander can be turned on or off using the FPU.

CIRCUIT DESCRIPTION

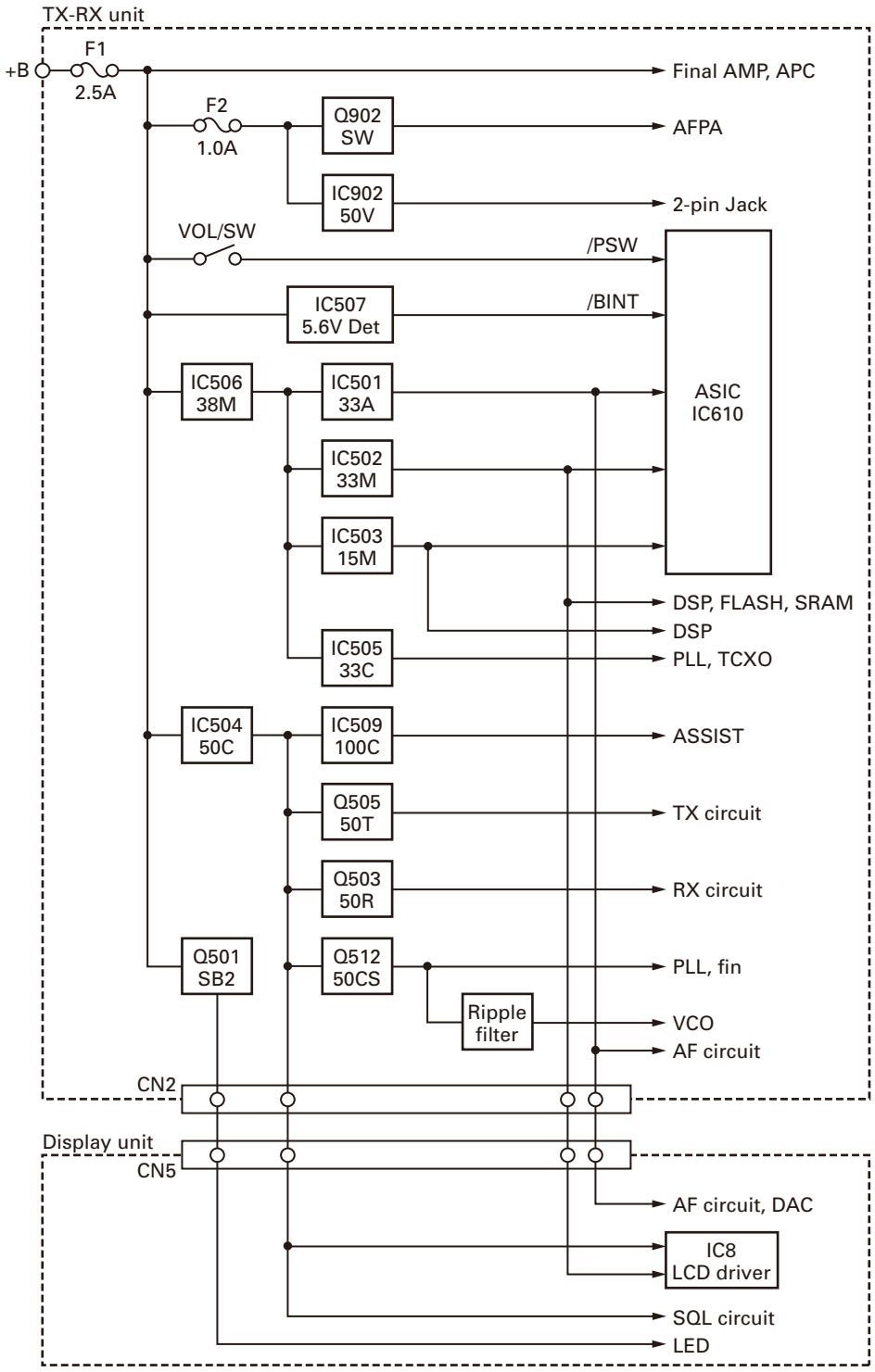


Fig. 7 Power supply circuit

COMPONENTS DESCRIPTION

Display unit (X54-3760-XX)

Ref. No.	Part Name	Description
IC1	IC	ASQ BPF
IC2	IC	AF LPF/MIC amplifier
IC4	IC	D/A converter
IC6	IC	VCO MOD/VREF
IC8	IC	LCD driver
Q1	Transistor	TX/BUSY LED switch
Q2	FET	SQL noise BW switch
Q3	Transistor	SQL noise amplifier
Q4,5	Transistor	MIC AGC
Q6	Transistor	KEY backlight switch
Q7	Transistor	KEY backlight switch control
Q8	Transistor	LCD backlight switch
D1	LED	TX/BUSY LED
D2	Diode	Noise detector
D3,4	Diode	AGC detector
D7~14	LED	KEY backlight
D15,16	Diode	KEY control
D18,19	LED	LCD backlight

TX-RX unit (X57-8040-10)

Ref. No.	Part Name	Description
IC101	IC	OP AMP (APC)
IC201	IC	DC amplifier (BPF)
IC302	IC	FM system
IC304	IC	DC amplifier (RSSI/ASQL)
IC402	IC	DC amplifier (Assist)
IC403	IC	PLL system
IC404	IC	DC amplifier (CV/APC)
IC501	IC	Voltage regulator (33A)
IC502	IC	Voltage regulator (33M)
IC503	IC	DC/DC converter (15M)
IC504	IC	Voltage regulator (50C)
IC505	IC	Voltage regulator (33C)
IC506	IC	DC/DC converter (38M)
IC507	IC	Voltage detector (BATT)
IC509	IC	DC/DC converter (100C)
IC601	IC	Flash memory
IC603	IC	DSP
IC605	IC	SRAM
IC607	IC	Voltage detector (Reset)
IC609	IC	Buffer (Clock)
IC610	IC	ASIC
IC611,612	IC	AND gate (2 input)
IC613	IC	Motion sensor
IC901	IC	AF power amplifier
IC902	IC	Voltage regulator (50V)
IC904	IC	OP AMP (Beep/voice/RX AF)
Q102	Transistor	Pre-drive amplifier
Q103	FET	Drive amplifier
Q104	FET	RF final amplifier
Q105~109	Transistor	APC switch
Q110	FET	PD switch
Q201	FET	1st mixer
Q202	FET	RF AMP (RX)
Q301	Transistor	Tripler (2nd local)
Q303	Transistor	IF amplifier
Q401	FET	RX VCO
Q402	FET	TX VCO
Q403	Transistor	Ripple filter
Q404	Transistor	Doubler (PLL in)
Q405	Transistor	Buffer amplifier
Q406,407	FET	T/R VCO switch
Q408	Transistor	Buffer amplifier
Q501	FET	DC switch (SB2)
Q502	FET	DC switch control (SB2)
Q503	Transistor	DC switch (50R)
Q505	Transistor	DC switch (50T)
Q506,507	FET	Level converter
Q509	Transistor	DC/DC control (100C)
Q510	Transistor	DC/DC control (38M)
Q511	Transistor	DC switch control (50T)
Q512	FET	DC switch (50CS)
Q602	FET	DC switch (System)
Q901	Transistor	DC switch (AF mute)
Q902	Transistor	DC switch (AF PA amplifier)
Q903	Transistor	DC switch (AF mute)
Q904,905	FET	AF power mute
Q906	Transistor	EXT/MIC switch
Q907	FET	Level converter
D101	Zener diode	APC protect
D102,103	Diode	Antenna switch

COMPONENTS DESCRIPTION

Ref. No.	Part Name	Description
D105,106	Diode	Antenna switch
D202~204	Variable capacitance diode	BPF tune
D206	Variable capacitance diode	BPF tune
D401	Diode	Bypass
D402	Variable capacitance diode	Assist tune
D403	Variable capacitance diode	TX VCO tune
D404	Variable capacitance diode	RX VCO tune
D405	Variable capacitance diode	Assist tune
D407	Variable capacitance diode	Assist tune
D409	Variable capacitance diode	Assist tune
D410	Variable capacitance diode	TX modulation

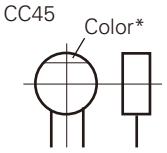
Ref. No.	Part Name	Description
D411	Variable capacitance diode	Assist tune
D412,413	Diode	T/R switch
D414	Diode	Speed up
D415	Variable capacitance diode	Assist tune
D416,417	Variable capacitance diode	Fin filter tune
D501	Diode	Reverse protection
D502	Diode	Speed up
D505,506	Diode	DC/DC converter
D508	Diode	DC/DC converter
D509	Diode	Reverse current protection
D511,512	Diode	DC/DC converter
D901	Diode	Reverse current protection
D902	Diode	50V switch control

PARTS LIST

CAPACITORS

C C	4 5	T H	1 H	2 2 0	J
1	2	3	4	5	6

1 = Type ... ceramic, electrolytic, etc.
2 = Shape ... round, square, etc.
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

2 2 0 = 22pF
0 = Multiplier
2 = 2nd number
2 = 1st number

• 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 –20	+80 –20	+100 –0	More than 10μF : –10~+50 Less than 4.7μF : –10~+75

(Less than 10pF)

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

• Voltage rating

1st word \ 2nd 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	2150	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

RESISTORS

• Chip resistor (Carbon)

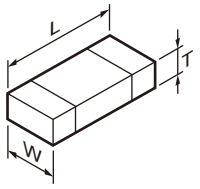
(EX) R D 7 3 E B 2 B 0 0 0 J
1 2 3 4 5 6 7
(Chip) (B, F)

• 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



Chip capacitor

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	3.2±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

Chip resistor

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. ⚠indicates safety critical components.
Parts without **Parts No.** are not supplied.
Les articles non mentionnes 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
C : China **X** : Australia **M** : Other Areas

NX-220
DISPLAY UNIT (X54-3760-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
NX-220					
1	2B	✻	A02-4130-03	PLASTIC CABINET ASSY	K,E3
2	2B	✻	A02-4131-03	PLASTIC CABINET ASSY (4KEY)	K2,E2
3	1B	✻	A02-4132-03	PLASTIC CABINET ASSY (16KEY)	K3,E
4	3A	✻	A10-4148-01	CHASSIS	
6	3A		B01-0694-13	ESCUTCHEON	
7	1C		B09-0686-03	CAP ACCESSORY	
8	3B		B11-1869-04	ILLUMINATION GUIDE (TX/BUSY)	
9	1A	✻	B11-1890-04	FILTER (LCD)	K2,K3,E
9	1A	✻	B11-1890-04	FILTER (LCD)	E2
10	1A	✻	B11-1891-02	ILLUMINATION GUIDE (LCD)	K2,K3,E
10	1A	✻	B11-1891-02	ILLUMINATION GUIDE (LCD)	E2
11	1A		B38-0935-05	LCD	K2,K3,E
11	1A		B38-0935-05	LCD	E2
12	1A		B42-7417-04	STICKER	
13	2D	✻	B62-2292-00	INSTRUCTION MANUAL (K TYPE)	K,K2,K3
14	2D	✻	B62-2319-00	INSTRUCTION MANUAL (E TYPE)	E,E2,E3
16	1B,1D	✻	D32-0454-04	STOPPER (16CH)	
18	3A		E04-0467-15	RF COAXIAL RECEPTACLE (SMA)	
19	2A	✻	E23-1363-04	TERMINAL (ANT)	
20	1A	✻	E29-1232-05	INTER CONNECTOR (LCD)	K2,K3,E
20	1A	✻	E29-1232-05	INTER CONNECTOR (LCD)	E2
21	1A	✻	E37-1532-05	LEAD WIRE WITH CONNECTOR (SP/ECM)	
22	2A	✻	E37-1537-05	FLAT CABLE (TXRX-DISPLAY)	
23	3A	✻	E72-0435-03	TERMINAL BLOCK	
25	1A	✻	G02-1864-04	EARTH SPRING (DISPLAY PCB)	
26	1B	✻	G09-0443-04	KNOB SPRING (VOL/SELECTOR)	
27	1B	✻	G10-1827-04	FIBROUS SHEET (SP)	
28	1A		G11-4272-14	RUBBER CUSHION (SP)	
29	3A		G11-4315-14	SHEET (FET)	
30	1A		G11-4335-14	SHEET (LCD)	K2,K3,E
30	1A		G11-4335-14	SHEET (LCD)	E2
31	3A		G11-4368-04	SHEET (TERMINAL BLOCK)	
32	3A		G11-4500-04	SHEET (AIR)	
33	1A		G11-4527-04	SHEET (SP)	
34	3A	✻	G11-4543-04	SHEET (PTT)	
35	1A	✻	G11-4558-04	SHEET (ECM)	
36	3A	✻	G11-4561-04	SHEET (CHASSIS:TX/BUSY)	
37	1A	✻	G11-4562-04	SHEET (SP HOLDER)	
38	2A		G13-2220-04	CUSHION (DISPLAY PCB)	
39	3A		G13-2249-04	CUSHION (CHASSIS)	
40	3A		G53-1603-04	PACKING (SMA)	
41	3A		G53-1832-03	PACKING (JACK)	
42	2B	✻	G53-1862-02	PACKING (TOP)	
43	2B	✻	G53-1863-01	PACKING	K,E3
44	2B	✻	G53-1864-01	PACKING (4KEY)	K2,E2
45	1B	✻	G53-1865-01	PACKING (16KEY)	K3,E
46	1A,3A	✻	G53-1866-04	PACKING (TERMINAL,ECM)	
47	1C	✻	H12-4312-02	PACKING FIXTURE	
48	3C	✻	H52-2437-02	ITEM CARTON CASE	K,K2,K3
49	1D		J19-5483-23	HOLDER ACCESSORY	
50	1A	✻	J19-5547-01	HOLDER (FG-SP)	
51	1A	✻	J21-8631-03	MOUNTING HARDWARE (LCD)	K2,K3,E
51	1A	✻	J21-8631-03	MOUNTING HARDWARE (LCD)	E2
52	1D		J29-0701-15	BELT CLIP ACCESSORY	
53	3A		J87-0027-05	FPC (LEAD FREE) (PTT)	
54	2A	✻	J87-0040-05	FPC (LEAD FREE) (VOL/SELECTOR)	
56	1A	✻	K29-9500-03	KNOB (PTT)	
57	1B	✻	K29-9501-03	BUTTON KNOB (SIDE1/SIDE2/AUX)	
58	1B	✻	K29-9485-03	KNOB (VOL)	
59	1B	✻	K29-9486-03	KNOB (SELECTOR)	
A	3A		N09-2438-05	BINDING HEAD SCREW (ANT)	
B	3A	✻	N09-6608-05	SPECIAL SCREW (CASE)	
C	3A	✻	N14-0864-04	CIRCULAR NUT (VOL)	
D	3A	✻	N14-0865-04	CIRCULAR NUT (SELECTOR)	
E	3A		N30-3006-43	PAN HEAD MACHINE SCREW (ESCUT)	
F	1A,2A,3A		N83-2005-48	PAN HEAD TAPTITE SCREW (PCB)	
VR1	3A	✻	R31-0685-05	VARIABLE RESISTOR (VOL)	
S101	3A	✻	S60-0448-05	ROTARY SWITCH (SELECTOR)	
65	1A		T07-0787-05	SPEAKER	
-		✻	X57-8040-11	SERVICE TX-RX UNIT	
DISPLAY UNIT (X54-3760-XX) -10: K3,E -11: K2,E2 -12: K,E3					
D1			B30-2278-05	LED (RED/YELLOW)	
D7-14			B30-2337-05	LED (YELLOW)	K3,E
D13,14			B30-2337-05	LED (YELLOW)	K2,E2
D18,19			B30-2210-05	LED (TLY)	K2,K3,E
D18,19			B30-2210-05	LED (TLY)	E2
C1			CK73HB1H471K	CHIP C 470PF K	
C2			CK73HB1H681K	CHIP C 680PF K	
C3			CC73HCH1H270J	CHIP C 27PF J	
C4			CK73HB1H471K	CHIP C 470PF K	
C5			CK73HB1A104K	CHIP C 0.10UF K	
C6			CK73HB1H102K	CHIP C 1000PF K	
C7,8			CC73HCH1H470J	CHIP C 47PF J	
C10			CC73HCH1H101J	CHIP C 100PF J	
C11			CK73HB1H681K	CHIP C 680PF K	
C13			CC73HCH1H101J	CHIP C 100PF J	
C15			CK73HB1E103K	CHIP C 0.010UF K	
C16			CK73HB1H102K	CHIP C 1000PF K	
C19			CK73HB1A104K	CHIP C 0.10UF K	
C20			CK73HB1H102K	CHIP C 1000PF K	
C21			CK73HB1E103K	CHIP C 0.010UF K	
C22			CK73HB1A224K	CHIP C 0.22UF K	
C23			CC73HCH1H470J	CHIP C 47PF J	
C25			CK73HB1A224K	CHIP C 0.22UF K	
C26			CC73HCH1H470J	CHIP C 47PF J	
C28,29			CC73HCH1H470J	CHIP C 47PF J	
C30			CK73HB0J105K	CHIP C 1.0UF K	
C31			CC73HCH1H470J	CHIP C 47PF J	
C32			CK73HB1H122K	CHIP C 1200PF K	
C33,34			CC73HCH1H470J	CHIP C 47PF J	
C35			CK73HB1A104K	CHIP C 0.10UF K	
C36			CC73HCH1H470J	CHIP C 47PF J	

PARTS LIST

DISPLAY UNIT (X54-3760-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
C37			CK73HB1H472K	CHIP C 4700PF K	
C38			CC73HCH1H181J	CHIP C 180PF J	
C39			CK73HB1A104K	CHIP C 0.10UF K	
C40			CC73HCH1H470J	CHIP C 47PF J	
C42-44			CC73HCH1H470J	CHIP C 47PF J	
C45			CK73HB1H102K	CHIP C 1000PF K	
C47			CK73HB1A104K	CHIP C 0.10UF K	
C48			CK73HB0J105K	CHIP C 1.0UF K	
C49			CK73HB1H102K	CHIP C 1000PF K	
C52,53			CK73HB1A104K	CHIP C 0.10UF K	
C54			CK73HB1H331K	CHIP C 330PF K	
C58			CC73HCH1H680J	CHIP C 68PF J	
C62			CC73HCH1H101J	CHIP C 100PF J	
C63,64			CK73HB0J105K	CHIP C 1.0UF K	
C67			CK73HB1H102K	CHIP C 1000PF K	
C68			CK73HB1E103K	CHIP C 0.010UF K	
C70			CK73HB0J105K	CHIP C 1.0UF K	
C71			CK73HB1A104K	CHIP C 0.10UF K	
C73			CK73GB0J106K	CHIP C 10UF K	
C74			CK73HB0J105K	CHIP C 1.0UF K	
C78			CK73HB1E103K	CHIP C 0.010UF K	K2,K3,E
C78			CK73HB1E103K	CHIP C 0.010UF K	E2
C79			CK73HB1A473K	CHIP C 0.047UF K	K2,K3,E
C79			CK73HB1A473K	CHIP C 0.047UF K	E2
C83			CK73HB1H102K	CHIP C 1000PF K	K2,K3,E
C83			CK73HB1H102K	CHIP C 1000PF K	E2
C84			CK73HB1A473K	CHIP C 0.047UF K	K2,K3,E
C84			CK73HB1A473K	CHIP C 0.047UF K	E2
C85			CK73HB1H681K	CHIP C 680PF K	K2,K3,E
C85			CK73HB1H681K	CHIP C 680PF K	E2
C90			CK73HB1E103K	CHIP C 0.010UF K	K2,K3,E
C90			CK73HB1E103K	CHIP C 0.010UF K	E2
C91			CK73HB1H471K	CHIP C 470PF K	
C92			CK73HB1H102K	CHIP C 1000PF K	
C93,94			CK73HB1E103K	CHIP C 0.010UF K	
CN5		*	E40-6893-05	FLAT CABLE CONNECTOR (24P)	
CN6			E40-6883-05	FLAT CABLE CONNECTOR (6P)	
L1,2			L92-0408-05	CHIP FERRITE	
L3			L92-0138-05	CHIP FERRITE	K2,K3,E
L3			L92-0138-05	CHIP FERRITE	E2
CP1			RK74HB1J101J	CHIP-COM 100 J 1/16W	
CP2			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	K2,K3,E
CP2			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	E2
CP3			RK74HB1J471J	CHIP-COM 470 J 1/16W	K2,K3,E
CP3			RK74HB1J471J	CHIP-COM 470 J 1/16W	E2
CP4,5			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	K2,K3,E
CP4,5			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	E2
CP6			RK74HB1J471J	CHIP-COM 470 J 1/16W	K3,E
CP7-9			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	K2,K3,E
CP7-9			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	E2
CP10			RK74HB1J101J	CHIP-COM 100 J 1/16W	K2,K3,E
CP10			RK74HB1J101J	CHIP-COM 100 J 1/16W	E2
CP11-13			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	K2,K3,E
CP11-13			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	E2
CP14			RK74HA1J102J	CHIP-COM 1.0K J 1/16W	K2,K3,E
CP14			RK74HA1J102J	CHIP-COM 1.0K J 1/16W	E2
R1			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R2			RK73HB1J103J	CHIP R 10K J 1/16W	
R3			RK73HB1J391J	CHIP R 390 J 1/16W	

Ref. No.	Address	New parts	Parts No.	Description	Destination
R4			RK73HB1J823J	CHIP R 82K J 1/16W	
R5			RK73HB1J100J	CHIP R 10 J 1/16W	
R6			RK73HB1J821J	CHIP R 820 J 1/16W	
R7			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R8			RK73HB1J153J	CHIP R 15K J 1/16W	
R9			RK73HB1J333J	CHIP R 33K J 1/16W	
R10			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R11,12			RK73HB1J334J	CHIP R 330K J 1/16W	
R13			RK73HB1J471J	CHIP R 470 J 1/16W	
R14			RK73HB1J334J	CHIP R 330K J 1/16W	
R15			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R16			RK73HB1J470J	CHIP R 47 J 1/16W	
R17			RK73HB1J104J	CHIP R 100K J 1/16W	
R18			RK73HB1J393J	CHIP R 39K J 1/16W	
R19,20			RK73HB1J224J	CHIP R 220K J 1/16W	
R21,22			RK73HB1J563J	CHIP R 56K J 1/16W	
R23			RK73HB1J222J	CHIP R 2.2K J 1/16W	
R24			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R26			RK73HB1J683J	CHIP R 68K J 1/16W	
R28-30			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R33-35			RK73HB1J104J	CHIP R 100K J 1/16W	
R37			RK73HB1J154J	CHIP R 150K J 1/16W	
R39,40			RK73HB1J103J	CHIP R 10K J 1/16W	
R41,42			RK73HB1J683J	CHIP R 68K J 1/16W	
R44,45			RK73HB1J104J	CHIP R 100K J 1/16W	
R47			RK73HB1J223J	CHIP R 22K J 1/16W	
R50			RK73HB1J223J	CHIP R 22K J 1/16W	
R52			RK73HB1J471J	CHIP R 470 J 1/16W	
R53			RK73HB1J182J	CHIP R 1.8K J 1/16W	
R61-64			RK73HB1J332J	CHIP R 3.3K J 1/16W	K3,E
R64			RK73HB1J332J	CHIP R 3.3K J 1/16W	K2,E2
R65			RK73HB1J682J	CHIP R 6.8K J 1/16W	K2,K3,E
R65			RK73HB1J682J	CHIP R 6.8K J 1/16W	E2
R66			RK73HB1J000J	CHIP R 0.0 J 1/16W	K2,K3,E
R66			RK73HB1J000J	CHIP R 0.0 J 1/16W	E2
R67			RK73HB1J471J	CHIP R 470 J 1/16W	K2,K3,E
R67			RK73HB1J471J	CHIP R 470 J 1/16W	E2
R69			RK73HB1J222J	CHIP R 2.2K J 1/16W	K2,K3,E
R69			RK73HB1J222J	CHIP R 2.2K J 1/16W	E2
R70-72			RK73HB1J103J	CHIP R 10K J 1/16W	K2,K3,E
R70-72			RK73HB1J103J	CHIP R 10K J 1/16W	E2
R73			RK73GB2A433J	CHIP R 43K J 1/10W	K2,K3,E
R73			RK73GB2A433J	CHIP R 43K J 1/10W	E2
R74			RK73HB1J121J	CHIP R 120 J 1/16W	K2,K3,E
R74			RK73HB1J121J	CHIP R 120 J 1/16W	E2
R75			RK73HB1J222J	CHIP R 2.2K J 1/16W	K2,K3,E
R75			RK73HB1J222J	CHIP R 2.2K J 1/16W	E2
R76			RK73HB1J681J	CHIP R 680 J 1/16W	K2,K3,E
R76			RK73HB1J681J	CHIP R 680 J 1/16W	E2
R77			RK73HB1J103J	CHIP R 10K J 1/16W	
R78			RK73HB1J682J	CHIP R 6.8K J 1/16W	
R79			RK73HB1J563J	CHIP R 56K J 1/16W	
R81			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R82			RK73HB1J332J	CHIP R 3.3K J 1/16W	K,E3
R83			RK73HB1J000J	CHIP R 0.0 J 1/16W	K,K2,E2
R83			RK73HB1J000J	CHIP R 0.0 J 1/16W	E3
R83,84			RK73HB1J000J	CHIP R 0.0 J 1/16W	K3,E
R85			RK73HB1J000J	CHIP R 0.0 J 1/16W	K2,E2
R86			RK73HB1J000J	CHIP R 0.0 J 1/16W	K,E3
R88			RK73HB1J000J	CHIP R 0.0 J 1/16W	

PARTS LIST

DISPLAY UNIT (X54-3760-XX)
TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
S1-4		✻	S70-0516-05	TACT SWITCH	
S5		✻	S70-0519-05	TACT SWITCH	K2,E2
S5-20		✻	S70-0519-05	TACT SWITCH	K3,E
S10		✻	S70-0519-05	TACT SWITCH	K2,E2
S15		✻	S70-0519-05	TACT SWITCH	K2,E2
S20		✻	S70-0519-05	TACT SWITCH	K2,E2
MIC1	1A		T91-0673-05	MIC ELEMENT	
D2			KDR731	DIODE	
D3,4			DA221	DIODE	
D15			HN2S03FE	DIODE	K2,K3,E
D15			HN2S03FE	DIODE	E2
D16			1SS388F	DIODE	K2,K3,E
D16			1SS388F	DIODE	E2
IC1,2			TC75W51FK(F)	MOS-IC	
IC4			R2A20178NP	MICROCONTROLLER IC	
IC6			TC75W51FK(F)	MOS-IC	
IC8			LC75857W-E	MOS-IC	K2,K3,E
IC8			LC75857W-E	MOS-IC	E2
Q1			UMG9N	TRANSISTOR	
Q2			SSM3K15TE(F)	FET	
Q3			KTC4075E(Y,GR)	TRANSISTOR	
Q4			2SC4738(GR)F	TRANSISTOR	
Q5			2SA1832(GR)F	TRANSISTOR	
Q6			2SA1362-F(GR)	TRANSISTOR	K2,K3,E
Q6			2SA1362-F(GR)	TRANSISTOR	E2
Q7,8			2SC5383-T111	TRANSISTOR	K2,K3,E
Q7,8			2SC5383-T111	TRANSISTOR	E2
TH1			ERTJ0EV104H	THERMISTOR	

TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
C101			CK73HB1H471K	CHIP C 470PF K	
C102			CK73HB1H102K	CHIP C 1000PF K	
C104			CK73HB1H102K	CHIP C 1000PF K	
C106			CK73HB1H102K	CHIP C 1000PF K	
C107			CC73HCH1H100B	CHIP C 10PF B	
C110			CK73HB1H102K	CHIP C 1000PF K	
C111			CK73HB1H471K	CHIP C 470PF K	
C112			CK73HB1A104K	CHIP C 0.10UF K	
C113			CC73HCH1H330J	CHIP C 33PF J	
C114			CK73HB1H102K	CHIP C 1000PF K	
C115			CC73HCH1H180J	CHIP C 18PF J	
C116			CK73HB1H102K	CHIP C 1000PF K	
C118			CC73HCH1H270J	CHIP C 27PF J	
C119			CK73HB1H102K	CHIP C 1000PF K	
C120			CC73HCH1H101J	CHIP C 100PF J	
C121,122			CK73HB1H102K	CHIP C 1000PF K	
C125			CC73HCH1H151J	CHIP C 150PF J	
C126			CK73GB1E105K	CHIP C 1.0UF K	
C127			CC73HCH1H151J	CHIP C 150PF J	
C128			CK73GB1C104K	CHIP C 0.10UF K	
C129			CK73HB1H102K	CHIP C 1000PF K	
C130			CK73HB1H471K	CHIP C 470PF K	
C139			CC73HCH1H390J	CHIP C 39PF J	
C141			CC73GCH1H300G	CHIP C 30PF G	
C142			CC73GCH1H470G	CHIP C 47PF G	
C143			CC73GCH1H080B	CHIP C 8.0PF B	
C144			CC73GCH1H180G	CHIP C 18PF G	
C145			CK73GB1H102K	CHIP C 1000PF K	
C146			CC73GCH1H040B	CHIP C 4.0PF B	
C147			CC73FCH1H050B	CHIP C 5.0PF B	
C148			CC73GCH1H020B	CHIP C 2.0PF B	
C149			CK73GB1H102K	CHIP C 1000PF K	
C150			CK73HB1H471K	CHIP C 470PF K	
C151			CK73GB1H102K	CHIP C 1000PF K	
C152			CC73GCH1H100C	CHIP C 10PF C	
C153			CC73GCH1H150G	CHIP C 15PF G	
C154			CC73GCH1H220G	CHIP C 22PF G	
C155			CC73GCH1H060B	CHIP C 6.0PF B	
C156			CC73GCH1H240G	CHIP C 24PF G	
C157			CC73GCH1H080B	CHIP C 8.0PF B	
C158			CC73GCH1H130G	CHIP C 13PF G	
C160			CC73GCH1H200G	CHIP C 20PF G	
C161			CC73HCH1H220G	CHIP C 22PF G	
C168			CK73HB1H102K	CHIP C 1000PF K	
C169			CK73HB1A104K	CHIP C 0.10UF K	
C170			CK73HB1H471K	CHIP C 470PF K	
C173			CK73HB1H471K	CHIP C 470PF K	
C174			CK73FB1E225K	CHIP C 2.2UF K	
C175			CK73HB1A333K	CHIP C 0.033UF K	
C177,178			CK73HB1H471K	CHIP C 470PF K	
C179			CC73HCH1H101J	CHIP C 100PF J	
C180,181			CK73HB1H471K	CHIP C 470PF K	
C182			CK73HB1A104K	CHIP C 0.10UF K	
C186			CC73HCH1H010B	CHIP C 1.0PF B	
C201			CK73HB1H103K	CHIP C 0.010UF K	
C202			CK73HB1E103K	CHIP C 0.010UF K	
C203			CK73HB1H471K	CHIP C 470PF K	
C204			CK73FB1E475K	CHIP C 4.7UF K	
C205			CK73HB1H471K	CHIP C 470PF K	
C207			CK73HB1H102K	CHIP C 1000PF K	
C208			CC73HCH1H100B	CHIP C 10PF B	
C209			CC73HCH1H120G	CHIP C 12PF G	
C210			CK73HB1H103K	CHIP C 0.010UF K	
C211			CC73HCH1H040B	CHIP C 4.0PF B	
C212			CC73HCH1H220G	CHIP C 22PF G	
C213			CC73HCH1H050B	CHIP C 5.0PF B	
C214			CC73HCH1H150J	CHIP C 15PF J	
C215,216			CK73HB1H102K	CHIP C 1000PF K	
C217			CC73HCH1H3R5B	CHIP C 3.5PF B	
C218			CC73HCH1H070B	CHIP C 7.0PF B	
C223			CK73HB1H102K	CHIP C 1000PF K	
C224			CC73HCH1H040B	CHIP C 4.0PF B	
C225			CC73HCH1H470J	CHIP C 47PF J	
C227			CK73HB1H102K	CHIP C 1000PF K	
C228			CC73HCH1H1R5B	CHIP C 1.5PF B	
C229			CC73HCH1H270J	CHIP C 27PF J	
C231			CK73HB1H102K	CHIP C 1000PF K	
C232			CC73HCH1H020B	CHIP C 2.0PF B	
C233			CK73HB1E103K	CHIP C 0.010UF K	
C235			CK73HB1H102K	CHIP C 1000PF K	
C236			CK73GB1E105K	CHIP C 1.0UF K	
C237			CK73HB1A104K	CHIP C 0.10UF K	
C240,241			CK73HB1H102K	CHIP C 1000PF K	
C242			CK73HB1A104K	CHIP C 0.10UF K	
C244			CK73HB1H102K	CHIP C 1000PF K	
C246			CC73HCH1H330J	CHIP C 33PF J	

PARTS LIST

TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
C247			CC73HCH1H030B	CHIP C 3.0PF B	
C249			CC73HCH1H180G	CHIP C 18PF G	
C251			CC73HCH1H1R5B	CHIP C 1.5PF B	
C255			CK73HB1H102K	CHIP C 1000PF K	
C258			CC73HCH1H180G	CHIP C 18PF G	
C260			CC73HCH1H080B	CHIP C 8.0PF B	
C261			CC73HCH1H390J	CHIP C 39PF J	
C262			CC73HCH1H120G	CHIP C 12PF G	
C293			CK73HB1H471K	CHIP C 470PF K	
C301,302			CK73HB1E103K	CHIP C 0.010UF K	
C303			CK73HB1A104K	CHIP C 0.10UF K	
C307			CC73HCH1H100B	CHIP C 10PF B	
C308			CC73HCH1H101J	CHIP C 100PF J	
C310			CC73HCH1H101J	CHIP C 100PF J	
C311			CC73HCH1H151J	CHIP C 150PF J	
C313			CC73HCH1H330G	CHIP C 33PF G	
C314-316			CK73HB1A104K	CHIP C 0.10UF K	
C317			CK73FB1A106K	CHIP C 10UF K	
C318			CC73HCH1H680G	CHIP C 68PF G	
C319			CK73HB1E103K	CHIP C 0.010UF K	
C320-323			CK73HB1A104K	CHIP C 0.10UF K	
C324			CK73FB1A106K	CHIP C 10UF K	
C327			CC73HCH1H100B	CHIP C 10PF B	
C330			CK73HB1A104K	CHIP C 0.10UF K	
C332			CK73HB1E103K	CHIP C 0.010UF K	
C335			CK73HB1A104K	CHIP C 0.10UF K	
C338			CK73HB1E103K	CHIP C 0.010UF K	
C339-341			CK73HB1A104K	CHIP C 0.10UF K	
C343			CK73GB1A474K	CHIP C 0.47UF K	
C346			CC73HCH1H470J	CHIP C 47PF J	
C350			CK73HB1H471K	CHIP C 470PF K	
C351			CK73HB1E103K	CHIP C 0.010UF K	
C353,354			CK73HB1E103K	CHIP C 0.010UF K	
C356			CC73HCH1H030B	CHIP C 3.0PF B	
C357			CC73HCH1H180J	CHIP C 18PF J	
C358			CC73HCH1H060B	CHIP C 6.0PF B	
C359			CC73HCH1H470J	CHIP C 47PF J	
C360			CK73HB1E103K	CHIP C 0.010UF K	
C398			CC73HCH1H100B	CHIP C 10PF B	
C401			CK73HB1E103K	CHIP C 0.010UF K	
C402			CK73GB1C225K	CHIP C 2.2UF K	
C405			CC73HCH1H101J	CHIP C 100PF J	
C406			CC73HCH1H100B	CHIP C 10PF B	
C408			CK73HB1E103K	CHIP C 0.010UF K	
C409			CC73HCH1H100B	CHIP C 10PF B	
C410			CC73HCH1H101J	CHIP C 100PF J	
C411			CK73HB1E103K	CHIP C 0.010UF K	
C412			CC73HCH1H100B	CHIP C 10PF B	
C413,414			CK73HB1E103K	CHIP C 0.010UF K	
C416-420			CC73HCH1H101J	CHIP C 100PF J	
C421			CK73HB1A104K	CHIP C 0.10UF K	
C422			CC73HCH1H101J	CHIP C 100PF J	
C423			CK73HB1A104K	CHIP C 0.10UF K	
C424,425			CC73HCH1H101J	CHIP C 100PF J	
C426			CS77CA1VR15M	CHIP TNTL 0.15UF 35WV	
C427			CS77BA1D100M	CHIP TNTL 10UF 20WV	
C428			C92-0863-05	CHIP TNTL 0.047UF 35WV	
C429			CK73HB1E103K	CHIP C 0.010UF K	
C431			CC73HCH1H101J	CHIP C 100PF J	
C432			C93-0787-05	CHIP C 0.1UF J	

Ref. No.	Address	New parts	Parts No.	Description	Destination
C434			CC73HCH1H101J	CHIP C 100PF J	
C437,438			CC73HCH1H101J	CHIP C 100PF J	
C439			CK73HB1A104K	CHIP C 0.10UF K	
C440-442			CC73HCH1H101J	CHIP C 100PF J	
C443			CK73HB1A105K	CHIP C 1.0UF K	
C444			CK73HB1H102K	CHIP C 1000PF K	
C445			CC73HCH1H180G	CHIP C 18PF G	
C446			CC73HCH1H330G	CHIP C 33PF G	
C447			CC73HCH1H680G	CHIP C 68PF G	
C448			CC73HCH1H040B	CHIP C 4.0PF B	
C449			CC73HCH1H020B	CHIP C 2.0PF B	
C450			CK73FB1A106K	CHIP C 10UF K	
C451			CC73HCH1H150G	CHIP C 15PF G	
C453			CC73HCH1HR75B	CHIP C 0.75PF B	
C454			CC73HCH1H181J	CHIP C 180PF J	
C455			CC73HCH1H080B	CHIP C 8.0PF B	
C456,457			CC73HCH1H100B	CHIP C 10PF B	
C458			CC73HCH1H120G	CHIP C 12PF G	
C459			CC73HCH1H150G	CHIP C 15PF G	
C460			CK73GB0J475K	CHIP C 4.7UF K	
C461			CK73HB1H471K	CHIP C 470PF K	
C462			CK73HB1H103K	CHIP C 0.010UF K	
C463			CK73HB1H102K	CHIP C 1000PF K	
C464			CK73HB1H471K	CHIP C 470PF K	
C465			CC73HCH1H181J	CHIP C 180PF J	
C466,467			CC73HCH1H0R5B	CHIP C 0.5PF B	
C468			CC73HCH1H120G	CHIP C 12PF G	
C469			CK73HB1H471K	CHIP C 470PF K	
C470			CK73HB1H102K	CHIP C 1000PF K	
C471			CC73HCH1H100B	CHIP C 10PF B	
C472			CK73HB1H471K	CHIP C 470PF K	
C473			CC73HCH1H120G	CHIP C 12PF G	
C474			CK73HB1H102K	CHIP C 1000PF K	
C475			CC73HCH1H030B	CHIP C 3.0PF B	
C476,477			CC73HCH1H100B	CHIP C 10PF B	
C478			CK73HB1H102K	CHIP C 1000PF K	
C480			CK73HB1A104K	CHIP C 0.10UF K	
C481			CK73HB1H102K	CHIP C 1000PF K	
C482			CC73HCH1H100B	CHIP C 10PF B	
C483			CK73HB1H102K	CHIP C 1000PF K	
C484			CK73HB1H471K	CHIP C 470PF K	
C486			CC73HCH1H101J	CHIP C 100PF J	
C491			CC73HCH1H101J	CHIP C 100PF J	
C492			CC73GCH1H101J	CHIP C 100PF J	
C501,502			CK73HB1H471K	CHIP C 470PF K	
C503			CK73HB1H102K	CHIP C 1000PF K	
C504			CK73HB1E682K	CHIP C 6800PF K	
C505			CK73HB1E103K	CHIP C 0.010UF K	
C506			CC73HCH1H220G	CHIP C 22PF G	
C507			CK73HB1H471K	CHIP C 470PF K	
C508,509			CK73HB1A105K	CHIP C 1.0UF K	
C510			CK73HB1H471K	CHIP C 470PF K	
C511			CK73GB1E105K	CHIP C 1.0UF K	
C512			CK73HB1H102K	CHIP C 1000PF K	
C513			CK73HB1E682K	CHIP C 6800PF K	
C514			CK73GB0J475K	CHIP C 4.7UF K	
C515			CK73HB1A105K	CHIP C 1.0UF K	
C516			CK73HB1A104K	CHIP C 0.10UF K	
C517,518			CK73HB1A105K	CHIP C 1.0UF K	
C519			CK73HB1H102K	CHIP C 1000PF K	

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TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description			Destination
C520			CK73HB1A104K	CHIP C	0.10UF	K	
C521			CK73GB0J106K	CHIP C	10UF	K	
C522			CK73HB1A224K	CHIP C	0.22UF	K	
C523			CK73HB1H471K	CHIP C	470PF	K	
C524			CK73HB1A105K	CHIP C	1.0UF	K	
C525			CK73HB1H102K	CHIP C	1000PF	K	
C526			CS77CP1A100M	CHIP TNTL	10UF	10WV	
C527			CK73GB0J106K	CHIP C	10UF	K	
C528			CK73HB1A105K	CHIP C	1.0UF	K	
C529			CK73GB1E105K	CHIP C	1.0UF	K	
C530			CK73HB1A105K	CHIP C	1.0UF	K	
C532			CC73HCH1H560J	CHIP C	56PF	J	
C533-535			CK73HB1H102K	CHIP C	1000PF	K	
C536			CK73HB1E682K	CHIP C	6800PF	K	
C537			CK73HB1E103K	CHIP C	0.010UF	K	
C538			CK73HB1H471K	CHIP C	470PF	K	
C539			CK73HB1H102K	CHIP C	1000PF	K	
C540			CK73FB1E475K	CHIP C	4.7UF	K	
C541			CK73HB1E103K	CHIP C	0.010UF	K	
C543			CS77BP1C010M	CHIP TNTL	1.0UF	16WV	
C545			CK73GB1E105K	CHIP C	1.0UF	K	
C548			CK73HB1H471K	CHIP C	470PF	K	
C549			CK73HB1A104K	CHIP C	0.10UF	K	
C550-552			CK73HB1H471K	CHIP C	470PF	K	
C553			CK73FB1C106K	CHIP C	10UF	K	
C555			CK73HB1H471K	CHIP C	470PF	K	
C558			CK73GB0J106K	CHIP C	10UF	K	
C599			CK73HB1H471K	CHIP C	470PF	K	
C601			CC73HCH1H101J	CHIP C	100PF	J	
C602			CK73HB1A104K	CHIP C	0.10UF	K	
C603			CK73HB1E103K	CHIP C	0.010UF	K	
C604			CK73HB1A683K	CHIP C	0.068UF	K	
C605			CK73HB1A104K	CHIP C	0.10UF	K	
C606-608			CK73HB1E103K	CHIP C	0.010UF	K	
C609,610			CK73GB0J106K	CHIP C	10UF	K	
C616			CC73HCH1H470J	CHIP C	47PF	J	
C618			CC73HCH1H470J	CHIP C	47PF	J	
C620			CC73HCH1H470J	CHIP C	47PF	J	
C622			CC73HCH1H470J	CHIP C	47PF	J	
C624			CC73HCH1H470J	CHIP C	47PF	J	
C626-631			CC73HCH1H470J	CHIP C	47PF	J	
C638-644			CC73HCH1H470J	CHIP C	47PF	J	
C646,647			CK73HB1A104K	CHIP C	0.10UF	K	
C648			CK73HB1E103K	CHIP C	0.010UF	K	
C649,650			CK73HB1H102K	CHIP C	1000PF	K	
C652			CK73HB1A105K	CHIP C	1.0UF	K	
C653			CK73HB1E103K	CHIP C	0.010UF	K	
C655			CK73HB1H102K	CHIP C	1000PF	K	
C657-660			CK73HB1A104K	CHIP C	0.10UF	K	
C661			CK73HB1A105K	CHIP C	1.0UF	K	
C663			CK73HB1A105K	CHIP C	1.0UF	K	
C664-667			CC73HCH1H470J	CHIP C	47PF	J	
C668			CK73HB1E103K	CHIP C	0.010UF	K	
C669			CK73HB1C473K	CHIP C	0.047UF	K	
C670,671			CK73HB1E103K	CHIP C	0.010UF	K	
C673			CK73HB1A104K	CHIP C	0.10UF	K	
C674			CK73HB1E103K	CHIP C	0.010UF	K	
C675			CK73HB1A104K	CHIP C	0.10UF	K	
C677			CK73GB0J106K	CHIP C	10UF	K	
C678,679			CK73HB1E103K	CHIP C	0.010UF	K	

Ref. No.	Address	New parts	Parts No.	Description			Destination
C680			CK73HB1A105K	CHIP C	1.0UF	K	
C681			CK73HB1A104K	CHIP C	0.10UF	K	
C682			CK73HB1H102K	CHIP C	1000PF	K	
C683			CK73HB1A104K	CHIP C	0.10UF	K	
C684			CK73HB1E682K	CHIP C	6800PF	K	
C685			CK73GB0J106K	CHIP C	10UF	K	
C686			CC73HCH1H030B	CHIP C	3.0PF	B	
C687			CK73HB1E103K	CHIP C	0.010UF	K	
C688			CK73HB1A105K	CHIP C	1.0UF	K	
C689			CK73HB1A104K	CHIP C	0.10UF	K	
C691			CK73HB1E103K	CHIP C	0.010UF	K	
C692			CK73HB1A105K	CHIP C	1.0UF	K	
C693			CK73HB1A104K	CHIP C	0.10UF	K	
C695			CK73HB1E103K	CHIP C	0.010UF	K	
C696,697			CK73HB1H102K	CHIP C	1000PF	K	
C698-700			CK73HB1E103K	CHIP C	0.010UF	K	
C701			CK73HB1A104K	CHIP C	0.10UF	K	
C901,902			CK73HB1H102K	CHIP C	1000PF	K	
C903			CK73HB1A105K	CHIP C	1.0UF	K	
C904			CC73HCH1H221J	CHIP C	220PF	J	
C905			CK73HB1A105K	CHIP C	1.0UF	K	
C906			CK73HB1A104K	CHIP C	0.10UF	K	
C907			CK73GB0J106K	CHIP C	10UF	K	
C908			CC73HCH1H101J	CHIP C	100PF	J	
C909			CK73HB1A473K	CHIP C	0.047UF	K	
C910			CK73GB1E105K	CHIP C	1.0UF	K	
C913			CK73GB1E105K	CHIP C	1.0UF	K	
C914			CS77BB20J101M	CHIP TNTL	100UF	6.3WV	
C915,916			CC73HCH1H101J	CHIP C	100PF	J	
C917			CK73HB1H102K	CHIP C	1000PF	K	
C918			CC73HCH1H101J	CHIP C	100PF	J	
C920			CK73HB1H102K	CHIP C	1000PF	K	
C921			CC73HCH1H101J	CHIP C	100PF	J	
C922			CK73HB1H102K	CHIP C	1000PF	K	
C923			CC73HCH1H470J	CHIP C	47PF	J	
C927			CC73HCH1H470J	CHIP C	47PF	J	
CN1			E40-6573-05	FLAT CABLE CONNECTOR (11P)			
CN2		✻	E40-6893-05	FLAT CABLE CONNECTOR (24P)			
CN3			E40-6568-05	FLAT CABLE CONNECTOR (6P)			
CN4			E41-2359-05	PIN ASSY			
J1			E11-0484-05	3.5D PHONE JACK (3.5D/3P)			
J2			E11-0715-05	2.5D PHONE JACK			
F1			F53-0324-15	FUSE (2.5A)			
F2			F53-0319-15	FUSE (1A)			
CF1			L72-1017-05	CERAMIC FILTER			
CF2			L72-1040-05	CERAMIC FILTER			
L102			L40-3375-71	SMALL FIXED INDUCTOR (33NH)			
L103			L40-1085-92	SMALL FIXED INDUCTOR (100NH)			
L104			L40-3975-71	SMALL FIXED INDUCTOR (39NH)			
L105			L41-1085-43	SMALL FIXED INDUCTOR (100NH)			
L106			L92-0149-05	CHIP FERRITE			
L107		✻	L41-4763-53	SMALL FIXED INDUCTOR (4.7NH)			
L108			L92-0149-05	CHIP FERRITE			
L109			L34-4569-05	AIR-CORE COIL			
L110			L34-4563-05	AIR-CORE COIL			
L111,112			L34-4565-05	AIR-CORE COIL			
L113			L34-4574-05	AIR-CORE COIL			
L114			L34-4566-05	AIR-CORE COIL			

PARTS LIST

TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
L115			L34-4569-05	AIR-CORE COIL	
L116			L34-4568-05	AIR-CORE COIL	
L117			L41-2295-39	SMALL FIXED INDUCTOR (2.2UH)	
L118			L34-4577-05	AIR-CORE COIL	
L120			L92-0163-05	BEADS CORE	
L121			L40-1085-71	SMALL FIXED INDUCTOR (100NH)	
L201			L92-0138-05	CHIP FERRITE	
L202			L41-5685-39	SMALL FIXED INDUCTOR (0.56UH)	
L203			L41-2785-39	SMALL FIXED INDUCTOR (0.27UH)	
L204,205			L40-3375-71	SMALL FIXED INDUCTOR (33NH)	
L206			L41-8275-53	SMALL FIXED INDUCTOR (82NH)	
L207			L41-2285-14	SMALL FIXED INDUCTOR (220NH)	
L208			L41-6878-14	SMALL FIXED INDUCTOR (68NH)	
L210			L92-0138-05	CHIP FERRITE	
L211-213			L41-6878-14	SMALL FIXED INDUCTOR (68NH)	
L302			L40-5681-86	SMALL FIXED INDUCTOR (0.56UH)	
L305			L40-5675-92	SMALL FIXED INDUCTOR (56NH)	
L306			L40-1085-57	SMALL FIXED INDUCTOR (100NH)	
L307			L40-1591-86	SMALL FIXED INDUCTOR (1.5UH)	
L308			L92-0138-05	CHIP FERRITE	
L401			L41-4795-39	SMALL FIXED INDUCTOR (4.7UH)	
L402,403			L92-0163-05	BEADS CORE	
L404			L40-3391-86	SMALL FIXED INDUCTOR (3.3UH)	
L405			L40-1891-86	SMALL FIXED INDUCTOR (1.8UH)	
L408-410			L40-2285-92	SMALL FIXED INDUCTOR (220NH)	
L411			L40-2785-92	SMALL FIXED INDUCTOR (270NH)	
L412			L40-2285-92	SMALL FIXED INDUCTOR (220NH)	
L413			L40-1085-92	SMALL FIXED INDUCTOR (100NH)	
L414			L40-5663-57	SMALL FIXED INDUCTOR (5.6NH)	
L415			L40-5678-67	SMALL FIXED INDUCTOR (56NH)	
L416			L40-2778-67	SMALL FIXED INDUCTOR (27NH)	
L417			L92-0446-05	BEADS CORE	
L418,419			L40-3391-86	SMALL FIXED INDUCTOR (3.3UH)	
L421			L40-5663-57	SMALL FIXED INDUCTOR (5.6NH)	
L422			L40-1285-71	SMALL FIXED INDUCTOR (120NH)	
L423			L40-8275-92	SMALL FIXED INDUCTOR (82NH)	
L424			L40-1285-92	SMALL FIXED INDUCTOR (120NH)	
L425			L92-0163-05	BEADS CORE	
L502			L92-0163-05	BEADS CORE	
L503			L33-1494-05	SMALL FIXED INDUCTOR (4.7UH)	
L504			L92-0149-05	CHIP FERRITE	
L505			L92-0467-05	CHIP FERRITE	
L506			L92-0162-05	BEADS CORE	
L508			L92-0467-05	CHIP FERRITE	
L509			L33-1530-05	SMALL FIXED INDUCTOR (15UH)	
L511		✻	L41-1092-02	SMALL FIXED INDUCTOR (1.0UH)	
L602-605			L92-0408-05	CHIP FERRITE	
L607			L92-0444-05	CHIP FERRITE	
L609			L92-0444-05	CHIP FERRITE	
L611			L92-0444-05	CHIP FERRITE	
L613			L92-0163-05	BEADS CORE	
L614-616			L92-0444-05	CHIP FERRITE	
L617			L92-0162-05	BEADS CORE	
L901-903			L92-0408-05	CHIP FERRITE	
X401		✻	L77-3073-05	TCXO (16.8MHZ)	
X601			L77-3015-05	TCXO (18.432MHZ)	
XF1			L71-0655-05	MCF (49.95MHZ)	
CP401			RK74HB1J100J	CHIP-COM 10 J 1/16W	
CP501			RK74HB1J104J	CHIP-COM 100K J 1/16W	

Ref. No.	Address	New parts	Parts No.	Description	Destination
CP601			RK74HB1J104J	CHIP-COM 100K J 1/16W	
CP602			RK74HB1J103J	CHIP-COM 10K J 1/16W	
CP603-605			RK74HB1J104J	CHIP-COM 100K J 1/16W	
CP607			RK74HB1J101J	CHIP-COM 100 J 1/16W	
CP608			RK74HB1J000J	CHIP-COM 0.0 J 1/16W	
CP610			RK74HB1J102J	CHIP-COM 1.0K J 1/16W	
R101			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R102			RK73HB1J180J	CHIP R 18 J 1/16W	
R103,104			RK73HB1J271J	CHIP R 270 J 1/16W	
R109			RK73HB1J220J	CHIP R 22 J 1/16W	
R110			RK73HB1J222J	CHIP R 2.2K J 1/16W	
R111			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R112			RK73HB1J561J	CHIP R 560 J 1/16W	
R113			RK73GB2A270J	CHIP R 27 J 1/10W	
R114			RK73GB2A100J	CHIP R 10 J 1/10W	
R115			RK73HB1J120J	CHIP R 12 J 1/16W	
R116,117			RK73HB1J471J	CHIP R 470 J 1/16W	
R118			RK73HB1J180J	CHIP R 18 J 1/16W	
R119			RK73HB1J823J	CHIP R 82K J 1/16W	
R120			RK73HB1J393J	CHIP R 39K J 1/16W	
R121			RK73HB1J470J	CHIP R 47 J 1/16W	
R122			RK73HB1J101J	CHIP R 100 J 1/16W	
R123			RK73HB1J563J	CHIP R 56K J 1/16W	
R124			RK73HB1J683J	CHIP R 68K J 1/16W	
R129,130			RK73HB1J271J	CHIP R 270 J 1/16W	
R131			RK73GB2A823J	CHIP R 82K J 1/10W	
R132,133			RK73GB2A000J	CHIP R 0.0 J 1/10W	
R141,142			RK73HB1J474J	CHIP R 470K J 1/16W	
R143			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R144			RK73HB1J273J	CHIP R 27K J 1/16W	
R146			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R147			RK73HB1J561J	CHIP R 560 J 1/16W	
R148-150			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R152			RK73HB1J103J	CHIP R 10K J 1/16W	
R153-155			RK73EB2ER39K	CHIP R 0.39 K 1/4W	
R156,157			RK73HH1J154D	CHIP R 150K D 1/16W	
R158			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R159			RK73HH1J474D	CHIP R 470K D 1/16W	
R160			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R161			RK73HH1J474D	CHIP R 470K D 1/16W	
R162			RK73HB1J103J	CHIP R 10K J 1/16W	
R163			RK73HB1J224J	CHIP R 220K J 1/16W	
R164			RK73HB1J104J	CHIP R 100K J 1/16W	
R165			RK73HB1J563J	CHIP R 56K J 1/16W	
R166			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R167			RK73HB1J222J	CHIP R 2.2K J 1/16W	
R168			RK73HB1J823J	CHIP R 82K J 1/16W	
R169			RK73HB1J104J	CHIP R 100K J 1/16W	
R201			RK73HB1J470J	CHIP R 47 J 1/16W	
R203			RK73HB1J681J	CHIP R 680 J 1/16W	
R204			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R205			RK73HH1J331D	CHIP R 330 D 1/16W	
R207			RK73HB1J104J	CHIP R 100K J 1/16W	
R208			RK73HB1J154J	CHIP R 150K J 1/16W	
R209			RK73HB1J104J	CHIP R 100K J 1/16W	
R210			RK73HB1J224J	CHIP R 220K J 1/16W	
R211			RK73HB1J000J	CHIP R 0.0 J 1/16W	
R212			RK73HB1J105J	CHIP R 1.0M J 1/16W	
R213			RK73HB1J104J	CHIP R 100K J 1/16W	
R216			RK73HB1J563J	CHIP R 56K J 1/16W	

PARTS LIST

TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description				Destination
R217			RK73HB1J104J	CHIP R	100K	J	1/16W	
R220			RK73HB1J105J	CHIP R	1.0M	J	1/16W	
R221			RK73HB1J103J	CHIP R	10K	J	1/16W	
R223			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R224			RK73HB1J103J	CHIP R	10K	J	1/16W	
R225			RK73HB1J680J	CHIP R	68	J	1/16W	
R226			RK73HH1J221D	CHIP R	220	D	1/16W	
R227			RK73HB1J224J	CHIP R	220K	J	1/16W	
R228			RK73HB1J104J	CHIP R	100K	J	1/16W	
R231			RK73HB1J823J	CHIP R	82K	J	1/16W	
R232			RK73HB1J154J	CHIP R	150K	J	1/16W	
R233,234			RK73HB1J104J	CHIP R	100K	J	1/16W	
R235			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R236,237			RK73HB1J104J	CHIP R	100K	J	1/16W	
R239			RK73GB2A000J	CHIP R	0.0	J	1/10W	
R240			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R245			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R301			RK73HB1J561J	CHIP R	560	J	1/16W	
R302			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R304			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R305			RK73HB1J100J	CHIP R	10	J	1/16W	
R306			RK73HB1J334J	CHIP R	330K	J	1/16W	
R308			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R310			RK73HB1J103J	CHIP R	10K	J	1/16W	
R317			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R320			RK73HB1J274J	CHIP R	270K	J	1/16W	
R321			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R326			RK73HB1J104J	CHIP R	100K	J	1/16W	
R327			RK73HB1J103J	CHIP R	10K	J	1/16W	
R328			RK73HB1J472J	CHIP R	4.7K	J	1/16W	
R329			RK73HB1J223J	CHIP R	22K	J	1/16W	
R330			RK73HB1J183J	CHIP R	18K	J	1/16W	
R331			RK73HB1J103J	CHIP R	10K	J	1/16W	
R332			RK73HB1J473J	CHIP R	47K	J	1/16W	
R335			RK73HH1J221D	CHIP R	220	D	1/16W	
R338			RK73HB1J101J	CHIP R	100	J	1/16W	
R340			RK73HB1J564J	CHIP R	560K	J	1/16W	
R341			RK73HB1J104J	CHIP R	100K	J	1/16W	
R344			RK73HB1J682J	CHIP R	6.8K	J	1/16W	
R345,346			RK73HB1J271J	CHIP R	270	J	1/16W	
R349			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R351			RK73HB1J104J	CHIP R	100K	J	1/16W	
R352			RK73HB1J103J	CHIP R	10K	J	1/16W	
R354			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R355,356			RK73HB1J822J	CHIP R	8.2K	J	1/16W	
R357			RK73GB2A821J	CHIP R	820	J	1/10W	
R400			RK73HB1J470J	CHIP R	47	J	1/16W	
R404			RK73HB1J470J	CHIP R	47	J	1/16W	
R407			RK73HB1J100J	CHIP R	10	J	1/16W	
R408,409			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R410			RK73HH1J124D	CHIP R	120K	D	1/16W	
R411,412			RK73HB1J100J	CHIP R	10	J	1/16W	
R413			RK73HB1J473J	CHIP R	47K	J	1/16W	
R414			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R415			RK73HB1J100J	CHIP R	10	J	1/16W	
R416,417			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R418			RK73HH1J121D	CHIP R	120	D	1/16W	
R419			RK73HH1J391D	CHIP R	390	D	1/16W	
R420			RK73HH1J473D	CHIP R	47K	D	1/16W	
R421			RK73HB1J103J	CHIP R	10K	J	1/16W	

Ref. No.	Address	New parts	Parts No.	Description				Destination
R422			RK73HB1J106J	CHIP R	10M	J	1/16W	
R423			RK73HH1J474D	CHIP R	470K	D	1/16W	
R424,425			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R426			RK73HB1J473J	CHIP R	47K	J	1/16W	
R427			RK73HB1J683J	CHIP R	68K	J	1/16W	
R428-431			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R432			RK73HH1J124D	CHIP R	120K	D	1/16W	
R433			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R434			RK73HB1J182J	CHIP R	1.8K	J	1/16W	
R435			RK73HB1J103J	CHIP R	10K	J	1/16W	
R436			RK73HB1J393J	CHIP R	39K	J	1/16W	
R437,438			RK73HB1J473J	CHIP R	47K	J	1/16W	
R439			RK73HB1J472J	CHIP R	4.7K	J	1/16W	
R440			RK73HB1J104J	CHIP R	100K	J	1/16W	
R441			RK73HB1J474J	CHIP R	470K	J	1/16W	
R442			RK73HB1J104J	CHIP R	100K	J	1/16W	
R443,444			RK73HH1J331D	CHIP R	330	D	1/16W	
R445			RK73HB1J104J	CHIP R	100K	J	1/16W	
R446,447			RK73HB1J220J	CHIP R	22	J	1/16W	
R448			RK73HB1J474J	CHIP R	470K	J	1/16W	
R449			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R450			RK73HB1J473J	CHIP R	47K	J	1/16W	
R451			RK73HB1J224J	CHIP R	220K	J	1/16W	
R452			RK73HB1J101J	CHIP R	100	J	1/16W	
R453			RK73HB1J560J	CHIP R	56	J	1/16W	
R454			RK73HB1J561J	CHIP R	560	J	1/16W	
R455			RK73HB1J563J	CHIP R	56K	J	1/16W	
R456			RK73HB1J103J	CHIP R	10K	J	1/16W	
R457			RK73HB1J472J	CHIP R	4.7K	J	1/16W	
R458			RK73HB1J332J	CHIP R	3.3K	J	1/16W	
R459			RK73HB1J331J	CHIP R	330	J	1/16W	
R460			RK73HB1J222J	CHIP R	2.2K	J	1/16W	
R461			RK73HB1J470J	CHIP R	47	J	1/16W	
R462			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R463			RK73HB1J224J	CHIP R	220K	J	1/16W	
R464			RK73HB1J183J	CHIP R	18K	J	1/16W	
R467			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R468			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R469			RK73HB1J104J	CHIP R	100K	J	1/16W	
R474			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R501			RK73HH1J274D	CHIP R	270K	D	1/16W	
R502			RK73HB1J272J	CHIP R	2.7K	J	1/16W	
R503			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R504			RK73HB1J222J	CHIP R	2.2K	J	1/16W	
R505			RK73HH1J184D	CHIP R	180K	D	1/16W	
R506			RK73HB1J101J	CHIP R	100	J	1/16W	
R507			RK73HB1J683J	CHIP R	68K	J	1/16W	
R508			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R509			RK73HB1J222J	CHIP R	2.2K	J	1/16W	
R510			RK73HB1J100J	CHIP R	10	J	1/16W	
R511			RK73HB1J471J	CHIP R	470	J	1/16W	
R512			RK73HH1J683D	CHIP R	68K	D	1/16W	
R513			RK73HH1J333D	CHIP R	33K	D	1/16W	
R514			RK73HH1J394D	CHIP R	390K	D	1/16W	
R515			RK73HH1J154D	CHIP R	150K	D	1/16W	
R516			RK73HB1J103J	CHIP R	10K	J	1/16W	
R517,518			RK73HB1J474J	CHIP R	470K	J	1/16W	
R519			RK73HB1J103J	CHIP R	10K	J	1/16W	
R520			RK73GB2A2R2J	CHIP R	2.2	J	1/10W	
R524			RK73HB1J474J	CHIP R	470K	J	1/16W	

PARTS LIST

TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description				Destination
R529			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R530-533			RK73HB1J104J	CHIP R	100K	J	1/16W	
R539,540			RK73HB1J474J	CHIP R	470K	J	1/16W	
R542,543			RK73HB1J474J	CHIP R	470K	J	1/16W	
R544			RK73HB1J103J	CHIP R	10K	J	1/16W	
R545			RK73HB1J474J	CHIP R	470K	J	1/16W	
R546			RK73HB1J103J	CHIP R	10K	J	1/16W	
R547			RK73GB2A000J	CHIP R	0.0	J	1/10W	
R548			RK73GB2A101J	CHIP R	100	J	1/10W	
R549,550			RK73HB1J474J	CHIP R	470K	J	1/16W	
R551			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R552			RK73HB1J101J	CHIP R	100	J	1/16W	
R553			RK73GB2A000J	CHIP R	0.0	J	1/10W	
R554			RK73GB2A1R0J	CHIP R	1.0	J	1/10W	
R604			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R606			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R609			RK73HB1J101J	CHIP R	100	J	1/16W	
R610,611			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R612-614			RK73HB1J101J	CHIP R	100	J	1/16W	
R615,616			RK73HB1J472J	CHIP R	4.7K	J	1/16W	
R617			RK73HB1J101J	CHIP R	100	J	1/16W	
R618			RK73HB1J474J	CHIP R	470K	J	1/16W	
R619,620			RK73HB1J100J	CHIP R	10	J	1/16W	
R623			RK73HB1J103J	CHIP R	10K	J	1/16W	
R624,625			RK73HB1J472J	CHIP R	4.7K	J	1/16W	
R628,629			RK73HB1J220J	CHIP R	22	J	1/16W	
R630			RK73HB1J474J	CHIP R	470K	J	1/16W	
R631			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R632			RK73HB1J104J	CHIP R	100K	J	1/16W	
R633,634			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R635			RK73HH1J103D	CHIP R	10K	D	1/16W	
R636			RK73HB1J104J	CHIP R	100K	J	1/16W	
R637			RK73HH1J104D	CHIP R	100K	D	1/16W	
R638			RK73HB1J183J	CHIP R	18K	J	1/16W	
R639			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R640-642			RK73HB1J102J	CHIP R	1.0K	J	1/16W	
R646,647			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R649			RK73HB1J104J	CHIP R	100K	J	1/16W	
R650			RK73HB1J474J	CHIP R	470K	J	1/16W	
R653			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R655			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R656			RK73HB1J563J	CHIP R	56K	J	1/16W	
R657,658			RK73HB1J103J	CHIP R	10K	J	1/16W	
R659			RK73HB1J563J	CHIP R	56K	J	1/16W	
R660			RK73HB1J823J	CHIP R	82K	J	1/16W	
R661			RK73HB1J184J	CHIP R	180K	J	1/16W	
R662			RK73HB1J103J	CHIP R	10K	J	1/16W	
R663			RK73HB1J223J	CHIP R	22K	J	1/16W	
R664			RK73HB1J153J	CHIP R	15K	J	1/16W	
R665			RK73GB2A000J	CHIP R	0.0	J	1/10W	
R666,667			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R668			RK73HB1J103J	CHIP R	10K	J	1/16W	
R690			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R901			RK73HB1J103J	CHIP R	10K	J	1/16W	
R902			RK73HB1J563J	CHIP R	56K	J	1/16W	
R903			RK73HB1J473J	CHIP R	47K	J	1/16W	
R904			RK73HB1J222J	CHIP R	2.2K	J	1/16W	
R905			RK73HB1J474J	CHIP R	470K	J	1/16W	
R906			RK73HB1J151J	CHIP R	150	J	1/16W	
R907			RK73HB1J103J	CHIP R	10K	J	1/16W	
R908			RK73HB1J334J	CHIP R	330K	J	1/16W	
R909			RK73HB1J274J	CHIP R	270K	J	1/16W	
R910			RK73HB1J473J	CHIP R	47K	J	1/16W	
R911			RK73HB1J273J	CHIP R	27K	J	1/16W	
R912			RK73HB1J681J	CHIP R	680	J	1/16W	
R913			RK73HB1J101J	CHIP R	100	J	1/16W	
R914			RK73HB1J562J	CHIP R	5.6K	J	1/16W	
R917,918			RK73HB1J000J	CHIP R	0.0	J	1/16W	
R919			RK73GB2A104J	CHIP R	100K	J	1/10W	
R920			RK73HB1J473J	CHIP R	47K	J	1/16W	
R921			RK73HB1J682J	CHIP R	6.8K	J	1/16W	
D101			HZU5CLL	ZENER DIODE				
D102,103			HVC131	DIODE				
D105,106			RN142S	DIODE				
D202-204			1SV305F	VARIABLE CAPACITANCE DIODE				
D206			1SV305F	VARIABLE CAPACITANCE DIODE				
D401			DA221	DIODE				
D402-405			1SV325F	VARIABLE CAPACITANCE DIODE				
D407			1SV325F	VARIABLE CAPACITANCE DIODE				
D409			1SV325F	VARIABLE CAPACITANCE DIODE				
D410			1SV278F	VARIABLE CAPACITANCE DIODE				
D411			1SV325F	VARIABLE CAPACITANCE DIODE				
D412,413			HSC277	DIODE				
D414			HSC119	DIODE				
D415			1SV325F	VARIABLE CAPACITANCE DIODE				
D416,417			1SV305F	VARIABLE CAPACITANCE DIODE				
D501			1SR154-400	DIODE				
D502			1SS388F	DIODE				
D505			1SS388F	DIODE				
D506			HRB0502A	DIODE				
D508			DAN222	DIODE				
D509			1SS388F	DIODE				
D511,512			1SS416	DIODE				
D901			1SS416	DIODE				
D902			DAN222	DIODE				
IC101			TA75W01FUF	MOS-IC				
IC201			TC75W51FK(F)	MOS-IC				
IC302			TK10931VTL-G	ANALOGUE IC				
IC304			TC75W51FK(F)	MOS-IC				
IC402			XC221A1200MRG	MOS-IC				
IC403			SKY72310-362	MOS-IC				
IC404			TC75W51FK(F)	MOS-IC				
IC501,502			NJM2878F4-33	BI-POLAR IC				
IC503			XC9235A15CM-G	MOS-IC				
IC504			XC6209B502P-G	MOS-IC				
IC505			XC6209B332M-G	MOS-IC				
IC506			LT1616ES6-PBF	ANALOGUE IC				
IC507			XC61CC5602N-G	MOS-IC				
IC509			TC7W53FK(F)	MOS-IC				
IC601			**Note 1**	ROM IC				
IC603			**Note 1**	MICROPROCESSOR IC				
IC605			**Note 1**	SRAM IC				
IC607			XC6119C29ANR	MOS-IC				
IC609			SM5023CNDH-G	MOS-IC				
IC610			**Note 1**	MOS-IC				
IC611,612			TC7SH08FU-F	MOS-IC				
IC613		*	KXSD9-2050	MOS-IC				
IC901			TA7368FG	MOS-IC				
IC902			XC6209B502P-G	MOS-IC				

Note 1: This part cannot be replaced. Therefore, this part is not supplied as a service part.

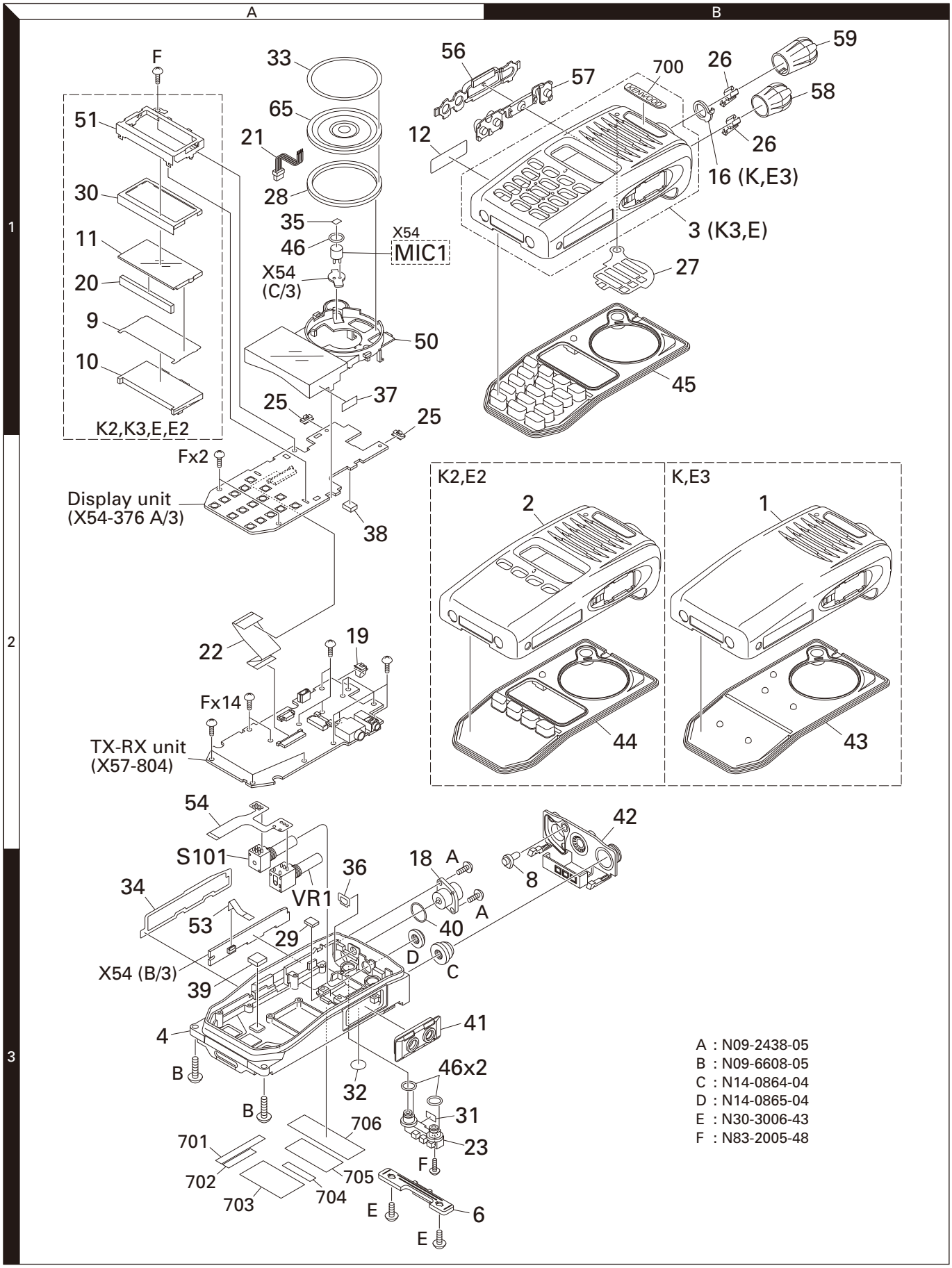
PARTS LIST

TX-RX UNIT (X57-8040-10)

Ref. No.	Address	New parts	Parts No.	Description	Destination
IC904			TC75S51FE(F)	MOS-IC	
Q102			2SC4926YD	TRANSISTOR	
Q103			RD01MUS1-T113	FET	
Q104			RD07MUS2BT112	FET	
Q105			2SC5383-T111	TRANSISTOR	
Q106			RT1N441U-T111	TRANSISTOR	
Q107			SSM3K15TE(F)	FET	
Q108			SSM3J05FU-F	FET	
Q109			SSM3K15TE(F)	FET	
Q110			SSM6L05FU-F	FET	
Q201			3SK318	FET	
Q202			3SK294-FP	FET	
Q301			2SC5108(Y)F	TRANSISTOR	
Q303			2SC4215-F(Y)	TRANSISTOR	
Q401,402			MCH3914(7)-H	FET	
Q403			2SC5383-T111	TRANSISTOR	
Q404			2SC5636	TRANSISTOR	
Q405			2SC5108(Y)F	TRANSISTOR	
Q406			SSM6L05FU-F	FET	
Q407			SSM3J05FU-F	FET	
Q408			2SC5636	TRANSISTOR	
Q501			2SJ648-A	FET	
Q502			SSM3K15TE(F)	FET	
Q503			EMD5	TRANSISTOR	
Q505			2SA1955A-F	TRANSISTOR	
Q506,507			SSM6N16FE-F	FET	
Q509			EMD12	TRANSISTOR	
Q510			RT1N141U-T111	TRANSISTOR	
Q511			RT1N441U-T111	TRANSISTOR	
Q512			SSM6L05FU-F	FET	
Q602			SSM3K15TE(F)	FET	
Q901			RT1N141U-T111	TRANSISTOR	
Q902			2SA1362-F(GR)	TRANSISTOR	
Q903			RT1N441U-T111	TRANSISTOR	
Q904,905			2SK3577-A	FET	
Q906			RT1N141U-T111	TRANSISTOR	
Q907			UPA672T-A	FET	
TH101			ERTJ0EV104H	THERMISTOR	
TH402			ERTJ0EV104H	THERMISTOR	

Ref. No.	Address	New parts	Parts No.	Description	Destination

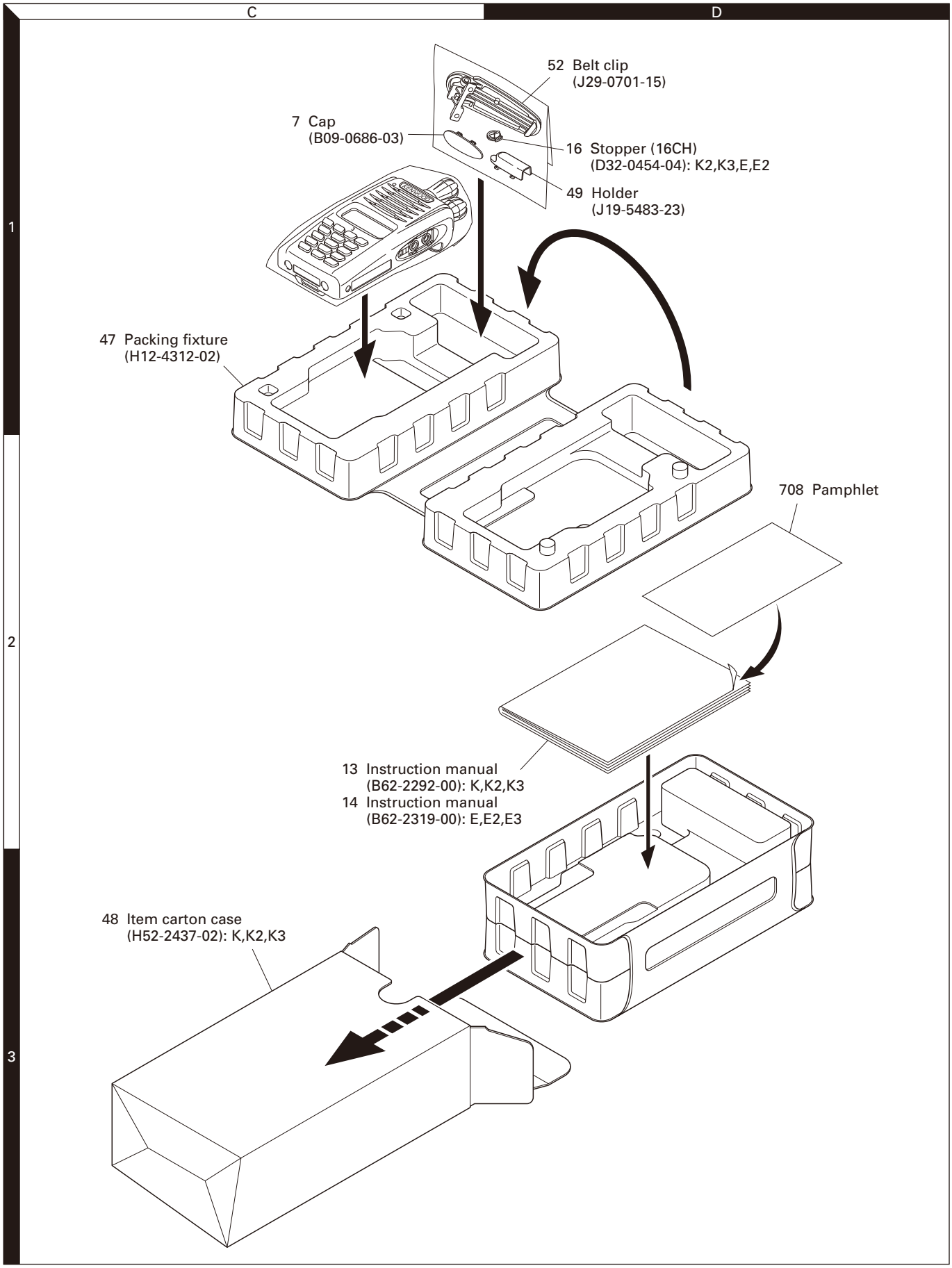
EXPLODED VIEW



A : N09-2438-05
B : N09-6608-05
C : N14-0864-04
D : N14-0865-04
E : N30-3006-43
F : N83-2005-48

Parts with the exploded numbers larger than 700 are not supplied.

PACKING



Parts with the exploded numbers larger than 700 are not supplied.

TROUBLE SHOOTING

Fault Diagnosis of the BGA (Ball Grid Array) IC

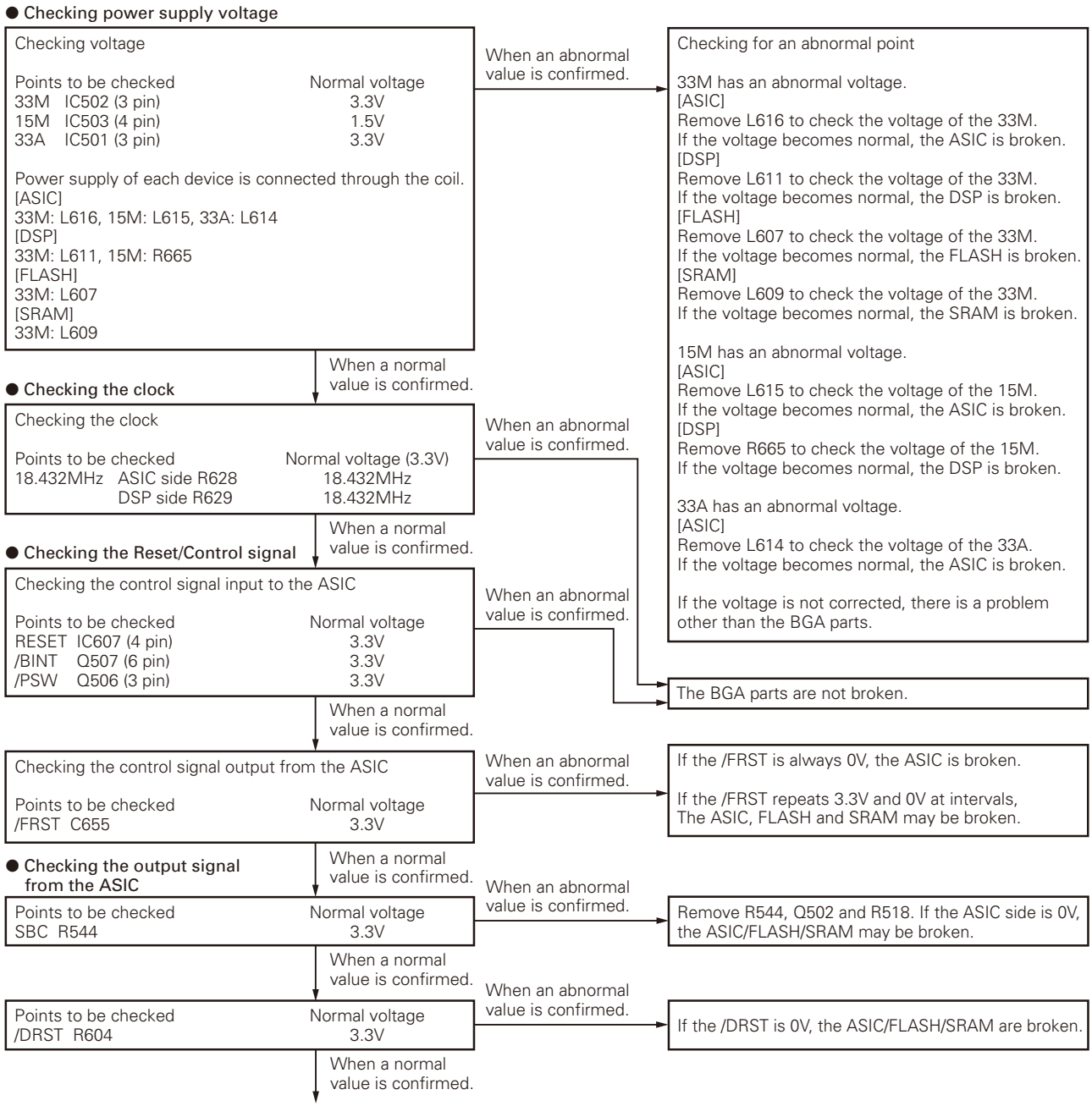
■ Overview

A flowchart for determining whether or not the transceiver can be powered on (the LCD does not function even if the power switch is turned on) due to broken BGA parts.

■ BGA parts

ASIC (IC610), DSP (IC603), FLASH (IC601), SRAM (IC605)

When the BGA IC is problematic, please bring the printed circuit board (X57-8040-11) in for service. Various ESN/default adjustment values are written on the printed circuit board for service.
Additionally various ESN stickers are included. (Please refer to pages 33 and 34.)
After the printed circuit board has been readjusted, please attach any ESN stickers to the chassis. When "ESN Validation" is used with Trunking, you must modify the ESN register.



TROUBLE SHOOTING

● The LCD displays control *1

Points to be checked	Normal voltage	When an abnormal value is confirmed.	If the /LCDCS is 0V or 3.3V, the ASIC/FLASH/SRAM may be broken.
/LCDCS R667	3.3V→0V→3.3V		

When a normal value is confirmed.

The LCD does not function even if it is exchanged with the Display unit. *1
It is unlikely that the BGA parts are broken.

● When an error display appears on the LCD *1

The LCD displays "ERR 1".	An error occurs when the ASIC internal RAM reads or writes. The ASIC may be broken.
The LCD displays "ERR 2".	An error occurs when the DSP internal RAM reads or writes. The DSP may be broken.
The LCD displays "ERR 3".	An error occurs when the SRAM internal RAM reads or writes. The SRAM may be broken.

● When the LED color changes red and orange alternately *2

A warning tone sounds	The frequency data was not written. (Unprogramming)
A warning tone does not sound	An error occurs when the ASIC internal RAM reads or writes. The ASIC may be broken.
	or An error occurs when the DSP internal RAM reads or writes. The DSP may be broken.
	or An error occurs when the SRAM internal RAM reads or writes. The SRAM may be broken.

*1: K2,K3,E and E2 models only
*2: K and E3 models only

■ Descriptions of signal names

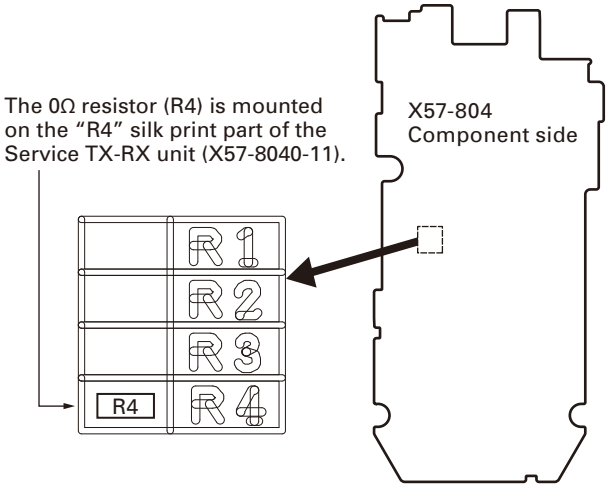
1) RST(RESET)	: ASIC reset signal	LOW → Reset
2) /BINT	: Battery final voltage monitoring	LOW → Final voltage
3) PSW	: Power switch signal	HIGH → ON
4) /FRST	: FLASH reset signal	LOW → Reset
5) SBC	: Switch B control	HIGH → ON
6) /DRST	: DSP reset signal	LOW → Reset

Replacing TX-RX Unit

■ TX-RX unit Information

Model Name	Original TX-RX unit Number	For Service TX-RX unit Number
NX-220	X57-8040-10	X57-8040-11

■ Method of confirming "Original TX-RX unit" and "Service TX-RX unit"



TROUBLE SHOOTING

X57-804	R4
0-10	(None)
0-11	0Ω

Note:
- The 0Ω resistor (R4) is used to differentiate the destination with a visual check. These are not connected with any PCB pattern; they are specifically for production control. There is no need to change the mount of the resistor.
- There is no difference between the schematic diagram of the Service TX-RX unit (X57-8040-11) and the schematic diagram of the original TX-RX unit (X57-8040-10). (R4 is connected with GND (ground) only.)

■ Supplied Accessories of "Service TX-RX unit"

Item (Including Parts Number)	Quantity
TX-RX Unit (X57-804)	1
Kenwood ESN Label	1
NXDN ESN Label	1
MPT ESN Label	1
Addendum (B59-2655-XX)	1

■ "Service TX-RX unit" Data

The following data is written on the service TX-RX unit:

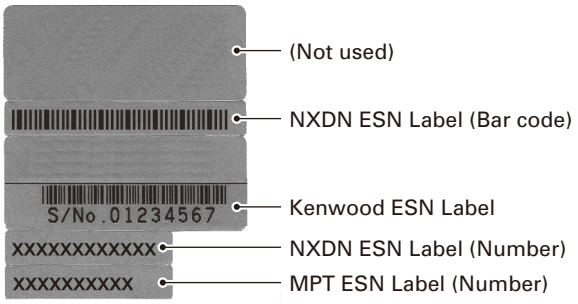
Data Type	Description
Firmware	NX-220 K type Firmware.
FPU Data (PC programming mode)	X57-804 (NX-220) Kx type data.
Various Adjustment Data (PC Test mode)	General adjustment values for the X57-804 (NX-220).
Kenwood ESN	Model name: NX-220S Type: Kx The same number as the Kenwood ESN label is written.
NXDN ESN/MPT ESN	The same number as the NXDN ESN/ MPT ESN label is written.

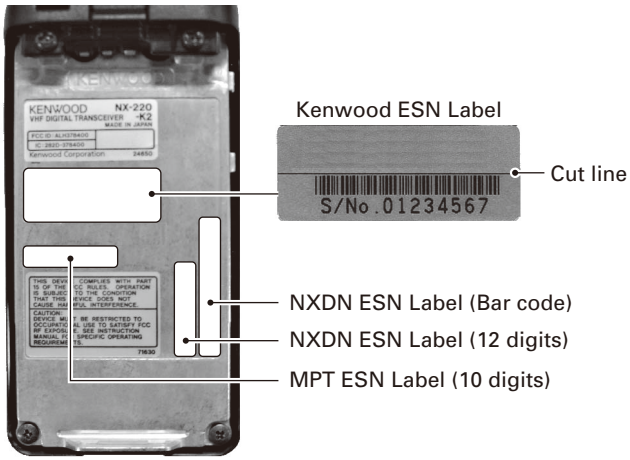
■ After Changing the PCB

1. After changing the printed circuit board, write the up-to-date Firmware following the instructions in the "RE-ALIGNMENT - 6.Firmware Programming Mode".
   - Write the Firmware in accordance to the Market. If you write different Market Firmware, there are times communication with the FPU is not possible.
2. Using the KPG-141D, select your desired item (Model Name and Frequency) from the Model> Product Information menu, then use Program> Write Data to the Transceiver to write the FPU data (PC Programming mode). When writing to the transceiver, a Warning Message, corresponding to the item selected, appears. Click [OK] to continue writing the data.
3. Enter Program> Test Mode, then adjust the various adjustment data (PC Test Mode) as described in the "ADJUSTMENT".
4. Attach the new labels corresponding to the new printed circuit board. (Refer to the images below for label placement.)
5. If necessary, write the FPU data used by the customer with the KPG-141D.

Note:
- When using the ESN Validation function of Trunking, the ESN number changes when the circuit board is changed (the number is written on the circuit board); the Trunking System cannot be accessed. Maintain the ESN data of the Trunking System following the new ESN.
- When a new printed circuit board is used, the Kenwood ESN changes, as does the Transceiver Information display of the KPG-141D, but this does not have any effect on the operation of the transceiver.
- If changing to the original ESN, please contact our service center.

■ ESN Label Layout



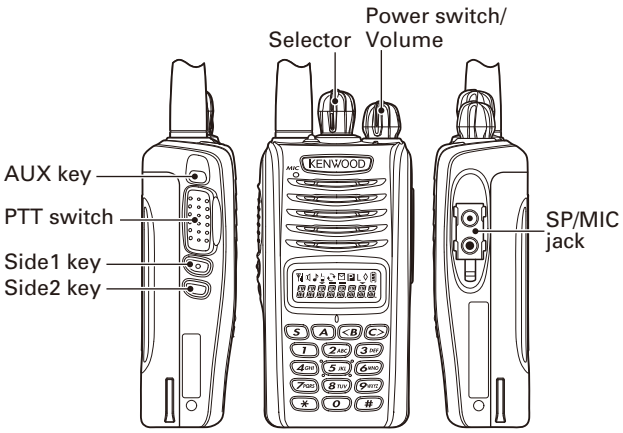


Note:

A UPC code and UPC barcode is not printed on the Kenwood ESN Label. If necessary, cut the label at the cut-off line and attach only the serial number.

ADJUSTMENT (K TYPE)

Controls



■ Preparations for checking/tuning the transceiver

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

Whenever the transmitter is turned on, 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 checking/tuning.

Panel Test Mode (K2 and K3 models only)

■ Test mode operation features

This transceiver has a test mode. ***To enter test mode, press and hold the [A] key while turning the transceiver power ON. Before the transceiver enters test mode, the frequency version information appears on the LCD momentarily.*** Test mode can be inhibited by programming. To exit test mode, turn the transceiver power OFF. The following functions are available in test mode.

■ Key operation

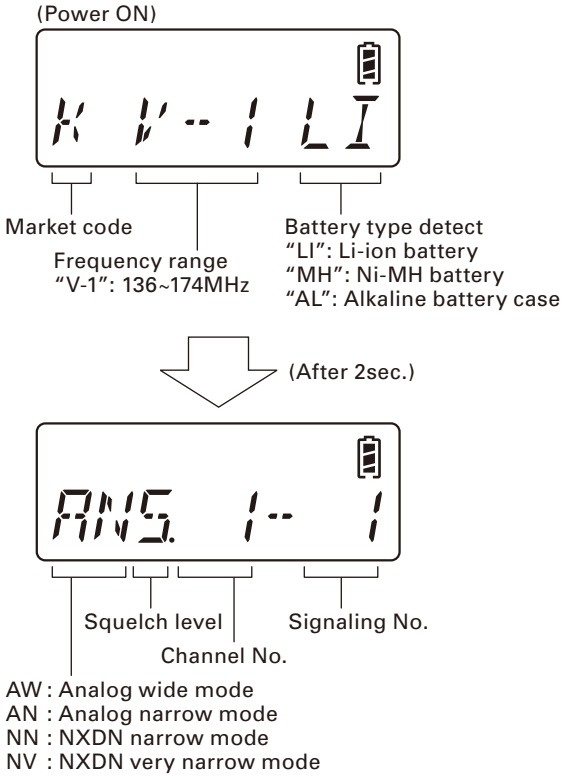
Key	"—" not appears on the LCD display	
	Function	Display
[Selector]	Test channel up/down	Channel No.
[Side1]	Push: Squelch level up Hold: Squelch off	Squelch level Squelch off: icon appears
[Side2]	Wide/Narrow/Very narrow	Wide: "W" Narrow: "N" Very narrow: "V"
[***S***]	Shift to panel tuning mode	-
[***A***]	Function on	"—" appears on the LCD display
[<***B***]	MSK 1200bps and 2400bps	2400bps: icon appears
[***C***>]	Push: Test signaling up Hold: Test signaling up continuously	Signaling No.
[AUX]	Analog/NXDN	Analog: "A", NXDN: "N"
[PTT]	Transmit	-
[0] to [9] and [#], [*]	Use as the DTMF keypad. If a key is pressed during transmission, the DTMF corresponding to the key that was presses is sent.	-

Key	"—" appears on the LCD display	
	Function	Display
[Selector]	Test channel up/down	Channel No.
[Side1]	Function off	-
[Side2]	LCD all lights	LCD all point appears
[***S***]	High power/Low power	High: L icon not appears Low : L icon appears
[***A***]	Function off	-
[<***B***]	Compander on/off	On: P icon appears
[***C***>]	Beat shift on/off	On: ◊ icon appears
[AUX]	Function off	-
[PTT]	Transmit	-
[0] to [9] and [#], [*]	Function off	-

• LED indicator

Red LED Lights during transmission.
Green LED Lights when there is carrier.

• LCD display in panel test mode



ADJUSTMENT (K TYPE)

■ 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.

• Test frequency

CH	RX (MHz)	TX (MHz)
1	155.05000	155.10000
2	136.05000	136.10000
3	173.95000	173.90000
4	155.00000	155.00000
5	155.20000	155.20000
6	155.40000	155.40000
7~16	-	-

• Analog mode signaling

No.	RX	TX
1	None	None
2	None	100Hz Square Wave
3	LTR Data: AREA=0, GOTO=12 HOME=12 ID=47, FREE=25	LTR Data: AREA=0, GOTO=12 HOME=12 ID=47, FREE=25
4	QT: 67.0Hz	QT: 67.0Hz
5	QT: 151.4Hz	QT: 151.4Hz
6	QT: 210.7Hz	QT: 210.7Hz
7	QT: 254.1Hz	QT: 254.1Hz
8	DQT: D023N	DQT: D023N
9	DQT: D754I	DQT: D754I
10	DTMF: 159D	DTMF: 159D
11	None	DTMF Code 9
12	2-tone: A: 304.7Hz B: 3106.0Hz	2-tone: A: 304.7Hz B: 3106.0Hz
13	Single Tone: 979.9Hz	Single Tone: 979.9Hz
14	None	Single Tone: 1000Hz
15	None	MSK
16	MSK	MSK

• NXDN mode signaling

No.	RX	TX
1	RAN1	RAN1
2	None	PN9
3	RAN1	Maximum deviation pattern
7	None	FSW+PN9 (PC test mode only)

RAN: Radio Access Number
PN9: Pseudo-Random Pattern (for production only)

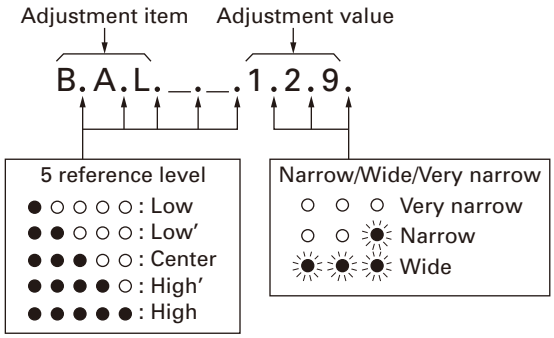
Panel Tuning Mode (K2 and K3 models only)

■ Transceiver tuning (To enter tuning mode)

To enter tuning mode, press the [***S***] key while the transceiver is in test mode. Use the [***<B***] key to write tuning data through tuning modes, and the [Selector] to adjust tuning requirements (1 to 4096 appears on the LCD).

Use the [***C>***] key to select the adjustment item through tuning modes. Use the [***A***] key to adjust 5 reference level adjustments, and use the [Side2] key to switch between Wide/Narrow/Very narrow.

• LCD display in panel tuning mode



■ Key operation

Key	Function	
	Push	Hold (1 second)
[Selector]	Adjustment value up/down	
[Side1]	20Hz/2kHz (During transmission in balance adjustment)	-
[Side2]	Wide/Narrow/Very narrow	-
[***S***]	Shift to panel test mode	-
[***A***]	To enter 5 reference level adjustments	-
[***<B***]	Writes the adjustment value	-
[***C>***]	Go to next adjustment item	Back to last adjustment item
[AUX]	-	
[PTT]	Transmit	
[0] to [9] and [#], [*]	-	

■ 5 reference level adjustments frequency

Tuning point	RX (MHz)	TX (MHz)
Low	136.05000	136.10000
Low'	145.55000	145.60000
Center	155.05000	155.10000
High'	164.55000	164.60000
High	173.95000	173.90000

ADJUSTMENT (K TYPE)

■ Adjustment item supplement

Adjustment Item	Description
Counterclockwise Volume	"Counterclockwise Volume" is adjusted at the minimum volume position. "Clockwise Volume" is adjusted at the maximum volume position. These adjustments can correct the volume variation. Both "Counterclockwise Volume" and "Clockwise Volume" must be adjusted. (The curve data of volume is applied.)
Clockwise Volume	
Receive Assist	The lock voltage of VCO (Receive) is adjusted. This item must be adjusted before all adjustment items for receiver section are adjusted. This item can be adjusted only in PC Test Mode.
Transmit Assist	The lock voltage of VCO (Transmit) is adjusted. This item must be adjusted before all adjustment items for transmitter section are adjusted. This item can be adjusted only in PC Test Mode.
Frequency	Frequency stability is adjusted under receiving condition with SSG. The SSG needs 0.003ppm accuracy so please use a standard oscillator if necessary. This item can be adjusted only in PC Test Mode so that the adjustment value is not changed easily.
High Transmit Power	High Transmit Power is adjusted.
Low Transmit Power	Low Transmit Power is adjusted.
Balance	The transmit audio frequency response is adjusted. This item is adjusted so that the deviation of 2kHz becomes the same deviation of 20Hz. This item must be adjusted before all adjustment items for deviations are adjusted.
Maximum Deviation (NXDN Narrow/Very Narrow)	Maximum Deviation of NXDN (Narrow/Very Narrow) is adjusted.
Maximum Deviation (Analog Wide/Narrow)	Maximum Deviation of Analog (Wide/Narrow) is adjusted. This item must be adjusted before all adjustment items for tone deviations are adjusted. **Note:** "Maximum Deviation (Analog Narrow)" must be adjusted before "CW ID Deviation (NXDN Very Narrow)" is adjusted.
QT Deviation	QT tone deviation is adjusted.
DQT Deviation	DQT tone deviation is adjusted.
LTR Deviation	LTR tone deviation is adjusted.
DTMF Deviation	DTMF tone deviation is adjusted.
Single Tone Deviation	The deviation of Single Tone used in "2-tone" is adjusted.
MSK Deviation	MSK tone deviation is adjusted.
CW ID Deviation	CW ID tone deviation is adjusted. CW ID is used to inform the others who is transmitting on a 6.25 kHz spacing channel. (In FCC rule, Analog mode or CW ID is required for each channel-spacing.)
Sensitivity 1	Band-Pass Filter is adjusted. The performance of Receive Sensitivity is improved. This item can be adjusted only in PC Test Mode.
Sensitivity 2	The gain of RF amplifier is adjusted. The performance of the interfering wave is improved. This item can be adjusted only in PC Test Mode.
RSSI Reference	The minimum RSSI level for scan stop is adjusted.
Open Squelch	The squelch level at level "5" is adjusted.
Low RSSI	RSSI display level "" is adjusted. Both "Low RSSI" and "High RSSI" must be adjusted. (The curve data of RSSI level is applied.)
High RSSI	
Tight Squelch	The squelch level at level "9" is adjusted.
Battery Warning Level	Battery Warning Level (LED blinking level) is adjusted. Battery Warning Level minus 0.4V is the transmission inhibited level.

ADJUSTMENT (K TYPE)

■ Adjustment item and Adjustment range

Order	Adjusutment item	Panel tuning	PC test	AW (Analog Wide)	AN (Analog Narrow)	NN (NXDN Narrow)	NV (NXDN Very Narrow)	Adjust item Number
				Adjustment range				
1	Counterclockwise Volume	✓	✓	1 point ADJ				Common Section 2
				1~256				
2	Clockwise Volume	✓	✓	1 point ADJ				Common Section 3
				1~256				
3	Receive Assist		✓	5 point ADJ				Common Section 4
				1~4096				
4	Transmit Assist		✓	5 point ADJ				Common Section 5
				1~4096				
5	Frequency		✓	1 point ADJ				Common Section 6
				1~4096				
6	High Transmit Power	✓	✓	-	5	-	-	Transmitter Section 1
				1~1024				
7	Low Transmit Power	✓	✓	-	5	-	-	Transmitter Section 2
				1~1024				
8	Balance	✓	✓	-	5	-	-	Transmitter Section 3
				1~1024				
9	Maximum Deviation (NXDN)	✓	✓	-	-	5	5	Transmitter Section 4
				1~1024				
10	Maximum Deviation (Analog)	✓	✓	5	5	-	-	Transmitter Section 5
				1~1024				
11	QT Deviation	✓	✓	1	1	-	-	Transmitter Section 6
				1~1024				
12	DQT Deviation	✓	✓	1	1	-	-	Transmitter Section 7
				1~1024				
13	LTR Deviation	✓	✓	1	1	-	-	Transmitter Section 8
				1~1024				
14	DTMF Deviation	✓	✓	1	1	-	-	Transmitter Section 9
				1~1024				
15	Single Tone Deviation	✓	✓	1	1	-	-	Transmitter Section 10
				1~1024				
16	MSK Deviation	✓	✓	1	1	-	-	Transmitter Section 11
				1~1024				
17	CW ID Deviation	✓	✓	-	-	-	1	Transmitter Section 12
				1~1024				
18	Sensitivity 1		✓	-	5	-	-	Receiver Section 2
				1~256				
19	Sensitivity 2		✓	-	5	-	-	Receiver Section 3
				1~256				
20	RSSI Reference	✓	✓	5	5	- *1	5	Receiver Section 4
				1~256				
21	Open Squelch	✓	✓	5	5	- *1	5	Receiver Section 5
				1~256				

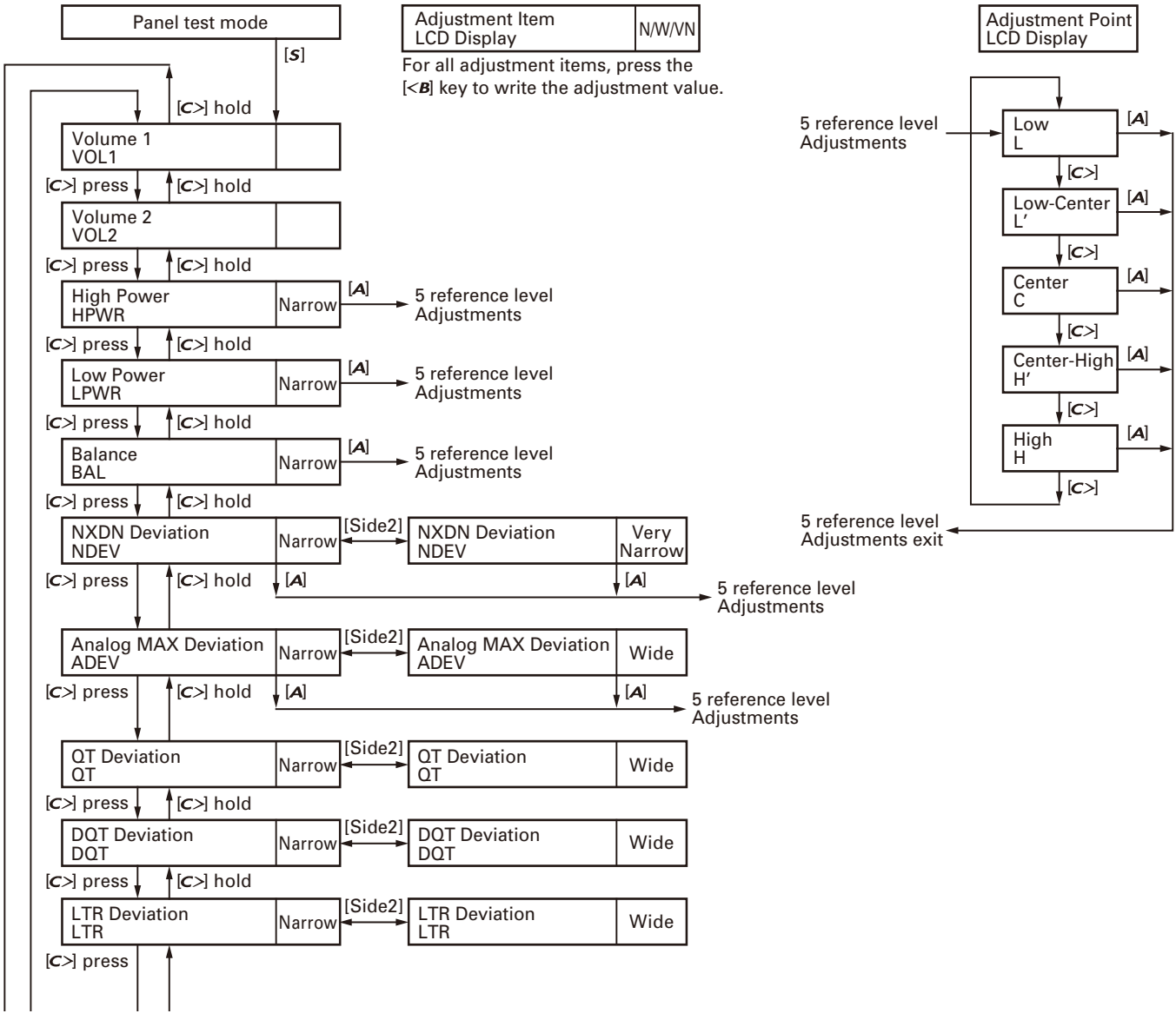
ADJUSTMENT (K TYPE)

Order	Adjusutment item	Panel tuning	PC test	AW (Analog Wide)	AN (Analog Narrow)	NN (NXDN Narrow)	NV (NXDN Very Narrow)	Adjust item Number
				Adjustment range				
22	Low RSSI	✓	✓	5	5	- *1	5	Receiver Section 6
				1~256				
23	High RSSI	✓	✓	5	5	- *1	5	Receiver Section 7
				1~256				
24	Tight Squelch	✓	✓	5	5	-	-	Receiver Section 8
				1~256				
25	Battery Warning Level	✓	✓	1 point ADJ				Transmitter Section 13
				1~256				

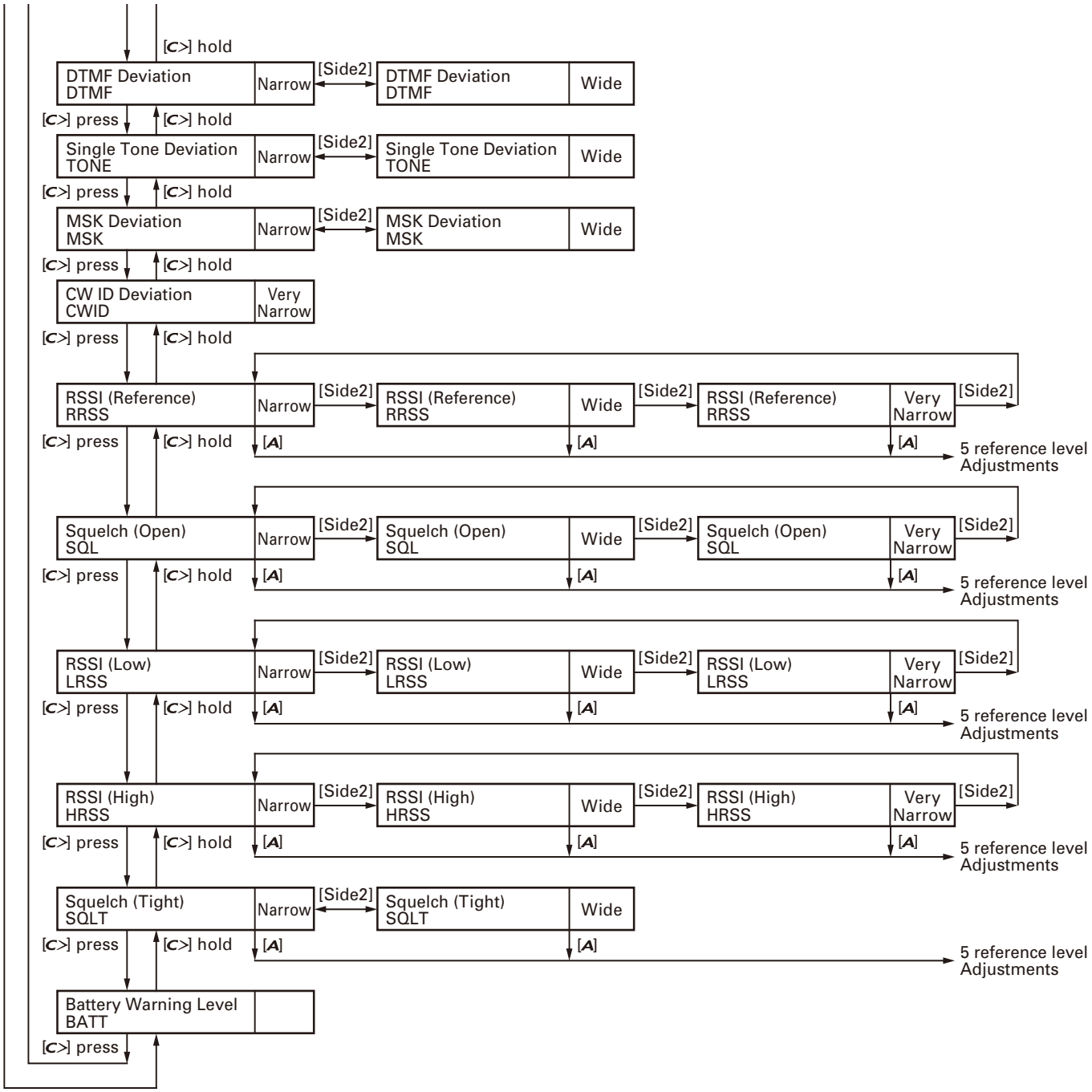
*1: Because NXDN Narrow is adjusted by adjusting Analog Narrow, it is not necessary to adjust NXDN Narrow.

■ Panel tuning mode flow chart

Note: In this Panel tuning mode flow chart, the Adjustment item name is modified.



ADJUSTMENT (K TYPE)



ADJUSTMENT (K TYPE)

Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range Modulation Output When performing the Frequency adjustment, the following accuracy is necessary. • 0.003ppm Use a standard oscillator for adjustments, if necessary.	136 to 174MHz Frequency modulation and external modulation –127dBm/0.1µV to greater than –20dBm/22.4mV
2. Power Meter	Input Impedance Operation Frequency Measurement Capability	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. 8Ω Dummy Load		Approx. 8Ω, 3W
12. Regulated Power Supply		5V to 10V, approx. 3A Useful if ammeter equipped

■ 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.)

■ Nut wrench

In order to turn the volume nut and the channel selector nut, use a recommendation tool.

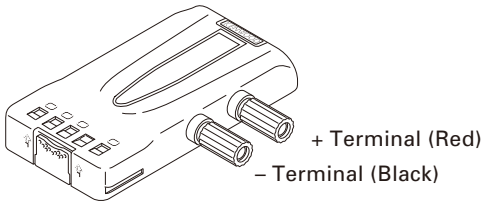
KENWOOD part No.: W05-1123-00

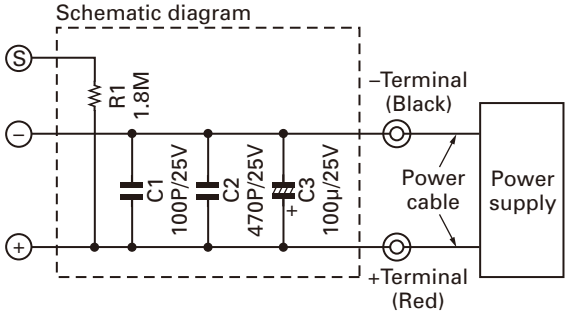
■ Battery Jig (W05-0909-00)

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.

When using the battery jig in user mode, the transceiver assumes that a lithium-ion battery pack is attached to the transceiver. In adjustment mode, battery type detection is not performed.

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 (K TYPE)

Radio Check Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel test mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Frequency check	1) CH-Sig: 1-1 PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	f. counter	Panel	ANT			Check an internal temperature of radio from 20˚C to 26˚C.	155.099962~ 155.100038MHz (±0.25ppm @155.1MHz)
2. High power check (Batt: 7.5V)	1) CH-Sig: 1-1 PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter					Check	4.0W~6.0W 2.0A or less
	2) CH-Sig: 2-1 PTT: ON	2) Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
	3) CH-Sig: 3-1 PTT: ON	3) Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
3. Low power check (Batt: 7.5V)	1) CH-Sig: 1-1 PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							0.7W~1.3W 1.0A or less
	2) CH-Sig: 2-1 PTT: ON	2) Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
	3) CH-Sig: 3-1 PTT: ON	3) Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel test mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. MIC sensitivity check	1) CH-Sig: 1-1 AG: 1kHz PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 AG: 1kHz PTT: Press [Transmit] button.	Deviation meter Oscilloscope AG AF VTVM	Panel	ANT SP/MIC connector			Adjust AG input to get a standard MOD.	12.5mV±5.8mV
5. Sensitivity check	1) CH-Sig : 1-1 SSG output Wide: –117dBm (0.32µV) (MOD: 1kHz/±3kHz) Narrow: –117dBm (0.32µV) (MOD: 1kHz/±1.5kHz)	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 SSG output Wide: –117dBm (0.32µV) (MOD: 1kHz/±3kHz) Narrow: –117dBm (0.32µV) (MOD: 1kHz/±1.5kHz)	SSG AF VTVM Oscilloscope Distortion meter 8Ω dummy load	Panel	ANT EXT SP connector			Check	12dB SINAD or more

Common Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	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. Counter-clockwise Volume	1) Adj item: [VOL1] Adjust: [✳✳✳]	1) Adj item: [Counterclockwise Volume]						[Panel tuning mode] Turn the volume knob counterclock-wise fully. Press [B] key to store the adjustment value. [PC test mode] Turn the volume knob counterclock-wise fully. Press [Apply] button to store the adjust-ment value.	This item is needed when the variable resistor (R31-0685-05) is replaced.
3. Clockwise volume	1) Adj item: [VOL2] Adjust: [✳✳✳]	1) Adj item: [Clockwise Volume]						[Panel tuning mode] Turn the volume knob clockwise fully. Press [B] key to store the adjust-ment value. [PC test mode] Turn the volume knob clockwise fully. Press [Apply] button to store the adjustment value.	This item is needed when the variable resistor (R31-0685-05) is replaced.

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. Receive Assist	* This adjustment can be performed only in PC test mode.	[Manual Adjustment] 1) Adj item: [Receive Assist] 2) Adj item: [Low], [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.				Panel	[PC test mode] [◀],[▶]	[PC test mode] [Automatic Adjustment] 1) Press [Tune Assist Voltage] button. 2) Press [Apply All] button to store the adjustment value after the automatic adjustment has finished. [Manual Adjustment] [V] indicator on the PC window shows VCO lock voltage. Change the adjustment value to get VCO lock voltage within the limit of the specified voltage. **Note:** Confirm the VCO lock voltage approximately 3 seconds after the adjustment value is changed.	2.5V±0.1V [Automatic Adjustment] After the automatic adjustment is performed, verify that the VCO lock voltage is within the voltage range which is specified by the manual adjustment. [Manual Adjustment] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted. **Note:** The assist adjustment value must be between from 340 to 3550.
5. Transmit Assist	* This adjustment can be performed only in PC test mode.	[Manual Adjustment] 1) Adj item: [Transmit Assist] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.							
6. Frequency	* This adjustment can be performed only in PC test mode.	1) Adj item: [Frequency] SSG output: –20dBm (22.4mV) (CW (without modulation)) **Caution:** Perform the frequency adjustment under the following conditions. • Temperature range of +20°C to +26°C (+68.0°F to +78.8°F). (The temperature is displayed on the Frequency adjustment screen of the KPG-141D.) • Use an accuracy of 0.003ppm for the SSG. (Use a standard oscillator if necessary.)	SSG	Panel	ANT			[PC test mode] Press [Start] button of "Auto Tuning". Press [Apply] button to store the adjustment value after the automatic adjustment has finished.	[PC test mode] "IF20" value = Within 0±12 digits. The value of "IF20" will become around "0" after the adjustment has finished. **Remark:** "Frequency" is adjusted under receiving condition with SSG.

ADJUSTMENT (K TYPE)

Transmitter Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. High power (Batt: 7.5V)	1) Adj item: [HPWR] Adjust: [✳✳✳✳.] 2) Adj item: [H.PWR_]→[H.P.WR_]→[H.P.W.R_]→[H.P.W.R._]→[H.P.W.R._.] Adjust: [✳✳✳✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [High Transmit Power] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	5.0W	±0.1W 2.1A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
2. Low power (Batt: 7.5V)	1) Adj item: [LPWR] Adjust: [✳✳✳✳.] 2) Adj item: [L.PWR_]→[L.P.WR_]→[L.P.W.R_]→[L.P.W.R._]→[L.P.W.R._.] Adjust: [✳✳✳✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Low Transmit Power] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.						1.0W	±0.05W 1.1A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
3. Balance *2	1) Adj item: [BAL] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [B.AL_._]→[B.A.L_._]→[B.A.L._._]→[B.A.L._._.] Adjust: [✳✳✳✳.] PTT: ON Press [B] key to store the adjustment value. [Side1] key: Press while transmitting to change 20Hz and 2kHz. 20Hz: "–" not appears 2kHz: "–" appears	1) Adj item: [Balance] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value. [2kHz Sine Wave Check box]: Check while transmitting change to 2kHz.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	The Deviation of 20Hz frequency is fixed. Change the 2kHz adjustment value to become the same deviation of 20Hz within the specified range.	2kHz Tone deviation is within ±1.0% of 20Hz tone deviation. [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
*2: Refer to the "Necessary Deviation adjustment item for each signaling and mode" table on page 50. Balance adjustment is common with the adjustment of all signaling deviations.									
4. Maximum Deviation (NXDN) *3 [Narrow]	1) Adj item: [NDEV] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [N.DEV_]→[N.D.EV_]→[N.D.E.V_]→[N.D.E.V._]→[N.D.E.V._.] Adjust: [✳✳✳✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (NXDN Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	3056Hz Write the value as followings. 513 (Reference value)	2995~3117Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
Maximum Deviation (NXDN) *3 [Very Narrow]	1) Adj item: [NDEV] Adjust: [✳✳✳✳] 2) Adj item: [N.DEV_]→[N.D.EV_]→[N.D.E.V_]→[N.D.E.V._]→[N.D.E.V._.] Adjust: [✳✳✳✳] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	1337Hz Write the value as followings. 513 (Reference value)	1311~1363Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
5. Maximum Deviation (Analog) *3 [Narrow]	1) Adj item: [ADEV] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [A.DEV_]→[A.D.EV_]→[A.D.E.V_]→[A.D.E.V._]→[A.D.E.V._.] Adjust: [✳✳✳✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.						2100Hz Write the value as followings. 513 (Reference value)	2050~2150Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
[Wide]	1) Adj item: [ADEV] Adjust: [✳✳.✳.✳.] 2) Adj item: [A.DEV_]→[A.D.EV_]→[A.D.E.V_]→[A.D.E.V._]→[A.D.E.V._.] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (Analog Wide)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.						4200Hz Write the value as followings. 513 (Reference value)	4150~4250Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

*3: Refer to the "Necessary Deviation adjustment item for each signaling and mode" table on page 50.
Regarding Maximum Deviation (Analog), it is common with the adjustment of all analog signalings.

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
6. QT Deviation *4 [Narrow]	1) Adj item: [QT] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 513 (Reference value)	0.35kHz±0.05kHz
[Wide]	1) Adj item: [QT] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Wide)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							0.75kHz±0.05kHz
7. DQT Deviation *4 [Narrow]	1) Adj item: [DQT] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 430 (Reference value)	0.35kHz±0.05kHz
[Wide]	1) Adj item: [DQT] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Wide)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							0.75kHz±0.05kHz
8. LTR Deviation *4 [Narrow]	1) Adj item: [LTR] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 465 (Reference value)	0.75kHz±0.05kHz
[Wide]	1) Adj item: [LTR] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Wide)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							1.00kHz±0.05kHz

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
9. DTMF Deviation *4 [Narrow]	1) Adj item: [DTMF] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 540 (Reference value)	1.25kHz±0.05kHz
[Wide]	1) Adj item: [DTMF] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Wide)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							2.50kHz±0.05kHz
10. Single Tone Deviation *4 [Narrow]	1) Adj item: [TONE] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Single Tone Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 513 (Reference value)	1.50kHz±0.05kHz
[Wide]	1) Adj item: [TONE] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Single Tone Deviation (Analog Wide)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							3.00kHz±0.05kHz
11. MSK Deviation *4 [Narrow]	1) Adj item: [MSK] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 513 (Reference value)	1.50kHz±0.05kHz
[Wide]	1) Adj item: [MSK] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Wide)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							3.00kHz±0.05kHz

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
12. CW ID Deviation *4 [NXDN Very Narrow]	1) Adj item: [CWID] Adjust: [✳✳✳✳] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [CW ID Deviation (NXDN Very Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 376 (Reference value)	1.00kHz±0.10kHz
*4: Refer to the "Necessary Deviation adjustment item for each signaling and mode" table on page 50.									
13. Battery Warning Level writing	1) Adj item: [BATT] Adjust: [✳✳✳] PTT: ON	1) Adj item: [Battery Warning Level] PTT: Press [Transmit] button.	Power meter DVM	Panel	ANT BATT terminal			Press the PTT switch or [Transmit] button on the PC window. Apply 6.20V to battery terminal. Confirm that one pre-determined numeric in the range 1 to 256 appears. [Panel tuning mode] Press [B] key to store the adjustment value. [PC test mode] Press [Apply] button to store the adjustment value.	
14. Battery Warning Level check	[Panel test mode] 1) CH-Sig: 1-1 BATT terminal voltage: 6.0V while transmitting	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 BATT terminal voltage: 6.0V while transmitting						Check	The transceiver can transmit with causing the LED to blink.

ADJUSTMENT (K TYPE)

■ Necessary Deviation adjustment item for each signaling and mode

The following shows the necessary adjustment items for each signaling deviation. Please read the following table like the following example. In the case of the signaling "QT (Wide)", this signaling is composed of three elements [Balance, Maximum Deviation (Analog Wide) and QT Deviation (Wide)]. Please adjust Balance and Maximum Deviation (Analog Wide) before adjusting QT Deviation (Wide).

Mode	Signaling	Necessary adjustment and order		
		Wide	Narrow	Very Narrow
Analog	Audio	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow)	-
	QT	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide) Step 3. QT Deviation (Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. QT Deviation (Narrow)	-
	DQT	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide) Step 3. DQT Deviation (Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. DQT Deviation (Narrow)	-
	LTR	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide) Step 3. LTR Deviation (Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. LTR Deviation (Narrow)	-
	DTMF	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide) Step 3. DTMF Deviation (Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. DTMF Deviation (Narrow)	-
	2TONE	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide) Step 3. Single Tone Deviation (Analog Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. Single Tone Deviation (Analog Narrow)	-
	MSK (FleetSync)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide) Step 3. MSK Deviation (Analog Wide)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. MSK Deviation (Analog Narrow)	-
NXDN	Audio	-	Step 1. Balance adjust Step 2. Maximum Deviation (NXDN Narrow)	Step 1. Balance adjust Step 2. Maximum Deviation (NXDN Very Narrow)
	CW ID	-	-	Step 1. Balance adjust Step 2. Maximun Deviation (Analog Narrow) Step 3. CW ID Deviation (NXDN Very Narrow)

- Balance is common with all the above deviation adjustments. If Balance (Transmitter Section 3) has already adjusted, please skip Step 1 and adjust from Step 2.
- Maximum Deviation (Analog Wide/Narrow) is common with all the analog signaling deviations and CW ID Deviation (NXDN Very Narrow). If Balance and Maximum Deviation (Analog Wide/Narrow) (Transmitter Section 5) have already adjusted, please skip Step 2 and adjust from Step 3.

Receiver Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. AF level setting	[Panel test mode] 1) CH-Sig: 1-1 SSG output: –47dBm (1mV) (MOD: 1kHz/±1.5kHz) Wide/Narrow: Narrow Beat Shift: Uncheck Compander: Uncheck	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 Wide/Narrow: Narrow Beat Shift: Uncheck Compander: Uncheck SSG output: –47dBm (1mV) (MOD: 1kHz/±1.5kHz)	SSG DVM AF VTVM Dummy load	Panel	ANT SP/MIC connector	Panel	Volume knob	Turn the Volume Knob to obtain 0.63V AF output.	0.63V±0.1V

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
2. Sensitivity 1	* This adjustment can be performed only in PC test mode.	1) Adj item: [Sensitivity 1] 2) Adj item: [Low], [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.	SSG AF VTVM Dummy load Oscilloscope	Panel	ANT SP/MIC connector		[PC test mode] [◀],[▶]	Write the value as followings. [Low]: 15 (Fixed) [Low']: 35 (Preset) [Center]: 80 (Preset) [High']: 135 (Preset) [High]: 180 (Preset)	**Note:** The Preset value of Sensitivity 2 must be written before adjusting Sensitivity 1.
		3) Adj item: [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.						Decrease the adjustment value from the preset value to get 12dB SINAD. SSG output: –119dBm (0.25μV) (MOD: 1kHz/±1.5kHz)	
3. Sensitivity 2	* This adjustment can be performed only in PC test mode.	1) Adj item: [Sensitivity 2] 2) Adj item: [Low], [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.						Write the value as followings. [Low]: 190 (Preset) [Low']: 165 (Fixed) [Center]: 165 (Fixed) [High']: 165 (Fixed) [High]: 165 (Fixed)	
		3) Adj item: [Low] Press [Apply All] button to store the adjustment value.						Decrease the adjustment value from the preset value to get 12dB SINAD. SSG output: –119dBm (0.25μV) (MOD: 1kHz/±1.5kHz)	
4. RSSI reference *5 [Analog Narrow]	1) Adj item: [RRSS] Adjust: [✳✳✳.] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [RSSI Reference (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Wide]	1) Adj item: [RRSS] Adjust: [✳.✳.✳.] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±3kHz)	1) Adj item: [RSSI Reference (Analog Wide)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±3kHz)							
[NXDN Very Narrow]	1) Adj item: [RRSS] Adjust: [✳✳✳] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [RSSI Reference (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)							Adjust with the analog signal.

*5: Because RSSI Reference (NXDN Narrow) is adjusted by adjusting RSSI Reference (Analog Narrow), it is not necessary to adjust RSSI Reference (NXDN Narrow).

ADJUSTMENT (K TYPE)

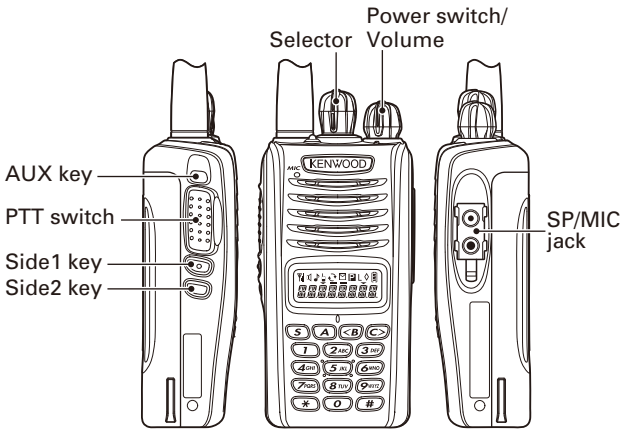
Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. Open Squelch *6 (Squelch level 5 adjust) [Analog Narrow]	1) Adj item: [SQL] Adjust: [✳✳✳.] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._.] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [Open Squelch (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	"Open Squelch" will not be adjusted correctly if MOD and Deviation are wrong. **Remark:** During production, a fixed value is written. Narrow: 110 (Fixed) Wide: 110 (Fixed)
[Analog Wide	1) Adj item: [SQL] Adjust: [✳.✳.✳.] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._.] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±3kHz)	1) Adj item: [Open Squelch (Analog Wide)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±3kHz)							
[NXDN Very Narrow]	1) Adj item: [SQL] Adjust: [✳✳✳] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._.] SSG output: 12dB SINAD level for Analog Narrow –4dB (MOD: 400Hz/±1.1kHz)	1) Adj item: [Open squelch (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level for Analog Narrow –4dB (MOD: 400Hz/±1.1kHz)							Adjust with the analog signal. This item is adjusted under the condition that MOD is "400Hz" and Deviation is "±1.1kHz" due to the circuit configuration. **Remark:** During production, a fixed value is written. 200 (Fixed)
*6: Because Open Squelch (NXDN Narrow) is adjusted by adjusting Open Squelch (Analog Narrow), it is not necessary to adjust Open Squelch (NXDN Narrow).									
6. Low RSSI at –118dBm *7 [Analog Narrow]	1) Adj item: [LRSS] Adjust: [✳✳✳.] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._]→[L.R.S.S._.] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [Low RSSI (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Wide]	1) Adj item: [LRSS] Adjust: [✳.✳.✳.] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._]→[L.R.S.S._.] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±3kHz)	1) Adj item: [Low RSSI (Analog Wide)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±3kHz)							

ADJUSTMENT (K TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
Low RSSI at –118dBm *7 [NXDN Very Narrow]	1) Adj item: [LRSS] Adjust: [✳✳✳] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._] SSG output: –118dBm (0.28µV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [Low RSSI (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28µV) (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	Adjust with the analog signal.
*7: Because Low RSSI at –118dBm (NXDN Narrow) is adjusted by adjusting Low RSSI at –118dBm (Analog Narrow), it is not necessary to adjust Low RSSI at –118dBm (NXDN Narrow).									
7. High RSSI at –80dBm *8 [Analog Narrow]	1) Adj item: [HRSS] Adjust: [✳✳✳.] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [High RSSI (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Wide]	1) Adj item: [HRSS] Adjust: [✳.✳.✳.] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±3kHz)	1) Adj item: [High RSSI (Analog Wide)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±3kHz)							
[NXDN Very Narrow]	1) Adj item: [HRSS] Adjust: [✳✳✳] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [High RSSI (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)							Adjust with the analog signal.
*8: Because High RSSI at –80dBm (NXDN Narrow) is adjusted by adjusting High RSSI at –80dBm (Analog Narrow), it is not necessary to adjust High RSSI at –80dBm (NXDN Narrow).									
8. Tight Squelch [Analog Narrow]	1) Adj item: [SQLT] Adjust: [✳✳✳.] 2) Adj item: [S.QLT_]→[S.Q.LT_]→[S.Q.L.T_]→[S.Q.L.T._] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [Tight Squelch (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	**Remark:** During production, a fixed value is written. 225 (Fixed)
[Analog Wide]	1) Adj item: [SQLT] Adjust: [✳.✳.✳.] 2) Adj item: [S.QLT_]→[S.Q.LT_]→[S.Q.L.T_]→[S.Q.L.T._] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±3kHz)	1) Adj item: [Tight Squelch (Analog Wide)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±3kHz)							

ADJUSTMENT (E TYPE)

Controls



■ Preparations for checking/tuning the transceiver

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

Whenever the transmitter is turned on, 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 checking/tuning.

Panel Test Mode (E and E2 models only)

■ Test mode operation features

This transceiver has a test mode. ***To enter test mode, press and hold the [A] key while turning the transceiver power ON. Before the transceiver enters test mode, the frequency version information appears on the LCD momentarily.*** Test mode can be inhibited by programming. To exit test mode, turn the transceiver power OFF. The following functions are available in test mode.

■ Key operation

Key	"—" not appears on the LCD display	
	Function	Display
[Selector]	Test channel up/down	Channel No.
[Side1]	Push: Squelch level up Hold: Squelch off	Squelch level Squelch off: icon appears
[Side2]	Wide 5k/Wide 4k/ Narrow/Very narrow	Wide 5k: "W" Wide 4k: "S" Narrow: "N" Very narrow: "V"
[S]	Shift to panel tuning mode	-
[A]	Function on	"—" appears on the LCD display
[<B]	MSK 1200bps and 2400bps	2400bps: icon appears
[C>]	Push: Test signaling up Hold: Test signaling up continuously	Signaling No.
[AUX]	Analog/NXDN	Analog: "A", NXDN: "N"
[PTT]	Transmit	-

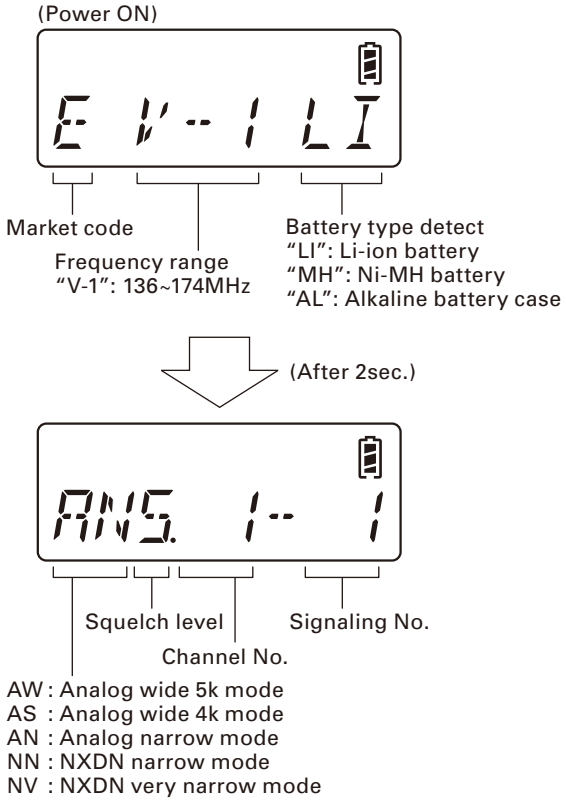
Key	"—" not appears on the LCD display	
	Function	Display
[0] to [9] and [#], [*]	Use as the DTMF keypad. If a key is pressed during transmission, the DTMF corresponding to the key that was presses is sent.	-

Key	"—" appears on the LCD display	
	Function	Display
[Selector]	Test channel up/down	Channel No.
[Side1]	Function off	-
[Side2]	LCD all lights	LCD all point appears
[S]	High power/Low power	High: L icon not appears Low : L icon appears
[A]	Function off	-
[<B]	Compander on/off	On: P icon appears
[C>]	Beat shift on/off	On: ◊ icon appears
[AUX]	Function off	-
[PTT]	Transmit	-
[0] to [9] and [#], [*]	Function off	-

• LED indicator

Red LED Lights during transmission.
Green LED Lights when there is carrier.

• LCD display in panel test mode



ADJUSTMENT (E TYPE)

■ 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.

• Test frequency

CH	RX (MHz)	TX (MHz)
1	155.05000	155.10000
2	136.05000	136.10000
3	173.95000	173.90000
4	155.00000	155.00000
5	155.20000	155.20000
6	155.40000	155.40000
7~16	-	-

• Analog mode signaling

No.	RX	TX
1	None	None
2	None	100Hz Square Wave
3	LTR Data: AREA=0, GOTO=12 HOME=12 ID=47, FREE=25	LTR Data: AREA=0, GOTO=12 HOME=12 ID=47, FREE=25
4	QT: 67.0Hz	QT: 67.0Hz
5	QT: 151.4Hz	QT: 151.4Hz
6	QT: 210.7Hz	QT: 210.7Hz
7	QT: 254.1Hz	QT: 254.1Hz
8	DQT: D023N	DQT: D023N
9	DQT: D754I	DQT: D754I
10	DTMF: 159D	DTMF: 159D
11	None	DTMF Code 9
12	2-tone: A: 304.7Hz B: 3106.0Hz	2-tone: A: 304.7Hz B: 3106.0Hz
13	Single Tone: 979.9Hz	Single Tone: 979.9Hz
14	None	Single Tone: 1000Hz
15	None	MSK
16	MSK	MSK

• NXDN mode signaling

No.	RX	TX
1	RAN1	RAN1
2	None	PN9
3	RAN1	Maximum deviation pattern
7	None	FSW+PN9 (PC test mode only)

RAN: Radio Access Number
PN9: Pseudo-Random Pattern (for production only)

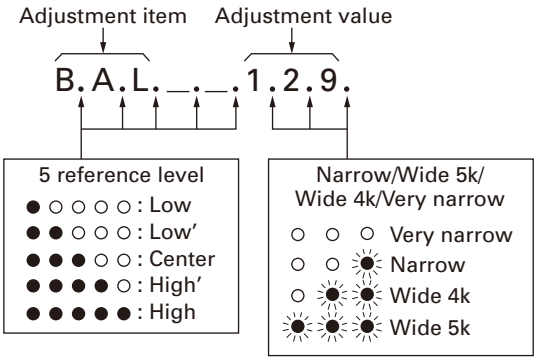
Panel Tuning Mode (E and E2 models only)

■ Transceiver tuning (To enter tuning mode)

To enter tuning mode, press the [***S***] key while the transceiver is in test mode. Use the [<***B***] key to write tuning data through tuning modes, and the [Selector] to adjust tuning requirements (1 to 4096 appears on the LCD).

Use the [***C***>] key to select the adjustment item through tuning modes. Use the [***A***] key to adjust 5 reference level adjustments, and use the [Side2] key to switch between Wide/Narrow/Very narrow.

• LCD display in panel tuning mode



■ Key operation

Key	Function	
	Push	Hold (1 second)
[Selector]	Adjustment value up/down	
[Side1]	20Hz/2kHz (During transmission in balance adjustment)	-
[Side2]	Wide 5k/Wide 4k/ Narrow/Very narrow	-
[***S***]	Shift to panel test mode	-
[***A***]	To enter 5 reference level adjustments	-
[<***B***]	Writes the adjustment value	-
[***C***>]	Go to next adjustment item	Back to last adjustment item
[AUX]	-	
[PTT]	Transmit	
[0] to [9] and [#], [*]	-	

■ 5 reference level adjustments frequency

Tuning point	RX (MHz)	TX (MHz)
Low	136.05000	136.10000
Low'	145.55000	145.60000
Center	155.05000	155.10000
High'	164.55000	164.60000
High	173.95000	173.90000

ADJUSTMENT (E TYPE)

■ Adjustment item supplement

Adjustment Item	Description
Counterclockwise Volume	"Counterclockwise Volume" is adjusted at the minimum volume position. "Clockwise Volume" is adjusted at the maximum volume position. These adjustments can correct the volume variation. Both "Counterclockwise Volume" and "Clockwise Volume" must be adjusted. (The curve data of volume is applied.)
Clockwise Volume	
Receive Assist	The lock voltage of VCO (Receive) is adjusted. This item must be adjusted before all adjustment items for receiver section are adjusted. This item can be adjusted only in PC Test Mode.
Transmit Assist	The lock voltage of VCO (Transmit) is adjusted. This item must be adjusted before all adjustment items for transmitter section are adjusted. This item can be adjusted only in PC Test Mode.
Frequency	Frequency stability is adjusted under receiving condition with SSG. The SSG needs 0.003ppm accuracy so please use a standard oscillator if necessary. This item can be adjusted only in PC Test Mode so that the adjustment value is not changed easily.
High Transmit Power	High Transmit Power is adjusted.
Low Transmit Power	Low Transmit Power is adjusted.
Balance	The transmit audio frequency response is adjusted. This item is adjusted so that the deviation of 2kHz becomes the same deviation of 20Hz. This item must be adjusted before all adjustment items for deviations are adjusted.
Maximum Deviation (NXDN Narrow/Very Narrow)	Maximum Deviation of NXDN (Narrow/Very Narrow) is adjusted.
Maximum Deviation (Analog Wide 5k/Wide 4k/ Narrow)	Maximum Deviation of Analog (Wide 5k/Wide 4k/Narrow) is adjusted. This item must be adjusted before all adjustment items for tone deviations are adjusted. **Note:** "Maximum Deviation (Analog Narrow)" must be adjusted before "CW ID Deviation (NXDN Very Narrow)" is adjusted.
QT Deviation	QT tone deviation is adjusted.
DQT Deviation	DQT tone deviation is adjusted.
LTR Deviation	LTR tone deviation is adjusted. (LTR is not used in user mode for E-type firmware.)
DTMF Deviation	DTMF tone deviation is adjusted.
Single Tone Deviation	The deviation of Single Tone used in "5-tone" is adjusted.
MSK Deviation	MSK tone deviation is adjusted.
CW ID Deviation	CW ID tone deviation is adjusted. CW ID is used to inform the others who is transmitting on a 6.25-kHz spacing channel. (In FCC rule, Analog mode or CW ID is required for each channel-spacing.)
Sensitivity 1	Band-Pass Filter is adjusted. The performance of Receive Sensitivity is improved. This item can be adjusted only in PC Test Mode.
Sensitivity 2	The gain of RF amplifier is adjusted. The performance of the interfering wave is improved. This item can be adjusted only in PC Test Mode.
RSSI Reference	The minimum RSSI level for scan stop is adjusted.
Open Squelch	The squelch level at level "5" is adjusted.
Low RSSI	RSSI display level "" is adjusted. Both "Low RSSI" and "High RSSI" must be adjusted. (The curve data of RSSI level is applied.)
High RSSI	
Tight Squelch	The squelch level at level "9" is adjusted.
Battery Warning Level	Battery Warning Level (LED blinking level) is adjusted. Battery Warning Level minus 0.4V is the transmission inhibited level.

ADJUSTMENT (E TYPE)

■ Adjustment item and Adjustment range

Order	Adjusutment item	Panel tuning	PC test	AW (Analog Wide 5k)	AS (Analog Wide 4k)	AN (Analog Narrow)	NN (NXDN Narrow)	NV (NXDN Very Narrow)	Adjust item Number
				Adjustment range					
1	Counterclockwise Volume	✓	✓	1 point ADJ					Common Section 2
				1~256					
2	Clockwise Volume	✓	✓	1 point ADJ					Common Section 3
				1~256					
3	Receive Assist		✓	5 point ADJ					Common Section 4
				1~4096					
4	Transmit Assist		✓	5 point ADJ					Common Section 5
				1~4096					
5	Frequency		✓	1 point ADJ					Common Section 6
				1~4096					
6	High Transmit Power	✓	✓	-	-	5	-	-	Transmitter Section 1
				1~1024					
7	Low Transmit Power	✓	✓	-	-	5	-	-	Transmitter Section 2
				1~1024					
8	Balance	✓	✓	-	-	5	-	-	Transmitter Section 3
				1~1024					
9	Maximum Deviation (NXDN)	✓	✓	-	-	-	5	5	Transmitter Section 4
				1~1024					
10	Maximum Deviation (Analog)	✓	✓	5	5	5	-	-	Transmitter Section 5
				1~1024					
11	QT Deviation	✓	✓	1	1	1	-	-	Transmitter Section 6
				1~1024					
12	DQT Deviation	✓	✓	1	1	1	-	-	Transmitter Section 7
				1~1024					
13	LTR Deviation	✓	✓	1	-	1	-	-	Transmitter Section 8
				1~1024					
14	DTMF Deviation	✓	✓	1	1	1	-	-	Transmitter Section 9
				1~1024					
15	Single Tone Deviation	✓	✓	1	1	1	-	-	Transmitter Section 10
				1~1024					
16	MSK Deviation	✓	✓	1	1	1	-	-	Transmitter Section 11
				1~1024					
17	CW ID Deviation	✓	✓	-	-	-	-	1	Transmitter Section 12
				1~1024					
18	Sensitivity 1		✓	-	-	5	-	-	Receiver Section 2
				1~256					
19	Sensitivity 2		✓	-	-	5	-	-	Receiver Section 3
				1~256					
20	RSSI Reference	✓	✓	5	5	5	- *1	5	Receiver Section 4
				1~256					
21	Open Squelch	✓	✓	5	5	5	- *1	5	Receiver Section 5
				1~256					

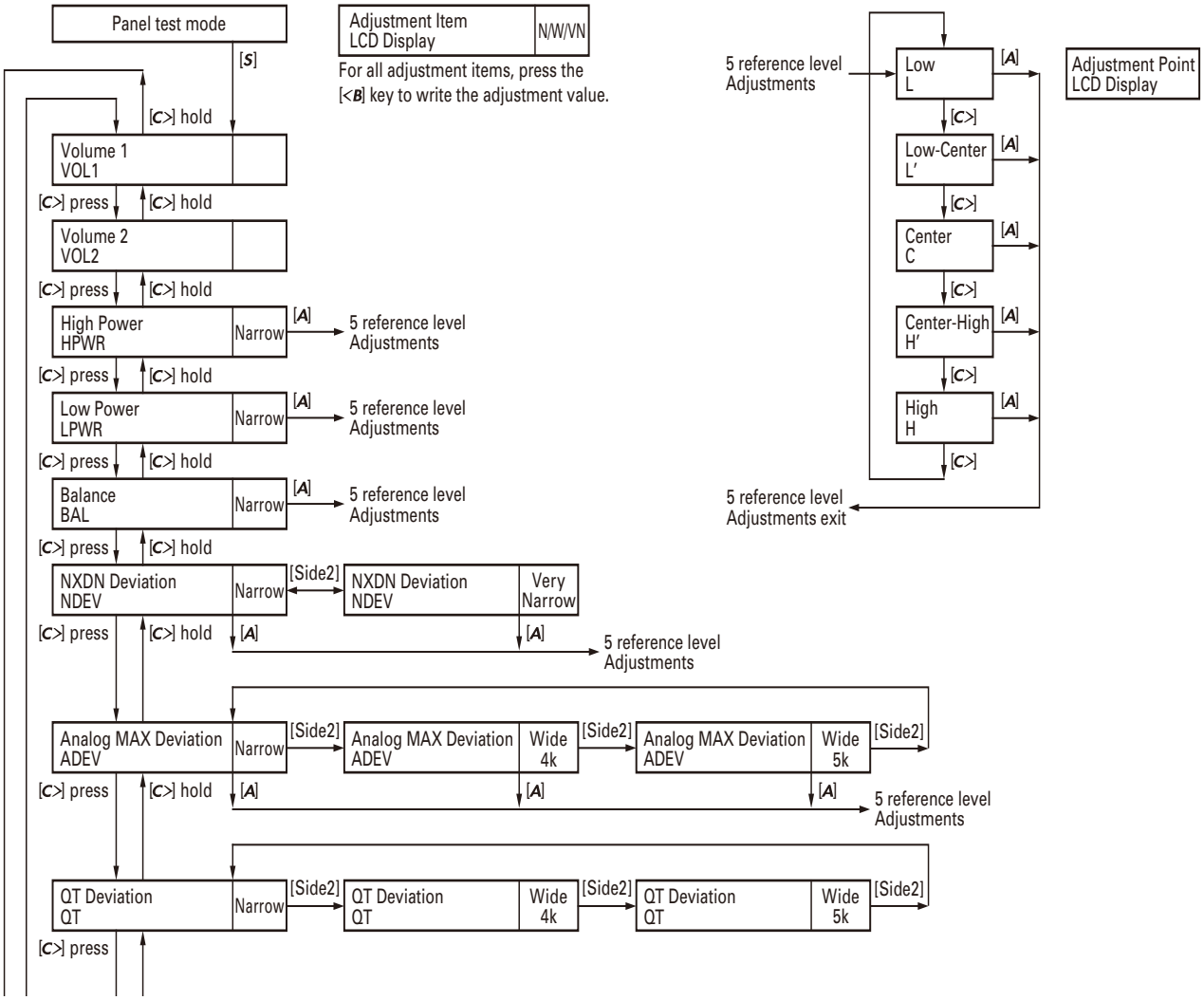
ADJUSTMENT (E TYPE)

Order	Adjusutment item	Panel tuning	PC test	AW (Analog Wide 5k)	AS (Analog Wide 4k)	AN (Analog Narrow)	NN (NXDN Narrow)	NV (NXDN Very Narrow)	Adjust item Number
				Adjustment range					
22	Low RSSI	✓	✓	5	5	5	- *1	5	Receiver Section 6
				1~256					
23	High RSSI	✓	✓	5	5	5	- *1	5	Receiver Section 7
				1~256					
24	Tight Squelch	✓	✓	5	5	5	-	-	Receiver Section 8
				1~256					
25	Battery Warning Level	✓	✓	1 point ADJ					Transmitter Section 13
				1~256					

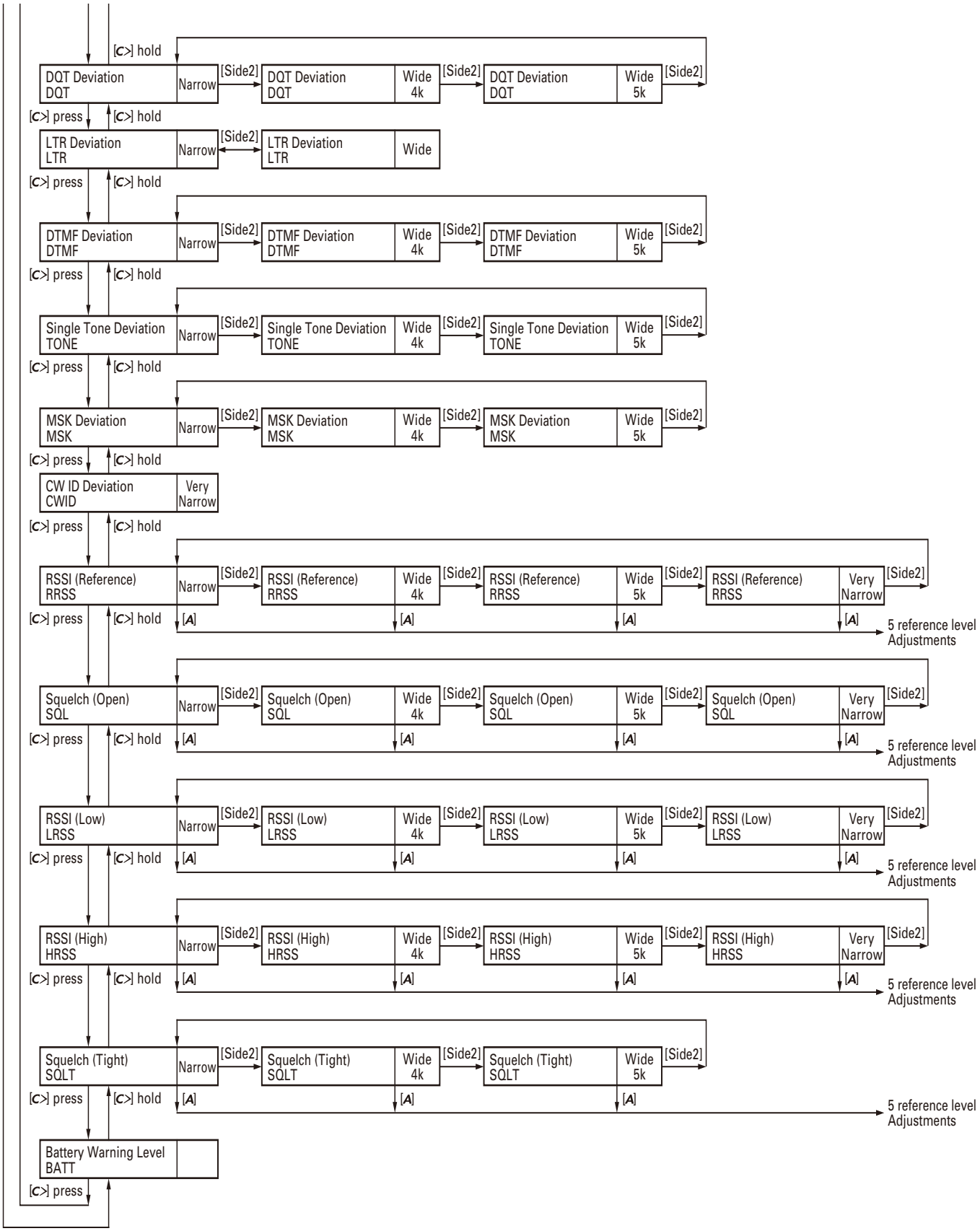
*1: Because NXDN Narrow is adjusted by adjusting Analog Narrow, it is not necessary to adjust NXDN Narrow.

■ Panel tuning mode flow chart

Note: In this Panel tuning mode flow chart, the Adjustment item name is modified.



ADJUSTMENT (E TYPE)



ADJUSTMENT (E TYPE)

Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range Modulation Output When performing the Frequency adjustment, the following accuracy is necessary. • 0.003ppm Use a standard oscillator for adjustments, if necessary.	136 to 174MHz Frequency modulation and external modulation –127dBm/0.1µV to greater than –20dBm/22.4mV
2. Power Meter	Input Impedance Operation Frequency Measurement Capability	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. 8Ω Dummy Load		Approx. 8Ω, 3W
12. Regulated Power Supply		5V to 10V, approx. 3A Useful if ammeter equipped

■ 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.)

■ Nut wrench

In order to turn the volume nut and the channel selector nut, use a recommendation tool.

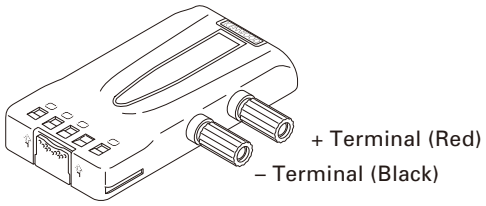
KENWOOD part No.: W05-1123-00

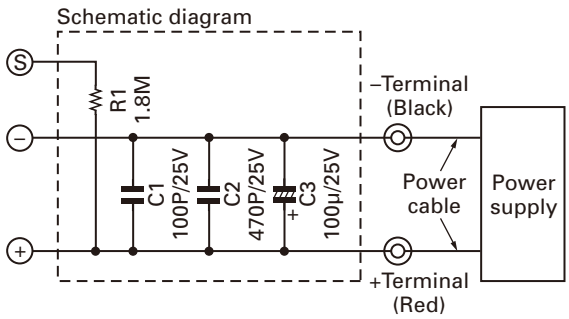
■ Battery Jig (W05-0909-00)

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.

When using the battery jig in user mode, the transceiver assumes that a lithium-ion battery pack is attached to the transceiver. In adjustment mode, battery type detection is not performed.

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 (E TYPE)

Radio Check Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel test mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Frequency check	1) CH-Sig: 1-1 PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	f. counter	Panel	ANT			Check an internal temperature of radio from 20˚C to 26˚C.	155.099962~ 155.100038MHz (±0.25ppm @155.1MHz)
2. High power check (Batt: 7.5V)	1) CH-Sig: 1-1 PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter					Check	4.0W~6.0W 2.0A or less
	2) CH-Sig: 2-1 PTT: ON	2) Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
	3) CH-Sig: 3-1 PTT: ON	3) Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
3. Low power check (Batt: 7.5V)	1) CH-Sig: 1-1 PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							0.7W~1.3W 1.0A or less
	2) CH-Sig: 2-1 PTT: ON	2) Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
	3) CH-Sig: 3-1 PTT: ON	3) Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.							
4. MIC sensitivity check	1) CH-Sig: 1-1 AG: 1kHz PTT: ON	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 AG: 1kHz PTT: Press [Transmit] button.	Deviation meter Oscilloscope AG AF VTVM	Panel	ANT SP/MIC connector			Adjust AG input to get a standard MOD.	12.5mV±5.8mV

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel test mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. Sensitivity check	1) CH-Sig : 1-1 SSG output Wide 5k: –117dBm (0.32μV) (MOD: 1kHz/±3kHz) Wide 4k: –117dBm (0.32μV) (MOD: 1kHz/±2.4kHz) Narrow: –117dBm (0.32μV) (MOD: 1kHz/±1.5kHz)	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 SSG output Wide 5k: –117dBm (0.32μV) (MOD: 1kHz/±3kHz) Wide 4k: –117dBm (0.32μV) (MOD: 1kHz/±2.4kHz) Narrow: –117dBm (0.32μV) (MOD: 1kHz/±1.5kHz)	SSG AF VTVM Oscilloscope Distortion meter 8Ω dummy load	Panel	ANT SP/MIC connector			Check	12dB SINAD or more

Common Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) BATT terminal voltage: 7.5V 2) SSG standard modulation [Wide 5k] MOD: 1kHz, DEV: 3kHz [Wide 4k] MOD: 1kHz, DEV: 2.4kHz [Narrow] MOD: 1kHz, DEV: 1.5kHz								
2. Counter-clockwise Volume	1) Adj item: [VOL1] Adjust: [✳✳✳]	1) Adj item: [Counterclockwise Volume]						[Panel tuning mode] Turn the volume knob counterclock-wise fully. Press [B] key to store the adjustment value. [PC test mode] Turn the volume knob counterclock-wise fully. Press [Apply] button to store the adjust-ment value.	This item is needed when the variable resistor (R31-0685-05) is replaced.
3. Clockwise volume	1) Adj item: [VOL2] Adjust: [✳✳✳]	1) Adj item: [Clockwise Volume]						[Panel tuning mode] Turn the volume knob clockwise fully. Press [B] key to store the adjust-ment value. [PC test mode] Turn the volume knob clockwise fully. Press [Apply] button to store the adjustment value.	This item is needed when the variable resistor (R31-0685-05) is replaced.

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. Receive Assist	* This adjustment can be performed only in PC test mode.	1) Adj item: [Receive Assist] 2) Adj item: [Low], [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.				Panel	[PC test mode] [◀],[▶]	[PC test mode] [Automatic Adjustment] 1) Press [Tune Assist Voltage] button. 2) Press [Apply All] button to store the adjustment value after the automatic adjustment has finished. [Manual Adjustment] [V] indicator on the PC window shows VCO lock voltage. Change the adjustment value to get VCO lock voltage within the limit of the specified voltage. **Note:** Confirm the VCO lock voltage approximately 3 seconds after the adjustment value is changed.	2.5V±0.1V [Automatic Adjustment] After the automatic adjustment is performed, verify that the VCO lock voltage is within the voltage range which is specified by the manual adjustment. [Manual Adjustment] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted. **Note:** The assist adjustment value must be between from 340 to 3550.
5. Transmit Assist	* This adjustment can be performed only in PC test mode.	1) Adj item: [Transmit Assist] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.							
6. Frequency	* This adjustment can be performed only in PC test mode.	1) Adj item: [Frequency] SSG output: –20dBm (22.4mV) (CW (without modulation)) **Caution:** Perform the frequency adjustment under the following conditions. • Temperature range of +20°C to +26°C (+68.0°F to +78.8°F). (The temperature is displayed on the Frequency adjustment screen of the KPG-141D.) • Use an accuracy of 0.003ppm for the SSG. (Use a standard oscillator if necessary.)	SSG	Panel	ANT			[PC test mode] Press [Start] button of "Auto Tuning". Press [Apply] button to store the adjustment value after the automatic adjustment has finished.	[PC test mode] "IF20" value = Within 0±12 digits. The value of "IF20" will become around "0" after the adjustment has finished. **Remark:** "Frequency" is adjusted under receiving condition with SSG.

ADJUSTMENT (E TYPE)

Transmitter Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. High power (Batt: 7.5V)	1) Adj item: [HPWR] Adjust: [✱✱✱✱.] 2) Adj item: [H.PWR_]→[H.P.WR_]→[H.P.W.R_]→[H.P.W.R._]→[H.P.W.R._.] Adjust: [✱✱✱✱.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [High Transmit Power] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	5.0W	±0.1W 2.0A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
2. Low power (Batt: 7.5V)	1) Adj item: [LPWR] Adjust: [✱✱✱✱.] 2) Adj item: [L.PWR_]→[L.P.WR_]→[L.P.W.R_]→[L.P.W.R._]→[L.P.W.R._.] Adjust: [✱✱✱✱.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Low Transmit Power] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.						1.0W	±0.05W 1.0A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
3. Balance *2	1) Adj item: [BAL] Adjust: [✱✱✱✱.] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [B.AL_ _]→[B.A.L_ _]→[B.A.L._ _]→[B.A.L._._]→[B.A.L._._.] Adjust: [✱✱✱✱.] PTT: ON Press [B] key to store the adjustment value. [Side1] key: Press while transmitting to change 20Hz and 2kHz. 20Hz: "–" not appears 2kHz: "–" appears	1) Adj item: [Balance] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value. [2kHz Sine Wave Check box]: Check while transmitting change to 2kHz.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	The Deviation of 20Hz frequency is fixed. Change the 2kHz adjustment value to become the same deviation of 20Hz within the specified range.	2kHz Tone deviation is within ±1.0% of 20Hz tone deviation. [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
*2: Refer to the "Necessary Deviation adjustment item for each signaling and mode" table on page 70. Balance adjustment is common with the adjustment of all signaling deviations.									
4. Maximum Deviation (NXDN) *3 [Narrow]	1) Adj item: [NDEV] Adjust: [✱✱✱✱.] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [N.DEV_]→[N.D.EV_]→[N.D.E.V_]→[N.D.E.V._]→[N.D.E.V._.] Adjust: [✱✱✱✱.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (NXDN Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	3056Hz Write the value as followings. 513 (Reference value)	2995~3117Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
Maximum Deviation (NXDN) *3 [Very Narrow]	1) Adj item: [NDEV] Adjust: [✳✳✳✳] 2) Adj item: [N.DEV_]→[N.D.EV_]→[N.D.E.V_]→[N.D.E.V._]→[N.D.E.V._.] Adjust: [✳✳✳✳] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	1337Hz Write the value as followings. 513 (Reference value)	1311~1363Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
5. Maximum Deviation (Analog) *3 [Narrow]	1) Adj item: [ADEV] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [A.DEV_]→[A.D.EV_]→[A.D.E.V_]→[A.D.E.V._]→[A.D.E.V._.] Adjust: [✳✳✳✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.						2100Hz Write the value as followings. 513 (Reference value)	2050~2150Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
[Wide 4k]	1) Adj item: [ADEV] Adjust: [✳✳✳.✳.] 2) Adj item: [A.DEV_]→[A.D.EV_]→[A.D.E.V_]→[A.D.E.V._]→[A.D.E.V._.] Adjust: [✳✳✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (Analog Wide 4k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.						3360Hz Write the value as followings. 513 (Reference value)	3310~3410Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
Maximum Deviation (Analog) *3 [Wide 5k]	1) Adj item: [ADEV] Adjust: [✳✳.✳.✳.] 2) Adj item: [A.DEV_]→[A.D.EV_]→[A.D.E.V_]→[A.D.E.V._]→[A.D.E.V._.] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Maximum Deviation (Analog Wide 5k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	4200Hz Write the value as followings. 513 (Reference value)	4150~4250Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
*3: Refer to the "Necessary Deviation adjustment item for each signaling and mode" table on page 70. Regarding Maximum Deviation (Analog), it is common with the adjustment of all analog signalings.									
6. QT Deviation *4 [Narrow]	1) Adj item: [QT] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 513 (Reference value)	0.35kHz±0.05kHz
[Wide 4k]	1) Adj item: [QT] Adjust: [✳✳✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Wide 4k)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							0.60kHz±0.05kHz
[Wide 5k]	1) Adj item: [QT] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Wide 5k)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							0.75kHz±0.05kHz

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. DQT Deviation *4 [Narrow]	1) Adj item: [DQT] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 430 (Reference value)	0.35kHz±0.05kHz
[Wide 4k]	1) Adj item: [DQT] Adjust: [✳✳✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Wide 4k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							0.60kHz±0.05kHz
[Wide 5k]	1) Adj item: [DQT] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Wide 5k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							0.75kHz±0.05kHz
8. LTR Deviation *4 [Narrow]	1) Adj item: [LTR] Adjust: [✳✳✳✳.] Deviation meter LPF: 3kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 465 (Reference value)	0.75kHz±0.05kHz
[Wide]	1) Adj item: [LTR] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Wide)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							1.00kHz±0.05kHz
9. DTMF Deviation *4 [Narrow]	1) Adj item: [DTMF] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 540 (Reference value)	1.25kHz±0.05kHz

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
DTMF Deviation *4 [Wide 4k]	1) Adj item: [DTMF] Adjust: [✳✳✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Wide 4k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 540 (Reference value)	2.00kHz±0.05kHz
[Wide 5k]	1) Adj item: [DTMF] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Wide 5k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							2.50kHz±0.05kHz
10. Single Tone Deviation *4 [Narrow]	1) Adj item: [TONE] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Single Tone Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 513 (Reference value)	1.50kHz±0.05kHz
[Wide 4k]	1) Adj item: [TONE] Adjust: [✳✳✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Single Tone Deviation (Analog Wide 4k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							2.40kHz±0.05kHz
[Wide 5k]	1) Adj item: [TONE] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [Single Tone Deviation (Analog Wide 5k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							3.00kHz±0.05kHz
11. MSK Deviation *4 [Narrow]	1) Adj item: [MSK] Adjust: [✳✳✳✳.] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 513 (Reference value)	1.50kHz±0.05kHz

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
MSK Deviation *4 [Wide 4k]	1) Adj item: [MSK] Adjust: [✳✳✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Wide 4k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] Selector [PC test mode] [◀],[▶]	Write the value as followings. 513 (Reference value)	2.40kHz±0.05kHz
[Wide 5k]	1) Adj item: [MSK] Adjust: [✳✳.✳.✳.] PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Wide 5k)] PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.							3.00kHz±0.05kHz
12. CW ID Deviation *4 [NXDN Very Narrow]	1) Adj item: [CWID] Adjust: [✳✳✳✳] Deviation meter LPF: 15kHz HPF: OFF PTT: ON Press [B] key to store the adjustment value.	1) Adj item: [CW ID Deviation (NXDN Very Narrow)] Deviation meter LPF: 15kHz HPF: OFF PTT: Press [Transmit] button. Press [Apply] button to store the adjustment value.						Write the value as followings. 376 (Reference value)	1.00kHz±0.10kHz
*4: Refer to the "Necessary Deviation adjustment item for each signaling and mode" table on page 70.									
13. Battery Warning Level writing	1) Adj item: [BATT] Adjust: [✳✳✳] PTT: ON	1) Adj item: [Battery Warning Level] PTT: Press [Transmit] button.	Power meter DVM	Panel	ANT BATT terminal			Press the PTT switch or [Transmit] button on the PC window. Apply 6.20V to battery terminal. Confirm that one pre-determined numeric in the range 1 to 256 appears. [Panel tuning mode] Press [B] key to store the adjustment value. [PC test mode] Press [Apply] button to store the adjustment value.	
14. Battery Warning Level check	[Panel test mode] 1) CH-Sig: 1-1 BATT terminal voltage: 6.0V while transmitting	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 BATT terminal voltage: 6.0V while transmitting						Check	The transceiver can transmit with causing the LED to blink.

ADJUSTMENT (E TYPE)

■ Necessary Deviation adjustment item for each signaling and mode

The following shows the necessary adjustment items for each signaling deviation. Please read the following table like the following example. In the case of the signaling "QT (Wide 5k)", this signaling is composed of three elements [Balance, Maximum Deviation (Analog Wide 5k) and QT Deviation (Wide 5k)]. Please adjust Balance and Maximum Deviation (Analog Wide 5k) before adjusting QT Deviation (Wide 5k).

Mode	Signaling	Necessary adjustment and order			
		Wide 5k	**Wide 4k**	**Narrow**	**Very Narrow**
Analog	Audio	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow)	-
	QT	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k) Step 3. QT Deviation (Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k) Step 3. QT Deviation (Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. QT Deviation (Narrow)	-
	DQT	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k) Step 3. DQT Deviation (Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k) Step 3. DQT Deviation (Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. DQT Deviation (Narrow)	-
	LTR	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k) Step 3. LTR Deviation (Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k) Step 3. LTR Deviation (Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. LTR Deviation (Narrow)	-
	DTMF	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k) Step 3. DTMF Deviation (Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k) Step 3. DTMF Deviation (Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. DTMF Deviation (Narrow)	-
	5TONE	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k) Step 3. Single Tone Deviation (Analog Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k) Step 3. Single Tone Deviation (Analog Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. Single Tone Deviation (Analog Narrow)	-
	MSK (FleetSync)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 5k) Step 3. MSK Deviation (Analog Wide 5k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Wide 4k) Step 3. MSK Deviation (Analog Wide 4k)	Step 1. Balance adjust Step 2. Maximum Deviation (Analog Narrow) Step 3. MSK Deviation (Analog Narrow)	-
NXDN	Audio	-		Step 1. Balance adjust Step 2. Maximum Deviation (NXDN Narrow)	Step 1. Balance adjust Step 2. Maximum Deviation (NXDN Very Narrow)
	CW ID	-		-	Step 1. Balance adjust Step 2. Maximun Deviation (Analog Narrow) Step 3. CW ID Deviation (NXDN Very Narrow)

- Balance is common with all the above deviation adjustments. If Balance (Transmitter Section 3) has already adjusted, please skip Step 1 and adjust from Step 2.
- Maximum Deviation (Analog Wide 5k/Wide 4k/Narrow) is common with all the analog signaling deviations and CWID Deviation (NXDN Very Narrow). If Balance and Maximum Deviation (Analog Wide 5k/Wide 4k/Narrow) (Transmitter Section 5) have already adjusted, please skip Step 2 and adjust from Step 3.

ADJUSTMENT (E TYPE)

Receiver Section

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. AF level setting	[Panel test mode] 1) CH-Sig: 1-1 SSG output: –47dBm (1mV) (MOD: 1kHz/±1.5kHz) Wide 5k/Wide 4k/ Narrow: Narrow Beat Shift: Uncheck Compander: Uncheck	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 Wide 5k/Wide 4k/ Narrow: Narrow Beat Shift: Uncheck Compander: Uncheck SSG output: –47dBm (1mV) (MOD: 1kHz/±1.5kHz)	SSG DVM AF VTVM Dummy load	Panel	ANT SP/MIC connector	Panel	Volume knob	Turn the Volume Knob to obtain 0.63V AF output.	0.63V±0.1V
2. Sensitivity 1	* This adjustment can be performed only in PC test mode.	1) Adj item: [Sensitivity 1] 2) Adj item: [Low], [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.	SSG AF VTVM Dummy load Oscilloscope	Panel	ANT SP/MIC connector		[PC test mode] [◀],[▶]	Write the value as followings. [Low]: 15 (Fixed) [Low']: 35 (Preset) [Center]: 80 (Preset) [High']: 135 (Preset) [High]: 180 (Preset)	**Note:** The Preset value of Sensitivity 2 must be written before adjusting Sensitivity 1.
		3) Adj item: [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.						Decrease the adjustment value from the preset value to get 12dB SINAD. SSG output: –119dBm (0.25µV) (MOD: 1kHz/±1.5kHz)	
3. Sensitivity 2	* This adjustment can be performed only in PC test mode.	1) Adj item: [Sensitivity 2] 2) Adj item: [Low], [Low'], [Center], [High'], [High] Press [Apply All] button to store the adjustment value.						Write the value as followings. [Low]: 190 (Preset) [Low']: 165 (Fixed) [Center]: 165 (Fixed) [High']: 165 (Fixed) [High]: 165 (Fixed)	
		3) Adj item: [Low] Press [Apply All] button to store the adjustment value.						Decrease the adjustment value from the preset value to get 12dB SINAD. SSG output: –119dBm (0.25µV) (MOD: 1kHz/±1.5kHz)	
4. RSSI reference *5 [Analog Narrow]	1) Adj item: [RRSS] Adjust: [✳✳✳.] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._]→[R.R.S.S._.] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [RSSI Reference (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
RSSI reference *5 [Analog Wide 4k]	1) Adj item: [RRSS] Adjust: [✳✳.✳.] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._]→[R.R.S.S._.] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±2.4kHz)	1) Adj item: [RSSI Reference (Analog Wide 4k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±2.4kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Wide 5k]	1) Adj item: [RRSS] Adjust: [✳.✳.✳.] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._]→[R.R.S.S._.] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±3kHz)	1) Adj item: [RSSI Reference (Analog Wide 5k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±3kHz)							
[NXDN Very Narrow]	1) Adj item: [RRSS] Adjust: [✳✳✳] 2) Adj item: [R.RSS_]→[R.R.SS_]→[R.R.S.S_]→[R.R.S.S._]→[R.R.S.S._.] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [RSSI Reference (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level –3dB (MOD: 1kHz/±1.5kHz)							Adjust with the analog signal.
*5: Because RSSI Reference (NXDN Narrow) is adjusted by adjusting RSSI Reference (Analog Narrow), it is not necessary to adjust RSSI Reference (NXDN Narrow).									
5. Open Squelch *6 (Squelch level 5 adjust) [Analog Narrow]	1) Adj item: [SQL] Adjust: [✳✳✳.] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._._] SSG output: 12dB SINAD level +1.0dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [Open Squelch (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +1.0dB (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	"Open Squelch" will not be adjusted correctly if MOD and Deviation are wrong. **Remark:** During production, a fixed value is written. Narrow: 110 (Fixed) Wide 4k: 110 (Fixed) Wide 5k: 110 (Fixed)
[Analog Wide 4k]	1) Adj item: [SQL] Adjust: [✳✳.✳.] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._._] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±2.4kHz)	1) Adj item: [Open Squelch (Analog Wide 4k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±2.4kHz)							
[Analog Wide 5k]	1) Adj item: [SQL] Adjust: [✳.✳.✳.] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._._] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±3kHz)	1) Adj item: [Open Squelch (Analog Wide 5k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +1dB (MOD: 1kHz/±3kHz)							

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
Open Squelch *6 (Squelch level 5 adjust) [NXDN Very Narrow]	1) Adj item: [SQL] Adjust: [✳✳✳] 2) Adj item: [S.QL_ _]→[S.Q.L_ _]→[S.Q.L._ _]→[S.Q.L._._]→[S.Q.L._._.] SSG output: 12dB SINAD level for Analog Narrow –4dB (MOD: 400Hz/±1.1kHz)	1) Adj item: [Open squelch (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level for Analog Narrow –4dB (MOD: 400Hz/±1.1kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	Adjust with the analog signal. This item is adjusted under the condition that MOD is "400Hz" and Deviation is "±1.1kHz" due to the circuit configuration. **Remark:** During production, a fixed value is written. 200 (Fixed)
*6: Because Open Squelch (NXDN Narrow) is adjusted by adjusting Open Squelch (Analog Narrow), it is not necessary to adjust Open Squelch (NXDN Narrow).									
6. Low RSSI at –118dBm *7 [Analog Narrow]	1) Adj item: [LRSS] Adjust: [✳✳✳.] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [Low RSSI (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Wide 4k]	1) Adj item: [LRSS] Adjust: [✳✳.✳.] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±2.4kHz)	1) Adj item: [Low RSSI (Analog Wide 4k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±2.4kHz)							
[Analog Wide 5k]	1) Adj item: [LRSS] Adjust: [✳.✳.✳.] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±3kHz)	1) Adj item: [Low RSSI (Analog Wide 5k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±3kHz)							
[NXDN Very Narrow]	1) Adj item: [LRSS] Adjust: [✳✳✳] 2) Adj item: [L.RSS_]→[L.R.SS_]→[L.R.S.S_]→[L.R.S.S._] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [Low RSSI (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –118dBm (0.28μV) (MOD: 1kHz/±1.5kHz)							Adjust with the analog signal.
*7: Because Low RSSI at –118dBm (NXDN Narrow) is adjusted by adjusting Low RSSI at –118dBm (Analog Narrow), it is not necessary to adjust Low RSSI at –118dBm (NXDN Narrow).									

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. High RSSI at –80dBm *8 [Analog Narrow]	1) Adj item: [HRSS] Adjust: [✳✳✳.] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._]→[H.R.S.S._.] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [High RSSI (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Wide 4k]	1) Adj item: [HRSS] Adjust: [✳✳.✳.] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._]→[H.R.S.S._.] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±2.4kHz)	1) Adj item: [High RSSI (Analog Wide 4k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±2.4kHz)							
[Analog Wide 5k]	1) Adj item: [HRSS] Adjust: [✳.✳.✳.] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._]→[H.R.S.S._.] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±3kHz)	1) Adj item: [High RSSI (Analog Wide 5k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±3kHz)							
[NXDN Very Narrow]	1) Adj item: [HRSS] Adjust: [✳✳✳] 2) Adj item: [H.RSS_]→[H.R.SS_]→[H.R.S.S_]→[H.R.S.S._]→[H.R.S.S._.] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)	1) Adj item: [High RSSI (NXDN Very Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: –80dBm (22.4µV) (MOD: 1kHz/±1.5kHz)							Adjust with the analog signal.
*8: Because "RSSI at –80dBm adjust" of NXDN Narrow is adjusted by adjusting "RSSI at –80dBm adjust [Analog Narrow]", it is not necessary to adjust "RSSI at –80dBm adjust" of NXDN Narrow.									
8. Tight Squelch [Analog Narrow]	1) Adj item: [SQLT] Adjust: [✳✳✳.] 2) Adj item: [S.QLT_]→[S.Q.LT_]→[S.Q.L.T_]→[S.Q.L.T._]→[S.Q.L.T._.] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [Tight Squelch (Analog Narrow)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±1.5kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	**Remark:** During production, a fixed value is written. 225 (Fixed)

ADJUSTMENT (E TYPE)

Item	Condition		Measurement			Adjustment			Specifications / Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
Tight Squelch [Analog Wide 4k]	1) Adj item: [SQLT] Adjust: [✳✳.✳.] 2) Adj item: [S.QLT_]→[S.Q.LT_]→[S.Q.L.T_]→[S.Q.L.T._] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±2.4kHz)	1) Adj item: [Tight Squelch (Analog Wide 4k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±2.4kHz)	SSG	Panel	ANT SP/MIC connector			[Panel tuning mode] After input signal from SSG, press [B] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	**Remark:** During production, a fixed value is written. Wide 4k: 225 (Fixed) Wide 5k: 225 (Fixed)
[Analog Wide 5k]	1) Adj item: [SQLT] Adjust: [✳.✳.✳.] 2) Adj item: [S.QLT_]→[S.Q.LT_]→[S.Q.L.T_]→[S.Q.L.T._] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±3kHz)	1) Adj item: [Tight Squelch (Analog Wide 5k)] 2) Adj item: [Low], [Low'], [Center], [High'], [High] SSG output: 12dB SINAD level +6dB (MOD: 1kHz/±3kHz)							

TERMINAL FUNCTION

Display unit (X54-3760-XX A/3)

Pin No.	Name	I/O	Function
		CN5	
1	33M	I	33M input
2	SCK0	I	Clock input
3	SDI0	I	Serial data input
4	SDO0	O	Serial data output
5	DISP_VER	O	Display version detection
6	/EVCS	I	Chip enable
7	/LCDCS	I	LCD IC chip enable
8	GND	-	GND
9	RXAF_2	I	RX AF input with BEEP and VOICE
10	ASQ	O	Analog squelch voltage output
11	ASQAPC	I	Analog squelch signal input
12	VOX	O	VOX voltage output
13	MIC	O	MIC modulation output
14	50C	I	50C input
15	MOD	I	AF modulation input
16	GND	-	GND
17	VCO_MOD	O	VCO modulation output
18	33A	I	33A input
19	TV2	O	Tuning control voltage 2 output
20	TV1	O	Tuning control voltage 1 output
21	SPAF	O	AF output for amplifier
22	GND	-	GND
23	MICI	I	MIC modulation input
24	SB2	I	SB2 input

Display unit (X54-3760-XX B/3)

Pin No.	Name	I/O	Function
		CN6	
1	GND	-	GND
2	PTT	O	Internal PTT input
3	/S1	O	Key input (SIDE1 key)
4	/S2	O	Key input (SIDE2 key)
5	/EMG	O	Key input (EMG key)
6	GND	-	GND

TX-RX unit (X57-8040-10)

Pin No.	Name	I/O	Function
		CN1	
1	+B	O	Power output after passing through the fuse
2	SB1	I	Power input after power switch
3	NC	-	No connection
4	33A	O	33A output
5	VOL	I	Volume level input for audio control
6	VOL_GND	-	GND for volume level
7	ENC3	I	Rotary switch input
8	GND	-	GND
9	ENC4	I	Rotary switch input
10	ENC2	I	Rotary switch input
11	ENC1	I	Rotary switch input
		CN2	
1	SB2	O	SB2 output
2	MICI	O	MIC modulation output
3	GND	-	GND
4	SPAF	I	AF input for AF amplifier
5	TV1	I	Tuning control voltage 1 input
6	TV2	I	Tuning control voltage 2 input
7	33A	O	33A output
8	VCO_MOD	I	VCO modulation input
9	GND	-	GND
10	MOD	O	AF modulation output
11	50C	O	50C output
12	MIC	I	MIC modulation input
13	VOX	I	VOX voltage input
14	ASQAPC	O	Analog squelch signal output
15	ASQ	I	Analog squelch voltage input
16	RXAF_2	O	RX AF output with BEEP and VOICE
17	GND	-	GND
18	/LCDCS	O	LCD IC chip enable
19	/EVCS	O	Chip enable
20	DISP_VER	I	Display version detection
21	SDO0	O	Serial data output
22	SDI0	I	Serial data input
23	SCK0	O	Clock output
24	33M	O	33M output
		CN3	
1	GND	-	GND
2	PTT	I	Internal PTT output
3	/S1	I	Key output (Side1 key)
4	/S2	I	Key output (Side2 key)
5	/EMG	I	Key output (EMG key)
6	GND	-	GND
		CN4	
1	MIC+	I	Internal MIC input
2	MIC–	-	Internal MIC GND
3	SP+	O	Internal speaker output
4	SP–	-	Internal speaker GND

TERMINAL FUNCTION

SP/MIC Connector Specification

Pin No.	Pin Name	I/O	Signal Type	Description	Item and Condition	Min	Typ	Max	Unit	Note
1	PTT/RXD	I	Digital	PTT/RXD input Zin=10kΩ	Input Voltage (High)	4	5	6	V	
					Input Voltage (Low)	0		0.5	V	
2	MICI	I	Analog	External MIC input Zin=1.8kΩ@1kHz	Maximum Input Voltage			1100	mVrms	
					Standard Input Voltage	6.7	12.5	18.3	mVrms	AF=1kHz 60% deviation MIC sens=Normal
3	MICO	O	Analog	Internal MIC output						
4	OPTDET	I	Digital	External option detection Zin=74kΩ						
5	50V	O	Power	DC 5V output	Output Voltage	4.9	5.0	5.1	V	Io=30mA
					Maximum Output Current			100	mA	
6	AE	-	GND	GND	Maximum Input Current			700	mA	
7	TXD	O	Digital	TXD output Zout=6.8kΩ	Output Voltage (High)	4.9	5.0	5.1	V	Load=Open
					Output Voltage (Low)	0		0.1	V	Load=Open
8	SPI	I	Analog	Internal Speaker input						
9	SPO	O	Analog	Internal Audio output	Maximum Output Power			1300	mW	AF=0.3~3kHz FM Dev.=Maximum Load=8Ω P.S.=9.0V
					Standard Output Power	400	500		mW	AF=1kHz Load=8Ω THD=10% P.S.=7.5V

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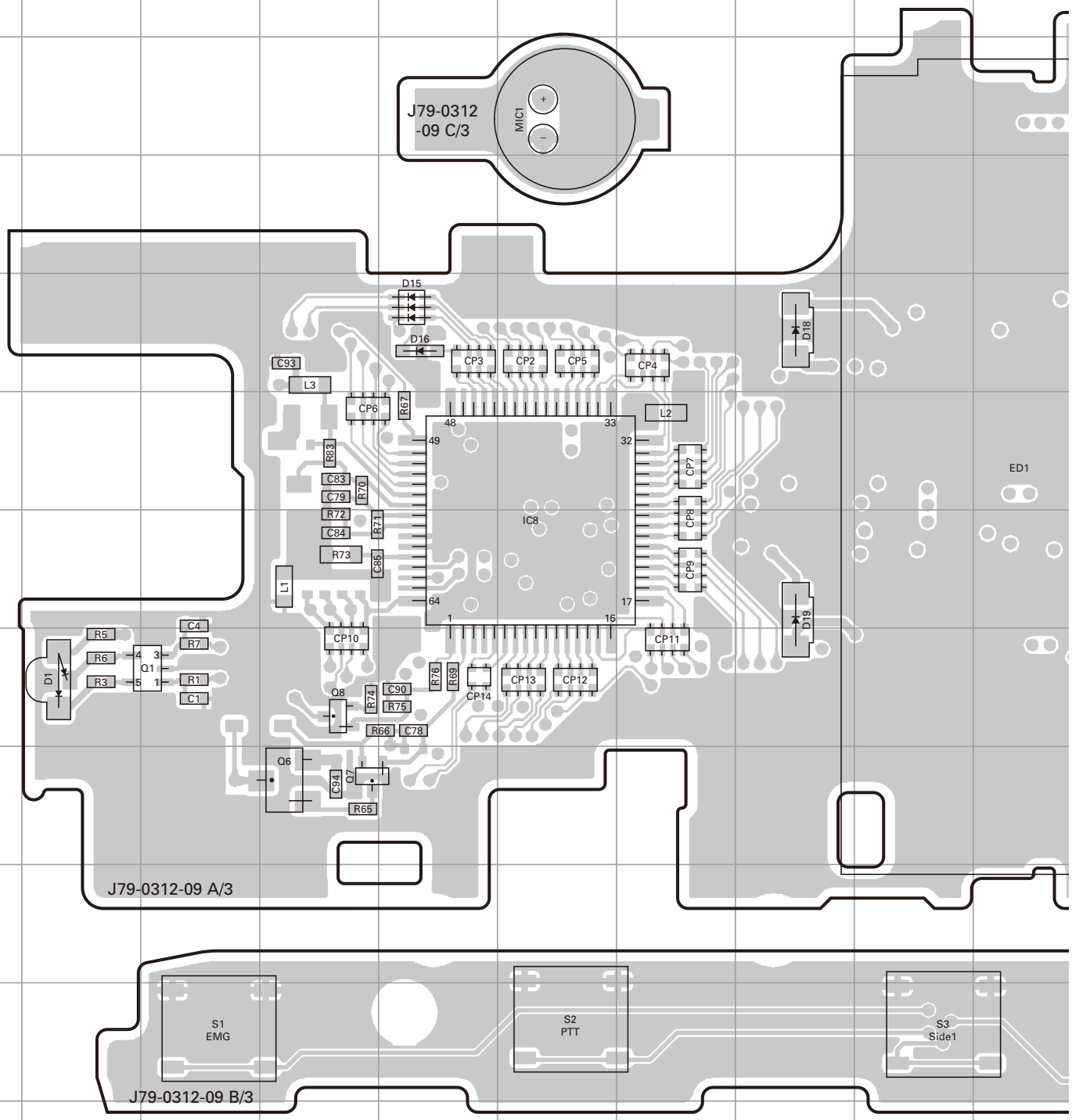
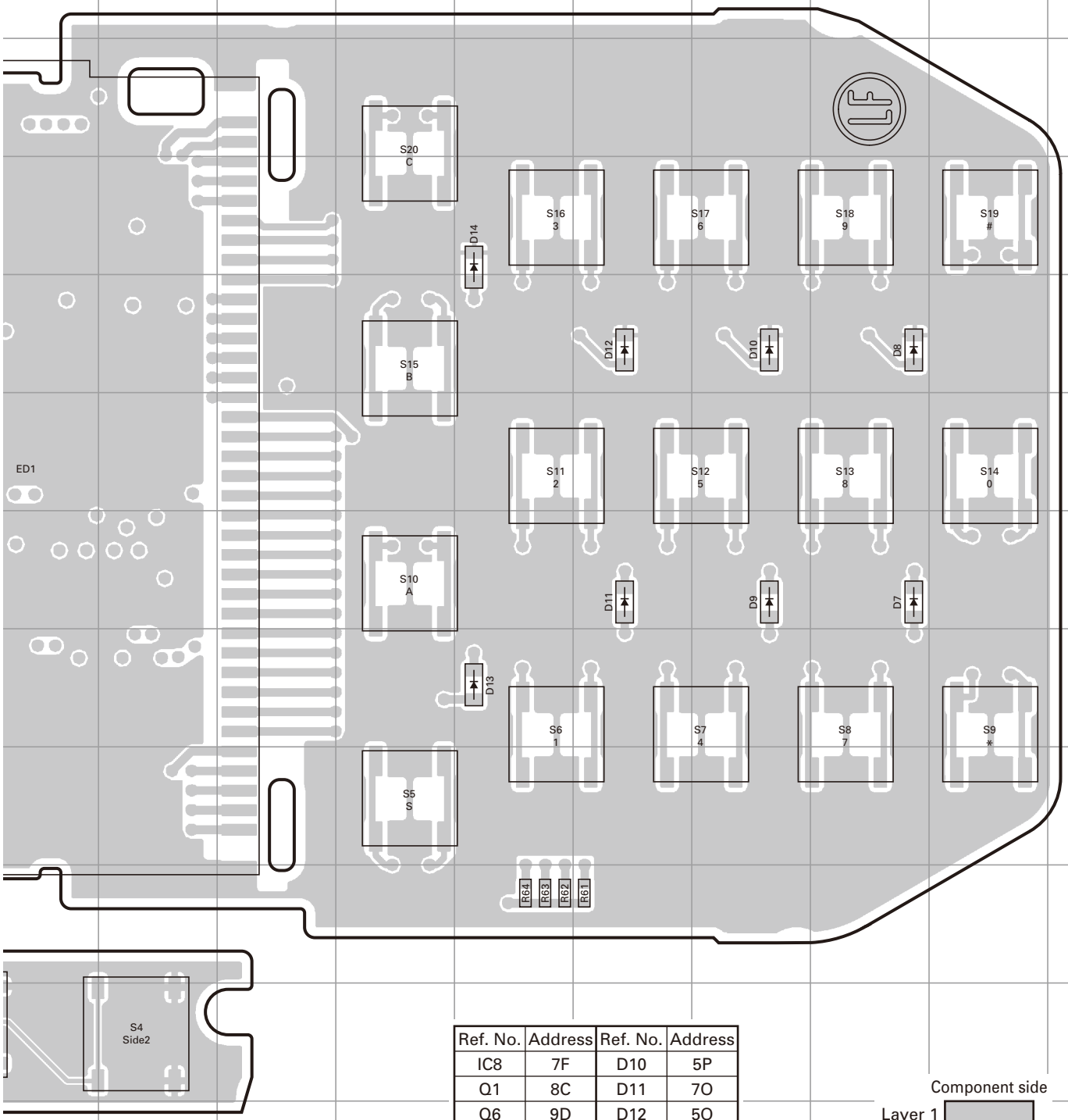
DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3

Component side view (J79-0312-09)



DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3

Component side view (J79-0312-09)



Ref. No.	Address	Ref. No.	Address
IC8	7F	D10	5P
Q1	8C	D11	7O
Q6	9D	D12	5O
Q7	9D	D13	8N
Q8	8D	D14	4N
D1	8B	D15	5E
D7	7Q	D16	5E
D8	5Q	D18	5H
D9	7P	D19	7H

Component side
Layer 1
Layer 2
Layer 3
Layer 4
Foil side

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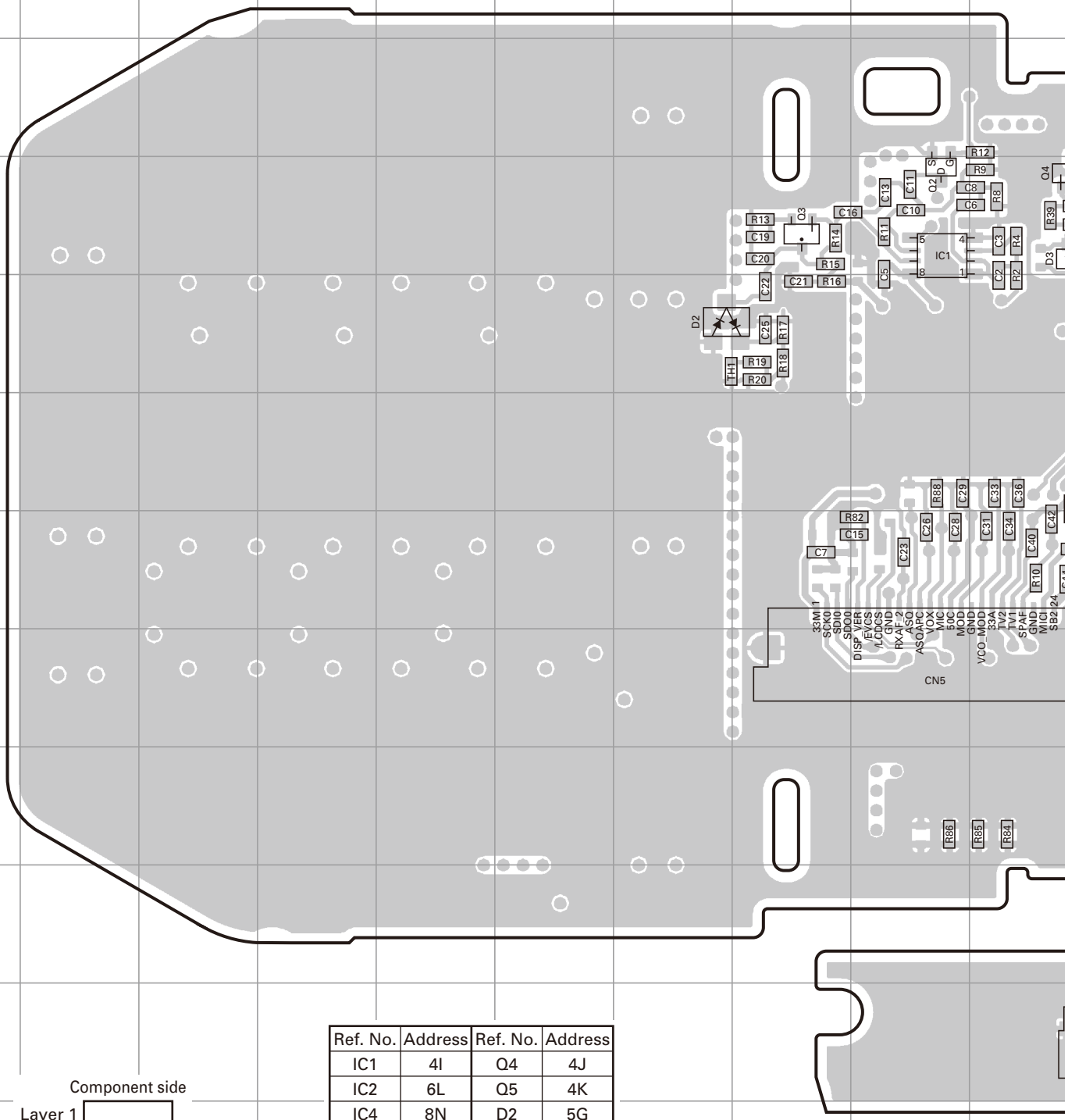
DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3
Foil side view (J79-0312-09)

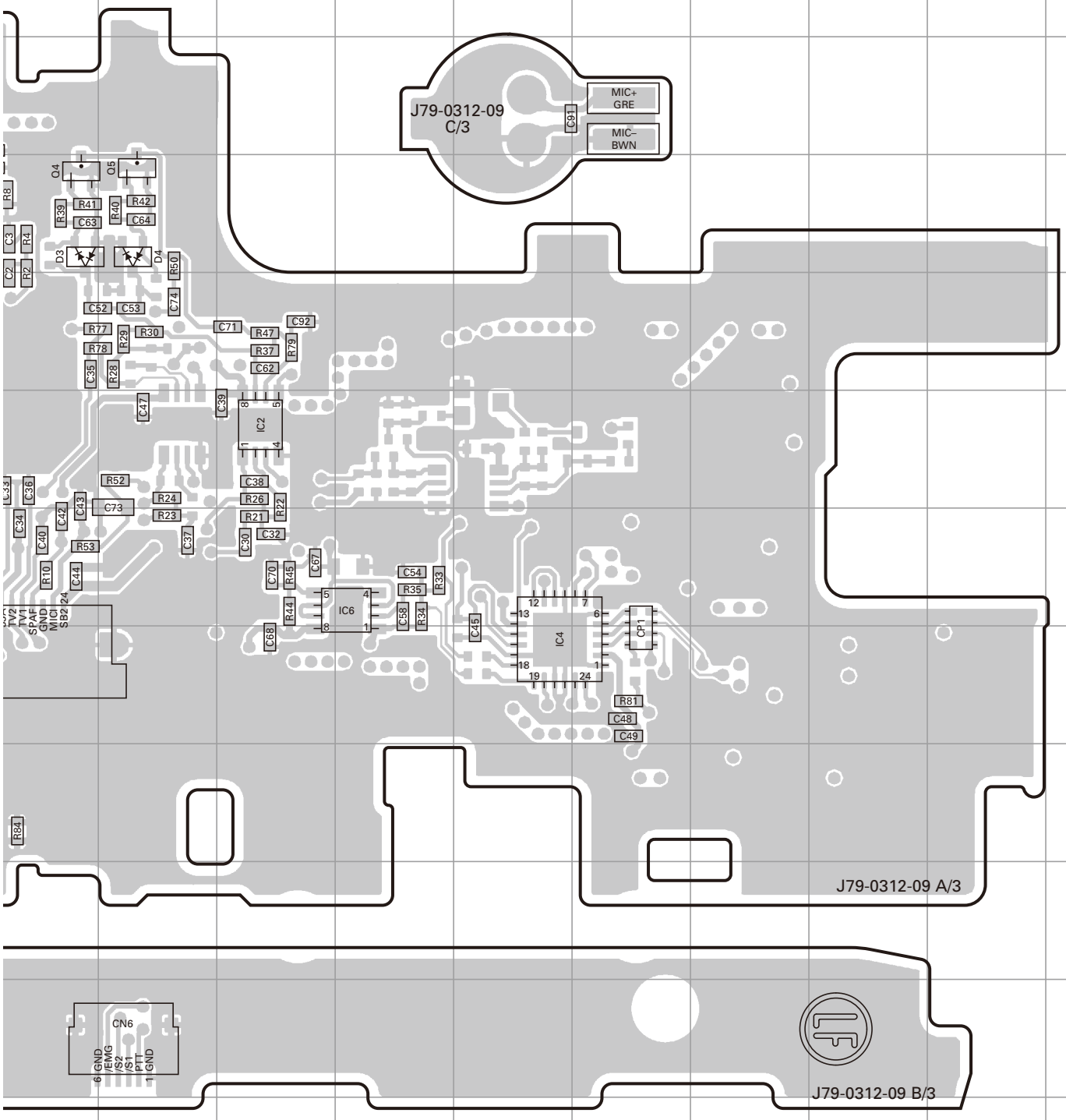


Ref. No.	Address	Ref. No.	Address
IC1	4I	Q4	4J
IC2	6L	Q5	4K
IC4	8N	D2	5G
IC6	7M	D3	4J
Q2	4I	D4	4K
Q3	4H		

Component side
Layer 1
Layer 2
Layer 3
Layer 4
Foil side

DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3

Foil side view (J79-0312-09)



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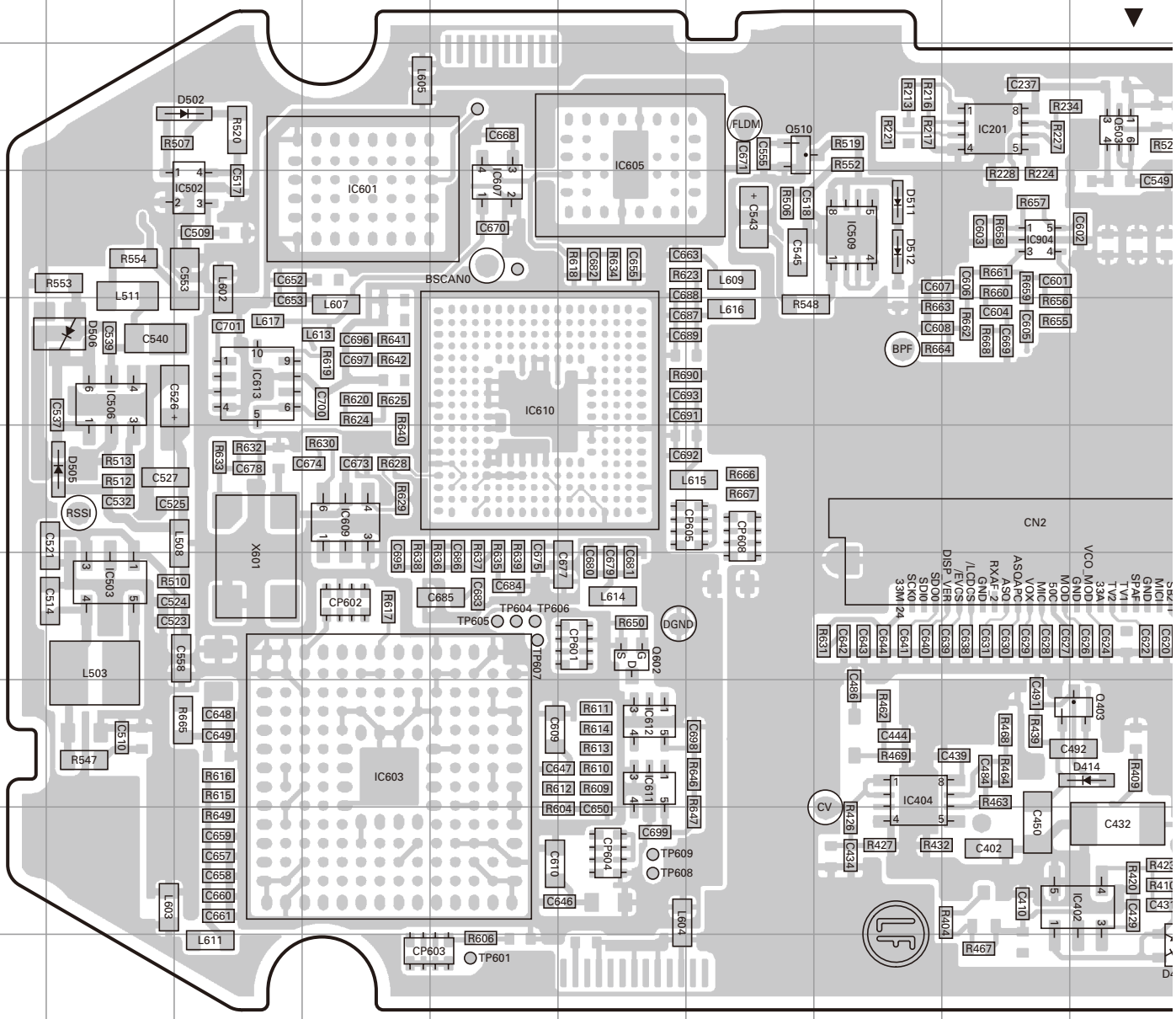
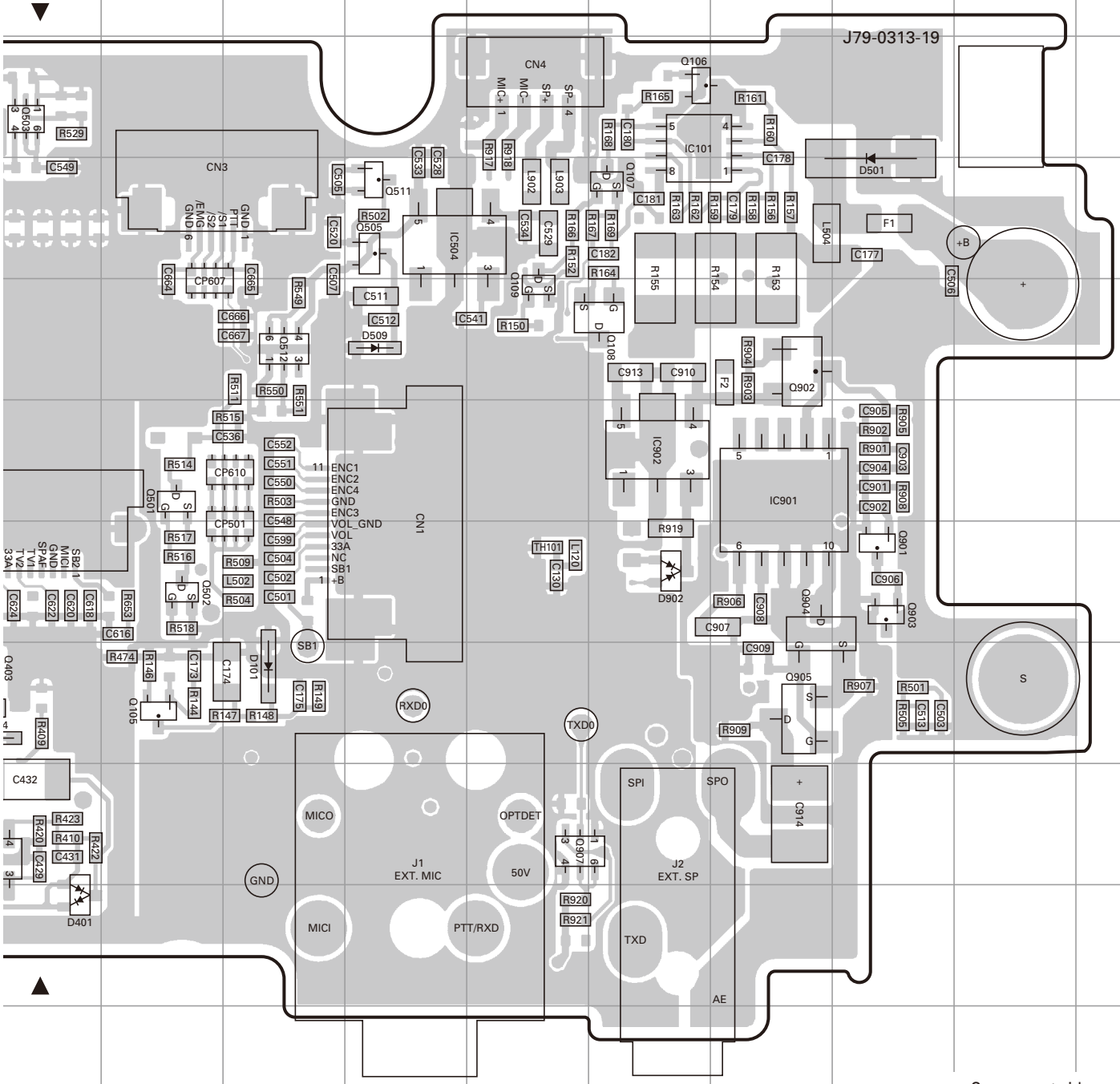
TX-RX UNIT (X57-8040-10) Component side view (J79-0313-19)



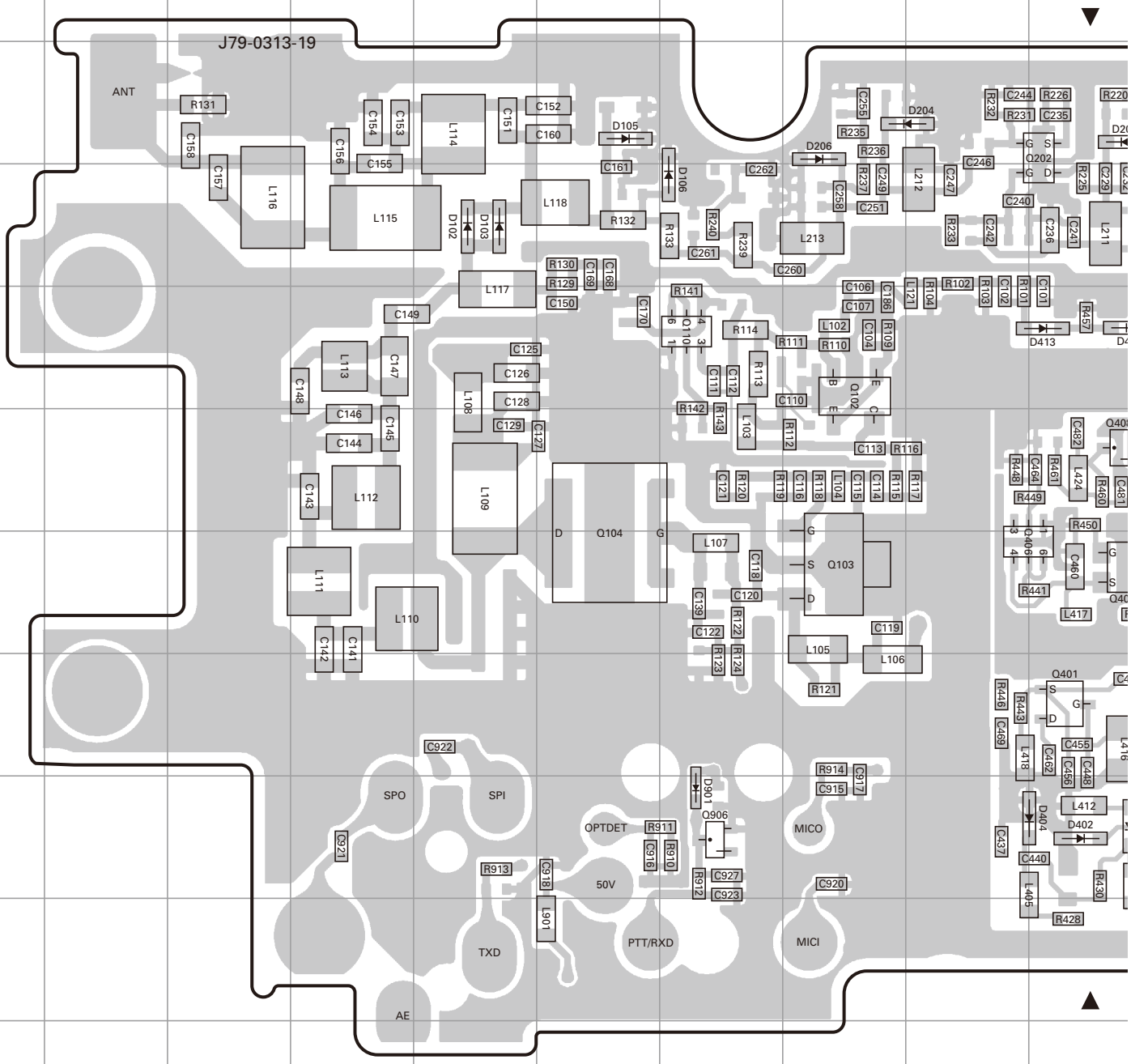
Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC101	3O	IC601	4D	IC901	6P	Q501	6K	Q902	5P	D502	3C
IC201	3I	IC603	8D	IC902	6O	Q502	7K	Q903	7Q	D505	6B
IC402	9J	IC605	3F	IC904	4I	Q503	3J	Q904	7P	D506	5B
IC404	8H	IC607	4E	Q105	8K	Q505	4M	Q905	8P	D509	5M
IC502	4C	IC609	6D	Q106	3O	Q510	3G	Q907	9N	D511	4H
IC503	7B	IC610	5E	Q107	4O	Q511	4M	D101	8L	D512	4H
IC504	4M	IC611	8F	Q108	5O	Q512	5L	D401	10J	D902	7O
IC506	5B	IC612	8F	Q109	5N	Q602	7F	D414	8J		
IC509	4H	IC613	5C	Q403	8J	Q901	7Q	D501	4Q		

TX-RX UNIT (X57-8040-10) Component side view (J79-0313-19)



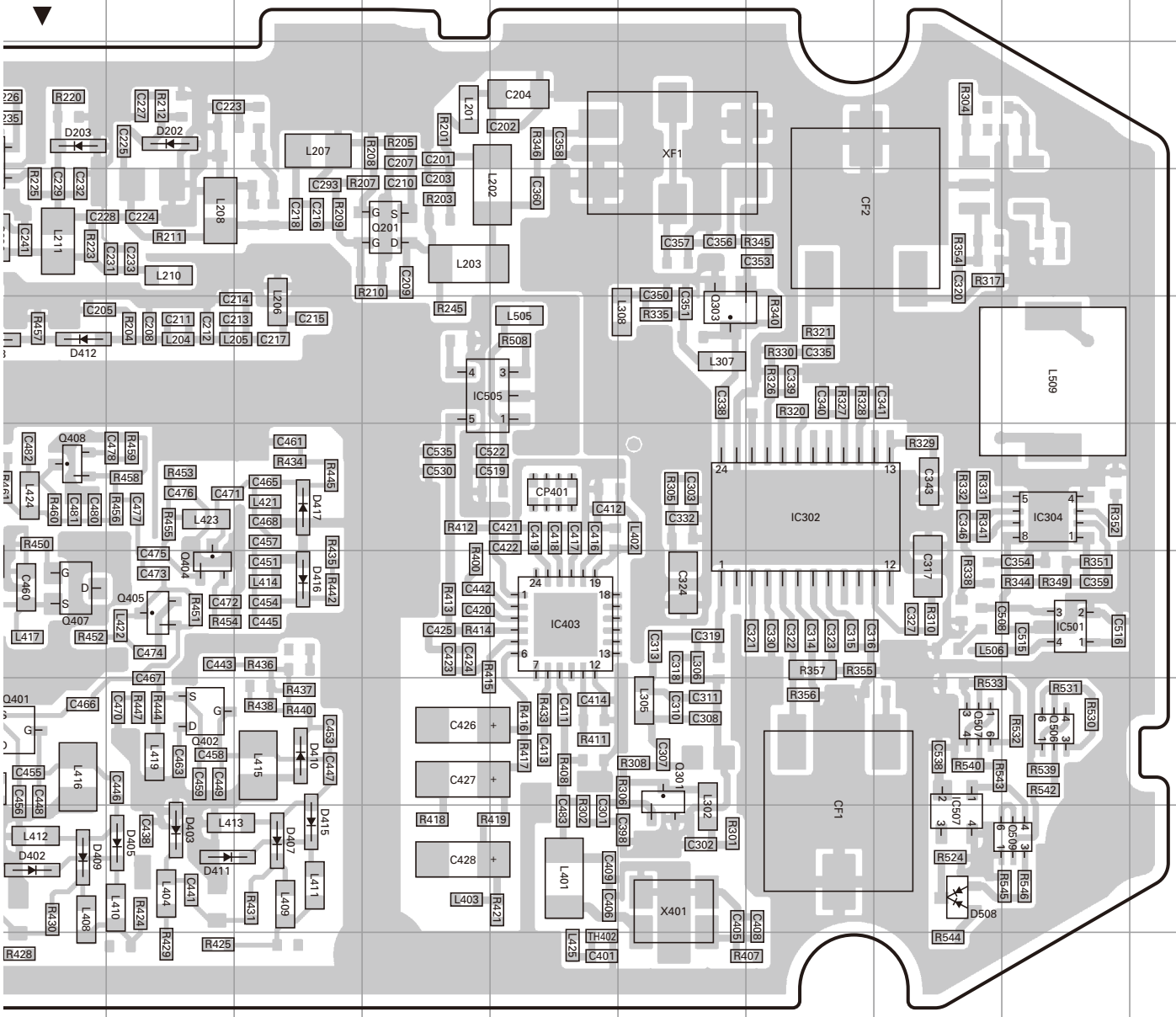
NX-220 PC BOARD

TX-RX UNIT (X57-8040-10) Foil side view (J79-0313-19)



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC302	6P	Q201	4M	Q408	6J	D203	3J	D411	9K
IC304	6R	Q202	3J	Q506	8R	D204	3I	D412	5J
IC403	7N	Q301	8O	Q507	8Q	D206	3H	D413	5J
IC501	7R	Q303	5O	Q509	9R	D402	9J	D415	9L
IC505	5M	Q401	8J	Q906	9G	D403	9K	D416	7L
IC507	9Q	Q402	8K	D102	4E	D404	9J	D417	6L
Q102	5H	Q404	7K	D103	4E	D405	9K	D508	9Q
Q103	7H	Q405	7K	D105	3F	D407	9L	D901	9G
Q104	7F	Q406	7I	D106	4G	D409	9J		
Q110	5G	Q407	7J	D202	3K	D410	8L		

TX-RX UNIT (X57-8040-10) Foil side view (J79-0313-19)



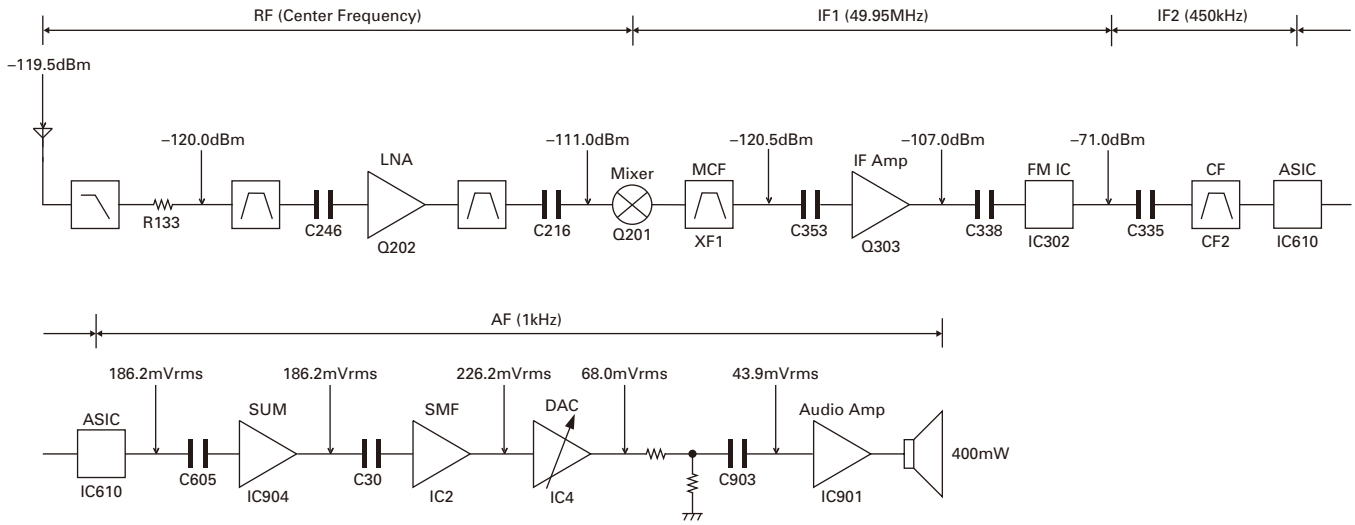
Component side

Layer 1	
Layer 2	
Layer 3	
Layer 4	
Layer 5	
Layer 6	
Layer 7	
Layer 8	

Foil side

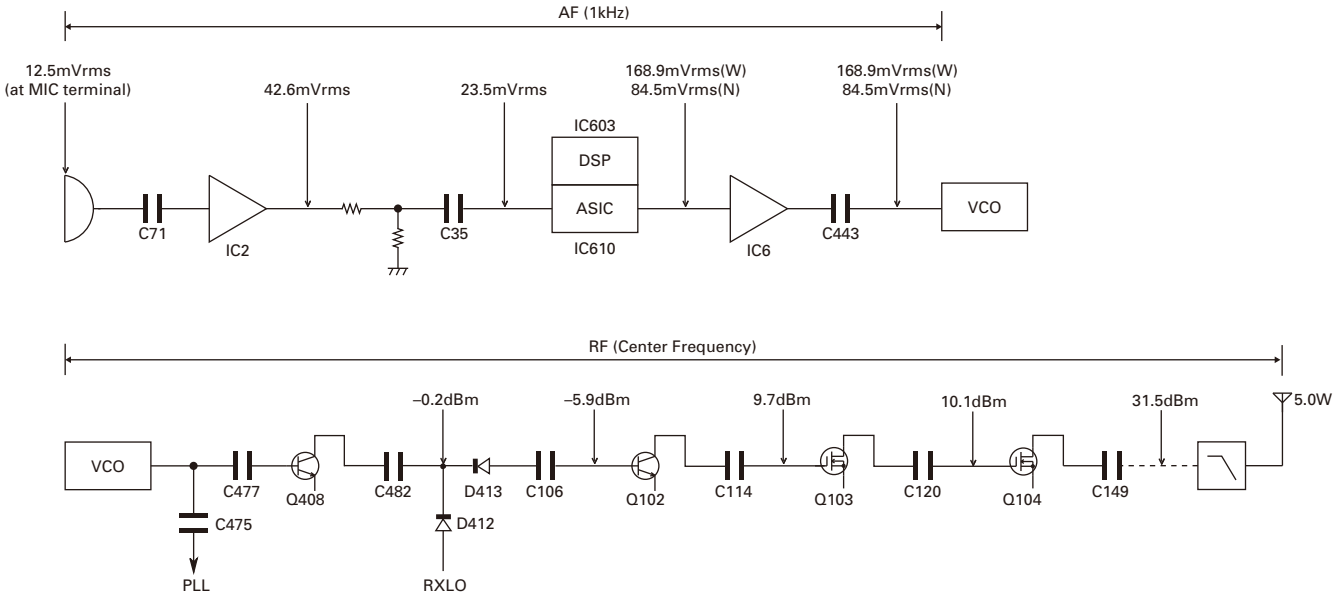
LEVEL DIAGRAM

Receiver Section



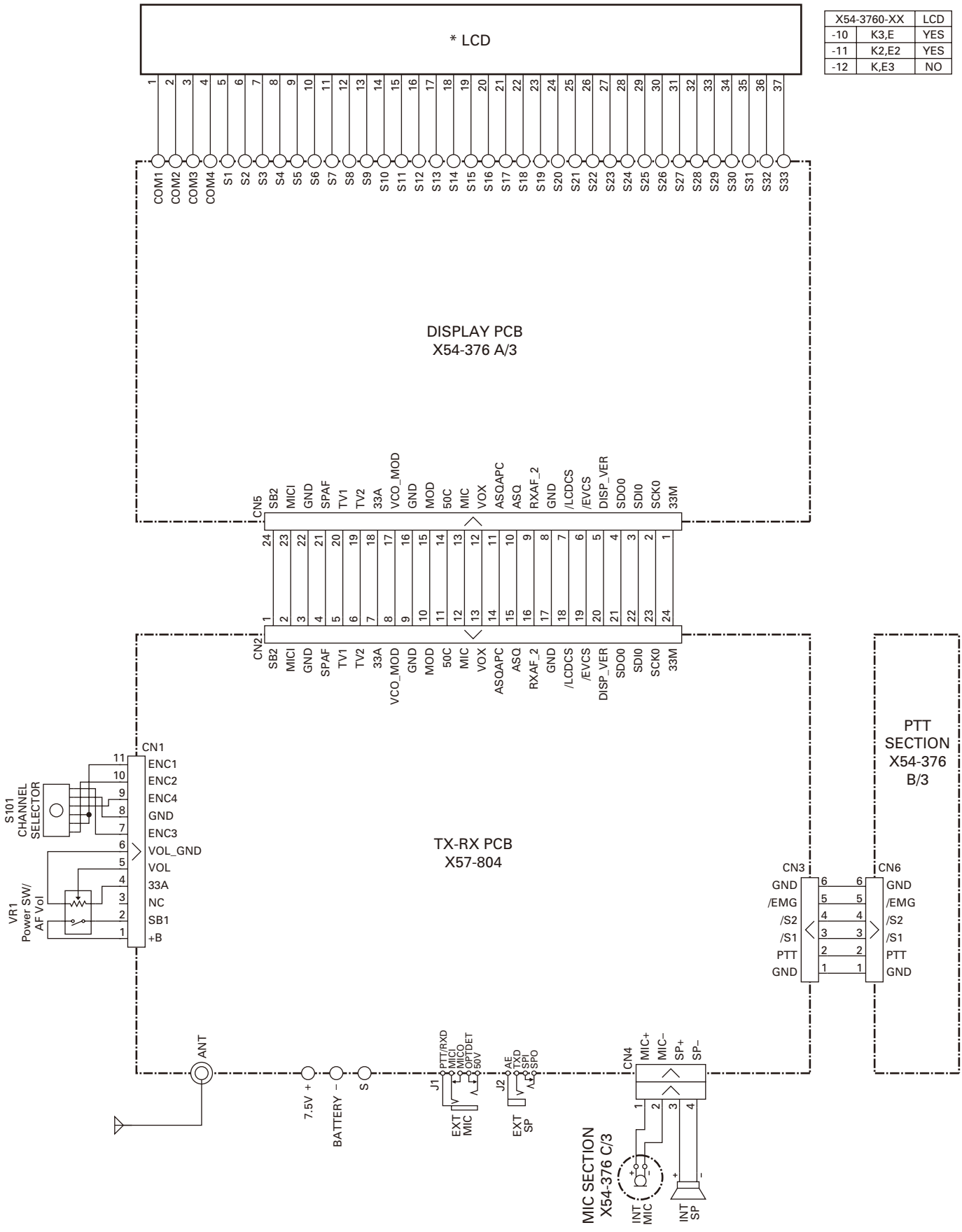
To make measurements in the AF section, connect the AC level meter. (ANT input: –53dB, 1kHz FM, 3kHz DEV (Wide))
In the RF section, use a 1000pF coupling capacitor.
(The display shows the SSG input value required to obtain 12dB SINAD without local level.)

Transmitter Section

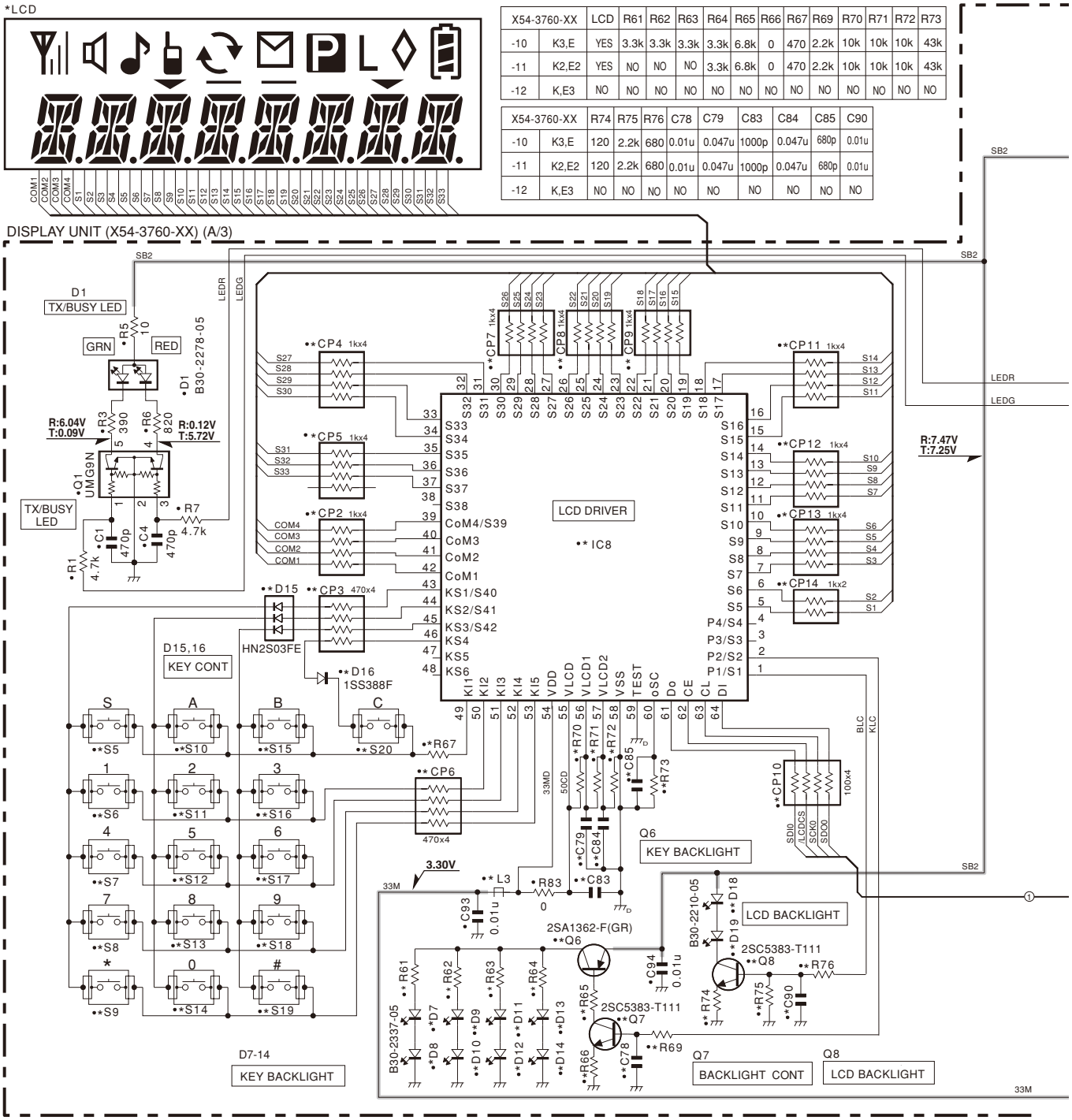


AG is set to the MIC input becomes (3kHz/1.5kHz) at 1kHz MOD (Wide/Narrow).
To make measurements in the AF section, connect the AC level meter.
In the RF section, use a 1000pF coupling capacitor.

INTERCONNECTION DIAGRAM



NX-220 SCHEMATIC DIAGRAM



X54-3760-XX		LCD	R61	R62	R63	R64	R65	R66	R67	R69	R70	R71	R72	R73
-10	K3,E	YES	3.3k	3.3k	3.3k	3.3k	6.8k	0	470	2.2k	10k	10k	10k	43k
-11	K2,E2	YES	NO	NO	NO	3.3k	6.8k	0	470	2.2k	10k	10k	10k	43k
-12	K,E3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

X54-3760-XX		R74	R75	R76	C78	C79	C83	C84	C85	C90
-10	K3,E	120	2.2k	680	0.01u	0.047u	1000p	0.047u	680p	0.01u
-11	K2,E2	120	2.2k	680	0.01u	0.047u	1000p	0.047u	680p	0.01u
-12	K,E3	NO	NO	NO	NO	NO	NO	NO	NO	NO

X54-3760-XX		CP2	CP3	CP4	CP5	CP6	CP7	CP8	CP9	CP10	CP11	CP12	CP13	CP14	L3
-10	K3,E	RK74HB1J102J	RK74HB1J471J	RK74HB1J102J	RK74HB1J102J	RK74HB1J471J	RK74HB1J102J	RK74HB1J102J	RK74HB1J102J	RK74HB1J101J	RK74HB1J102J	RK74HB1J102J	RK74HB1J102J	RK74HB1J102J	L92-0138-05
-11	K2,E2	RK74HB1J102J	RK74HB1J471J	RK74HB1J102J	RK74HB1J102J	NO	RK74HB1J102J	RK74HB1J102J	RK74HB1J102J	RK74HB1J101J	RK74HB1J102J	RK74HB1J102J	RK74HB1J102J	RK74HB1J102J	L92-0138-05
-12	K,E3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

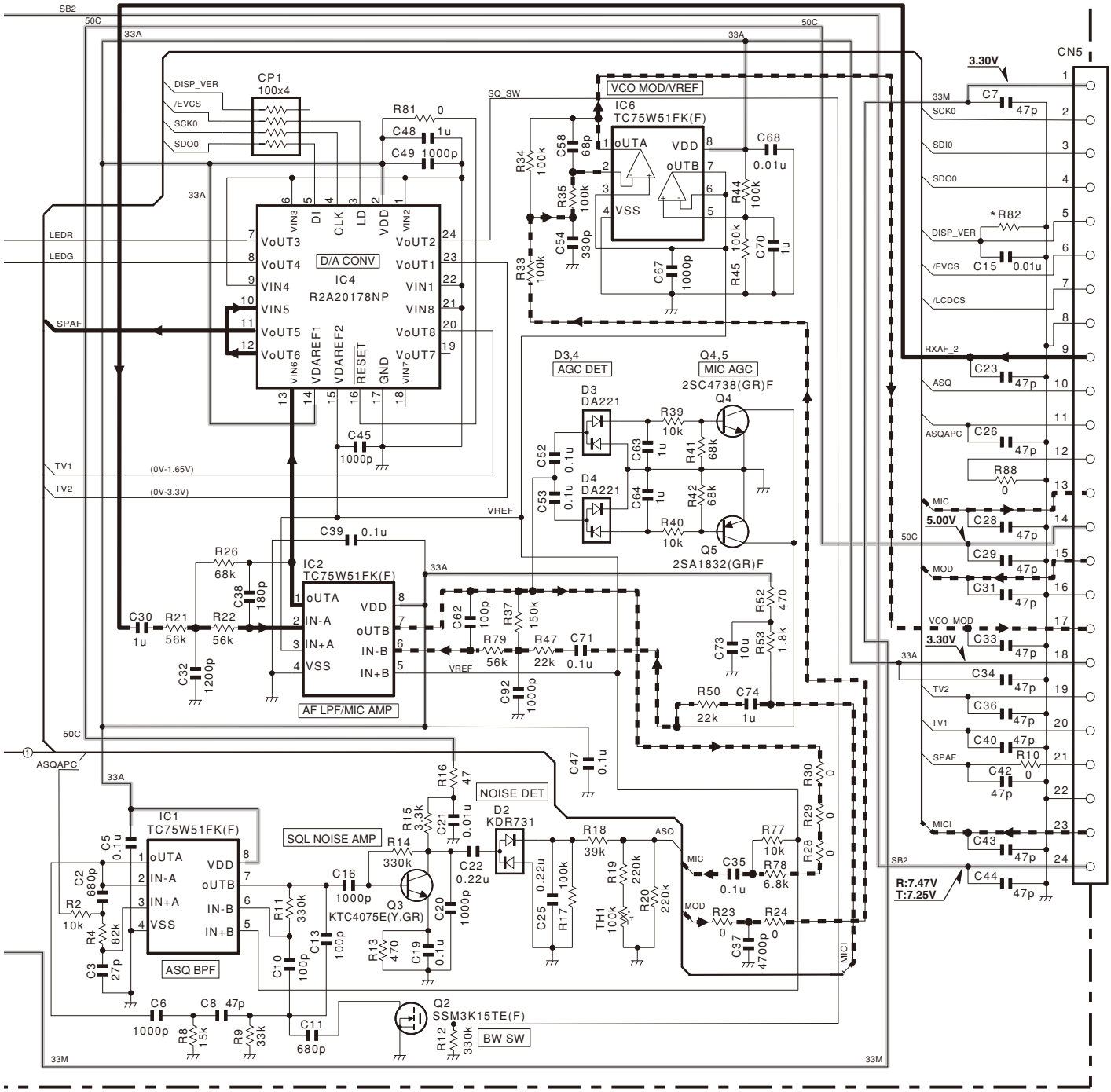
X54-3760-XX		D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D18	D19	IC8	Q6	Q7	Q8
-10	K3,E	B30-2337-05	B30-2337-05	B30-2337-05	B30-2337-05	B30-2337-05	B30-2337-05	B30-2337-05	B30-2337-05	HN2S03FE	1SS388F	B30-2210-05	B30-2210-05	LC75857W-E	2SA1362-F(GR)	2SC5383-T111	2SC5383-T111
-11	K2,E2	NO	NO	NO	NO	NO	NO	B30-2337-05	B30-2337-05	HN2S03FE	1SS388F	B30-2210-05	B30-2210-05	LC75857W-E	2SA1362-F(GR)	2SC5383-T111	2SC5383-T111
-12	K,E3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

X54-3760-XX		S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
-10	K3,E	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05	S70-0519-05
-11	K2,E2	S70-0519-05	NO	NO	NO	NO	S70-0519-05	NO	NO	NO	NO	S70-0519-05	NO	NO	NO	NO	S70-0519-05
-12	K,E3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

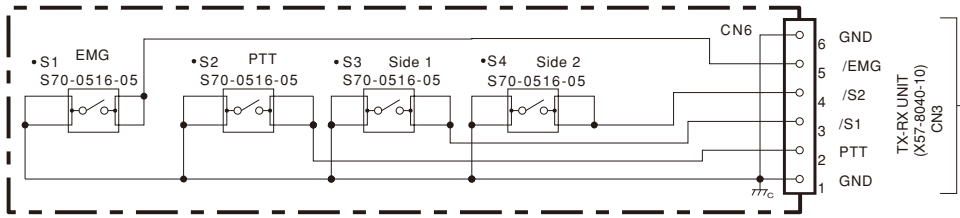
SCHEMATIC DIAGRAM NX-220

DISPLAY UNIT (X54-3760-XX) (A/3)

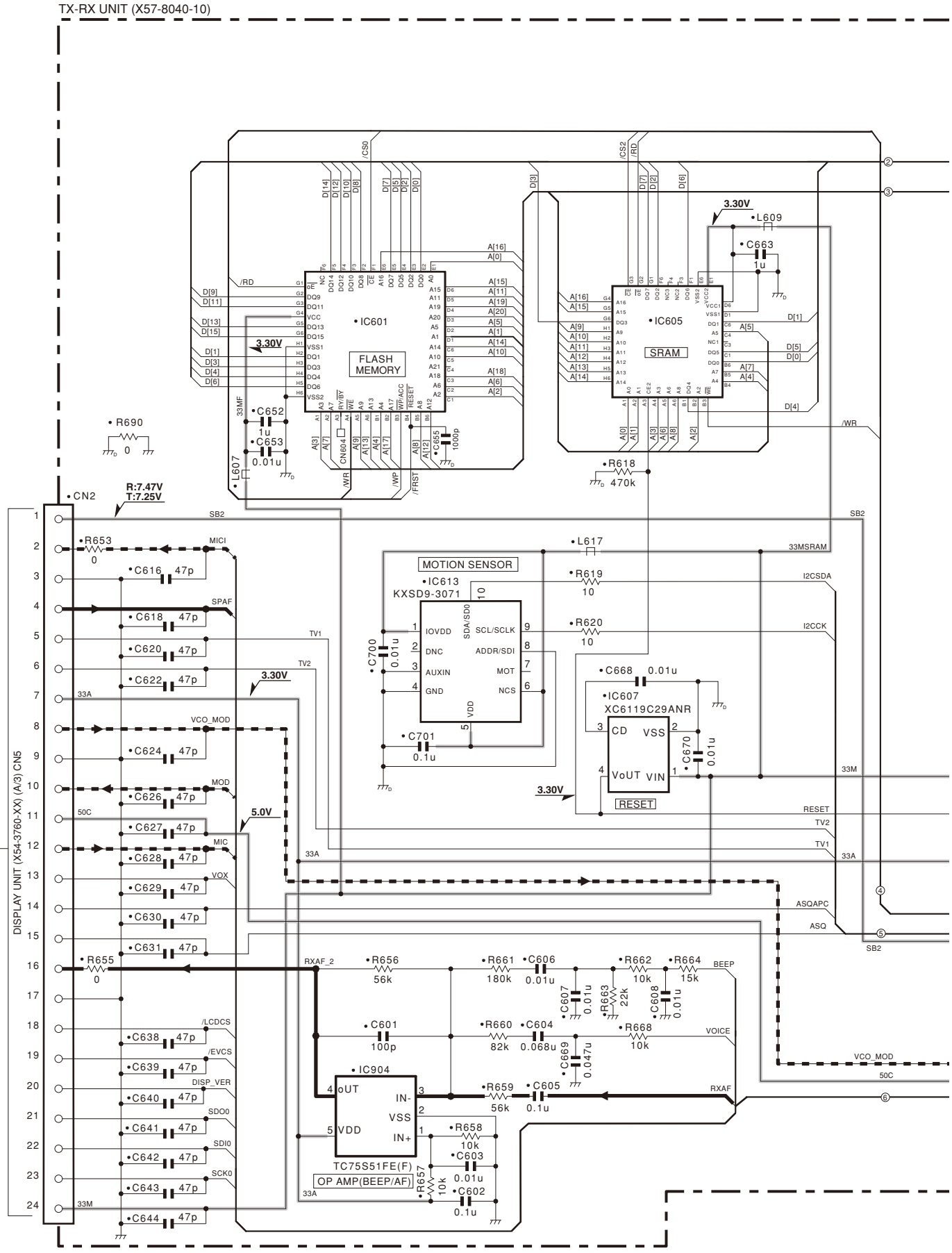
X54-3760-XX		R82	R84	R85	R86
0-10	K3,E	NO	0	NO	NO
0-11	K2,E2	NO	NO	0	NO
0-12	K,E3	3.3k	NO	NO	0



PTT SECTION
(X54-3760-XX)
(B/3)

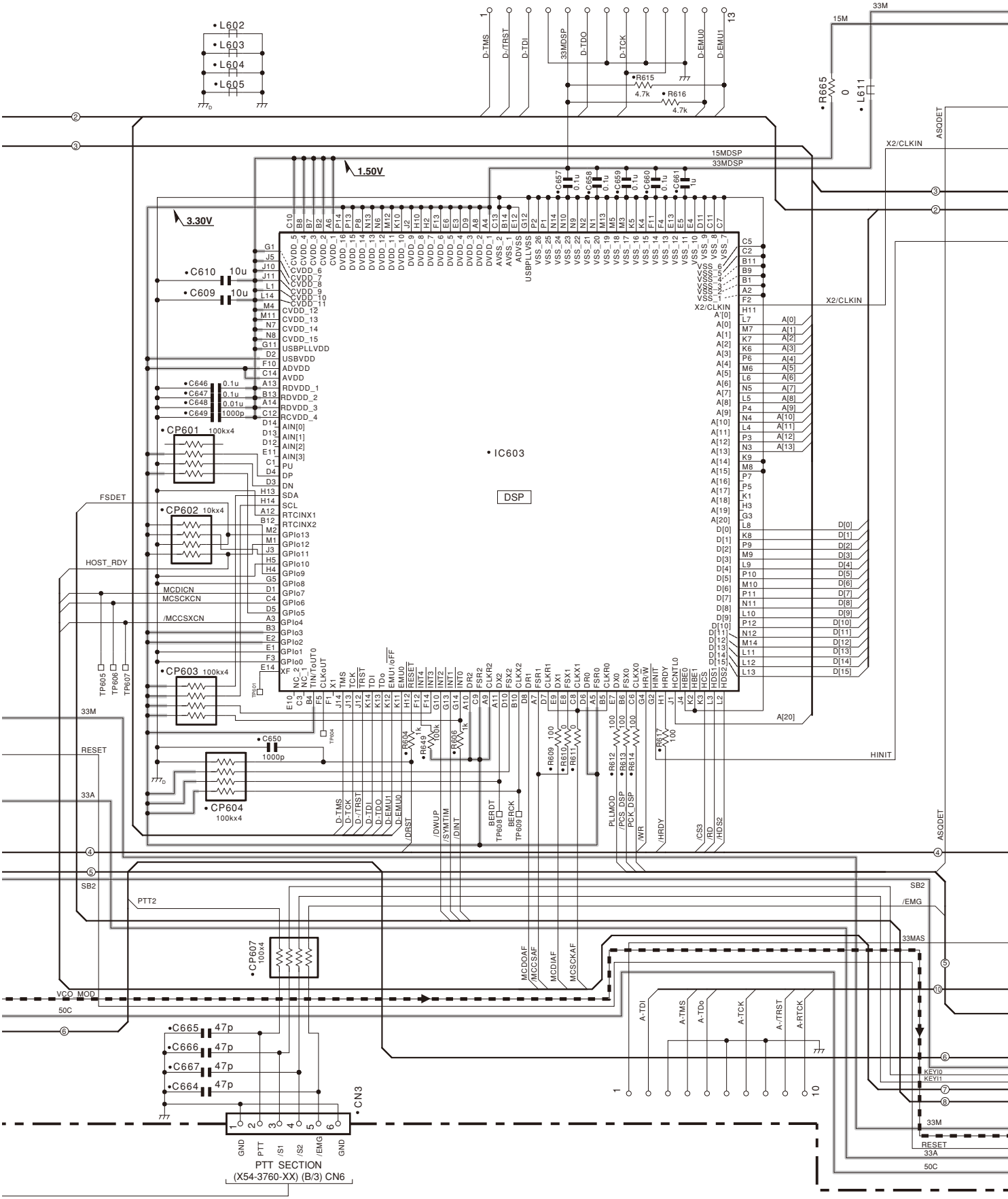


NX-220 SCHEMATIC DIAGRAM

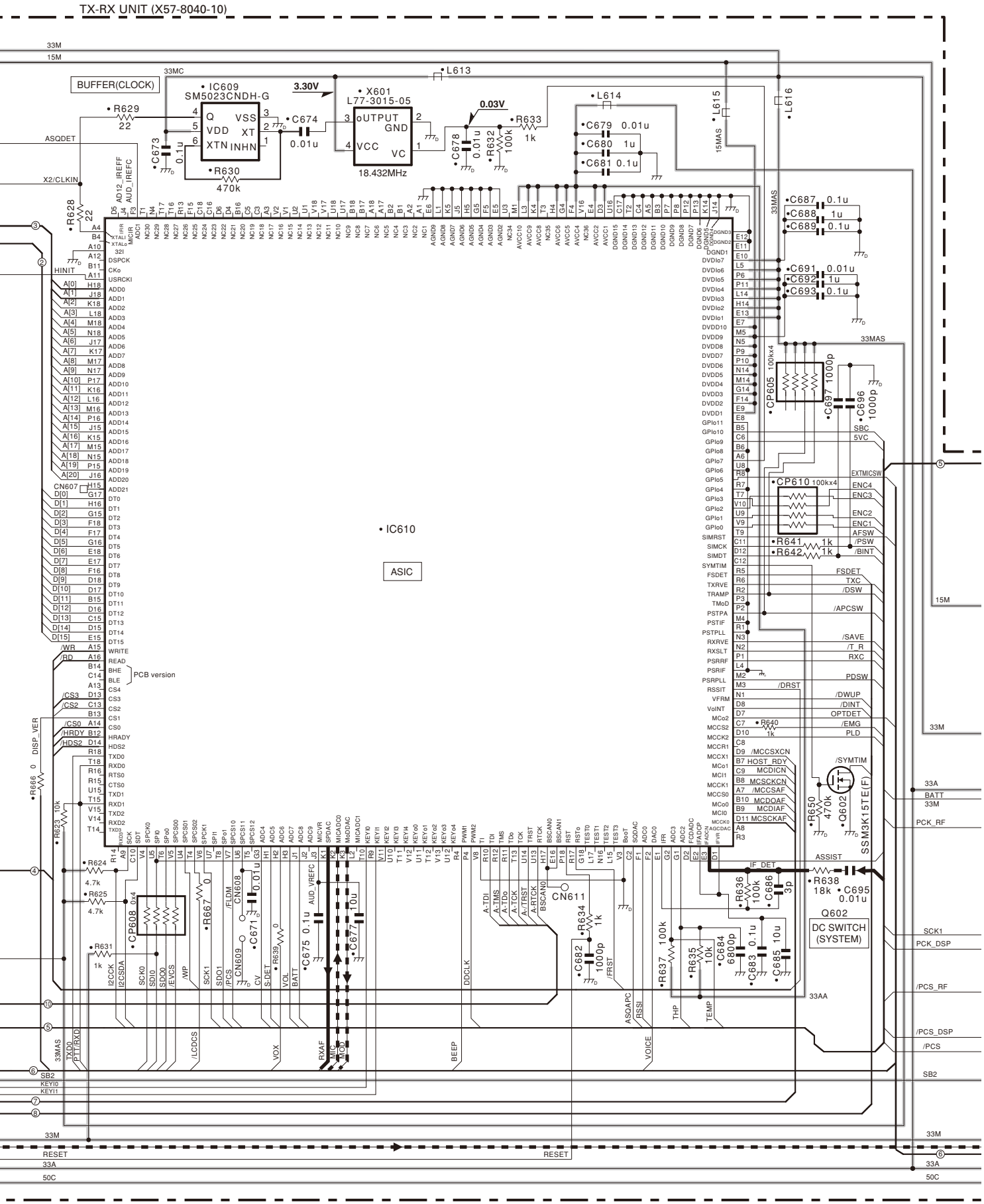


SCHEMATIC DIAGRAM NX-220

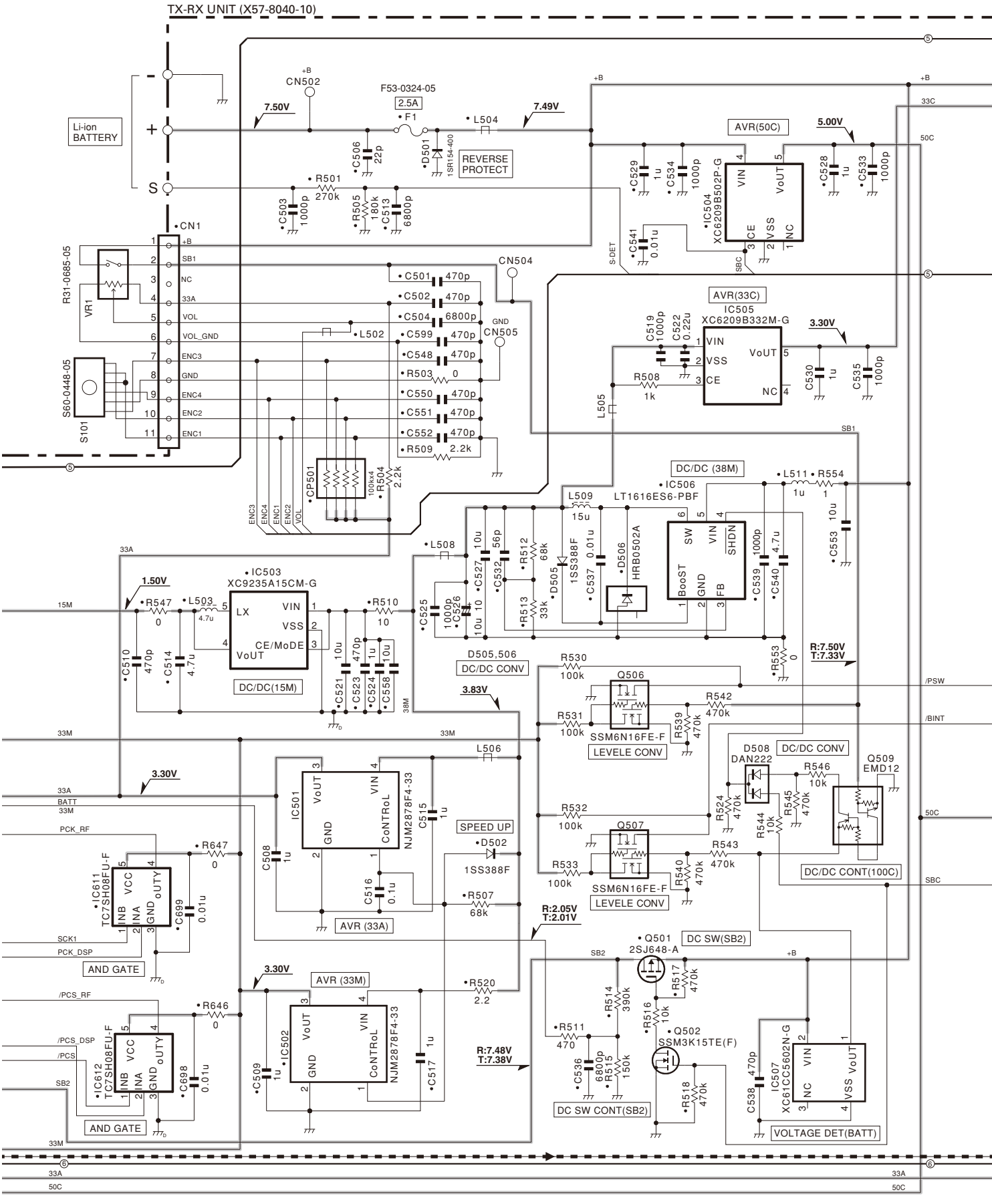
TX-RX UNIT (X57-8040-10)



NX-220 SCHEMATIC DIAGRAM

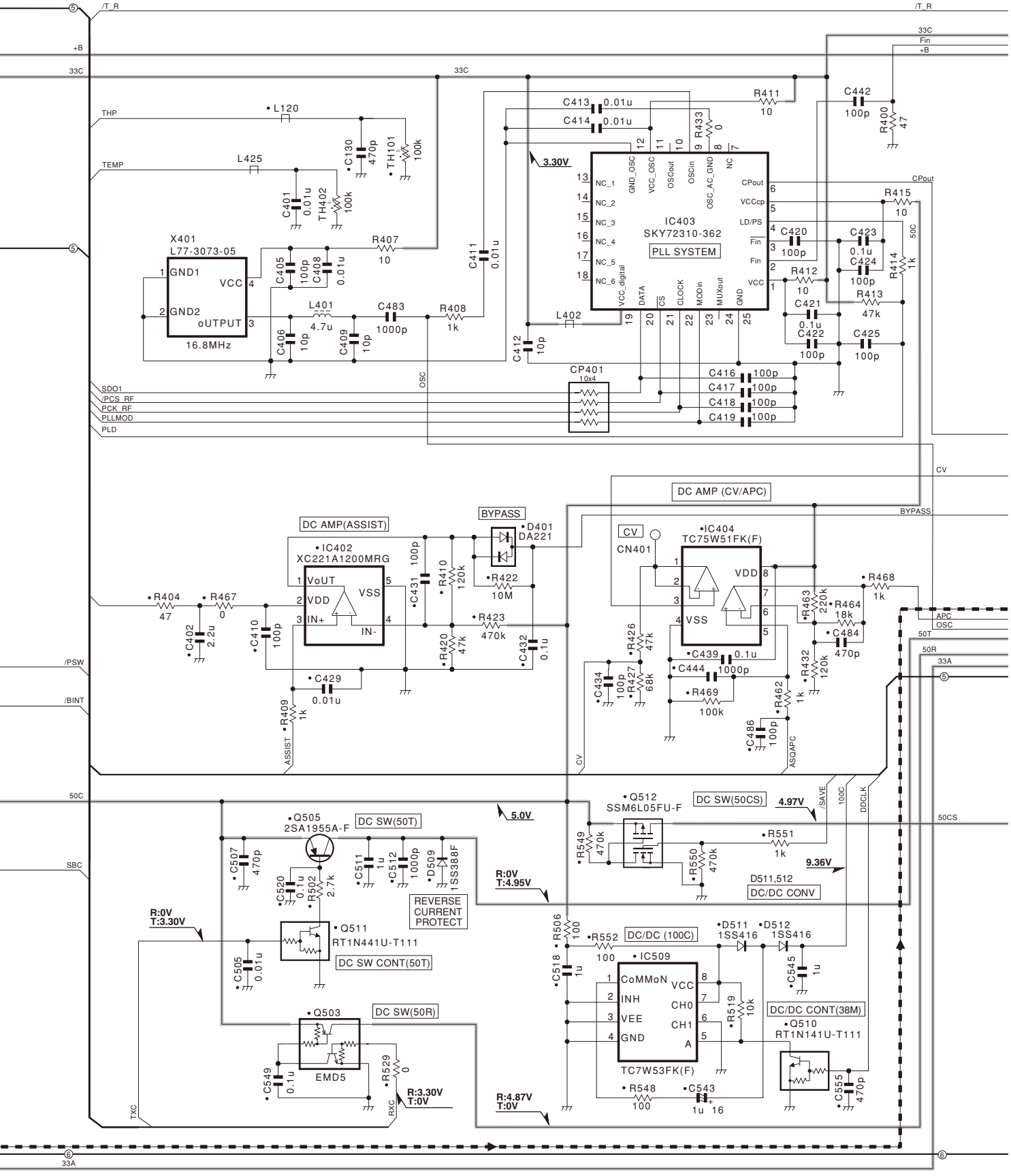


SCHEMATIC DIAGRAM NX-220



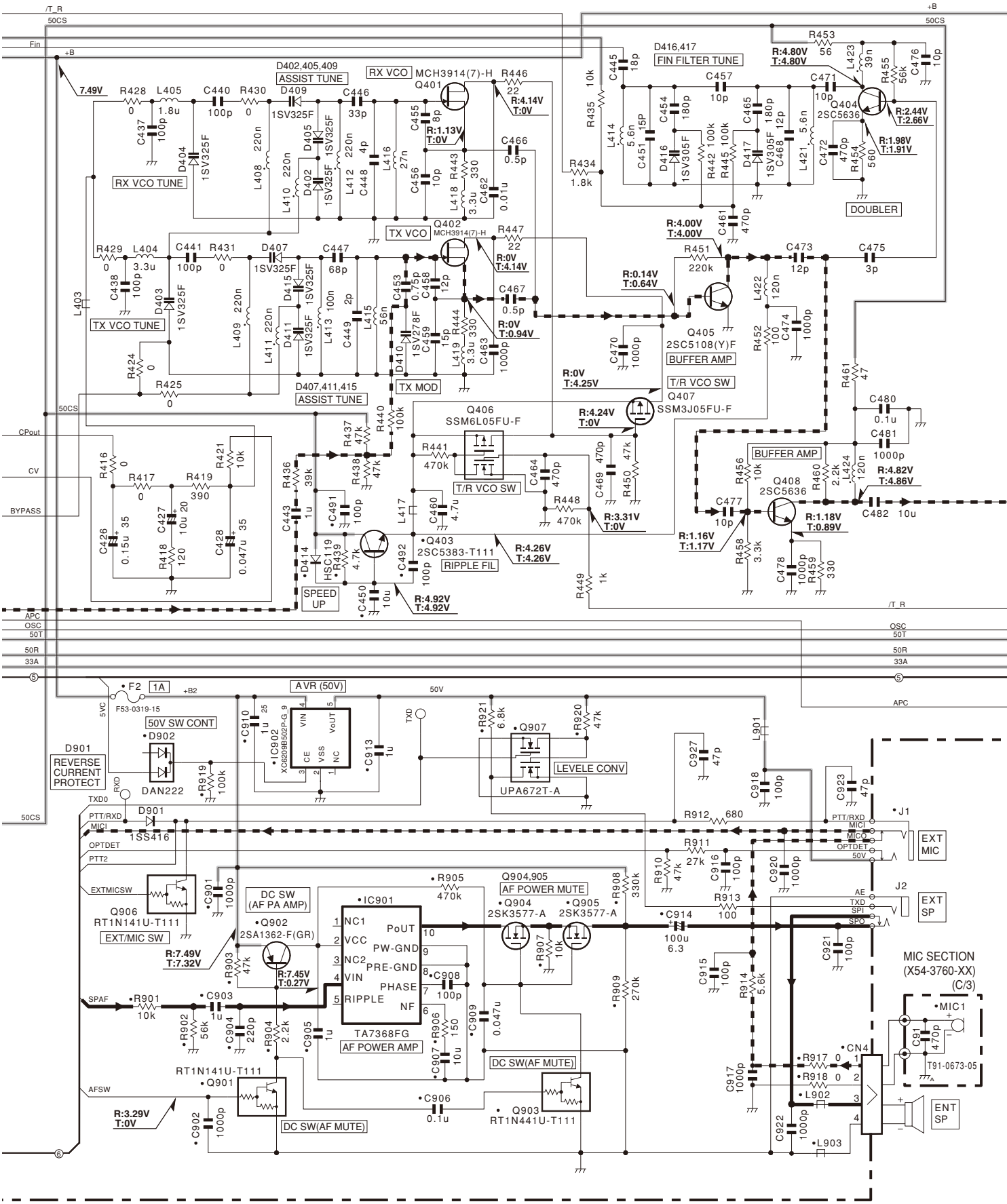
NX-220 SCHEMATIC DIAGRAM

TX-RX UNIT (X57-8040-10)



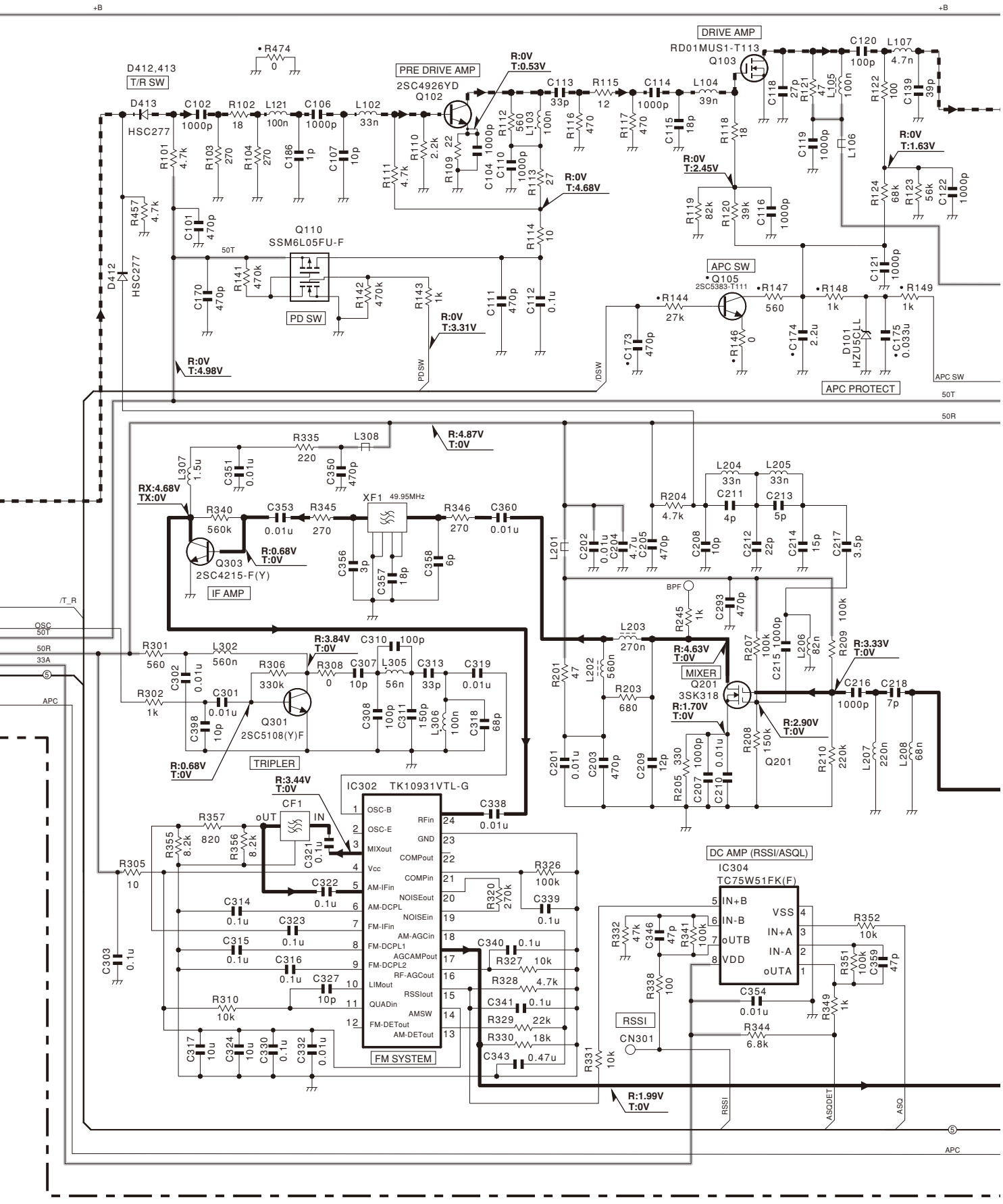
SCHEMATIC DIAGRAM NX-220

TX-RX UNIT (X57-8040-10)



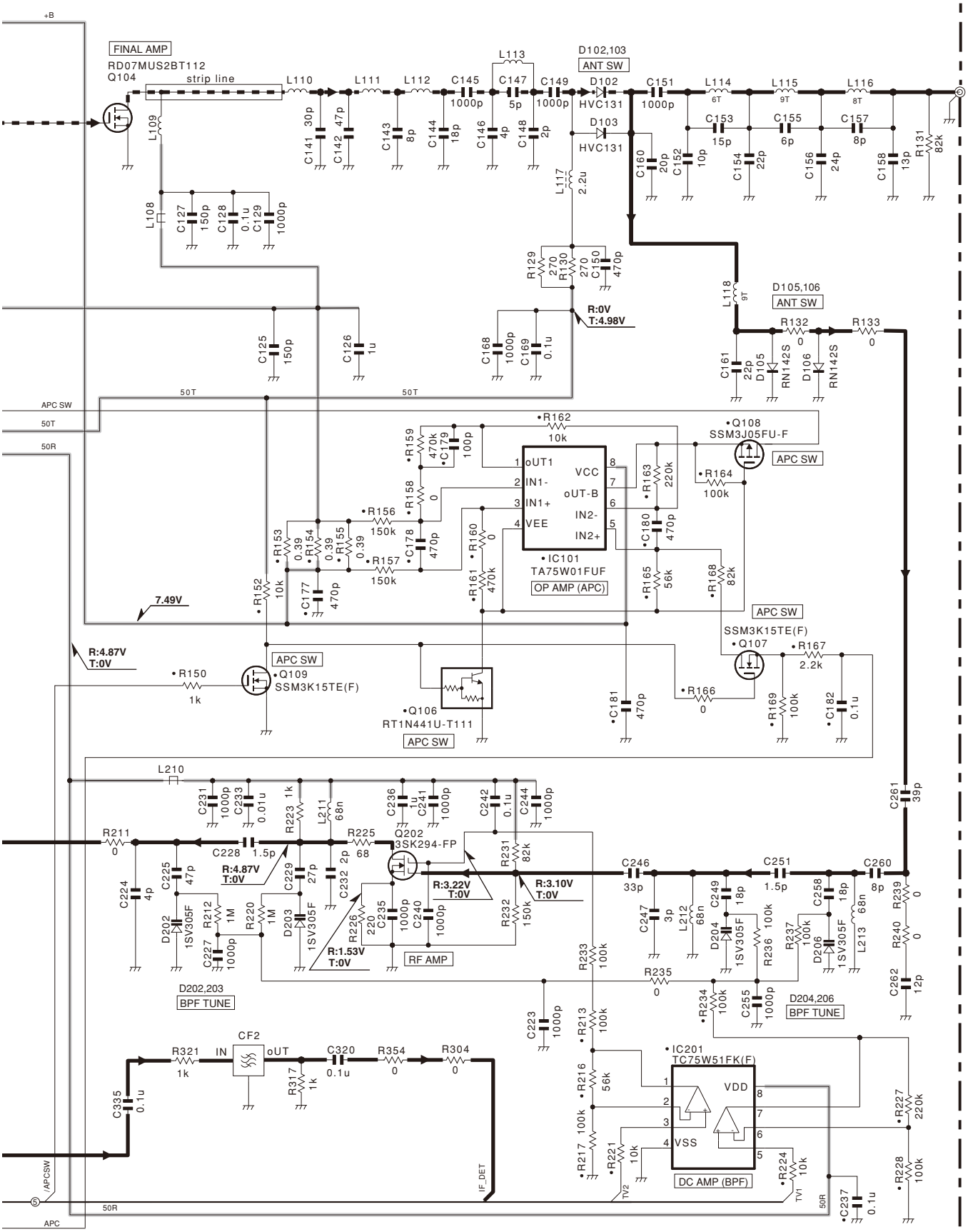
NX-220 SCHEMATIC DIAGRAM

TX-RX UNIT (X57-8040-10)



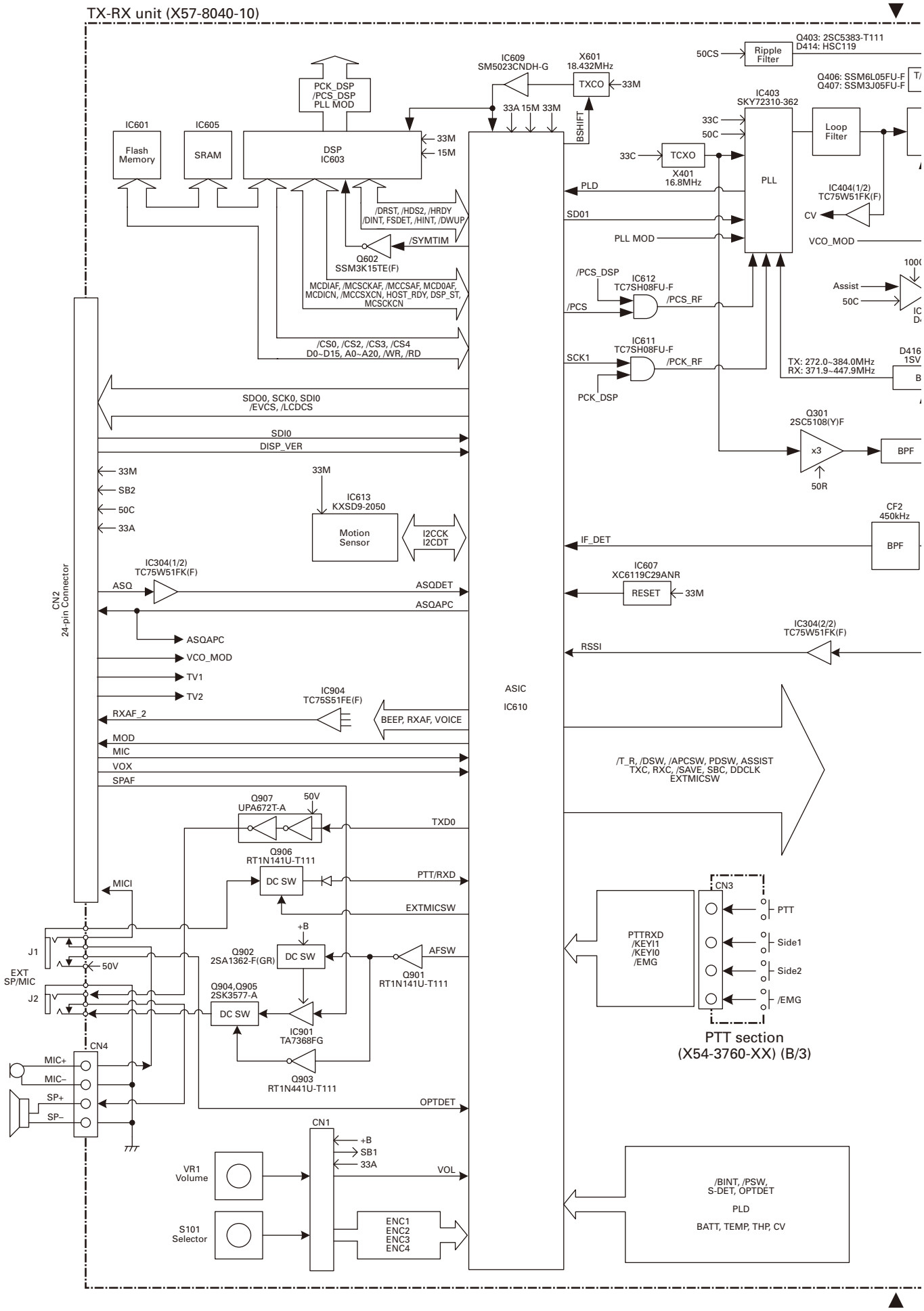
SCHEMATIC DIAGRAM NX-220

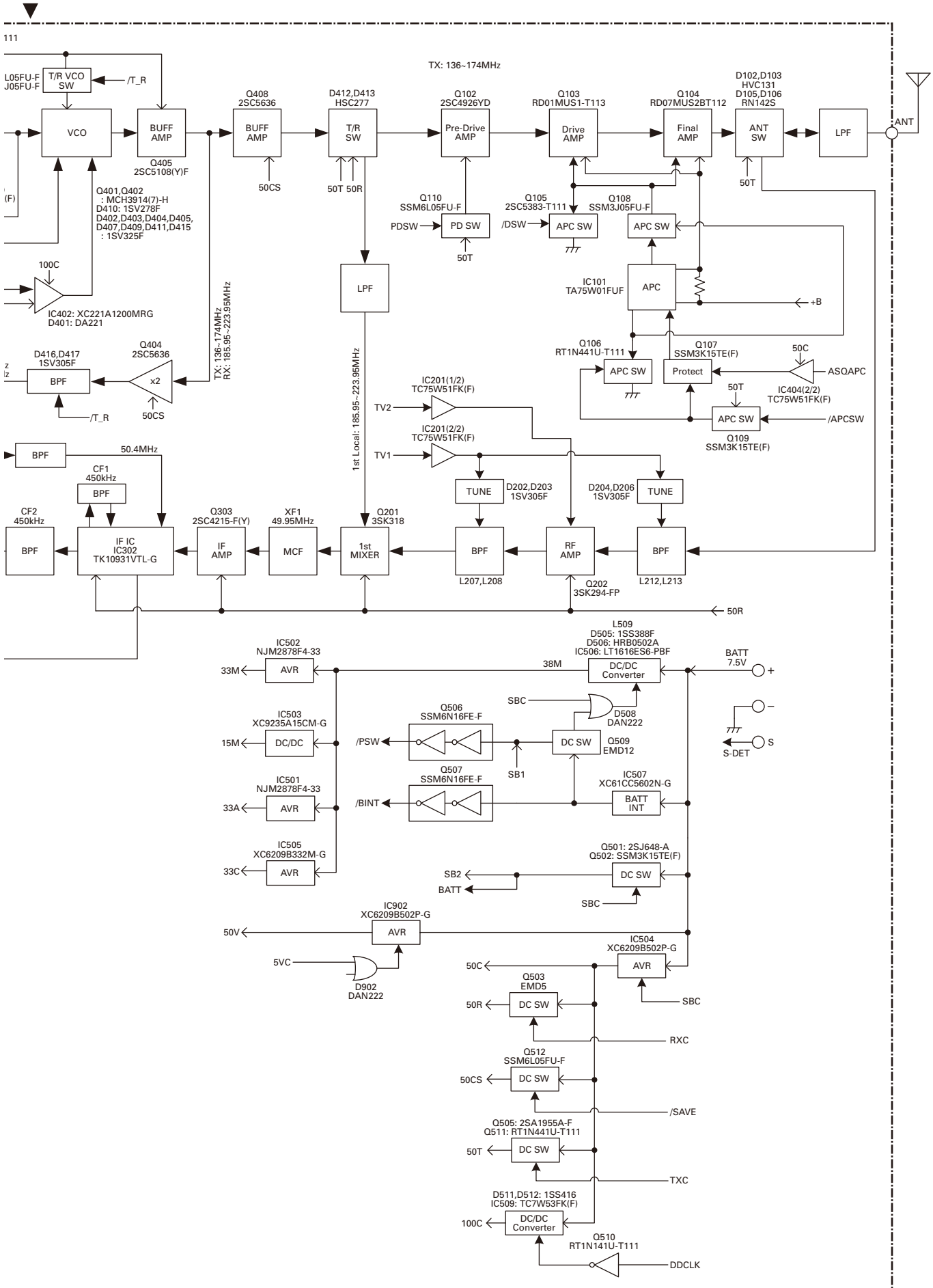
TX-RX UNIT (X57-8040-10)



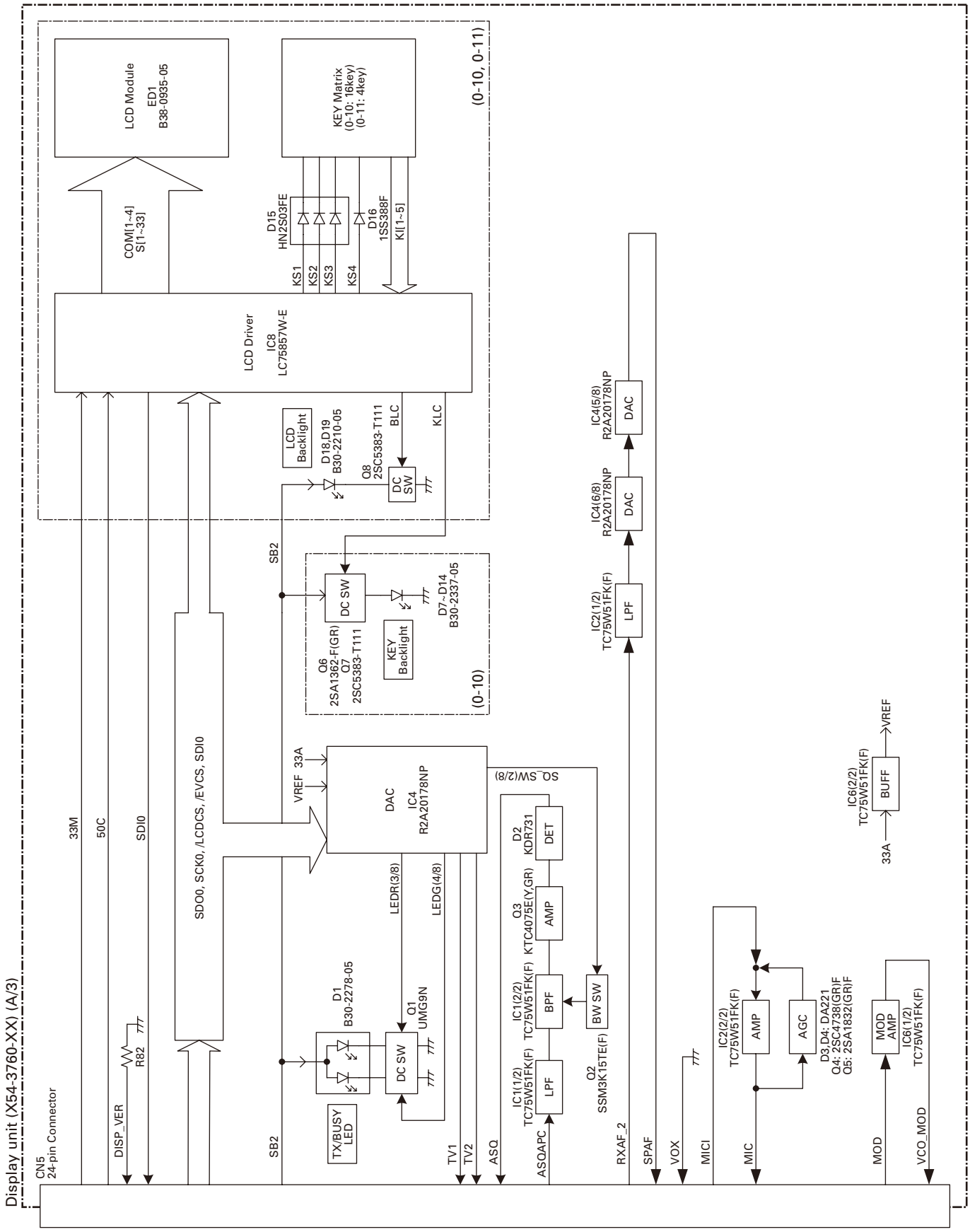
Note : The components marked with a dot (•) are parts of layer 1.

NX-220 BLOCK DIAGRAM




TX: 136~174MHz
T/R VCO SW
/T_R
VCO
BUFF AMP
Q405 2SC5108(Y)F
Q408 2SC5636
BUFF AMP
50CS
D412,D413 HSC277
T/R SW
50T 50R
Q102 2SC4926YD
Pre-Drive AMP
Q103 RD01MUS1-T113
Drive AMP
Q104 RD07MUS2BT112
Final AMP
D102,D103 HVC131
D105,D106 RN142S
ANT SW
LPF
ANT
50T
Q401,Q402 : MCH3914(7)-H
D410: 1SV278F
D402,D403,D404,D405,
D407,D409,D411,D415
: 1SV325F
Q110 SSM6L05FU-F
PDSW
PD SW
50T
Q105 2SC5383-T111
/DSW
APC SW
Q108 SSM3J05FU-F
APC SW
100C
IC402: XC221A1200MRG
D401: DA221
LPF
IC101 TA75W01FUF
APC
+B
Q106 RT1N441U-T111
APC SW
Q107 SSM3K15TE(F)
Protect
50C
ASQAPC
IC404(2/2) TC75W51FK(F)
50T
APC SW
/APCSW
Q109 SSM3K15TE(F)
D416,D417 1SV305F
BPF
/T_R
Q404 2SC5636
x2
50CS
TX: 136~174MHz
RX: 185.95~223.95MHz
1st Local: 185.95~223.95MHz
IC201(1/2) TC75W51FK(F)
TV2
IC201(2/2) TC75W51FK(F)
TV1
BPF
50.4MHz
CF1 450kHz
BPF
TUNE
D202,D203 1SV305F
D204,D206 1SV305F
TUNE
CF2 450kHz
BPF
IF IC IC302 TK10931VTL-G
Q303 2SC4215-F(Y)
IF AMP
XF1 49.95MHz
MCF
Q201 3SK318
1st MIXER
BPF
L207,L208
RF AMP
Q202 3SK294-FP
BPF
L212,L213
50R
L509
D505: 1SS388F
D506: HRB0502A
IC506: LT1616ES6-PBF
IC502 NJM2878F4-33
33M
AVR
38M
DC/DC Converter
BATT 7.5V
+
–
S
S-DET
SBC
D508 DAN222
IC503 XC9235A15CM-G
15M
DC/DC
Q506 SSM6N16FE-F
/PSW
DC SW
Q509 EMD12
SB1
Q507 SSM6N16FE-F
/BINT
IC507 XC61CC5602N-G
BATT INT
IC501 NJM2878F4-33
33A
AVR
IC505 XC6209B332M-G
33C
AVR
Q501: 2SJ648-A
Q502: SSM3K15TE(F)
SB2
BATT
DC SW
SBC
IC902 XC6209B502P-G
50V
AVR
5VC
D902 DAN222
IC504 XC6209B502P-G
50C
AVR
SBC
Q503 EMD5
50R
DC SW
RXC
Q512 SSM6L05FU-F
50CS
DC SW
/SAVE
Q505: 2SA1955A-F
Q511: RT1N441U-T111
50T
DC SW
TXC
D511,D512: 1SS416
IC509: TC7W53FK(F)
100C
DC/DC Converter
Q510 RT1N141U-T111
DDCLK

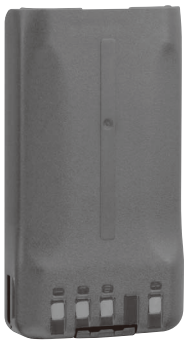
BLOCK DIAGRAM



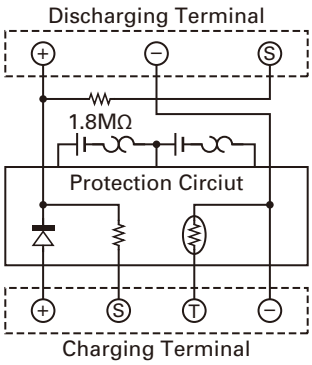
OPTIONAL ACCESSORIES

KNB-55L (Li-ion Battery Pack)

■ External View



■ Schematic Diagram

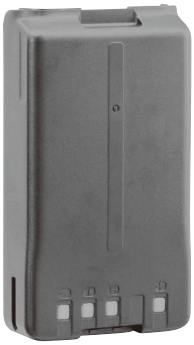


■ Specifications

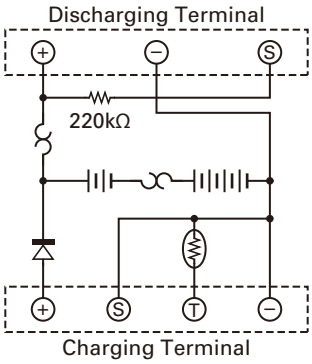
Voltage : 7.4V (3.7V x 2)
Capacity : 1480mAh

KNB-56N (Ni-MH Battery Pack)

■ External View



■ Schematic Diagram

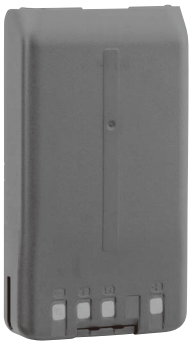


■ Specifications

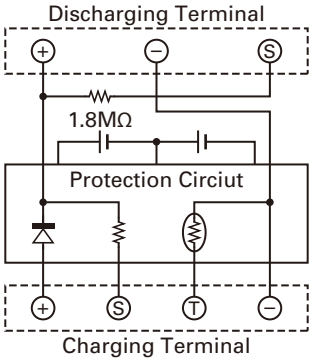
Voltage : 7.2V (1.2V x 6)
Capacity : 1400mAh

KNB-57L (Li-ion Battery Pack)

■ External View



■ Schematic Diagram



■ Specifications

Voltage : 7.4V (3.7V x 2)
Capacity : 2000mAh

SPECIFICATIONS (K TYPE)

GENERAL

Models	K: Basic Model K2: 4-Key w/LCD Model K3: Full Key w/LCD Model
Frequency Range	136~174MHz
Number of Channels	K2, K3: 260 K: 64
Zones	K2, K3: 128 K: 4
Max. Channels per Zone	K2, K3: 250 K: 16
Channel Spacing	Analog: 12.5/15/25/30kHz Digital: 6.25/12.5kHz
Operating Voltage	7.5V DC ±20%
Battery Life (5-5-90)	
with KNB-55L	Approx. 8.5 hours
with KNB-56N	Approx. 8.5 hours
with KNB-57L	Approx. 11.5 hours
Operating Temperature Range	–22°F to +140°F (–30°C to +60°C)
Frequency Stability	±2.0ppm
Antenna Impedance	50Ω
Dimensions (W x H x D) (Projections not included)	
K	
Radio only	2.20 x 4.35 x 1.48 in (56 x 110.5 x 37.5 mm)
with KNB-55L	2.20 x 4.35 x 1.50 in (56 x 110.5 x 38.1 mm)
with KNB-56N	2.20 x 4.35 x 1.72 in (56 x 110.5 x 43.8 mm)
with KNB-57L	2.20 x 4.35 x 1.58 in (56 x 110.5 x 40.1 mm)
K2, K3	
Radio only	2.20 x 4.35 x 1.45 in (56 x 110.5 x 36.9 mm)
with KNB-55L	2.20 x 4.35 x 1.48 in (56 x 110.5 x 37.5 mm)
with KNB-56N	2.20 x 4.35 x 1.70 in (56 x 110.5 x 43.2 mm)
with KNB-57L	2.20 x 4.35 x 1.56 in (56 x 110.5 x 39.5 mm)
Weight (net)	
Radio only	K: 7.2 oz (205g) K2, K3: 7.4 oz (210g)
with KNB-55L	K: 10.6 oz (300g) K2, K3: 10.8 oz (305g)
with KNB-56N	K: 14.1 oz (400g) K2, K3: 14.3 oz (405g)
with KNB-57L	K: 11.5 oz (325g) K2, K3: 11.6 oz (330g)

RECEIVER

Sensitivity	Digital @6.25kHz (3% BER): 0.20µV Digital @12.5kHz (3% BER): 0.25µV Analog (12dB SINAD): 0.25µV
Selectivity	Analog @25kHz: 72dB Analog @12.5kHz: 65dB
Intermodulation Distortion	Analog: 70dB
Spurious Response	Analog: 70dB
Audio Distortion	Less than 3%
Audio Output	500mW/8Ω

TRANSMITTER

RF Power Output	5W/1W
Spurious Response	70dB
FM Hum and Noise	Analog @25kHz: 45dB Analog @12.5kHz: 40dB
Audio Distortion	Less than 3%
Modulation	16K0F3E, 11K0F3E, 8K30F1E, 8K30F1D, 8K30F7W, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D

Analog measurements made per TIA/EIA 603 and specifications shown are typical.
Kenwood reserves the right to change specifications without prior notice or obligation.

SPECIFICATIONS (E TYPE)

GENERAL

Models	E3: Basic Model E2: 4-Key w/LCD Model E: Full Key w/LCD Model
Frequency Range	136~174MHz
Number of Channels	E, E2: 260 E3: 64
Zones	E, E2: 128 E3: 4
Max. Channels per Zone	E, E2: 250 E3: 16
Channel Spacing	Analogue: 12.5/20/25kHz Digital: 6.25/12.5kHz
Operating Voltage	7.5V DC ±20%
Battery Life (5-5-90)	
with KNB-55L	Approx. 8.5 hours
with KNB-56N	Approx. 8.5 hours
with KNB-57L	Approx. 11.5 hours
Operating Temperature Range	–30°C to +60°C
Frequency Stability	±2.0ppm
Antenna Impedance	50Ω
Dimensions (W x H x D) (Projections not included)	
E3	
Radio only	56 x 110.5 x 37.5 mm
with KNB-55L	56 x 110.5 x 38.1 mm
with KNB-56N	56 x 110.5 x 43.8 mm
with KNB-57L	56 x 110.5 x 40.1 mm
E, E2	
Radio only	56 x 110.5 x 36.9 mm
with KNB-55L	56 x 110.5 x 37.5 mm
with KNB-56N	56 x 110.5 x 43.2 mm
with KNB-57L	56 x 110.5 x 39.5 mm
Weight (net)	
Radio only	E3: 205g E, E2: 210g
with KNB-55L	E3: 300g E, E2: 305g
with KNB-56N	E3: 400g E, E2: 405g
with KNB-57L	E3: 325g E, E2: 330g

RECEIVER

Sensitivity (Analogue)	
EIA 12dB SINAD	25kHz: 0.28µV 20kHz: 0.28µV 12.5kHz: 0.32µV
EN 20dB SINAD	25kHz: –3dBµV (0.35µV) 20kHz: –3dBµV (0.35µV) 12.5kHz: –1dBµV (0.45µV)
Sensitivity (Digital)	
3% BER	12.5kHz: 0.32µV 6.25kHz: 0.25µV
1% BER	12.5kHz: –1dBµV (0.45µV) 6.25kHz: –4dBµV (0.32µV)
Adjacent Channel Selectivity (Analogue)	25kHz: 76dB 20kHz: 74dB 12.5kHz: 68dB
Intermodulation (Analogue)	65dB
Spurious Response Rejection (Analogue)	75dB
Audio Distortion	Less than 3%
Audio Output	500mW/8Ω

TRANSMITTER

RF Power Output (High/Low)	5W/1W
Modulation Limiting (Analogue)	±5.0kHz at 25kHz ±4.0kHz at 20kHz ±2.5kHz at 12.5kHz
Spurious Emission	–36dBm ≤ 1GHz, –30dBm > 1GHz
FM Noise (EIA) (Analogue)	25kHz: 45dB 20kHz: 45dB 12.5kHz: 40dB
Modulation Distortion	Less than 3%
Microphone Impedance	1.8kΩ
Modulation	16K0F3E, 14K0F3E, 14K0F2D, 12K0F2D, 8K50F3E, 7K50F2D, 8K30F1E, 8K30F1D, 8K30F7W, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D

Analog measurements made per EN standards or TIA/EIA 603 and specifications shown are typical.
Kenwood reserves the right to change specifications without prior notice or obligation.

NX-220

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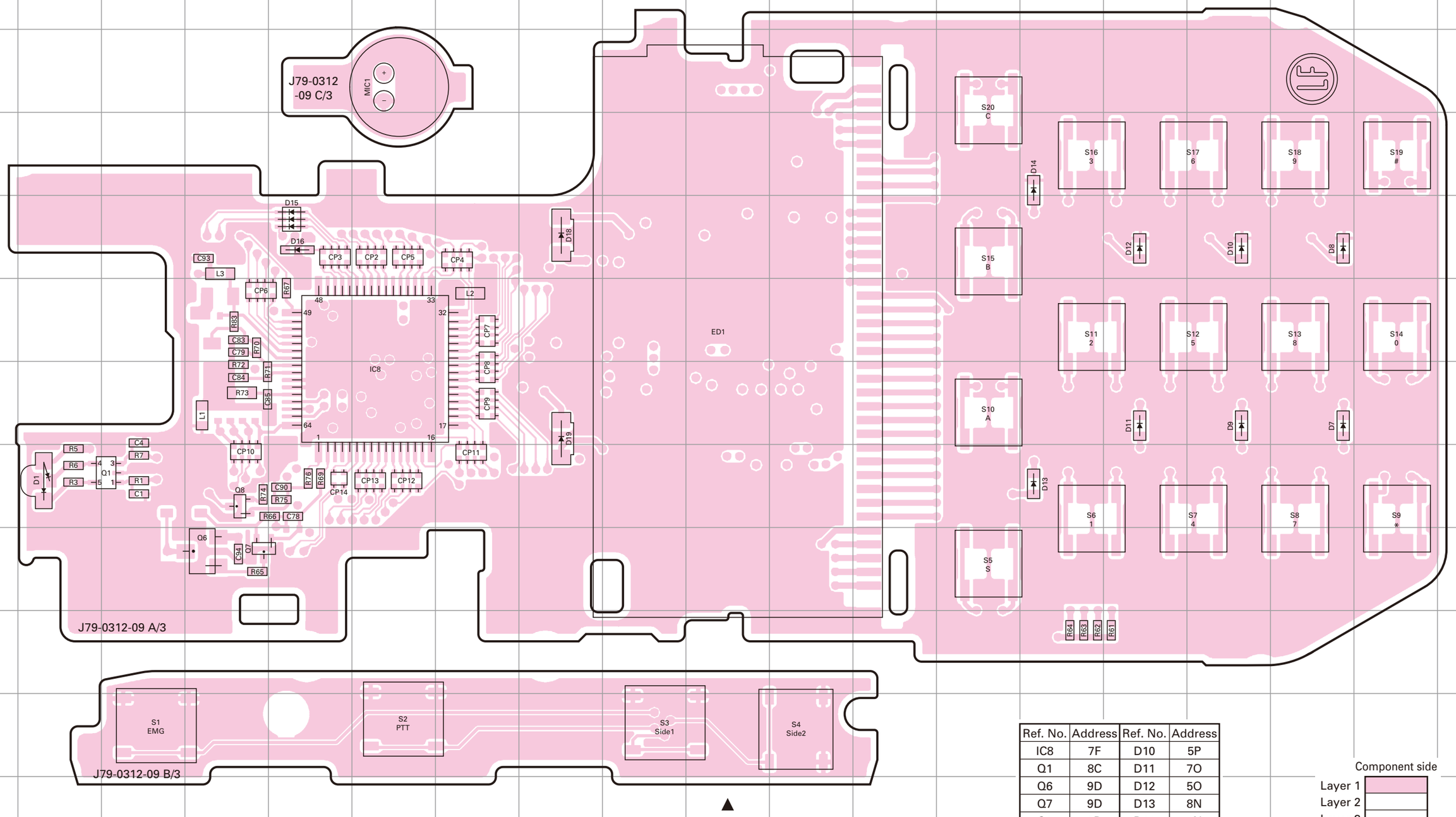
NX-220 PC BOARD

PC BOARD NX-220

DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3
Component side view (J79-0312-09)

DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3
Component side view (J79-0312-09)



Ref. No.	Address	Ref. No.	Address
IC8	7F	D10	5P
Q1	8C	D11	7O
Q6	9D	D12	5O
Q7	9D	D13	8N
Q8	8D	D14	4N
D1	8B	D15	5E
D7	7Q	D16	5E
D8	5Q	D18	5H
D9	7P	D19	7H

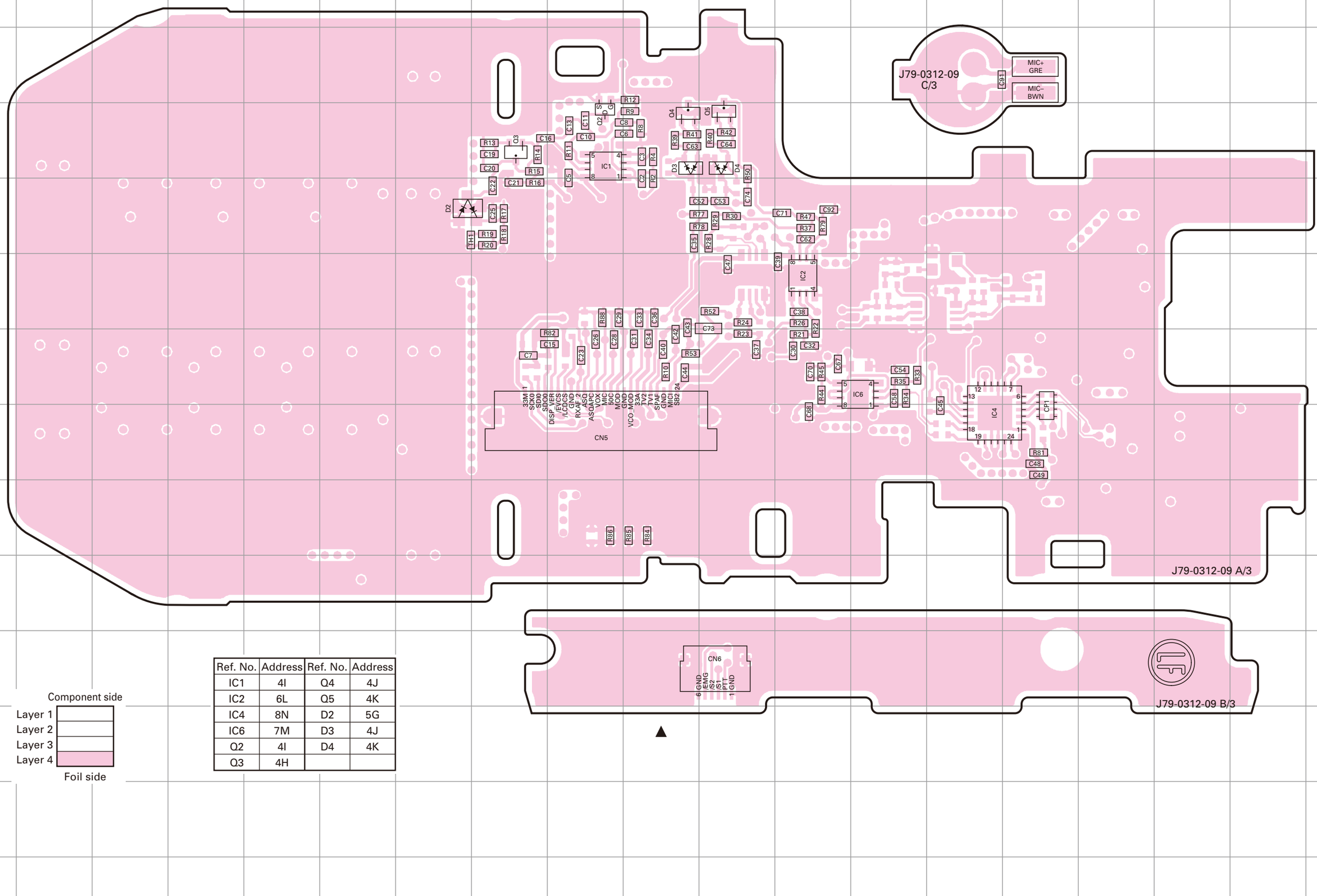
Component side
Layer 1
Layer 2
Layer 3
Layer 4
Foil side

NX-220 PC BOARD

PC BOARD NX-220

DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3
Foil side view (J79-0312-09)

DISPLAY UNIT (X54-3760-XX) -10: K3, E -11: K2, E2 -12: K, E3
Foil side view (J79-0312-09)



Ref. No.	Address	Ref. No.	Address
IC1	4I	Q4	4J
IC2	6L	Q5	4K
IC4	8N	D2	5G
IC6	7M	D3	4J
Q2	4I	D4	4K
Q3	4H		

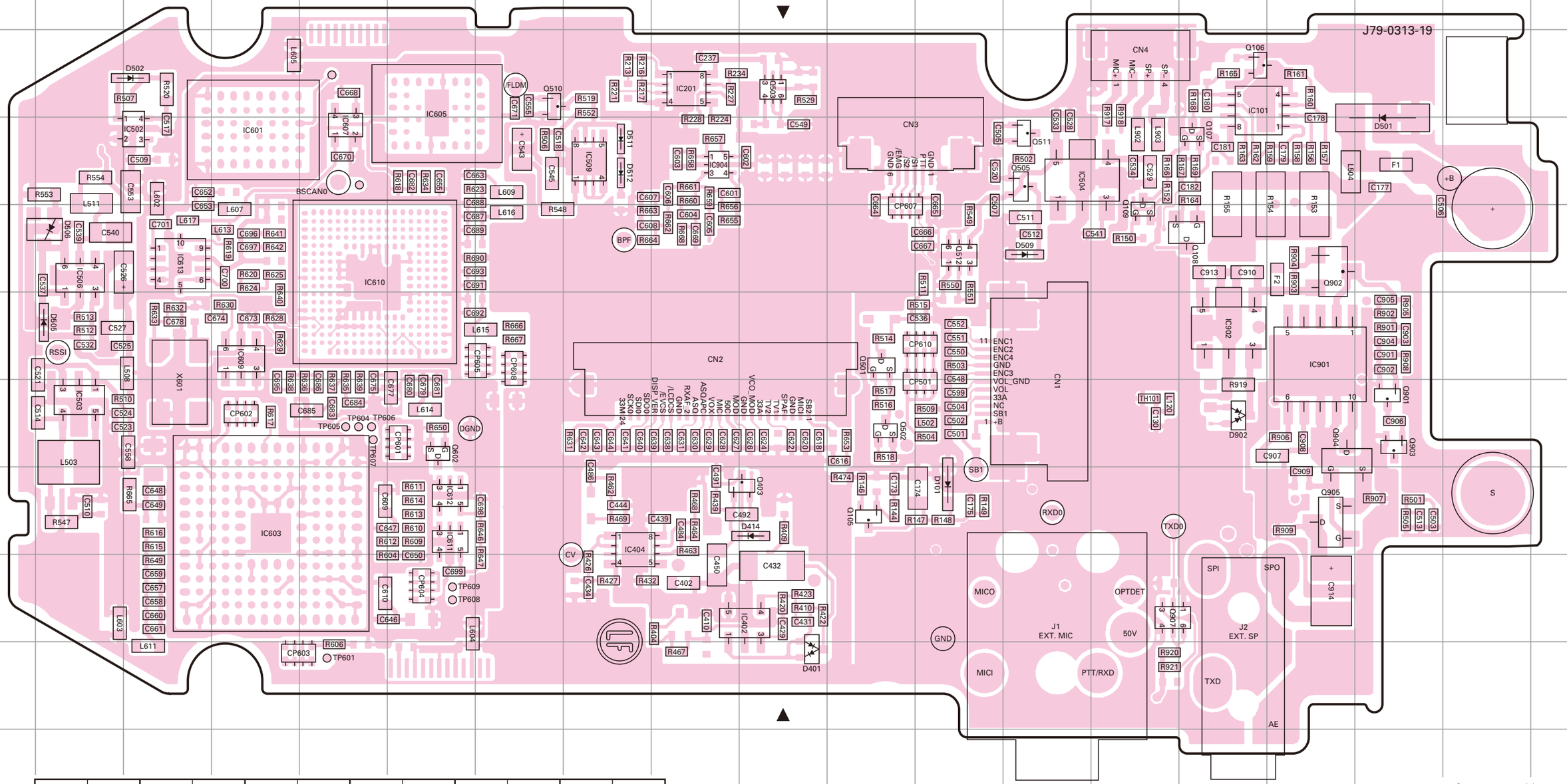
Component side
Layer 1
Layer 2
Layer 3
Layer 4
Foil side

NX-220 PC BOARD

PC BOARD NX-220

TX-RX UNIT (X57-8040-10) Component side view (J79-0313-19)

TX-RX UNIT (X57-8040-10) Component side view (J79-0313-19)



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC101	3O	IC601	4D	IC901	6P	Q501	6K	Q902	5P	D502	3C
IC201	3I	IC603	8D	IC902	6O	Q502	7K	Q903	7Q	D505	6B
IC402	9J	IC605	3F	IC904	4I	Q503	3J	Q904	7P	D506	5B
IC404	8H	IC607	4E	Q105	8K	Q505	4M	Q905	8P	D509	5M
IC502	4C	IC609	6D	Q106	3O	Q510	3G	Q907	9N	D511	4H
IC503	7B	IC610	5E	Q107	4O	Q511	4M	D101	8L	D512	4H
IC504	4M	IC611	8F	Q108	5O	Q512	5L	D401	10J	D902	7O
IC506	5B	IC612	8F	Q109	5N	Q602	7F	D414	8J		
IC509	4H	IC613	5C	Q403	8J	Q901	7Q	D501	4Q		

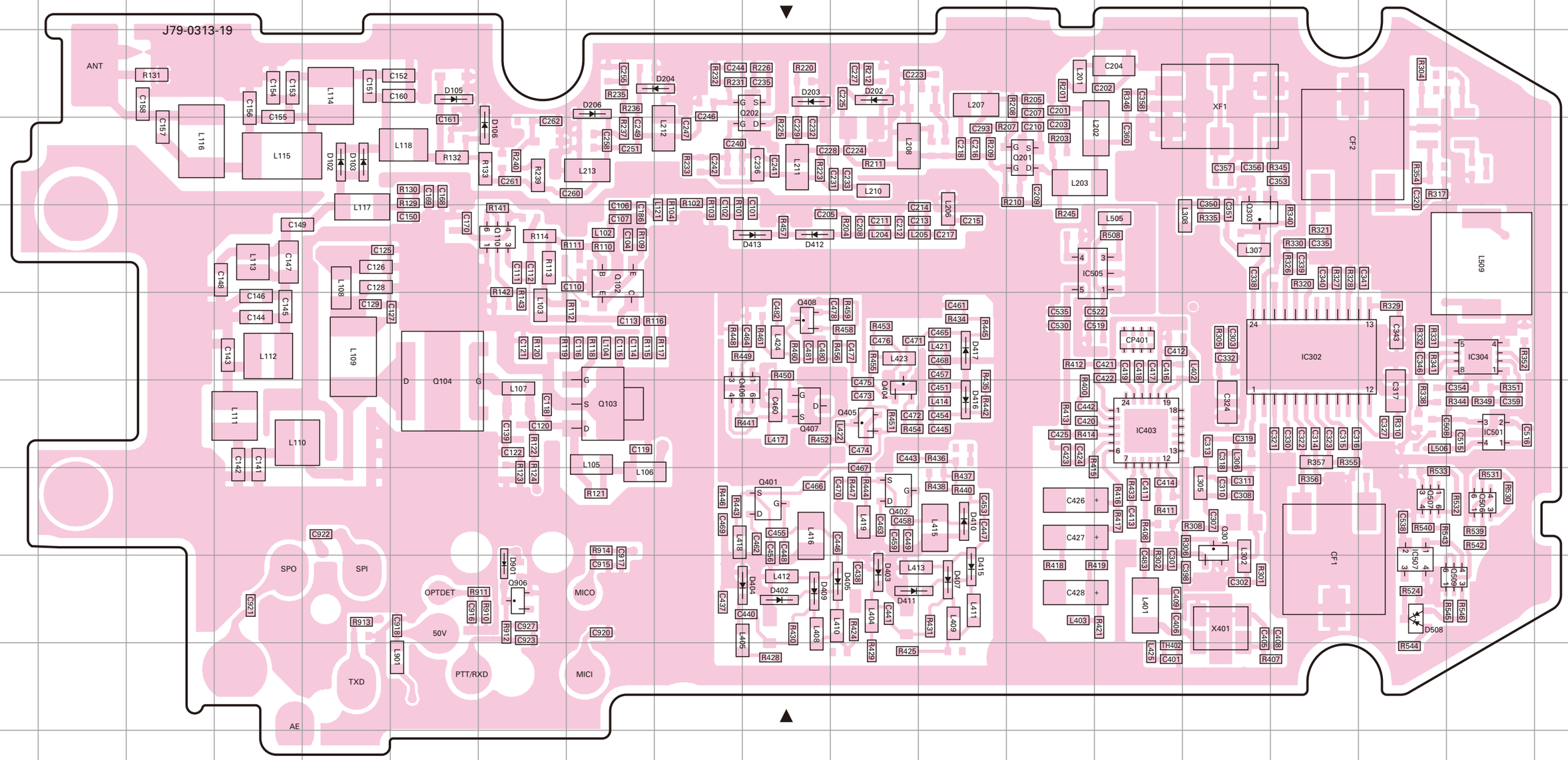
Component side
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
Layer 7
Layer 8
Foil side

NX-220 PC BOARD

PC BOARD NX-220

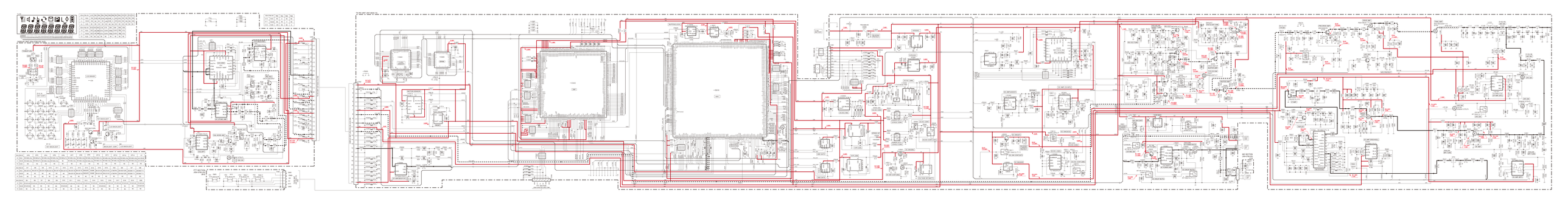
TX-RX UNIT (X57-8040-10) Foil side view (J79-0313-19)

TX-RX UNIT (X57-8040-10) Foil side view (J79-0313-19)



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC302	6P	Q201	4M	Q408	6J	D203	3J	D411	9K
IC304	6R	Q202	3J	Q506	8R	D204	3I	D412	5J
IC403	7N	Q301	8O	Q507	8Q	D206	3H	D413	5J
IC501	7R	Q303	5O	Q509	9R	D402	9J	D415	9L
IC505	5M	Q401	8J	Q906	9G	D403	9K	D416	7L
IC507	9Q	Q402	8K	D102	4E	D404	9J	D417	6L
Q102	5H	Q404	7K	D103	4E	D405	9K	D508	9Q
Q103	7H	Q405	7K	D105	3F	D407	9L	D901	9G
Q104	7F	Q406	7I	D106	4G	D409	9J		
Q110	5G	Q407	7J	D202	3K	D410	8L		

Component side
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
Layer 7
Layer 8
Foil side



TX-RX unit (X57-8040-10)