

KENWOOD

SERVICE MANUAL

VHF DIGITAL TRANSCEIVER

NX-5200

NX-5200 F2,K2,E2

NX-5200 F3,K3,E

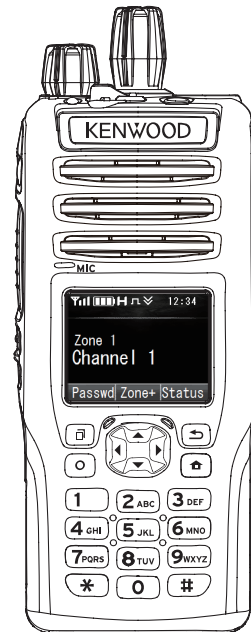
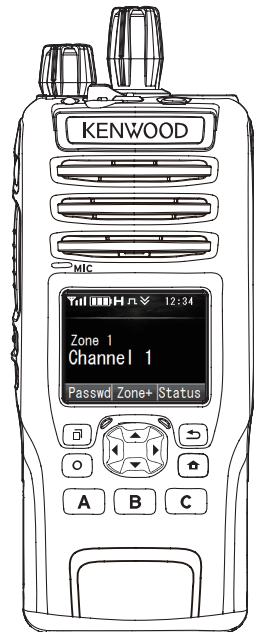


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REVISED

This service manual has been revised due to the addition of NX-5200 type E, E2.

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



This product uses Lead Free solder.

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NOTE

- This equipment should be serviced by only qualified technicians.
- Danger of explosion if the battery is incorrectly replaced; replace only with the same type.
- To dispose of batteries, be sure to comply with the laws and regulations in your country or region.

Service Manual List

Manual number	Model name	Type	Serial number	Main unit number	Remarks
No.RA018<Rev.001>	NX-5200	F2,F3,K2,K3	-	XC1-0331-80 (J79-0410-09)	First edition
No.RA018<Rev.002>	NX-5200	F2,F3,K2,K3	From B5910001	XC1-0331-80/ XC1-0360-10	Revised This service manual
		E,E2	-	(J79-0410-19)	

SPECIFICATION

(F2,F3,K2,K3 TYPE)

GENERAL			
Frequency Range		136 ~ 174 MHz	
Max. Channels per Radio		1024 (Up to 4000 CH with option)	
Number of Zones		128	
Max. Channels per Zone		512	
Channel Spacing	Analog	12.5 / 15 / 20 / 25* / 30* kHz	
	Digital	6.25 / 12.5 kHz	
Operating Voltage		7.5V DC±20%	
Battery Life 5-5-90 (10-10-80) duty cycle	KNB-L1(2,000mAh)		10 hours (6.5 hours)
	KNB-L2(2,600mAh)		12.5 hours (8.5 hours)
	KNB-L3(3,400mAh)		17 hours (11 hours)
	KNB-N4(2,500mAh)		12.5 hours (8.5 hours)
	KBP-8(w/AA x 12)	High Power	Approx. 11 hours (8 hours)
Low Power		Approx. 25 hours (18 hours)	
Operating Temperature Range		-22°F ~ +140°F (-30°C ~ +60°C)	
Frequency Stability		±2.0ppm	
Antenna Impedance		50Ω	
Dimensions (W x H x D) (Projections not included)	KNB-L1(2,000mAh)		2.28 x 5.47 x 1.57 in. (58.0 x 138.9 x 39.8 mm)
	KNB-L2(2,600mAh)		2.28 x 5.47 x 1.69 in. (58.0 x 138.9 x 42.8 mm)
	KNB-L3(3,400mAh)		2.28 x 5.47 x 1.90 in. (58.0 x 138.9 x 48.2 mm)
	KNB-N4(2,500mAh)		2.28 x 6.55 x 1.91 in. (58.0 x 166.4 x 48.5 mm)
	KBP-8		2.64 x 8.59 x 1.76 in. (67.0 x 218.3 x 44.6 mm)
Weight (net)	KNB-L1(2,000mAh)		13.5 oz (382 g)
	KNB-L2(2,600mAh)		14.3 oz (406 g)
	KNB-L3(3,400mAh)		15.8 oz (449 g)
	KNB-N4(2,500mAh)		20.4 oz (579 g)
	KBP-8(w/AA x 12)		Approx. 25.1 oz (712 g)
RECEIVER			
Sensitivity	NXDN 6.25kHz Digital(3%BER)		0.20μV
	NXDN 12.5kHz Digital(3%BER)		0.25μV
	P25 Digital (5% BER)		0.25μV
	P25 Digital (1% BER)		0.40μV
	Analog (12dB SINAD)		0.25μV
Selectivity	P25 Digital		60dB
	Analog@12.5kHz		67dB
	Analog@25kHz		73dB
Intermodulation		73dB	
Spurious Rejection		80dB	
Audio Distortion		Less than 3%	
Audio Output	3% Distortion		500mW / 8Ω
	5% Distortion		1000mW / 8Ω
TRANSMITTER			
RF Power Output		6W to 1W	
Spurious Emission		-70dB	

FM Hum & Noise	Analog @ 25 kHz	45dB
	Analog @ 12.5 kHz	40dB
Audio Distortion		Less than 2%
Modulation		16K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W, 8K30F1E, 8K30F1D, 8K30F7W, 4K00F1E,4K00F1D, 4K00F7W, 4K00F2D

*25 and 30 kHz are not included in the models sold in the USA or US territories.

Analog measurements made per TIA 603 and specifications shown are typical.

P25 Digital measurements made per TIA 102CAA and specifications shown are typical.

JVC KENWOOD Corporation reserves the right to change specifications without prior notice or obligation.

SPECIFICATION

(E,E2 TYPE)

GENERAL			
Frequency Range		136 ~ 174 MHz	
Max. Channels per Radio		1024 (Up to 4000 CH with option)	
Number of Zones		128	
Max. Channels per Zone		512	
Channel Spacing	Analogue	12.5 / 20 / 25 kHz	
	Digital	6.25 / 12.5 kHz	
Operating Voltage		7.5V DC±20%	
Battery Life 5-5-90 (10-10-80) duty cycle NEXEDGE	KNB-L1(2,000mAh)		10 hours (6.5 hours)
	KNB-L2(2,600mAh)		12.5 hours (8.5 hours)
	KNB-L3(3,400mAh)		17 hours (11 hours)
	KNB-N4(2,500mAh)		12.5 hours (8.5 hours)
	KBP-8(w/AA x 12)	High Power	Approx. 11 hours (8 hours)
Low Power		Approx. 25 hours (18 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)	KNB-L1(2,000mAh)		58.0 x 138.9 x 39.8 mm
	KNB-L2(2,600mAh)		58.0 x 138.9 x 42.8 mm
	KNB-L3(3,400mAh)		58.0 x 138.9 x 48.2 mm
	KNB-N4(2,500mAh)		58.0 x 166.4 x 48.5 mm
	KBP-8		67.0 x 218.3 x 44.6 mm
Weight (net)	KNB-L1(2,000mAh)		382 g
	KNB-L2(2,600mAh)		406 g
	KNB-L3(3,400mAh)		449 g
	KNB-N4(2,500mAh)		579 g
	KBP-8(w/AA x 12)		Approx. 712 g
RECEIVER			
Sensitivity	Analogue @ 12.5/20&25 kHz	12dB SINAD	0.32 μV / 0.28 μV
		20dB SINAD	-1 dB μV (0.45 μV) / -3 dB μV (0.35 μV)
	Digital @ 6.25/12.5 KHz	NXDN 3% BER	0.25 μV / 0.32 μV
		NXDN 1% BER	-4 dB μV (0.32 μV) / -1 dB μV (0.45 μV)
	P25 5% BER	0.28 μV	
Selectivity	P25 Digital		63dB
	Analogue @ 12.5 kHz		68dB
	Analogue @ 20 kHz		74dB
	Analogue @ 25 kHz		76dB
Intermodulation	Analogue		65dB
Spurious Rejection	Analogue		75dB
Audio Distortion		Less than 3%	
Audio Output	3% Distortion		500mW / 8Ω
	5% Distortion		1000mW / 8Ω

TRANSMITTER		
RF Power Output		6W to 1W
Spurious Emission		-36dBm ≤ 1GHz, -30dBm > 1GHz
FM Hum & Noise	Analogue @ 25 kHz	45dB
	Analogue @ 20 kHz	45dB
	Analogue @ 12.5 kHz	40dB
Modulation Distortion		Less than 2%
Modulation		16K0F3E, 14K0F3E, 14K0F2D, 12K0F2D, 11K0F3E, 8K50F3E, 7K50F2D, 8K30F1E, 8K30F1D, 8K30F7W, 8K10F1E, 8K10F1D, 8K10F1W, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D

Analogue measurements made per EN standards or TIA/EIA 603 and specifications shown are typical.

P25 Digital measurements made per TIA 102CAA and specifications shown are typical.

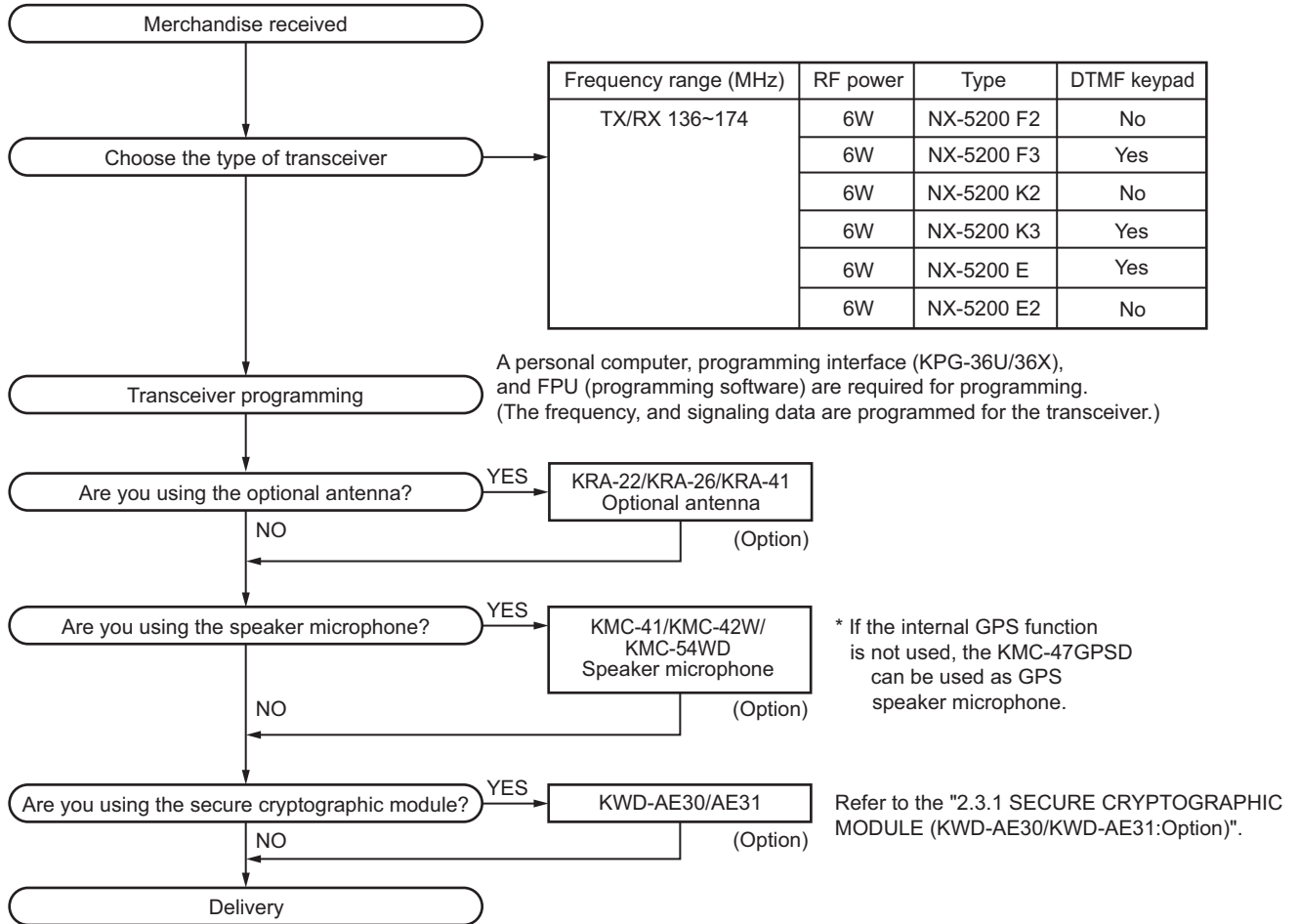
JVC KENWOOD Corporation reserves the right to change specifications without prior notice or obligation.

SECTION 1 PRECAUTION

This service manual does not describe PRECAUTION.

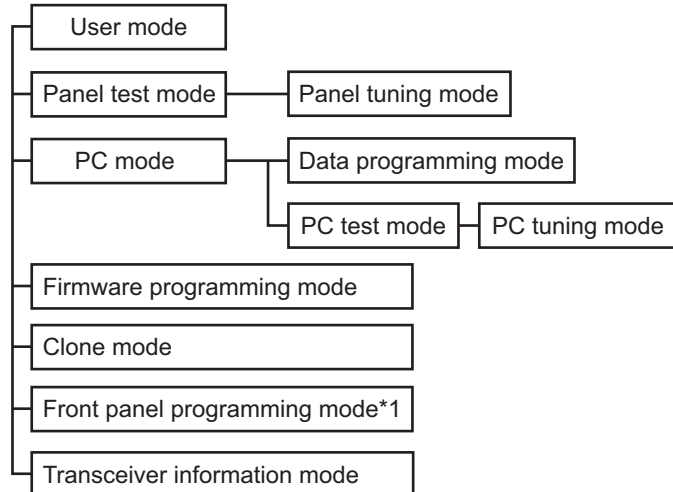
SECTION 2 SPECIFIC SERVICE INSTRUCTIONS

2.1 SYSTEM SET-UP



2.2 REALIGNMENT

2.2.1 Modes



*1: In order to use the Front panel programming mode, it is necessary to purchase the "Front panel program" feature option.

Mode	Function
User mode	For normal use.
Panel test mode	Used by the dealer to check the fundamental characteristics.
Panel tuning mode	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	Used to transfer programming data from one transceiver to another.
Front panel programming mode	Frequency, signaling and features write to the transceiver.
Transceiver information mode	Used to confirm the transceiver firmware version, SCM firmware version and SCM Hardware version.

2.2.2 How to Enter Each Mode

Mode	Operation
User mode	Power ON
Panel test mode*2	<ul style="list-style-type: none"> • [↵] + Power ON • [□] + Power ON Select the "Panel Test" using the [▲] / [▼] key. Press the [□] key.
PC mode	Received commands from PC
Panel tuning mode	[Panel test mode] + [□]

Mode	Operation
Firmware programming mode*2	<ul style="list-style-type: none"> • [AUX (Orange)] + Power ON • [□] + Power ON Select the "Firmware Prog" using the [▲] / [▼] key. Press the [□] key. • If Write is performed by KFL, Firmware programming mode will start automatically.
Clone mode*2	<ul style="list-style-type: none"> • [○] + Power ON • [□] + Power ON Select the "Clone" using the [▲] / [▼] key. Press the [□] key.
Front panel programming mode*2	<ul style="list-style-type: none"> • Press the PF key to which Front panel programming mode is set during the user mode. • Press the [□] key and enter the Menu mode. Select the any icon assigned the Front panel programming mode using the [▲] / [▼] key. Press [□] key. Select the "Panel Program" using the [▲] / [▼] key. Press the [□] key.
Transceiver information mode*2	<ul style="list-style-type: none"> • [Side 3] + Power ON • [□] + Power ON Select the "Transceiver Info" using the [▲] / [▼] key. Press the [□] key.

*2 There is the two or three as how to enter.

2.2.3 Panel Test Mode

Setting method refer to ADJUSTMENT.

2.2.4 Panel Tuning Mode

Setting method refer to ADJUSTMENT.

2.2.5 PC Mode

2.2.5.1 Preface

The transceiver is programmed by using a personal computer, programming interface (KPG-36U/36X) and FPU (programming software).

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

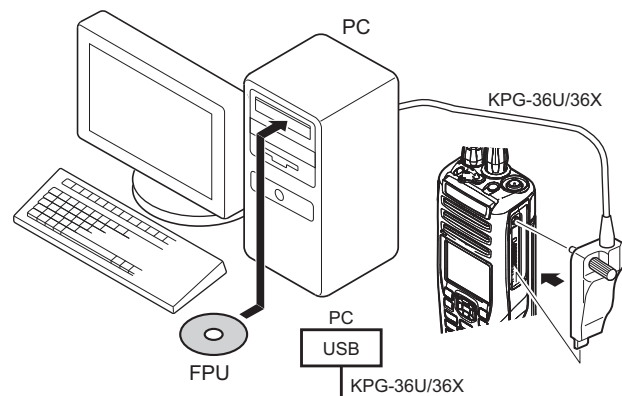


Fig.1

2.2.5.2 Connection procedure

- (1) Connects the transceiver to the computer using the interface cable (KPG-36U/36X).

Note:

You must install the KPG-36U/36X driver in the computer to use the USB programming interface cable (KPG-36U/36X).

- (2) When the POWER switch on, user mode can be entered immediately. When PC sends command the transceiver enter PC mode, and "PROGRAM" is displayed on the LCD. When data transmitting from the transceiver, the red LED lights.

When data receiving to the transceiver, the green LED light.

Note:

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

2.2.5.3 KPG-36U/36X description (USB programming interface cable: Option)

The KPG-36U/36X is a cable which connects to a USB port on a computer.

When using the KPG-36U/36X, install the supplied CD (with driver software) in the computer. The KPG-36U driver runs under Windows XP, Vista, 7, 8 or 8.1.

The KPG-36X driver runs under Windows Vista, 7, 8 or 8.1.

The latest version of the USB driver is available for download from the following URL:

<http://www.kenwood.com/usb-com/>

(This URL may change without notice.)

2.2.5.4 Programming software KPG-D1/D1N (Ver. 1.60 or later) description

The FPU is the programming software for the transceiver supplied on a CD-ROM. This software runs under Windows Vista 7, 8 or 8.1 on a PC.

The data can be input to or read from the transceiver and edited on the screen.

Note:

KPG-D1N can't be used for E, E2 types.

2.2.6 Firmware Programming Mode

2.2.6.1 Preface

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

2.2.6.2 Connection procedure

Connect the transceiver to the personal computer using the programming interface (KPG-36U/36X). (Connection is same as in the PC mode.)

2.2.6.3 Programming



- (1) Start up the firmware programming software (KENWOOD Firmware Loader). The KFL.exe exists in the KPG-D1/D1N installed holder.
- (2) Set the baud rate to "auto" or 1152000, 576000, 115200, and 57600.
- (3) Set the firmware to be upgrade by file name item.
- (4) Enter the Firmware programming mode by using section "2.2.2 How to Enter Each Mode". Then, the yellow LED on the transceiver light and "FIRMWARE PROG" 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 step (4) to (7).

Note:

If write is performed by KFL, Firmware programming mode will start automatically even if Firmware programming is set to disable in the programming software.

2.2.6.4 Function

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




2.2.7 Clone Mode

Programming data can be transferred from one transceiver to another by connecting them via their external universal connectors. The operation is as follows.

■The following data cannot be cloned.

- Tuning data
- Embedded message with password
- ESN (Electronic Serial Number) data


■Key guide on the Clone/ Front Panel Programming Password input screen.

- Confirm ([] key): The password confirmation
 - Delete ([] key): Delete the latest digit from the current password number (Press and hold to delete all password numbers)
 - Select([] key): Determine the latest digit of the password number.
- (1) In the source transceiver, enter the clone mode by using section "2.2.2 How to Enter Each Mode". When the Clone/ Front Panel Programming Password is set to the transceiver, "Input Password" is displayed on the LCD. If the password is not set, the transceiver displays "CLONE MODE".
 - (2) When you enter the correct password, "CLONE MODE" 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;





If one of the keys 0 to 9 is pressed while the "Input Password" is displayed, the password 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 [] or [*] key, "CLONE MODE" displayed if the entered password is correct. If password is incorrect, "Input Password" is redisplayed.

- How to enter password using the [] and [] keys;

If the [] / [] key is pressed while "Input Password" is displayed, the Clone/ Front Panel Programming Password input screen is displayed.

If the [] or [] key is pressed while the clone/ Front Panel Programming Password input screen is displayed, the number (0 to 9) blinks on the LCD. When you press the [] key, currently selected number is determined. If you press the [] key after entering password in this

procedure, "CLONE MODE" is displayed if entered password is correct. If the password is incorrect, "Input Password" is redisplayed.

- (4) Power ON the target transceiver.
- (5) Connecting the cloning cable (part No.E30-3325-05) to the universal connectors on the source and target.
- (6) Press [] key on the source while the source displays "CLONE MODE". The data of the source is sent to the target. While the target is receiving the data, "PROGRAM" is displayed. When cloning of the 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 [] key on the source is pressed while the source displays "END", the source displays "CLONE MODE". 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.

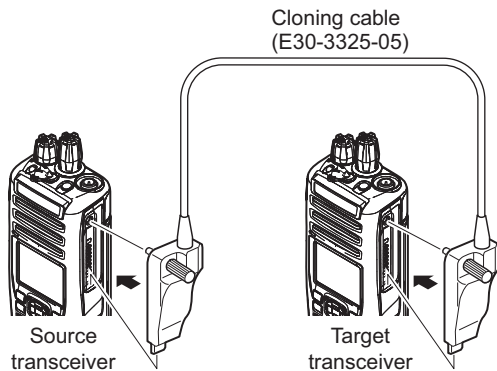


Fig.2

2.2.8 Front Panel Programming Mode




If the Front Panel Programming Mode is used, the frequency or other data of the conventional channel is rewritable only by the transceiver.

Moreover, the conventional channel can be added.

■The following setup items can be changed or added by using the Front panel programming mode.

- RX/TX Frequency
- Channel Type
- Channel Spacing
- Decode QT/DQT/RAN/NAC, Encode QT/DQT/RAN/NAC
- Talkgroup ID List No.
- Transmit Power
- Channel Name

■Key guide on the Clone/ Front Panel Programming Password input screen.

- Confirm ([] key): The password confirmation
- Delete ([] key): Delete the latest digit from the current password number (Press and hold to delete all password numbers)
- Select ([] key): Determine the latest digit of the password number.

2.2.8.1 Enter to the Front panel programming mode.

Enter to the Menu Mode by pressing [Front Panel Mode] PF key or [Menu] key. When the Front Panel Mode is selected, it can enter to the Front panel programming mode.

If the Clone/Front panel programming Password is not set to the transceiver, "Panel Program" is displayed on the LCD.

If the Clone/Front panel programming Password is set to the transceiver, "Panel Program" is displayed on the LCD when you enter the correct password while "Input Password" is displayed.

2.2.8.2 Data Writing

Before moving to next Zone/Channel, "Keep This Change?" appears on the LCD, if you select "OK", the new data is written to memory. If you select "Cancel", the new data not be written; the new data will be erased.

• The setup items for Front panel programming mode are as follows.

No.	Setup item	Display	Remarks
1	RX Frequency	RX Frequency	Receive Frequency
2	TX Frequency	TX Frequency	Transmit Frequency
3	Channel Type	Channel Type	Analog/NXDN/P25
4	Channel Spacing	Channel Space	Analog: 12.5kHz/20kHz/25kHz Note: 20kHz is applied for E and E2 types only.
			NXDN: 6.25kHz/12.5kHz
			P25: 12.5kHz
5	RX Signaling	RX QT/DQT	Receive QT/DQT
6	TX Signaling	TX QT/DQT	Transmit QT/DQT
7	RX RAN	RX RAN	None, 1~63
8	TX RAN	TX RAN	None, 1~63
9	RX NAC	RX NAC	000~FFF (Hexadecimal) Note: "F7F" cannot set.
10	TX NAC	TX NAC	000~FFF (Hexadecimal) Note: "F7E" and "F7F" cannot set.
11	Talkgroup ID List Number	Talkgroup	None, 1~1500
12	Transmit Power	Transmit Power	Low/Medium/High
13	Channel Name	Channel Name	

• Key operation

Key/Item	Zone Select	Channel Select	RX Frequency	TX Frequency	Channel Type	Channel Spacing	RX Signaling	TX Signaling
[□]	Decision	Decision	Decision	Decision	Decision	Decision	Decision	Decision
[↶]	Unused	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item
[○]	Unused	Unused	Unused	TX Frequency OFF	Unused	Unused	Unused	Unused
[🏠]	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode
[▲]	Zone change	Channel change	Fresuency up	Fresuency up	Channel type change	Channel Spacing Change	Signaling number change	Signaling number change
[▼]	Zone change	Channel change	Frequency down	Frequency down	Channel type change	Channel Spacing Change	Signaling number change	Signaling number change
[▶]	Unused	Unused	Frequency step change	Frequency step change	Unused	Unused	Signaling type change	Signaling type change
[◀]	Unused	Unused	Frequency step change	Frequency step change	Unused	Unused	Signaling type change	Signaling type change
Keypad [0] ~ [9] *1	Zone number select	Channel number select	Go to the direct enter mode		Channel number select (1 or 2)	Channel spacing select (1 or 2)	Go to the direct enter mode	
Keypad [*] *1	Decision	Decision	Decision	Decision	Decision	Decision	Decision	Decision
Keypad [#] *1	Unused	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item

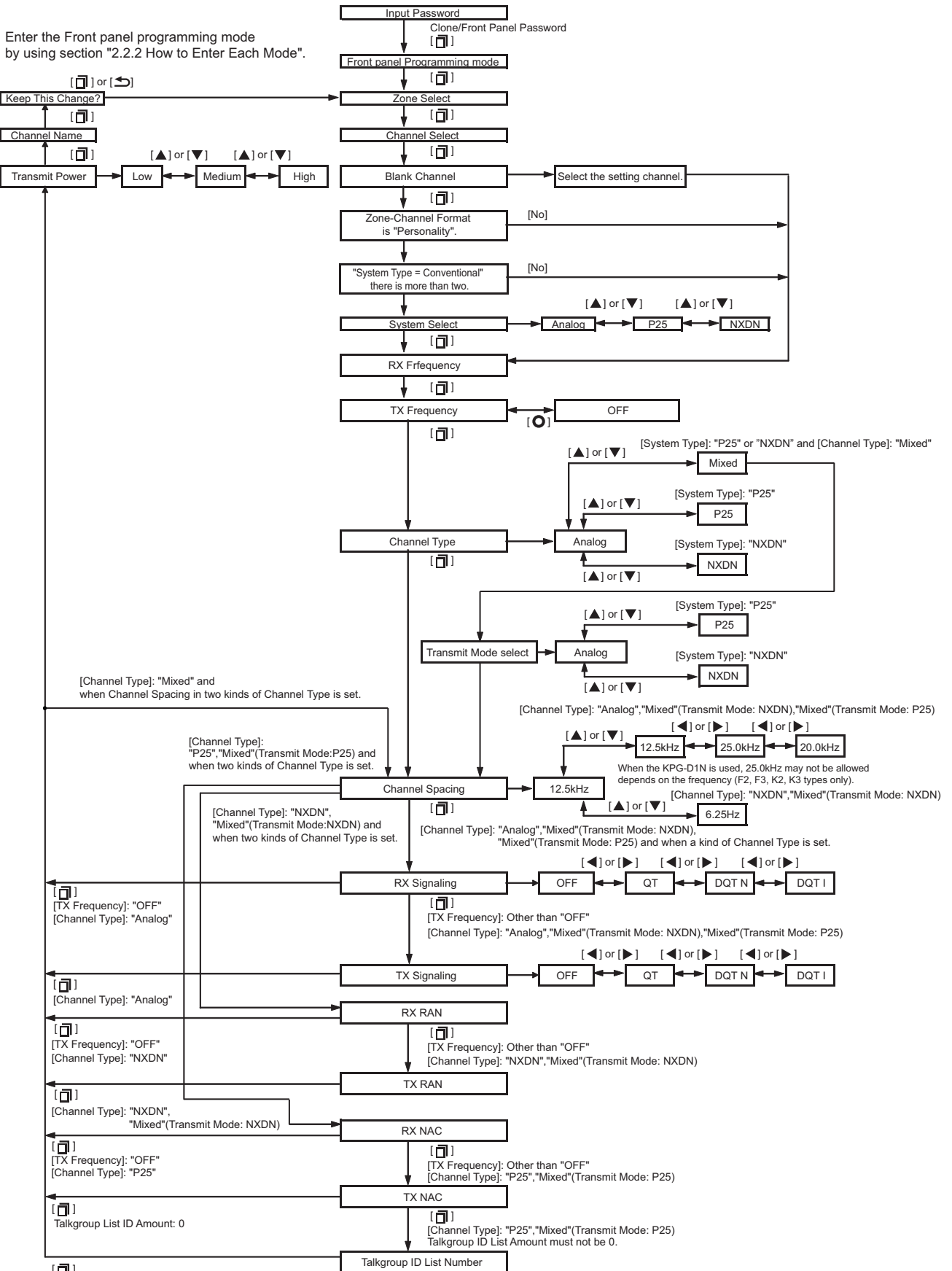
Key/Item	RX RAN	TX RAN	RX NAC	TX NAC	TG ID List No.	Transmit Power	Channel Name
[□]	Decision	Decision	Decision	Decision	Decision	Decision	Decision
[↶]	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item/Delete
[○]	Unused	Unused	Unused	Unused	Unused	Unused	Character/Digit switching
[🏠]	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode	Exit panel program mode
[▲]	RX RAN up	TX RAN up	RX NAC up	TX NAC up	TG List number up	Transmit power change	Go to the direct enter mode
[▼]	RX RAN down	TX RAN down	RX NAC down	TX NAC down	TG List number down	Transmit power change	
[▶]	RX RAN ON/OFF	RX RAN ON/OFF	Unused	Unused	Unused	Unused	
[◀]	RX RAN ON/OFF	RX RAN ON/OFF	Unused	Unused	Unused	Unused	
Keypad [0] ~ [9] *1	Go to the direct enter mode				Talkgroup List number select	Transmit power select (1, 2 or 3)	
Keypad [*] *1	Decision	Decision	Decision	Decision	Decision	Decision	Decision/ Character/ Digit switching
Keypad [#] *1	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item	Back to the previous item

• Direct enter mode

Key/Item	RX Frequency	TX Frequency	RX Signaling	TX Signaling	RX RAN	TX RAN	RX NAC	TX NAC	Channel Name
[☐]	Decision								Character/Channel name decision
[↵]	Delete								
[○]	Unused								
[🏠]	Exit panel program mode								
[▲]	Unused								Character selection (upper case character → lower-case character → digit → upper case character...)
[▼]									Character selection (upper case character → lower-case character → digit → upper case character...)
[▶]									Move a cursor to the right
[◀]									Move a cursor to the left
Keypad [0] ~ [9] *1	Add a digit to the current number								
Keypad [*] *1	Decision								Input character switching
Keypad [#] *1	Delete/Back to the previous item								Delete

*1: F3,K3,E types only

• Front panel programming mode flow chart

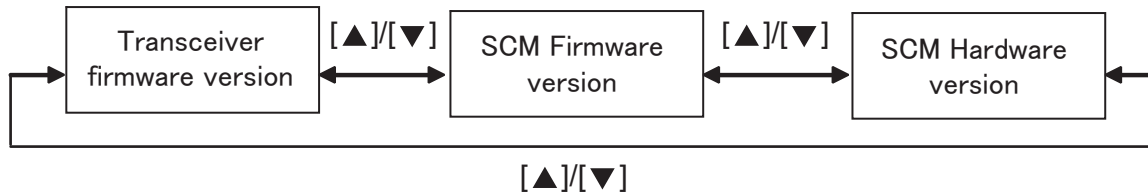


Note: Zone-Channel Format allows you to whether to configure for each zone the channels in the same system, or channels in different system. P25 can be configured for System Select or Channel Type if one or more P25 conventional system is preconfigured by the FPU.

2.2.9 Transceiver Information Mode

Use this function to confirm the transceiver firmware version, SCM Firmware version and SCM Hardware version.

- (1) Enter the Transceiver Information mode by using section "2.2.2 How to Enter Each Mode".
- (2) The transceiver firmware version appears on the LCD.
- (3) Use the [▲] and [▼] keys to select the confirmation items.



- (4) To exit the transceiver information mode, turn the transceiver power OFF.

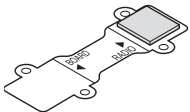
Note:

When the SCM board is not equipped to the transceiver, SCM Firmware Version and SCM Hardware Version are displayed as "-.-.-".

2.3 INSTALLATION

2.3.1 SECURE CRYPTOGRAPHIC MODULE (KWD-AE30/KWD-AE31:Option)

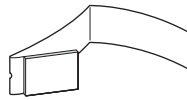
2.3.2 SUPPLIED ACCESSORIES



Connecting cable *
(X42-3330-XX)



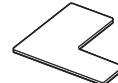
Cushion A *
(G13-2179-XX)



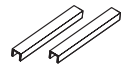
Cushion B *
(G13-2178-XX)



Cushion C *
(G1D-0006-XX)



Cushion D
(G1D-0055-XX)



Spacer
(F3K-0004-XX)

Note:

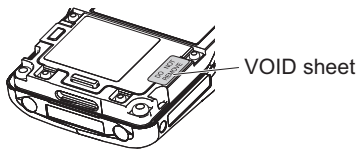
Supplied accessories with * mark are not used for the NX-5200.

2.3.3 INSTALLING THE MODULE IN THE TRANSCEIVER

ATTENTION:

When installing the module, please take measures to prevent static electricity.

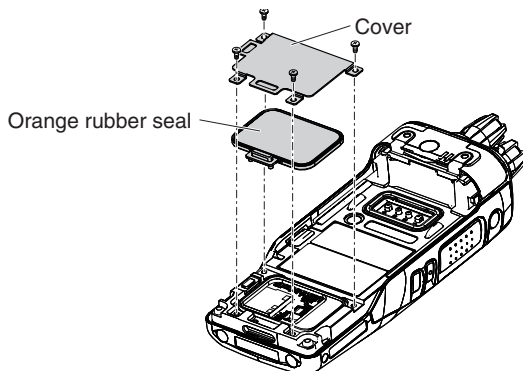
- (1) Remove the VOID sheet.



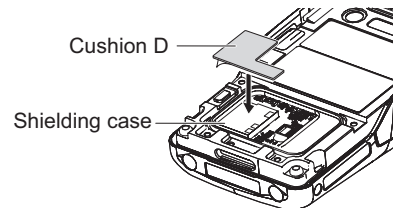
CAUTION:

Regarding VOID, confirm the service policy of the NX-5200 to KENWOOD (or authorized distributor). In addition, when installing the module, remove VOID sheet after understanding the service policy.

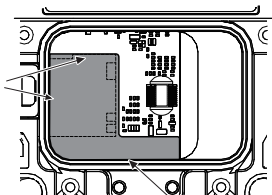
- (2) Remove the 4 screws from the cover.
- (3) Remove the cover and orange rubber seal from the transceiver.



- (4) Remove the release paper from one side of cushion D, then attach the cushion to the shielding case of the module.

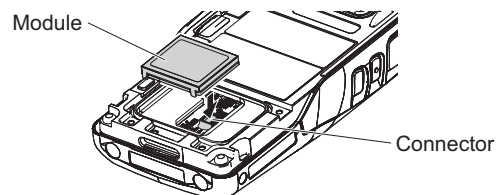


Attach the cushion correctly to the position of the chassis and shielding case (end-face).

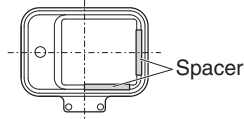


Insert the cushion under the chassis.

- (5) Insert the module to the connector of the PCB.



- (6) Attach two spacers to the back side of the orange rubber seal as indicated below.



Note:

Rubber seal may not attach correctly if the spacer is brought near by the corner too much.

- (7) Reinstall the cover and orange rubber seal using the 4 screws removed in step 2 and 3.

Note:

When installing the rubber orange seal on the chassis, ensure that you do not damage the rubber seal and that the contact area of the chassis is dust-free.

Note:

- When the KWD-AE30/ KWD-AE31 is installed, select the "Secure Cryptographic Module" checkbox in the Product Information of the KPG-D1/KPG-D1N (programming software), and then set each parameter.
- If the KWD-AE30/ KWD-AE31 connector is not properly installed, the TX/RX indicator will blink red or "No SCM" will appear on the display when the transceiver power is turned on.
- If the Encryption Key data is not written at the Keyloader, or the Encryption Key data is zeroized, "Key Fail" will appear on the display.
- If the KWD-AE30/ KWD-AE31 is installed in other transceivers, the Encryption Key data will be forced to zeroize.

2.4 CIRCUIT DESCRIPTION

2.4.1 Overview

The NX-5200 is a VHF Analog FM & Digital Portable transceiver designed to operate in the frequency range of 136 to 174MHz. The unit consists of a receiver, a transmitter, a phase-locked loop (PLL) frequency synthesizer, a digital control unit, and a power supply circuit.

2.4.2 Frequency Configuration

The receiver is a double-conversion super-heterodyne using a first intermediate frequency (IF) of 49.95MHz and second IF of 2.25MHz. 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 47.7MHz second local oscillator output to produce the 2.25MHz 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.

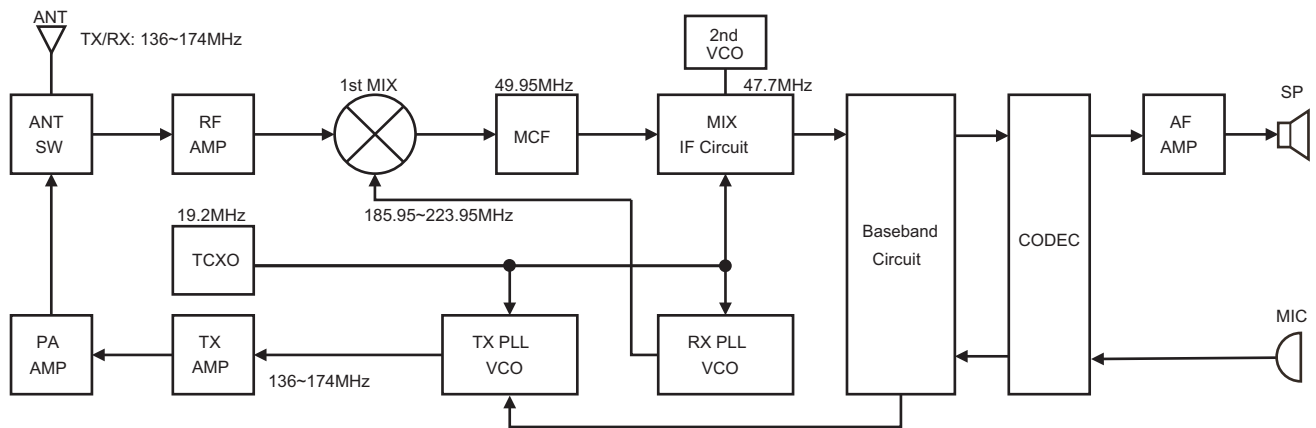


Fig.1 Frequency configuration

2.4.3 Receiver System

2.4.3.1 RF Circuit

The receive signal from antenna switch (D350, D351, D370 and D371) is amplified by a RF amplifier (Q530) and passes through the band-pass filter (L530, L535, L520 and L532) to remove unwanted signals. The signal is then fed to the 1st mixer (Q500).

2.4.3.2 IF Circuit

The first IF signal is passed through a four-pole monolithic crystal filter (XF670) to reject adjacent channel signals. The filtered first IF signal is amplified by the first IF amplifier (Q670 and Q660) and then applied to the IF system IC (IC600). The IF system IC provides a second mixer, second PLL, AGC and A/D converter.

The second mixer mixes the first IF signal with the 47.7MHz of second local oscillator output and produces the second IF signal of 2.25MHz.

The second IF signal is then be fed into an A/D converter, generates the I and Q data. This data is in the form of SSI (Serial Synchronous Interface), and sent to the DSP (IC702).

2.4.3.3 Audio Amplifier Circuit

Audio processing (high-pass filter, low-pass filter, de-emphasized and so on) at Analog FM mode and decoding at Digital mode are processed by DSP. SSI signal from DSP is converted to audio signal at IC902. The signal goes to amplifier (IC904 or IC905). While INTAMT is High, IC904 is activated and audio is heard from internal speaker. While EXTAMT is High, IC905 is activated and audio is heard from external speaker.

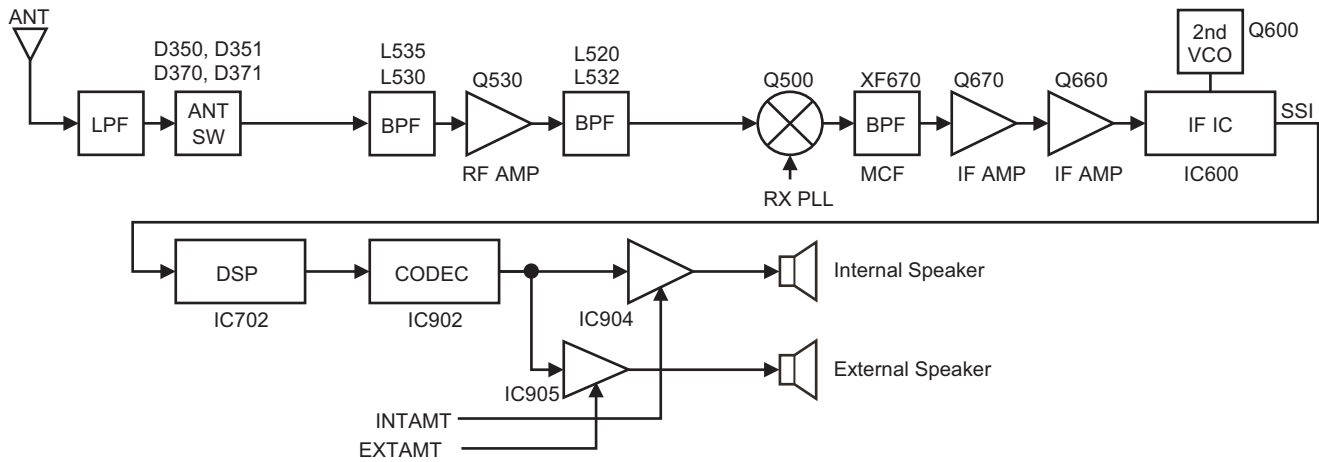


Fig.2 RF and IF circuit

2.4.4 Transmitter System

2.4.4.1 Audio Band Circuit

The signal from microphone is amplified and converted to digital signal by IC902. IC902 includes AGC function. Digital signal is transferred to IC702 through SSI.

2.4.4.2 Baseband Circuit

The audio signal transferred from IC902 is processed at IC702. Voice signals of 300Hz or lower and frequencies of 3kHz or higher are cut off and an audio range 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 transferred to PLL Frequency Synthesizer block. The DTMF and MSK baseband signals are also generated by IC702.

In Digital mode, the audio signal is converted to the 4-Level FSK baseband signal and is transferred to PLL Frequency Synthesizer block.

The output level according to the transmit carrier is fine-adjusted according to each modulation method.

2.4.4.3 Drive and Final Amplifier

The signal from the TX PLL is amplified by pre-drive amplifier (IC300 and Q310). The output of the pre-drive amplifier is amplified by the drive amplifier (Q320) and final amplifier (Q330) to 6W (1W when the power is low). IC300 is MMIC. Q310, Q320 and Q330 are MOS FET. The output of the final amplifier is then passed through the harmonic filter (LPF) and antenna switch (D350, D351, D370 and D371) and applied to the antenna terminal.

2.4.4.4 APC Circuit

The APC circuit always monitors the current flowing through the drive amplifier (Q320) and final amplifier (Q330). The APC keeps a current constant.

The voltage drop at R400 and R402 is caused by the current flowing through the RF power amplifier and this voltage is applied to APC circuit. Output voltage from APC controls the VGG of Q310, Q320 and Q330 to keep the current constant. The change of power high/low is carried out by the change of the reference voltage.

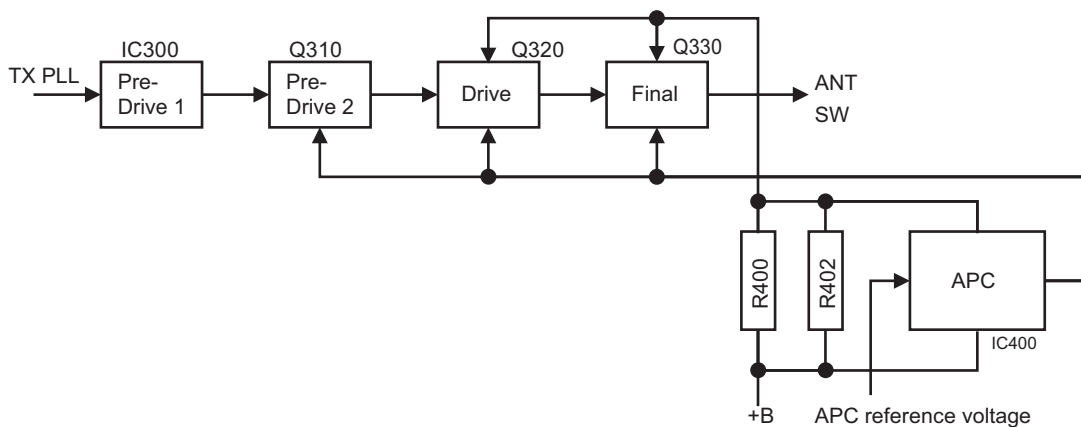


Fig.3 Drive and Final amplifier and APC circuit

2.4.5 PLL Frequency Synthesizer

2.4.5.1 TCXO (X700)

TCXO (X700) generates a reference frequency of 19.2MHz for the PLL frequency synthesizer. This reference signal is buffered by Q700 and IC700. And it is distributed to TX PLL (IC100), RX PLL (IC200), IF IC (IC600), GPS/Bluetooth (IC850), and IC702. The frequency adjustment is achieved by adjusting a D/A converter (IC901) output in the voltage of the control terminal of TCXO.

2.4.5.2 VCO

There are TX VCO and RX VCO.

The TX VCO (Q160) generates the carrier for the transmitter. The VCO oscillation frequency range is 136 to 174MHz. The transmit frequency range is 136 to 174MHz.

The RX VCO (Q240) generates the 1st local signal for the receiver.

The VCO oscillation frequency range is 185.95 to 223.95MHz. The 1st local signal frequency range is 185.95 to 223.95MHz.

The VCO oscillation frequency is determined by voltage control terminals "CV" and "ASSIST". The voltage control terminal "CV" is controlled by PLL IC (IC100 for TX PLL, IC200 for RX PLL). The voltage control terminal "ASSIST" is controlled by the control voltage from D/A converter (IC901).

For the modulation input terminal, "VCO_MOD" of TX VCO (Q160), the output frequency changes according to the applied voltage. This is used to modulate the VCO output.

2.4.5.3 PLL IC

There are TX PLL IC and RX PLL IC. PLL ICs compare the difference in phases of the VCO oscillation signal and the TCXO reference frequency. And it returns the difference voltage to the VCO CV terminal and realizes the "Phase Locked Loop". This allows the VCO oscillation frequency to accurately match (lock) the desired frequency.

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 MPU 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 approx. 2.0V.

The desired frequency is set for the PLL IC by the MPU (IC702) through the 3-line "SDO1", "SCK1", "/PCS_R" serial bus for RX PLL and "SDO1", "SCK1", "/PCS_T" serial bus for TX PLL. The MPU monitors through the "PLD_R" and "PLD_T" signal line, whether the PLL IC is locked or not. If the VCO does not lock to desired frequency (unlock), the "PLD_R" and "PLD_T" logic is low.

2.4.6 Control Circuit

The control circuit consists of MPU/DSP (IC702) and its peripheral circuits. IC702 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 the audio mute circuit by decode data input.

2.4.6.1 MPU

The MPU/DSP (IC702) is 32-bit RISC processor and fixed floating-point VLIW DSP, equipped with peripheral function.

This MPU operates at 288MHz (MAX) clock and 3.3V /1.8V/ 1.2V DC. Controls the flash memory, Mobile DDR, the receive circuit, the transmitter circuit, the control circuit, and the display circuit and transfers data to or from an external device.

2.4.6.2 Memory Circuit

Memory circuit consists of the MPU (IC702) and the Mobile DDR (IC703), the flash memory (IC705). The flash memory has capacity of 512M-bit that contains the transceiver control program for the MPU and stores the data. It also stores the data for transceiver channels and operating parameter that are written by the FPU. This program can be easily written from external devices. The Mobile DDR has capacity of 512 M-bit. The MPU copies the program to the Mobile DDR from the flash memory. The MPU is used as a work area Mobile DDR.

■Flash Memory

Note:

The flash memory stores the data that is written by the FPU (KPG-D1/D1N), tuning data (Deviation, Squelch, etc.), and firmware program (User mode, Test mode, Tuning mode, etc.). This data must be rewritten when replacing the flash memory.

■Mobile DDR (static memory)

Note:

Mobile DDR is used as a work area of the MPU.

2.4.6.3 LCD

The LCD is controlled using parallel interface from the MPU (IC702).

2.4.6.4 Key Detection Circuit

Keys are detected using I/O Expander IC (IC708). If pressed key is detected by IC708, it is informed to the MPU (IC702) through serial line.

2.4.6.5 Low Battery Warning

The battery voltage is divided using R40 and R41 and is detected by A/D converter (IC900). 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.

2.4.6.6 DSP

The DSP circuit consists of a MPU/DSP (IC702) and processes the baseband signal. The DSP operates at 288MHz (MAX) clock, the I/O section operates at 3.3V/1.8V and the core section operates at 1.2V.

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
- DTMF encoding/decoding
- MSK encoding/decoding
- 2-tone encoding/decoding
- Compressor/expander processing
- Voice scrambler processing
- Transmit/receive audio filtering processing
- Microphone amplifier AGC processing
- Audio mute processing
- Modulation level processing
- Active Noise Reduction
- Voice recording/playback processing
- Voice announce processing

2.4.7 Power Supply Circuit

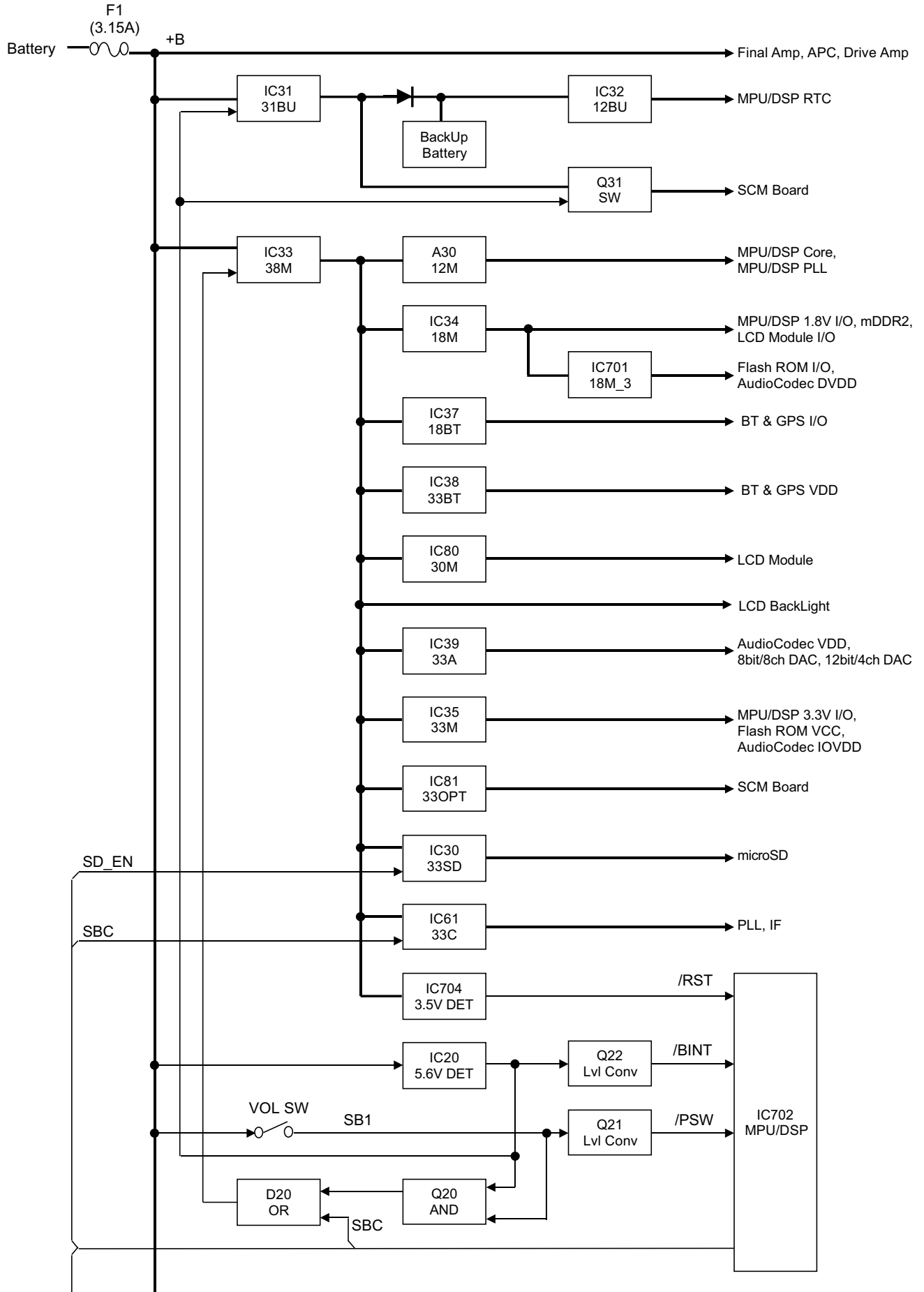
The battery voltage (+B) is provided from battery terminal. The battery voltage passes through the 3.15A fuse (F1), and goes to RF final amplifier, AVR ICs (IC31, IC82, IC801, IC36, IC63, IC65, IC64), DC/DC converter (IC33), transistor (Q32, Q71 through the 1A fuse (F2)), and voltage detector IC (IC20). Voltage detector (IC20) watches battery voltage. If the battery voltage is enough higher than 5.6V, detector outputs High. Then, IC31 (31BU) outputs 3.1V, and IC32 (12BU) outputs 1.2V, and Q31 is turned on.

When the VOL SW is turned on, SB1 becomes high (battery voltage). The DC/DC (IC33) operates if both SB1 and output of detector are high. IC33 (38M) outputs 3.8V, and A30 (12M) outputs 1.2V. Then, IC34 (18M) and IC37 (18BT) outputs 1.8V. Then, IC80 (30M) outputs 3.0V, and IC38 (33BT) and IC35 (33M) and IC81 (33OPT) outputs 3.3V. Then, IC39 (33A) outputs 3.3V, and IC82 (50A) outputs 5.0V. Then, IC701 (18M_3) outputs 1.8V, and Q71 (53AF) is turned on. Voltage detector (IC704) watches IC33 (38M) output voltage. If the 38M output voltage is enough higher than 3.5V, detector outputs High. As a result, the MPU/DSP operate.

The SBC signal becomes High after the MPU/DSP operates, and IC61 (33C), IC36 (50C), IC63 (50VCO) and Q32 (SB2) are turned on. When SD_EN signal becomes High, IC30 (33SD) operates. When 5UC signal becomes High, IC801 (50U) operates. When TXC signal becomes High, IC65 (50T) operates. IC65 (50T) is turned on in transmit mode.

When RXC signal becomes High, IC64 (50R) operates. IC64 (50R) is turned on in receive mode. Switches are controlled by the MPU/DSP.

When the VOL SW is turned off /PSW signal becomes Low. After detecting /PSW signal, the MPU/DSP changes SBC signal to Low. The 50C is fed to IC60 (130C). IC60 (130C) is the DC/DC boost converter. IC60, D60, C64 consist of a DC/DC boost converter. The 130C circuit then outputs approximately +13VDC.



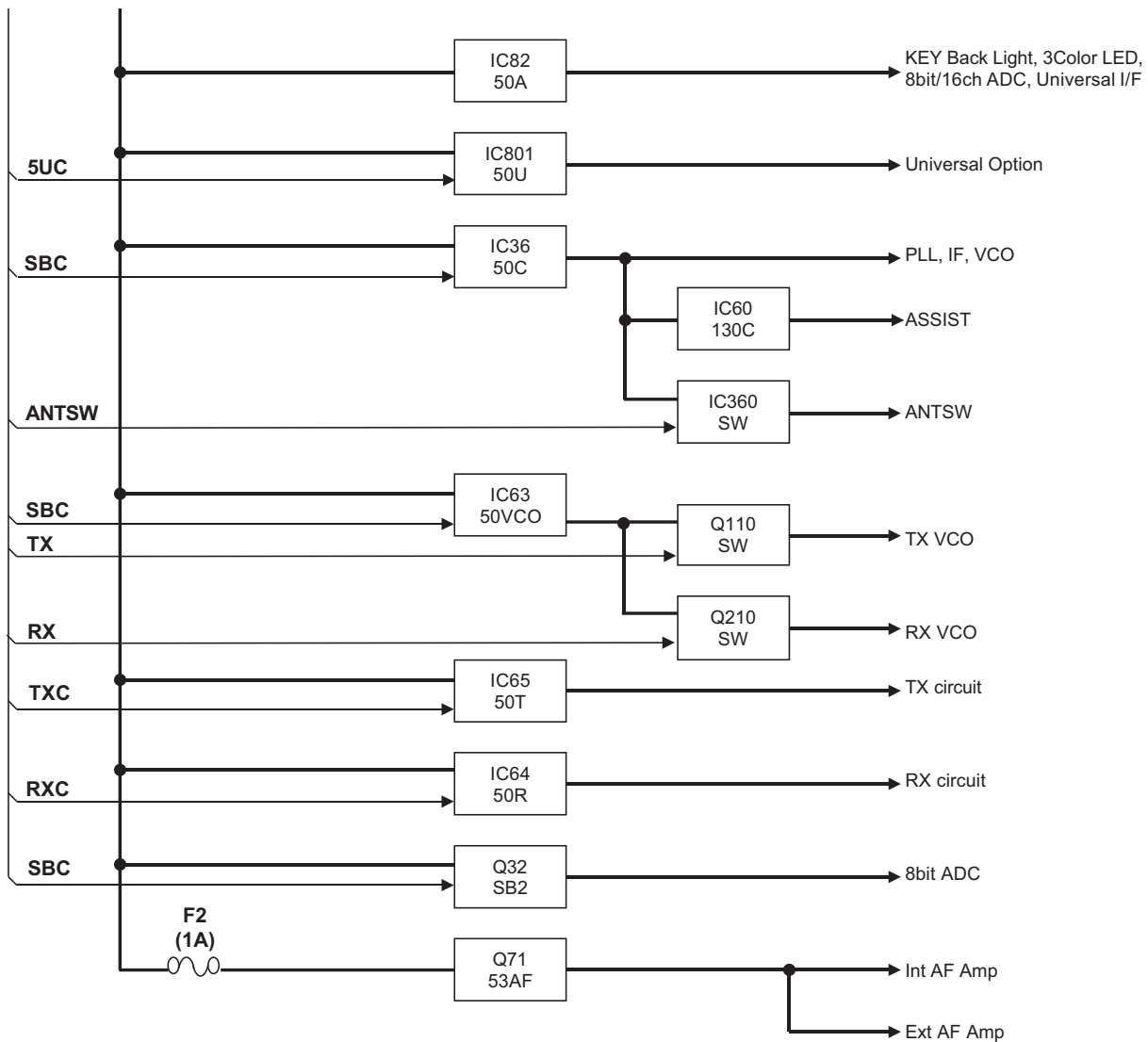


Fig.4 Power supply circuit

2.4.8 Signaling Circuit

2.4.8.1 Encode (QT/DQT/DTMF/2-tone/MSK)

Each signaling data signal of QT, DQT, DTMF, 2-tone and MSK is generated by IC702, superposed on a modulation signal and is sent to TX VCO and TX PLL IC.

2.4.8.2 Decode (QT/DQT/DTMF/2-tone/MSK)

The audio signal is removed from the FM detection signal sent to the IC702 and the resulting signal is decoded by IC702.

2.4.9 Bluetooth/GPS Circuit

The main component of the BT/GPS circuit is BT/GPS IC (IC850).

The clocks of BT/GPS IC require 19.2MHz for core and 32.768kHz slow clock (X850) for UART.

19.2MHz clock (X700) is shared with MPU/DSP (IC702), and is supplied through the clock buffer IC (IC700).

The BT/GPS IC communicates to the MPU/DSP (IC702) on the HCI UART. Interface of UART & Digital audio (PCM) between the MPU/DSP (IC702) and the BT/GPS IC (IC850), have level conversion at the level conversion IC (IC852, IC853).

The BT/GPS IC is powered by 1.8V and 3.3V which are supplied from two discrete external regulators (IC38 and IC37). The input of these regulators is sourced from a switching regulator (IC33) which regulates the battery voltage to 3.8V.

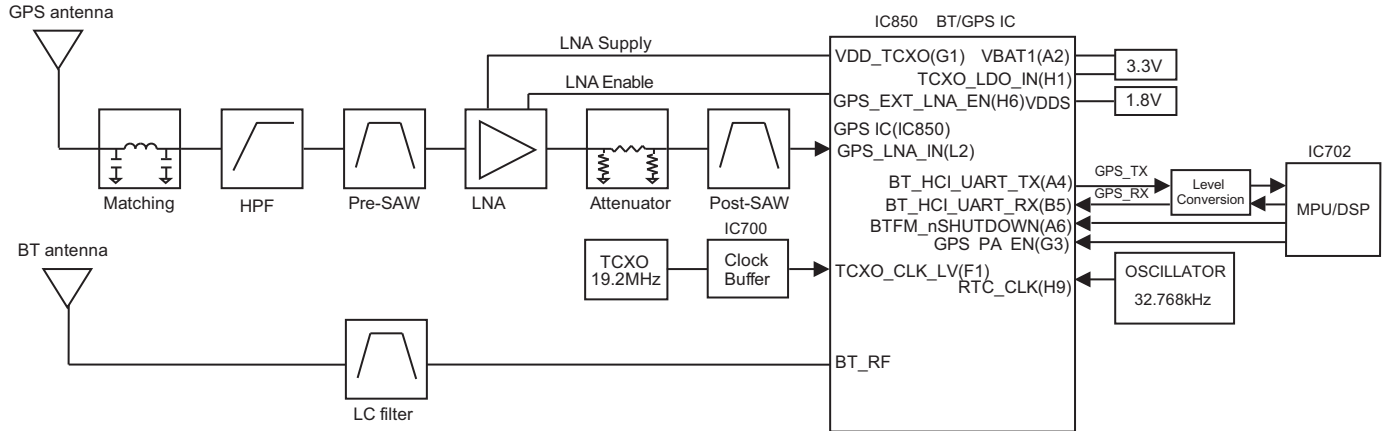


Fig.5 Bluetooth/GPS circuit

2.4.9.1 Bluetooth Circuit

The BT/GPS IC (IC850) support Bluetooth 3.0 up to HCI level.

The TX/RX frequency is 2400-2483.5MHz (79ch Hopping, 2402-2480MHz, 1MHz step). The transmit power is +2dBm at Bluetooth antenna input.

The Bluetooth antenna is made of sheet metal, and connected to the BT/GPS IC (IC850) through the LC filter (L855).

Frequency configuration for Bluetooth is following:

There are two LO modes: 2X and Offset LO (OSLO). 2X where LO is $2 * RF_FREQ$ (e.g. when transmitting at 2441MHz it is at 4882MHz). OSLO where LO is at $2/3 * RF_FREQ$ (e.g. when transmitting at 2441MHz it is at 1627.333MHz).

In RX the 2X is always used.

In GFSK TX if power is 10dBm or more then OSLO is used.

In EDR2 TX if power is -12dBm or more then OSLO is used.

In EDR3 TX if power is -12dBm or more then OSLO is used.

Otherwise 2X is used for TX as well.

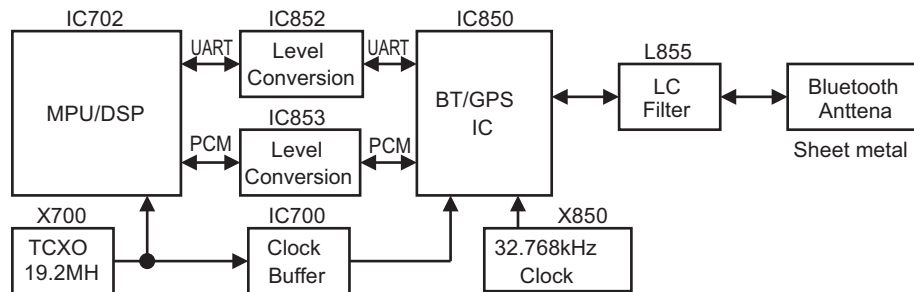


Fig.6 Bluetooth circuit

2.4.9.2 GPS Circuit

The RF signal is received by the antenna matched by the matching circuit. The matching circuit consists of L905, C948 and C883. And this signal applied to a high-pass filter. The filter consists of C882, C881, C880, L859 and L858. The filtered RF signal is then applied to a SAW filter (L857).

The output of the SAW filter is fed into the LNA (IC851). The LNA is enabled by GPS_EXT_LNA_EN (pin H6 of the BT/GPS IC, IC850). The LNA input match comprises of C879, C878 and L856. The LNA output match comprises of C874. And through the Attenuator comprised of R857, R856 and R855, the RF signal is further filtered by a second SAW filter (L853).

The output of the second SAW filter is passed to pin L2 of the BT/GPS IC. The input match for pin L2 comprises of C867, C866 and L852. The control and data lines for the BT/GPS IC are GPS_PA_EN, BTFM_nSHUTDOWN, GPS_TX and GPS_RX. GPS_TX and GPS_RX are shared with the Bluetooth data line.

Frequency configuration for GPS is following:

Lo is GPS: 1571.324MHz

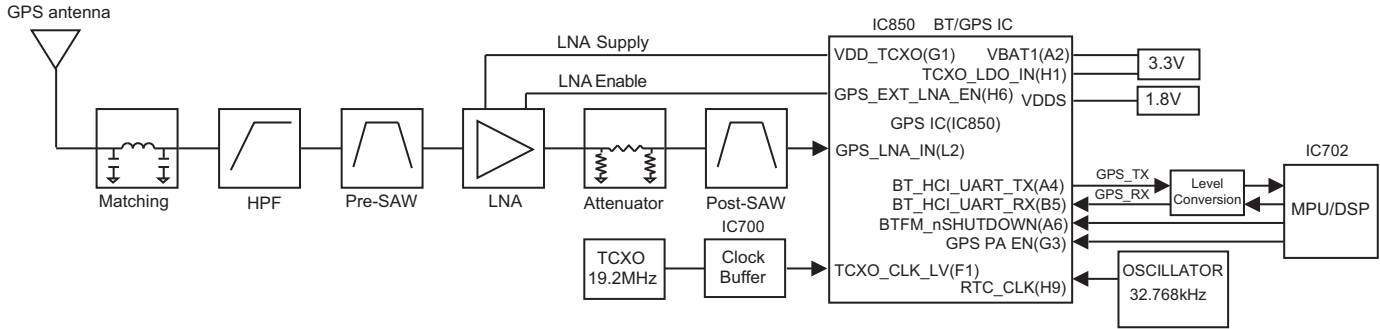


Fig.7 GPS circuit

2.5 COMPONENTS DESCRIPTION

2.5.1 Main unit (XC1-0331-80, XC1-0360-10)

Ref. No.	Part Name	Description
IC20	IC	Reset
IC30	IC	Voltage regulator (33SD)
IC31	IC	Voltage regulator (31BU)
IC32	IC	Voltage regulator (12BU)
IC33	IC	DC/DC converter (38M)
IC34	IC	DC/DC converter (18M)
IC35	IC	Voltage regulator (33M)
IC36	IC	Voltage regulator (50C)
IC37	IC	Voltage regulator (18BT)
IC38	IC	Voltage regulator (33BT)
IC39	IC	Voltage regulator (33A)
IC60	IC	DC/DC converter (130C)
IC61	IC	Voltage regulator (33C)
IC63	IC	Voltage regulator (50VCO)
IC64	IC	Voltage regulator (50R)
IC65	IC	Voltage regulator (50T)
IC70	IC	Voltage regulator (53AF)
IC80	IC	Voltage regulator (30M)
IC81	IC	Voltage regulator (33OPT)
IC82	IC	Voltage regulator (50A)
IC100	IC	PLL IC
IC101	IC	DC AMP
IC102	IC	Voltage regulator (DC AMP)
IC200	IC	PLL IC
IC201	IC	DC AMP

Ref. No.	Part Name	Description
IC300	IC	Pre-drive AMP 1
IC360	IC	DC SW (Antenna SW)
IC400	IC	APC
IC550, 551	IC	DC AMP
IC600	IC	IF IC
IC700	IC	Clock buffer
IC701	IC	DC SW (18M)
IC702	IC	MPU
IC703	IC	SDRAM
IC704	IC	Reset
IC705	IC	Flash memory
IC706	IC	Logic control
IC708	IC	I/O control
IC709	IC	Motion sensor
IC711,712	IC	Logic control
IC800	IC	LED driver
IC801	IC	Voltage regulator (50U)
IC802	IC	Analog SW
IC803	IC	Level converter
IC804~807	IC	Logic control
IC850	IC	GPS/Bluetooth
IC851	IC	GPS LNA
IC852,853	IC	Level converter
IC900	IC	A/D converter

Ref. No.	Part Name	Description
IC901	IC	D/A converter
IC902	IC	CODEC
IC903	IC	D/A converter
IC904,905	IC	Audio AMP
IC906	IC	Logic control
Q20	Transistor	DC SW
Q21,22	FET	DC SW
Q30	FET	DC SW
Q31	Transistor	DC SW
Q32,33	FET	DC SW
Q70	Transistor	DC SW
Q71	Transistor	Voltage regulator (53AF)
Q100	FET	DC SW
Q101	Transistor	Ripple filter
Q110,111	FET	DC SW
Q160	FET	VCO oscillation
Q180,181	Transistor	Buffer AMP
Q200	FET	DC SW
Q201	Transistor	Ripple filter
Q210,211	FET	DC SW
Q240	FET	VCO oscillation
Q280,281	Transistor	Buffer AMP
Q310	FET	Pre-drive AMP 2
Q320	FET	Drive AMP
Q330	FET	Final AMP
Q390	Transistor	DC SW
Q400	Transistor	DC SW
Q401,402	FET	DC SW
Q403	Transistor	DC SW
Q404	FET	DC SW
Q500	FET	Mixer
Q530	FET	LNA
Q580	Transistor	Buffer AMP
Q600	FET	VCO oscillation
Q601	Transistor	DC SW
Q602	Transistor	Ripple filter
Q660	Transistor	IF AMP
Q670	FET	IF AMP
Q700	Transistor	Buffer AMP
Q701	FET	DC SW
Q702	Transistor	DC SW
Q703	FET	DC SW
Q800	FET	DC SW
Q801	Transistor	DC SW
Q850	FET	DC SW
D1	Diode	Reverse connection prevention

Ref. No.	Part Name	Description
D2	Diode	Overvoltage protection
D20	Diode	DC SW
D30	Diode	Backup battery charge
D60	Diode	DC/DC converter
D100	Zener diode	Overvoltage protection
D101	Diode	Ripple filter
D160~164	Variable capacitance diode	VCO frequency control
D200	Zener diode	Overvoltage protection
D201	Diode	Ripple filter
D240~243	Variable capacitance diode	VCO frequency control
D350,351	Diode	Antenna SW
D370,371	Diode	Antenna SW
D390	Zener diode	Voltage limiter
D520,521	Variable capacitance diode	BPF wave tune
D530,531	Variable capacitance diode	BPF wave tune
D600,601	Variable capacitance diode	VCO frequency control
D603	Diode	Overvoltage protection
D700	Diode	Overvoltage protection
D701,702	Diode	Port protection
D703	Diode	Overvoltage protection
D704	LED	LED
D705	Diode	Reverse current prevention
D800,801	Diode	Port protection
D802~804	Diode	Reverse current prevention
D805,806	Zener diode	Surge protection
D807	Diode	DC SW
D808	Zener diode	Surge protection
D809,810	Varistor	Surge protection
D850,851	Diode	Overvoltage protection
D900,901	Zener diode	Surge protection
D902	Diode	Reverse current prevention
D903	Diode	DC SW
D904	Diode	Reverse current prevention
D905	Diode	Overvoltage protection
D906	Diode	Reverse current prevention
D907	Diode	Overvoltage protection

2.6 TERMINAL FUNCTION

2.6.1 Main unit (XC1-0331-80, XC1-0360-10)

Pin No.	Name	I/O	Function
CN3			
1	LEDK3	I	LCD backlight (Cathode)
2	LEDK2	I	LCD backlight (Cathode)
3	LEDK1	I	LCD backlight (Cathode)
4	LEDA	O	LCD backlight (Anode)
5	VSSA	-	GND
6	VSSA	-	GND
7	VCC	O	3.0V output
8	VCC	O	3.0V output
9	DC	O	Data/Command control signal
10	/CS	O	LCD CS signal
11	/RESET	O	LCD reset signal
12	/RD	O	LCD read signal
13	/WR	O	LCD write signal
14	IM0	O	System interface select
15	BD15	I/O	LCD Data Bus 15
16	BD14	I/O	LCD Data Bus 14
17	BD13	I/O	LCD Data Bus 13
18	BD12	I/O	LCD Data Bus 12
19	BD11	I/O	LCD Data Bus 11
20	BD10	I/O	LCD Data Bus 10
21	BD9	I/O	LCD Data Bus 9
22	BD8	I/O	LCD Data Bus 8
23	BD7	I/O	LCD Data Bus 7
24	BD6	I/O	LCD Data Bus 6
25	BD5	I/O	LCD Data Bus 5
26	BD4	I/O	LCD Data Bus 4
27	BD3	I/O	LCD Data Bus 3
28	BD2	I/O	LCD Data Bus 2
29	BD1	I/O	LCD Data Bus 1
30	BD0	I/O	LCD Data Bus 0
31	CABC	I	Backlight control signal
32	IOVCC	O	1.8V output
33	IOVCC	O	1.8V output
34	VSSD	-	GND
35	VSSD	-	GND
CN4			
1	+B	O	Power output after passing through the fuse
2	SB	I	Switched B input
3	NC	-	No connection
4	NC	-	No connection
5	VOL	I	Volume level input
6	50A	O	5.0V output
7	ENC0	I	Rotary switch input

Pin No.	Name	I/O	Function
8	GND	-	GND
9	ENC1	I	Rotary switch input
10	GND	-	GND
11	ENC2	I	Rotary switch input
12	ENC3	I	Rotary switch input
13	CNTSW	I	Lever switch input
14	GND	-	GND
15	GND	-	GND
16	ME	-	MIC GND
17	GND	-	GND
18	INTM_S	I	Internal MIC (SUB)
19	INTM_M	I	Internal MIC (MAIN)
20	ME	-	MIC GND
CN8			
1	/Side0	I	Side 0 input
2	GND	-	GND
3	/Side2	I	Side 2 input
4	/Side1	I	Side 1 input
5	/PTT	I	PTT input
6	NC	-	No connection
CN10			
1	GND	-	GND
2	/KEY10	I	Key matrix input
3	GND	-	GND
4	/KEY11	I	Key matrix input
5	GND	-	GND
6	/KEY12	I	Key matrix input
7	KEY_BLC	O	Key backlight output
8	/KEY13	I	Key matrix input
9	KEY_BLC	O	Key backlight output
10	/KEY14	I	Key matrix input
11	KEYO3	O	Key matrix output
12	GND	-	GND
13	KEYO2	O	Key matrix output
14	GND	-	GND
15	KEYO1	O	Key matrix output
16	GND	-	GND
17	KEYO0	O	Key matrix output
18	GND	-	GND
19	GND	-	GND
20	GND	-	GND
CN11 (for production)			
1~20	-	-	-
CN12			
1	SMIC	I	External MIC input
2	RXD	I/O	Serial data input/USB DM

Pin No.	Name	I/O	Function
3	TXD	I/O	Serial data output/USB DP
4	5V	O	5V power supply output
5	E	-	GND
6	OPT	I	MIC identification
7	PF	I	Programmable function key input
8	PTT	I	PTT input
9	ME	-	MIC GND
10	EMC	I	External MIC input/USB VBUS
11	MSW	I	EXT/Int MIC switch input
12	SP-	O	BTL output for external speaker -
13	SP+	O	BTL output for external speaker +
14	SSW	I	EXT/Int speaker switch input
CN13			
1	SP-	O	BTL output for internal speaker -
2	SP+	O	BTL output for internal speaker +

Pin No.	Name	I/O	Function
J1			
1	DAT2	I/O	Data 2
2	CD/DAT3	I/O	Data 3
3	CMD	I/O	Command input/output
4	VDD	O	3.3V output
5	CLK	O	Clock output
6	VSS	-	GND
7	DAT0	I/O	Data 0
8	DAT1	I/O	Data 1
9	CD	I	Card detect switch
10	COMMON	-	GND
11	GND1	-	GND
12	GND2	-	GND

2.6.2 Universal connector specification

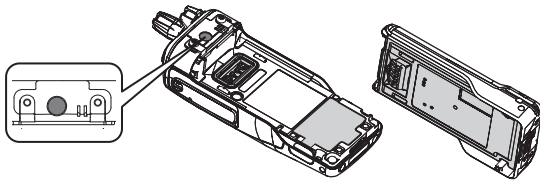
Pin No.	Name	I/O	Signal Type	Function	Rating and Condition				
					Parameter	Min	Typ	Max	Unit
1	SSW	I	Digital	EXT/INT speaker switch input	VIH	2.5	-	5.3	V
					VIL	0.0	-	0.15	V
2	SP+	O	Analog	BTL output for external speaker	[8Ω load]				
					Max output power (1kHz, Batt=7.5V)		1.3	1.8	W
					DC Bias		2.5		V
					Allowable Frequency	300		3000	Hz
3	SP-	O	Analog	BTL output for external speaker	[16Ω load]				
					Max output power (1kHz, Batt=7.5V)		0.9	1.4	W
					DC Bias		2.5		V
					Allowable Frequency	300		3000	Hz
4	MSW	I	Digital	EXT/INT MIC switch input	VIH	3.5	-	5.3	V
					VIL	0.0	-	0.15	V
5	EMC	I	Analog	External MIC input	Audio Level (STD deviation)	7.7	12.5	17.3	mV
					DC Bias		3.3		V
					Allowable Frequency	300		3000	Hz
					Input impedance	-	1.8	-	kΩ
	VBUS		Analog	USB VBUS (5V) input	VIH	4.8	-	5.3	V
				VIL	0.0	-	0.50	V	
6	ME	-	-	MIC GND	This is GND port for Microphone.				
7	PTT	I	Digital	PTT input	VIH	2.5	-	5.3	V
					VIL	0.0	-	0.40	V
8	PF	I	Analog	Programmable function key input	V(PF2)	3.5	-	3.9	V
					V(PF1)	2.5	-	3.5	V
9	OPT	I	Digital	MIC identification	VIH	4.0	-	5.3	V
					VIL	0.0	-	0.7	V
10	GND	-	-	GND					

Pin No.	Name	I/O	Signal Type	Function	Rating and Condition				
					Parameter	Min	Typ	Max	Unit
11	5U	-	Power	5V power supply output	Output Voltage(Iout = 100mA)	4.9	5.0	5.1	V
					Maximum Current	-	-	0.2	A
12	TXD	O	Digital	Serial data output	VOH(Io=-5mA)	4.1	-	5.1	V
					VOL(Io=5mA)	0.0	-	0.8	V
					Baud Rate			1.1875	Mbps
	USB_DP	IO	Analog	USB DP	VIH	2.7	-	3.6	V
					VIL	-	-	0.8	V
					VOH	2.8	-	3.5	V
					VOL	0.0	-	0.3	V
					Baud Rate (Full-Speed)			12	Mbps
13	RXD	I	Digital	Serial data input	VIH	2.0	-	5.3	V
					VIL	0.0	-	0.8	V
					Baud Rate			1.1875	Mbps
	USB_DM	IO	Analog	USB DM	VIH	2.7	-	3.6	V
					VIL	-	-	0.8	V
					VOH	2.8	-	3.5	V
					VOL	0.0	-	0.3	V
					Baud Rate (Full-Speed)			12	Mbps
14	SMIC	I	Analog	External MIC input	Audio Level (STD deviation)	7.7	12.5	17.3	mV
					DC Bias		3.3		V
					Allowable Frequency	300		3000	Hz
					Input impedance	-	1.8	-	kΩ

SECTION 3 DISASSEMBLY

3.1 Precautions for Waterproof

- Do not remove the black sheet from the reverse side of the transceiver (refer to the illustration below). Removal of this sheet decreases the waterproof efficiency of the transceiver and may cause malfunctions if water seeps into the transceiver.
- The orange packing material on the reverse side of the transceiver is important with respect to the waterproof efficiency of the transceiver. Do not place stickers or other materials on or around the packing material shown in the figure, or on the reverse side of the battery pack. Doing so will impair the waterproof efficiency of the transceiver and may cause it to break down. Additionally, in order to prevent damage to the packing material, do not allow it to come in contact with foreign materials.



3.2 Precautions for Disassembly

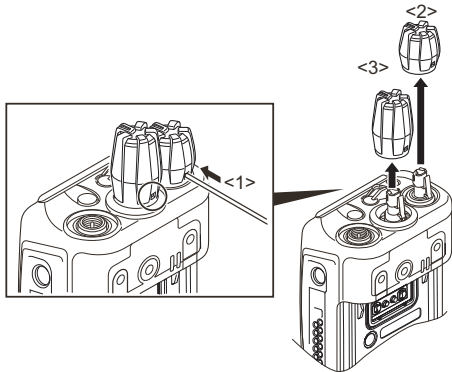
3.2.1 Removing the selector knob and volume knob

- 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.

- Lift and remove the selector knob <2> while pushing the knob spring.
- 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.

- Match the direction for the hole of the knob and the knob spring.
- Push the knob onto the knob spring until a click sounds.

3.2.2 Removing the selector knob spring and volume knob spring

- Lightly grasp the left and right sides of the selector knob spring together, and lift up as shown in the figure. <1>

Note:

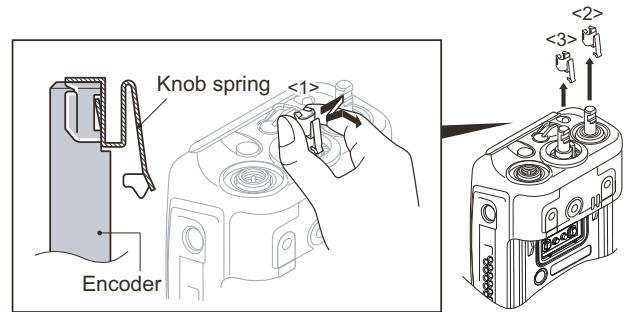
Do not grasp the knob spring tightly.

- Remove the selector knob spring <2>.

Note:

Use minimal contact with your fingers on the knob spring.

- 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.

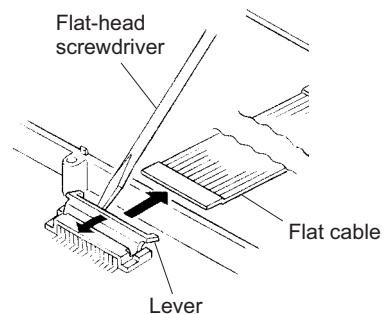
- Match the direction for the knob spring and the encoder.
- Insert the encoder onto the knob spring until a click sounds.

3.2.3 How to remove the flat cable

- Gently rise up the connector lever in the direction of the arrow with a flat-head screwdriver or tweezers. (CN8, CN9, CN12)

Note:

Gently push both sides of the connector lever, when put in the flat cable.

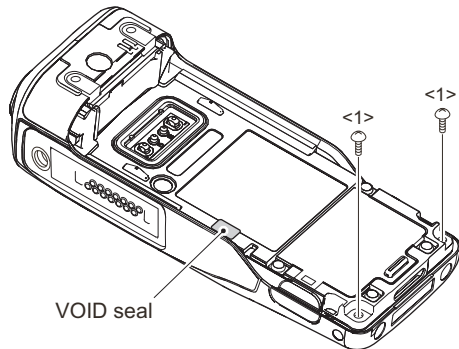


3.2.4 Remove the front case from the chassis

- (1) Remove two screws <1>.
- (2) Lift the base of the chassis and remove the chassis from the front case.

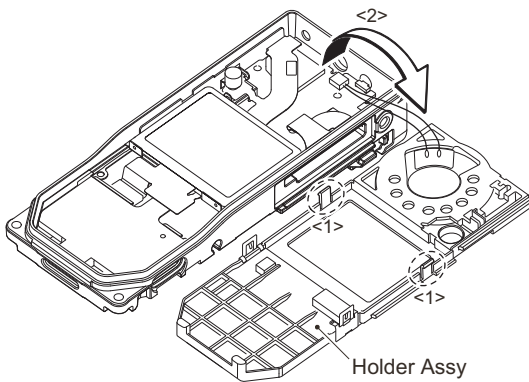
Note:

- There is a void seal stuck to the chassis and the front case, the void sheet peels off of when the chassis is removed from the case. Once the void seal is peeled off, it cannot be used again.
- When the chassis does not remove from the front case, remove by pushing in the key top with the finger.
- Regarding VOID, confirm the service policy of the NX-5200 to KENWOOD (or authorized distributor).



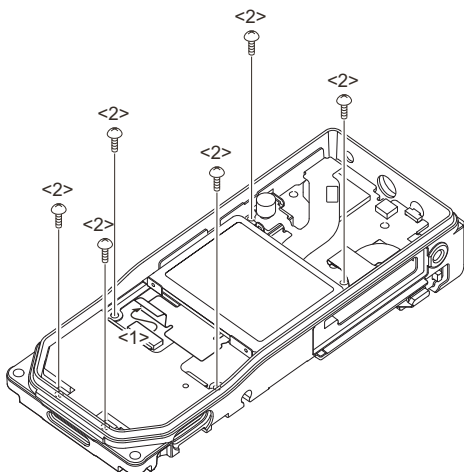
3.2.5 Remove the holder ASSY from the chassis

- (1) Remove the two hooks on the holder ASSY from the chassis. <1>
- (2) Rotate the holder ASSY to the right as shown in the figure. <2>

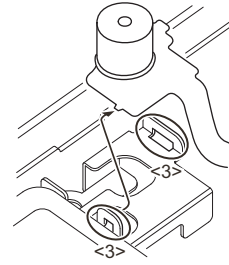


3.2.6 Removing the LCD shielding case from the Main unit

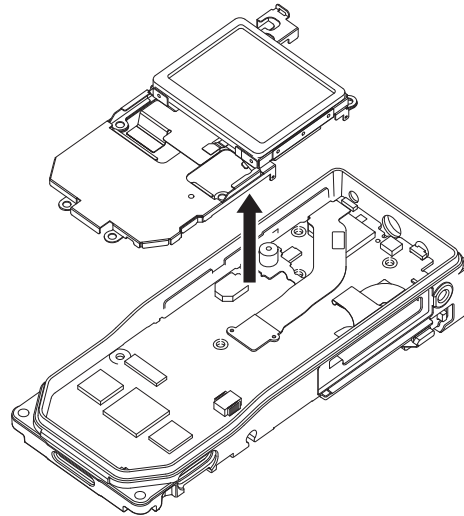
- (1) Remove the LCD FPC from the connector (CN9). <1>
- (2) Remove the six screws. <2>



- (3) Remove the VOL/SEL/MIC FPC from the two holes of the LCD shielding case. <3>

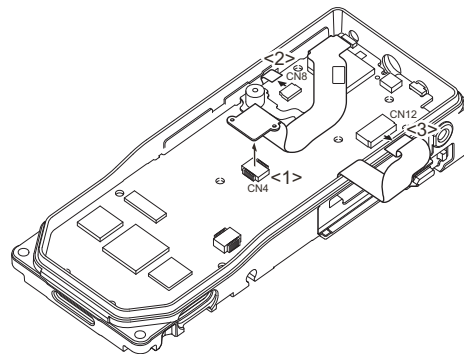


- (4) Remove the LCD shielding case from the Main unit. <4>



3.2.7 Removing the Main unit from the chassis

- (1) Remove the VOL/SEL/MIC FPC from the connector (CN4). <1>
- (2) Remove the PTT FPC from the connector (CN8). <2>
- (3) Remove the Universal connector FPC from the connector (CN12). <3>

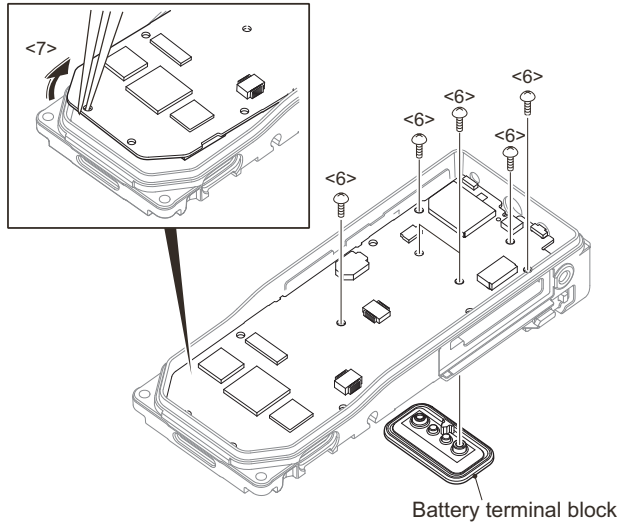


(4) Remove the six screws <6>.

Note:

When you remove two screws (black), the battery terminal block is removed.

(5) Anchor the screw hole of the Main unit using the tip of a pair of tweezers as shown in the figure. Then lift the Main unit to remove it from the chassis. <7>



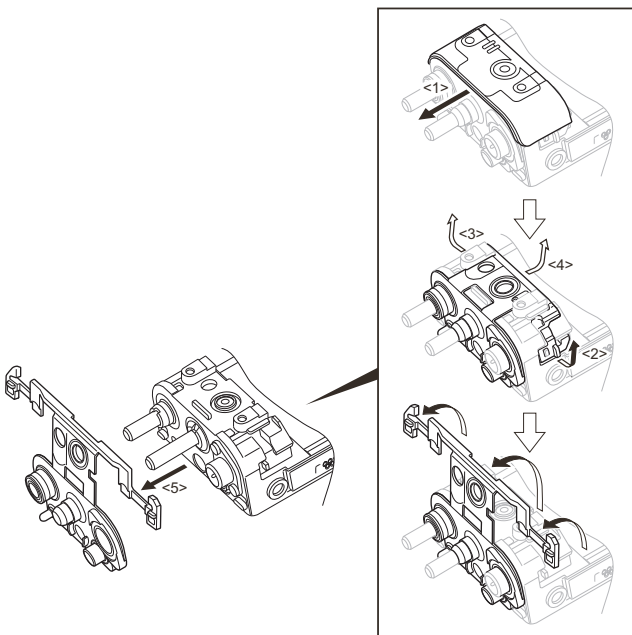
3.2.8 Removing the TOP packing

- (1) Remove the rear panel by sliding it upwards. <1>
- (2) Pull the TOP packing to the left to remove the packing that is fit into the left groove of the chassis. <2>
- (3) Pull the TOP packing to the right to remove the packing that is fit into the right groove of the chassis. <3>
- (4) Pull the TOP packing to the center to remove the packing that is fit into the center groove of the chassis. <4>
- (5) Remove the TOP packing. <5>

Note:

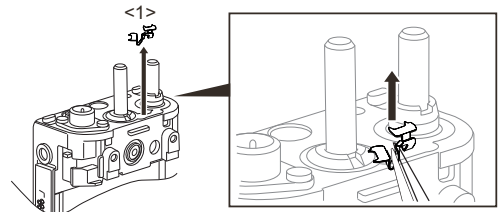
Remove the packing slowly, as the packing of the selector part might be overset when the TOP packing is removed.

If the packing is turned over, return it to the original position using a soft tipped item (e.g., your finger).



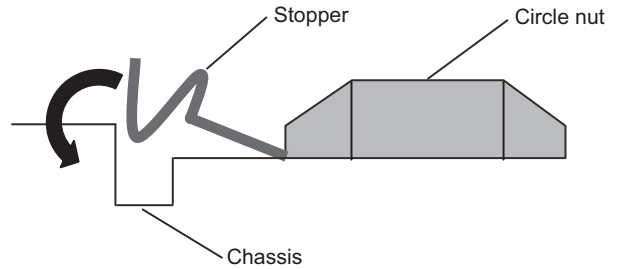
3.2.9 Removing the stopper of the selector circle nut and volume circle nut

- (1) Remove the stopper <1> using a pair of tweezers.



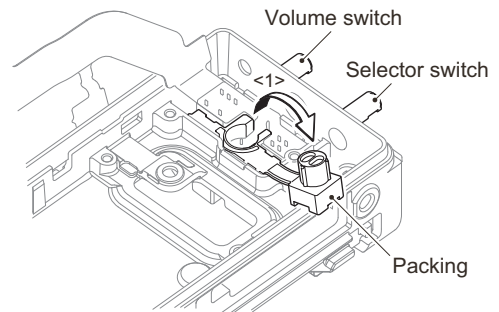
Note:

When reassembling the stopper, install it as shown in the figure.

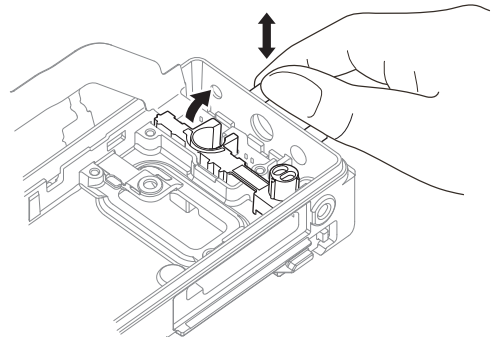


3.2.10 Remove the selector and volume switches from the chassis

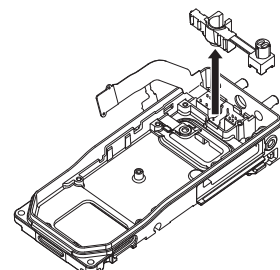
- (1) Pull up the cover of the packing. <1>



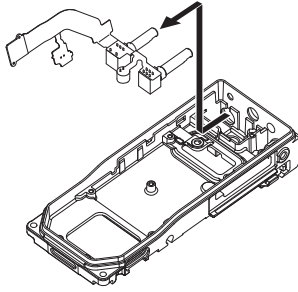
- (2) Move the selector and volume switches vertically to lift the packing.



- (3) Pull on the packing and remove it from the chassis.

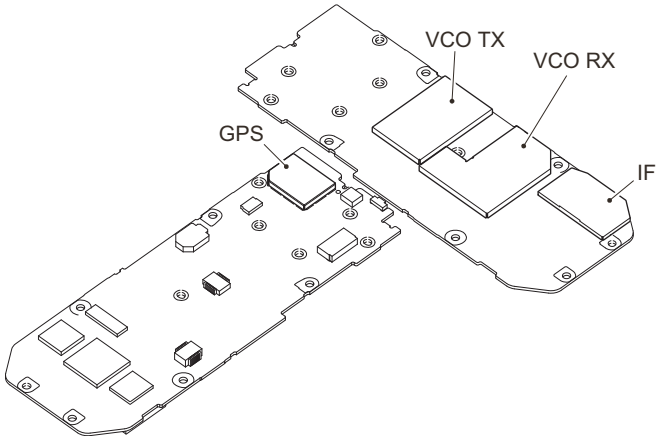


- (4) Move the selector and volume switches and then remove them both from the holes in the chassis.



3.2.11 Remove the top cover from the shield cover

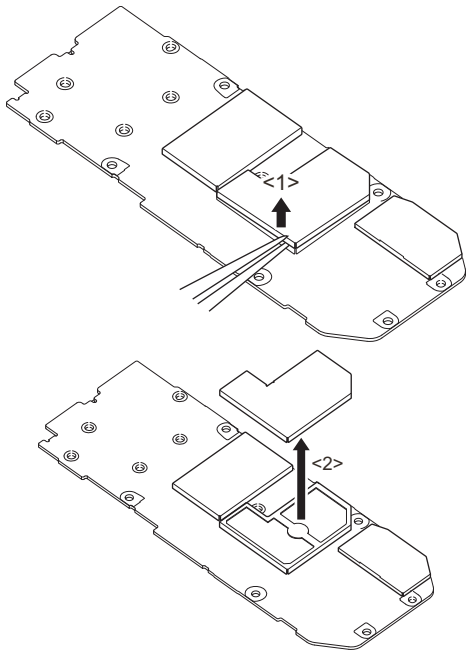
- (1) There are four shield covers (GPS, IF, VCO RX, and VCO TX) on the main unit, the top covers can be removed.



- (2) Use tweezers to slightly lift the edge of the top cover. <1>
 (3) As you do step 2 above, vary the position you hold the top cover as you lift it, and remove the top cover <2>.

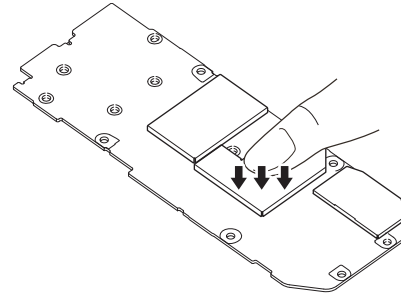
Note:

Once the top cover is removed, it cannot be used again.



Note:

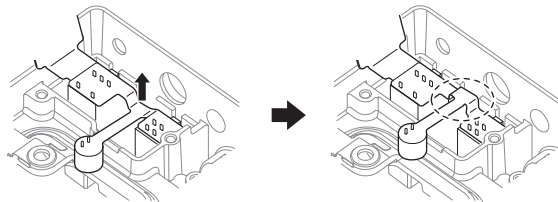
Push evenly on the top cover and be careful that you do not bend it as you install it on the shield cover.



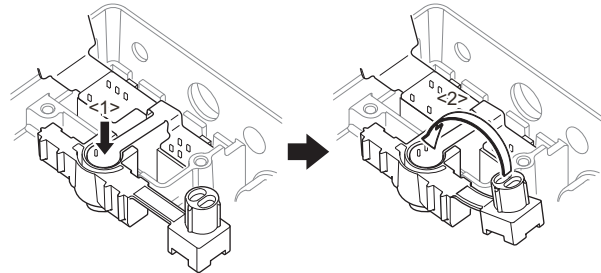
3.3 Precautions for Reassembly

3.3.1 Install the packing in the chassis

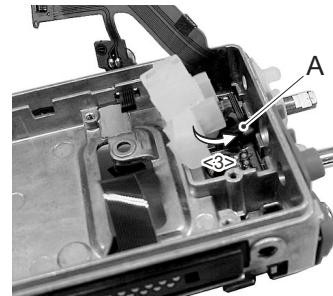
- (1) Lift up the VOL/SEL/MIC FPC as shown by the arrow in the figure so it is in the shape shown inside the dotted line.



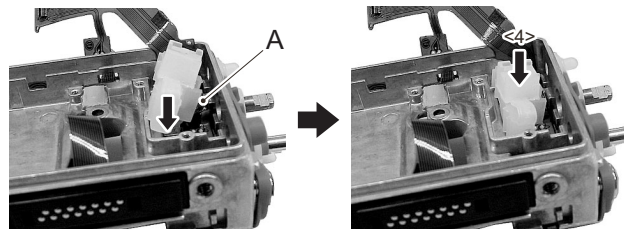
- (2) Insert the microphone into the packing. <1>
 (3) Insert the cover into the packing. <2>



- (4) Tuck the packing under the A part of the FPC. <3>



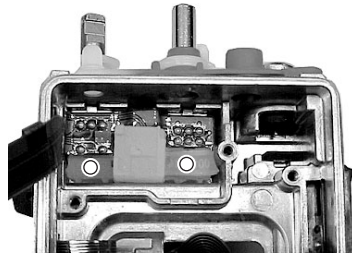
- (5) Keep the packing tucked under A as you insert it into the chassis. <4>



(6) Press the packing evenly to the base of the chassis.

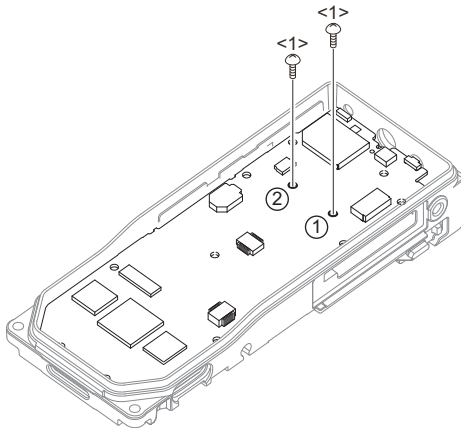
Note:

To prevent doing any damage, do not press forcefully on the packing.

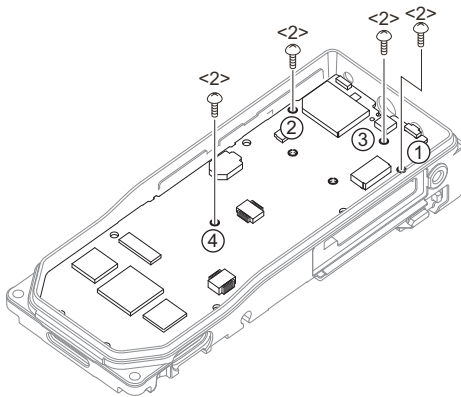


3.3.2 Install the main unit in the chassis

(1) Tighten the two screws (black) <1> to affix the battery terminal block to the chassis.



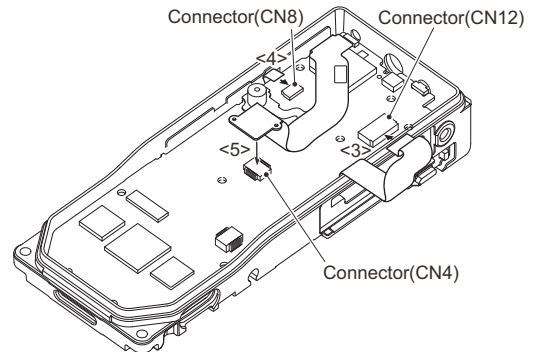
(2) Tighten the four screws <2> to affix the main unit to the chassis.



(3) Insert the universal connector FPC into the connector (CN12). <3>

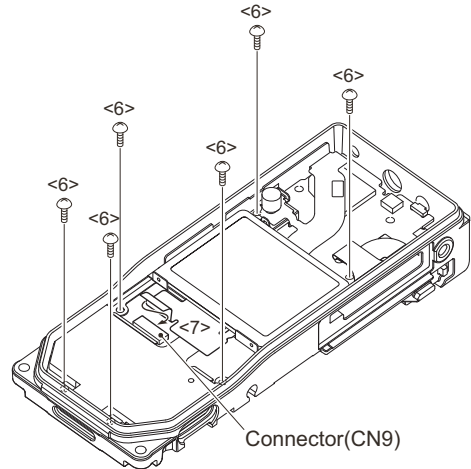
(4) Insert the PTT FPC into the connector (CN8). <4>

(5) Insert the VOL/SEL/MIC FPC into the connector (CN4). <5>

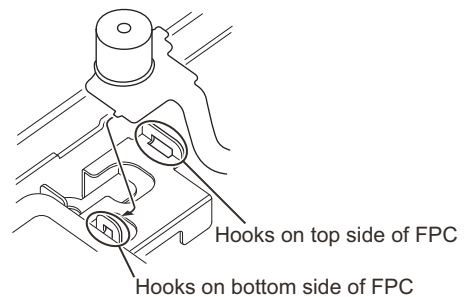


(6) Place the LCD shield cover on the main unit and tighten the six screws. <6>

(7) Insert the LCD FPC into the connector (CN9). <7>



(8) After inserting the hooks on the top side of the VOL/SEL/MIC FPC (mic part) into the holes on the top side of the LCD shield cover, insert the hooks on the bottom side of the FPC into the holes on the bottom side of the shield cover.



3.3.3 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>

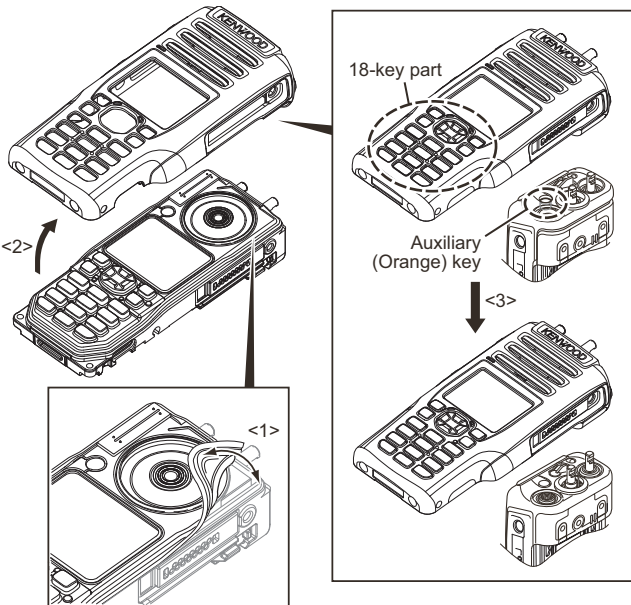
Note:

Confirm that the entire groove of the key top fits to the chassis tightly.

- (2) Mount the chassis onto the case. <2>

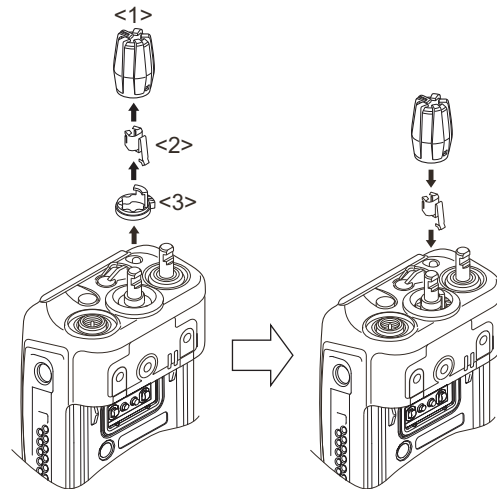
Note:

- After mounting the chassis onto the case, if the 18-key part on the key top or the Auxiliary (Orange) key part of the VOL/SEL packing gets stuck inside the case as shown in the figure, return it to the normal position using a soft tipped item (e.g., finger) . <3>
- Prying it with a pointed metal tool such as forceps, may damage the key top or packing.



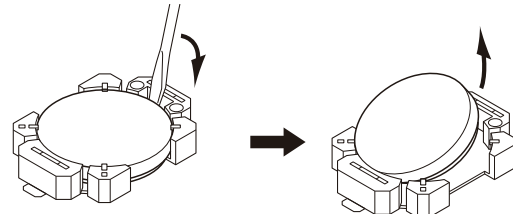
3.3.4 Changing the channel selector from 16-channel operation to free

- (1) Remove the channel selector knob <1>. (Refer to "Removing the selector knob and volume knob" for how to remove the channel selector knob.)
- (2) Remove the knob spring <2>. (Refer to "Removing the selector knob spring and volume knob spring" for how to remove the knob spring.)
- (3) Remove the mechanical stopper <3>.
- (4) Reassemble the channel selector knob and knob spring that were removed in steps 1 and 2, in their original positions.



3.3.5 Removing the lithium cell (W09-0971-05)

Insert a non-conductive screwdriver to groove of one side of the socket (CN7) and pry the lithium cell up from the socket.



3.3.6 Installing the lithium cell (W09-0971-05)

Insert a lithium cell into one side of the socket (CN7).

Push the lithium cell to insert the lithium cell into the socket



3.3.7 Assembly Information (Sheet/Cushion)

When "Main Parts" is changed (ordered), "Assembled Sheet / Cushion" should also be changed (ordered) together.

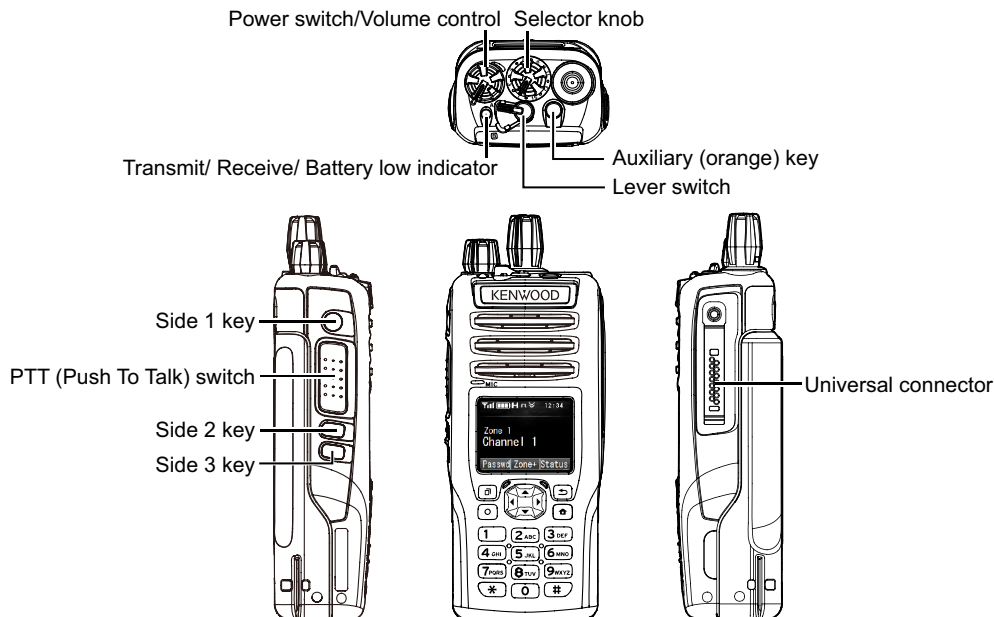
The Sticker and Sheet etc are non-reusable parts. It requires the new one to get the radio's performance after repairs.

For example, when "Plastic Cabinet (A0C-0001-00 (F3,K3,E)/ A0C-0002-00 (F2,K2,E2))" is changed, "Badge (B4D-0002-00)", "Fibrous Sheet (G1A-0001-00)", "Sheet (G1B-0074-00)", "Spacer (J3K-0003-00)" and "Knob (K2K-0013-00)" should be ordered and changed together because Badge (B4D-0002-00), Fibrous Sheet (G1A-0001-00), Sheet (G1B-0074-00), Spacer (J3K-0003-00) and Knob (K2K-0013-00) are non-reusable.

Main Parts		Assembled Sheet/ Cushion		
Part Name	Part Number	Part Name	Part Number	Remark
Plastic Cabinet (F3,K3,E) Plastic Cabinet (F2,K2,E2)	A0C-0001-00	Badge	B4D-0002-00	"KENWOOD" is printed.
	A0C-0002-00	Fibrous Sheet (SP)	G1A-0001-00	
		Sheet (LCD)	G1B-0074-00	
		Spacer (2CH)	J3K-0003-00	
		Knob (2CH)	K2K-0013-00	
Rear Panel	A8A-0005-00	Sheet (Air)	G11-4440-04	
Terminal Block	E7C-0001-00	Terminal Sticker	B4C-0105-00	
Cover (OP board)	F0G-0005-00	Cushion (Cover)	G1D-0062-00	
Shielding Cover (MPU)	F1B-0005-00	Sheet (Insulating)	G1B-0031-00	
Shielding Cover (LCD)	F1B-0006-00	Cushion (LCD/Front)	G1D-0009-00	
Holder (F3,K3,E)	J1K-0004-10	Cushion (20-pin Connector)	G1D-0021-00	
FPC (UNIV)	J87-0056-05	R.Receptacle	E58-0532-05	
FPC (PTT)	J87-0057-05	Sheet (PTT)	G1B-0016-00	
FPC (VOL, SEL, ECM)	J87-0058-05	Sheet (Conducting)	G11-4459-04	
		Cushion	G1D-0025-00	
Speaker	T0H-0002-00	Rubber Cushion (SP)	G1B-0045-10	

SECTION 4 ADJUSTMENT

4.1 F2,F3,K2,K3 TYPE Controls



4.1.1 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 an 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.

4.2 Panel Test Mode

4.2.1 Test mode operation features

This transceiver has a test mode. To enter test mode, press and hold the [↵] key while turning the transceiver power ON or press the [□] key and select the "Panel Test". 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.

- When the panel test mode is activated, the channel selected with the [Selector] knob and the last used signaling number are displayed. When it is activated for the first time, the signaling number is 1.
- If test signaling 10 (P25 Phase1), 7 (P25 Phase2) and 7 (NXDN Mode) is selected, the result of Bit Error Rate (BER) calculation is displayed on the LCD.

4.2.2 Key operation

Key	"FNC" not appears on the sub LCD display	
	Function	Display
[Selector]	-	-
[▲]	Push: Test channel up Hold: Test channel up continuously	Channel No.
[▼]	Push: Test channel down Hold: Test channel down continuously	Channel No.

Key	"FNC" not appears on the sub LCD display	
	Function	Display
[◀]	Push: Squelch level up *1 Hold: Squelch off	Squelch level Squelch off: [🔊] icon appears
[▶]	Wide/Narrow/ Very Narrow *2	Wide: "w" Narrow: "n" Very Narrow: "v"
[Side1]	-	-
[Side2]	-	-
[Side3]	Push: Microphone (Front MIC/Rear MIC) select	Rear MIC: [🎤] icon appears
[□]	Shift to panel tuning mode	-
[↵]	Function on	"FNC" appears on the sub LCD display
[○]	MSK 1200bps and 2400bps *1	2400bps: [☑] icon appears
[🏠]	Push: Test signaling up Hold: Test signaling up continuously	Signaling No.
[AUX (Orange)]	-	-
[PTT]	Transmit	-
[0] to [9] and [#], [*]	-	-

*1: When the mode is selected as Analog, this function is enabled.

*2: When the Mode is selected as P25, bandwidth is fixed to Narrow.

Key	"FNC" appears on the sub LCD display	
	Function	Display
[Selector]	-	-
[▲]	Talk Around on/off	On: icon appears
[▼]	Analog/Phase1/Phase2/NXDN	Analog: "A" P25 phase1: "P1" P25 phase2: "P2" NXDN: "N"
[◀]	-	-
[▶]	Key/LCD check	The position of the selector knob, etc., appear.
[Side1]	Function off	-
[Side2]	Function off	-
[Side3]	P25 Modulation Type (C4FM/LSM) *3	LSM : icon appears
	High power/Low power	High: "H" Medium: "M" Low: "L"

Key	"FNC" appears on the sub LCD display	
	Function	Display
	Function off	-
	Compander on/off	On: icon appears
	Function off	-
[AUX (Orange)]	For production	-
[PTT]	Transmit	-
[0] to [9] and [#], [*]	Function off	-

*3: When the mode is selected as P25, this function is enabled.

- **LED indicator**
Red LED Lights during transmission.
Green LED Lights when there is carrier.
- **Sub LCD indicator**
"FNC" Appears at function on.

• LCD display in panel test mode

(Power ON)

Battery type detect → "LI"
"ALKALI": Alkaline battery pack
"LI": Li-ion
"LI IS": Li-ion(IS)
"NIMH": Ni-MH

Type → "K"
Fx, Kx types are displayed as "K".

Frequency range → "VHF F1"
136~174MHz

Temperature → "+25"

Power →

Sub LCD display

Main LCD display → "An SQ5 1-1"
Signaling No. → "1-1"
Channel No. → "1-1"

(After 2sec.)

An : Analog narrow mode
Aw : Analog wide 5k mode
As : Analog wide 4k mode *1
P1 : P25 Phase1 mode
P2 : P25 Phase2 mode
Nn : NXDN narrow mode
Nv : NXDN very narrow mode

Squelch level (Analog mode only)

*1: Wide 4k is displayed only when the PC test mode is used. However, it aims at production for factory, or a operation verification of the transceiver. It is not necessary in operation of the transceiver to adjust.

4.2.3 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.

(1) 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

CH	RX (MHz)	TX (MHz)
5	155.20000	155.20000
6	155.40000	155.40000
7~16	-	-

(2) Test signaling

■Analog mode signaling

No.	RX	TX
1	None	None
2	None	Square Wave
3	LTR Data	LTR Data
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 Decode (CODE: 159D)	DTMF Encode (CODE: 159D)
11	None	DTMF Encode (CODE: 9)
12	2-tone Decode (A: 304.7Hz, B: 3106.0Hz)	2-tone Encode (A: 304.7Hz, B: 3106.0Hz)
13	Single Tone Decode (979.9Hz)	Single Tone Encode (979.9Hz)
14	None	Single Tone Encode (1000Hz)
15	None	MSK PN9
16	MSK Decode	MSK Encode

■P25 Phase1 signaling

No.	RX	TX
1	NAC 293	NAC 293
2	NAC 023	NAC 023
3	NAC 5EA	NAC 5EA
4	None	PN9
5	NAC 293	Symbol Rate Pattern
6	NAC 293	1/3 Deviation Pattern
7	NAC 293	0 Continuous Pattern
8	NAC 293	Fidelity Pattern
9	None	FSW+PN9
10	NAC 293	1011Hz Tone Test Pattern
11	Tone Pattern	1011Hz Tone Test Pattern
12	Silence Pattern	Silence Pattern
13	Audio Test Pattern	NAC293 + Audio Test Pattern
14	Vocoder Loop	None

■P25 Phase2 signaling

No.	RX	TX
1	STTP-OB-1031-0	STTP-IB1031-1+Audio
2	None	PN9 Phase2
3	STTP-OB-1031-1	Symbol Rate Pattern Phase2
4	STTP-OB-1031-1	1/3 Deviation Pattern Phase2
5	STTP-OB-1031-1	0 Continuous Pattern

No.	RX	TX
6	STTP-OB-1031-1	0 Burst Pattern
7	STTP-OB-1031	Symmetrical STTP-IB1031-1
8	Tone Pattern (Half rate)	STTP-IB1031-1
9	Silence Pattern (Half Rate)	STP-IB-1 + Silence Pattern (Half Rate)
10	Audio Test Pattern (Half Rate)	STTP-IB1031-1 + Audio Test Pattern (Half Rate)
11	Codec Loop	STTP-IB1031-1 + Codec Loop
12	Vocoder Loop (Half Rate)	STTP-IB1031-1 + Vocoder Loop (Half Rate)





■NXDN Mode signaling




No.	RX	TX
1	RAN1	RAN1
2	None	PN9
3	RAN1	Maximum Deviation Pattern
7	FSW + PN9	FSW + PN9
9	Tone Pattern (1031Hz)	Tone Pattern (1031Hz)

RAN: Radio Access Number
 PN9: Pseudo-Random Pattern
 No.7, 9 Item: PC test mode only

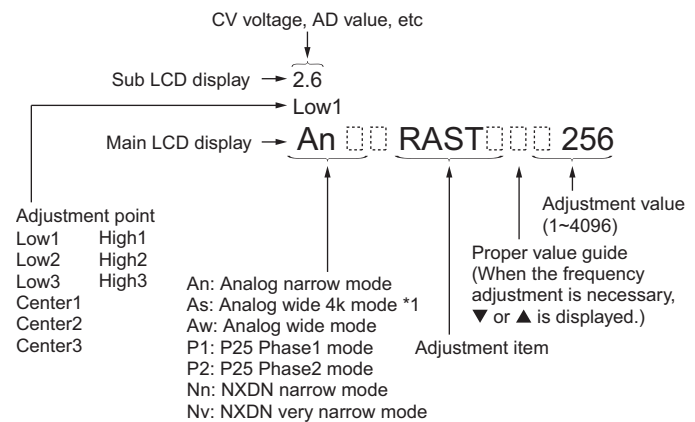
4.3 Panel Tuning Mode

4.3.1 Transceiver tuning (To enter tuning mode)

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




Use the [] key to select the adjustment item through tuning modes. Use the [] key to adjust 5, 9 or 17 reference level adjustments, and use the [] key to switch between Wide/Narrow.

- LCD display in panel tuning mode



*1: Wide 4k is displayed only when the PC test mode is used. However, it aims at production for factory, or a operation verification of the transceiver. It is not necessary in operation of the transceiver to adjust.

4.3.2 Key operation

Key	Function	
	Push	Hold (1 second)
[Selector]	-	
[▲]	Adjustment value up	Continuation up
[▼]	Adjustment value down	Continuation down
[◀]	Auto adjustment start	-
[▶]	Wide/Narrow/P25/NXDN	-
[Side1]	-	
[Side2]	-	
[Side3]	-	
[]	Shift to panel test mode	-
[]	To enter 5,9 or 17 reference level adjustments	-
[○]	Writes the adjustment value	-
[]	Go to next adjustment item	Back to last adjustment item (At the time of 5, 9 or 17 point adjustment: Adjustment point change)
[AUX (Orange)]	Output tone pattern change of balance adjustment (A change is possible only during balance adjustment.)	-
[PTT]	Transmit	
[0] to [9] and [#],[*]	-	

4.3.3 5 or 9 reference level adjustments frequency

High Transmit Power, Medium Transmit Power, Low Transmit Power, Balance, Maximum Deviation , P25 High Deviation, P25 H-CPM Deviation, NXDN High Deviation, QT Deviation, DQT Deviation, LTR Deviation, DTMF Deviation, Single Tone Deviation, MSK Deviation, CW ID Deviation, Sensitivity 1, Sensitivity 2, RSSI Reference, Open Squelch, Low RSSI, High RSSI, Tight Squelch

Tuning point	Display	RX (MHz)	TX (MHz)
1	Low 1	136.05000	136.10000
2	Low 3	145.55000	145.60000
3	Center 2	155.05000	155.10000
4	High 1	164.55000	164.60000
5	High 3	173.95000	173.90000


Receive Assist, Transmit Assist

Tuning point	Display	RX (MHz)	TX (MHz)
1	Low 1	136.05000	136.10000
2	Low 2	140.80000	140.85000
3	Low 3	145.55000	145.60000
4	Center 1	150.30000	150.35000
5	Center 2	155.05000	155.10000
6	Center 3	159.80000	159.85000
7	High 1	164.55000	164.60000
8	High 2	169.30000	169.35000
9	High 3	173.95000	173.90000

4.3.4 Adjustment item supplement

Adjustment Item	Description
Receive Assist	The lock voltage of VCO (Receive) is adjusted. This item must be adjusted before all adjustment items for receiver section are adjusted.
Transmit Assist	The lock voltage of VCO (Transmit) is adjusted. This item must be adjusted before all adjustment items for transmitter section are adjusted.
Frequency	Frequency 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.
Ramp Offset	Adjust this item to the optimal Ramp voltage.
High Transmit Power	High Transmit Power is adjusted.
Medium Transmit Power	Medium Transmit Power is adjusted.
Low Transmit Power	Low Transmit Power is adjusted.
Balance	The transmit modulation 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 (P25/NXDN)	Maximum Deviation of P25/NXDN 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.
QT Deviation	QT deviation is adjusted.

Adjustment Item	Description
DQT Deviation	DQT deviation is adjusted.
LTR Deviation	LTR deviation is adjusted.
DTMF Deviation	DTMF deviation is adjusted.
Single Tone Deviation	The deviation of Single Tone used in "2-tone" is adjusted.
MSK Deviation	MSK tone deviation is adjusted.
CWID Deviation	CWID tone deviation is adjusted. CWID is used to inform the others who is transmitting on a 6.25-kHz spacing channel. (In FCC rule, Analog mode or CWID is required for each channel-spacing.)
Sensitivity 1	Band-Pass Filter is adjusted. The performance of Receive Sensitivity is improved.
Sensitivity 2	Band-Pass Filter is adjusted. The performance of Receive Sensitivity is improved.

Adjustment Item	Description
RSSI Reference	The minimum RSSI level for scan stop is adjusted.
Open Squelch	The squelch level at level "1" is adjusted.
Low RSSI	RSSI display level "  " is adjusted.
High RSSI	Both "Low RSSI" and "High RSSI" must be adjusted. (The curve data of RSSI level is applied.)
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.
Internal Microphone Gain	Internal Microphone Gain is adjusted. This item can be adjusted only in PC Test Mode.

4.3.5 Adjustment item and Display

Order	Adjustment item	Main LCD display	Sub LCD display	Aw	As *2	An	P1	P2	Nn	Nv	Adjust item Number
				(Analog Wide)	(Analog Wide 4k)	(Analog Narrow)	(P25 Phase1)	(P25 Phase2)	(NXDN Narrow)	(NXDN Very Narrow)	
				Adjustment range							
1	Receive Assist	RAST	(CV voltage)	9 point ADJ							Common Section 2
				1 ~ 4096							
2	Transmit Assist	TAST	(CV voltage)	9 point ADJ							Common Section 3
				1 ~ 4096							
3	RTC Correction	RTC	-	-							Common Section 5
				-2.00~-0.01 ,0.00 ,+0.01~+2.00							
4	Ramp Up Offset	RAMPU	(ADC measurement value)	-							Transmitter Section 1
				1~1024							
5	Ramp Down Offset	RAMPD	(ADC measurement value)	-							Transmitter Section 2
				1~1024							
6	High Transmit Power	H_PWR	-	-	-	5	-	-	-	-	Transmitter Section 3
				1~1024							
7	Medium Transmit Power	M_PWR	-	-	-	5	-	-	-	-	Transmitter Section 4
				1~1024							
8	Low Transmit Power	L_PWR	-	-	-	5	-	-	-	-	Transmitter Section 5
				1~1024							
9	Balance	BAL	(Encode frequency)	-	-	5	-	-	-	-	Transmitter Section 6
				1~1024							
10	Maximum Deviation	ADEV	-	5	5 *2	5	-	-	-	-	Transmitter Section 7
				1~1024							
11	P25 High Deviation	PDEV	-	-	-	-	5	-	-	-	Transmitter Section 8
				1~1024							
12	P25 H-CPM Deviation	P2DEV	-	-	-	-	-	5	-	-	Transmitter Section 9
				1~1024							

Order	Adjustment item	Main LCD display	Sub LCD display	Aw (Analog Wide)	As *2 (Analog Wide 4k)	An (Analog Narrow)	P1 (P25 Phase1)	P2 (P25 Phase2)	Nn (NXDN Narrow)	Nv (NXDN Very Narrow)	Adjust item Number
				Adjustment range							
13	NXDN High Deviation	NDEV	-	-	-	-	-	-	5	5	Transmitter Section 10
				1~1024							
14	QT Deviation	QT	-	5	5 *2	5	-	-	-	-	Transmitter Section 11
				1~1024							
15	DQT Deviation	DQT	-	5	5 *2	5	-	-	-	-	Transmitter Section 12
				1~1024							
16	LTR Deviation	LTR	-	5	5 *2	5	-	-	-	-	Transmitter Section 13
				1~1024							
17	DTMF Deviation	DTMF	-	5	5 *2	5	-	-	-	-	Transmitter Section 14
				1~1024							
18	Single Tone Deviation	TONE	-	5	5 *2	5	-	-	-	-	Transmitter Section 15
				1~1024							
19	MSK Deviation	MSK	-	5	5 *2	5	-	-	-	-	Transmitter Section 16
				1~1024							
20	CW ID Deviation	CWID	-	-	-	5	-	-	-	-	Transmitter Section 17
				1~1024							
21	Battery Warning Level	BATT	(BATT measurement value)	1point ADJ							Transmitter Section 18
				1~256							
22	Internal Microphone Gain	INMIC	-	-	-	-	-	-	-	-	Transmitter Section 20
				-250~250							
23	Sensitivity 1	SENS1	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 2
				1~256							
24	Sensitivity 2	SENS2	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 3
				1~256							
25	RSSI Reference	RRSSI	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 4
				1~256							
26	Open Squelch	SQL	(ASQDET measurement value)	5	5 *2	5	5 *3	-	5	5	Receiver Section 5
				1~256							
27	Low RSSI	LRSSI	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 6
				1~256							
28	High RSSI	HRSSI	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 7
				1~256							
29	Tight Squelch	SQLT	(ASQDET measurement value)	5	5 *2	5	-	-	-	-	Receiver Section 8
				1~256							

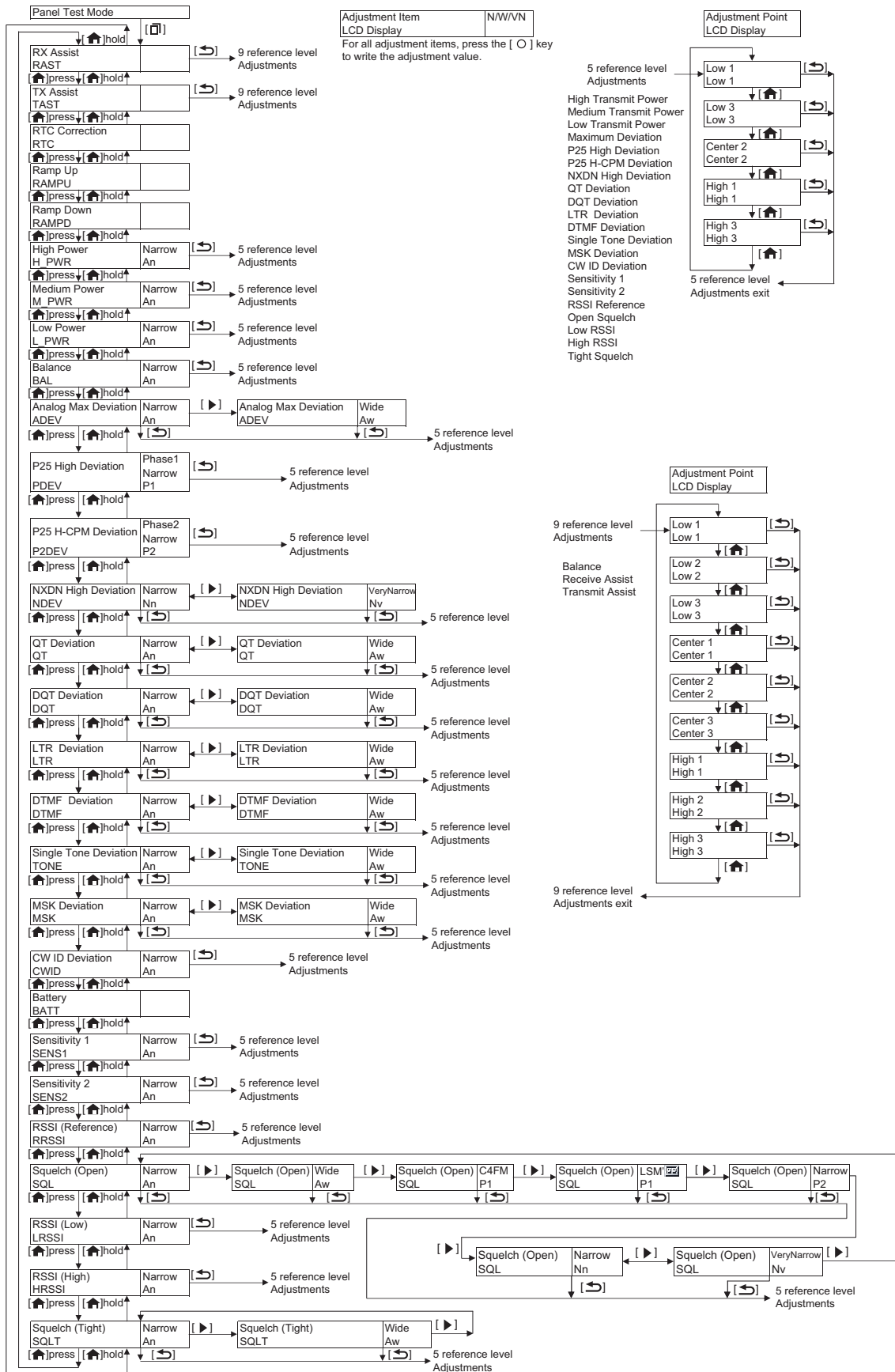
*2: Wide4K can be set up only when the PC test mode is used.

*3: When P25 Phase1 is selected, in C4FM and LSM, there is an adjustment item, respectively.

4.3.6 Panel tuning mode flow chart

Note:

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



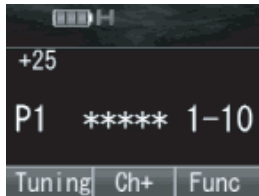
4.4 BER (Bit Error Rate) Measurement

- (1) The Panel Test Mode is used to measure the BER (Refer "4.2.1 Test mode operation features").
- (2) Select "10" (P25 Phase1), "7" (P25 Phase2) and "7" (NXDN Mode) for test signaling (Refer to "4.2.3 Frequency and Signaling" (2) Test signaling).

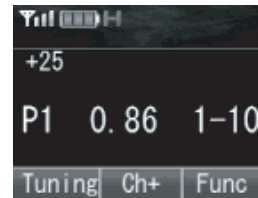
Note:

"7" (NXDN Mode) can be selected only by PC test mode.

- (3) Select a bandwidth (Narrow/Very Narrow) by pressing the [▶] key. When P25 Phase1 or P25 Phase2 is selected, it is not necessary to select a bandwidth.
- (4) Select a test frequency ("4.2.3 Frequency and Signaling" (2) Test signaling Test frequency).



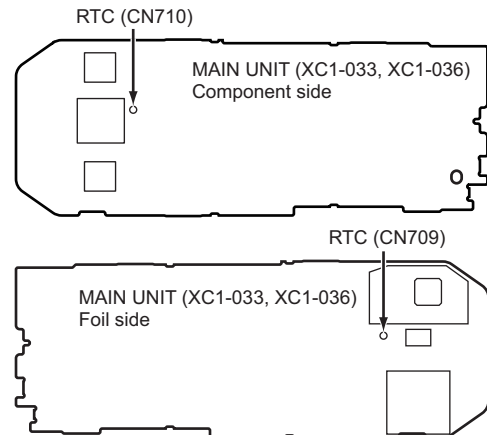
- (5) Measure the BER (Bit Error Rate) using the digital radio tester.
Enter a standard input signal into the transceiver as a standard tone test pattern for P25, FSW+PN9 for NXDN.
- (6) Adjust the input signal level to achieve the standard bit error rate (BER).
(For example, if the BER is 0.86%, the display shows "0.86".)



Note:

"4", "9" (P25 Phase1), "2" (P25 Phase2) is for production.

4.5 Adjustment points



4.6 Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range	100 to 900MHz
	Modulation	Frequency modulation and external modulation
	Output	-127dBm/0.1uV to greater than -20dBm/22.4mV
	When performing the Frequency adjustment, the following accuracy is necessary.	
	• 0.003ppm	
	Use a standard oscillator for adjustments, if necessary.	
2. Power Meter	Input Impedance	50Ω
	Operation Frequency	100 to 900MHz
	Measurement Capability	Vicinity of 10W
3. Deviation Meter	Frequency Range	100 to 900MHz
4. Digital Volt Meter (DVM)	Measuring Range	10mV to 10V DC
	Input Impedance	High input impedance for minimum circuit loading
5. Oscilloscope		DC through 30MHz
6. Frequency Counter	Frequency Range	10Hz to 1000MHz
	Frequency Stability	0.2ppm or less
	To measure the oscillating frequency of the internal clock 32766.00Hz~32770.00Hz for RTC Correction Resolution 0.01Hz is better for accuracy adjustment.	
7. Ammeter		5A
8. AF Volt Meter (AF VM)	Frequency Range	50Hz to 10kHz
	Voltage Range	1mV to 10V
9. Audio Generator (AG)	Frequency Range	50Hz to 5kHz or more
	Output	0 to 1V
10. Distortion Meter	Capability	3% or less at 1kHz
	Input Level	50mV to 10Vrms
11. Spectrum Analyzer	Measuring Range	DC to 1GHz or more
12. 8Ω Dummy Load		Approx. 8Ω, 3W
13. Regulated Power Supply		5V to 10V, approx. 3A, Useful if ammeter equipped

* The test equipment which is not used for adjustment is contained in this table.

■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.

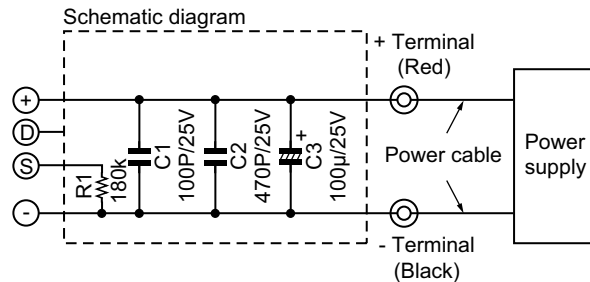
KENWOOD part No.: W05-1123-00

■Battery Jig (W3F-0001-00)

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

Note:

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



■Universal connector

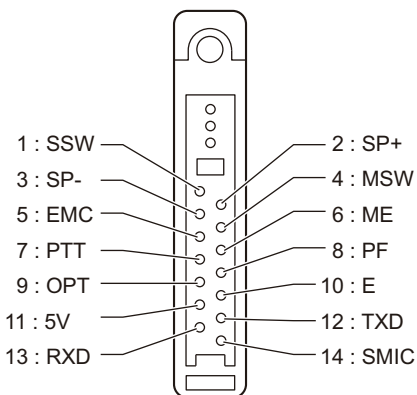
Use the interface cable (KPG-36U/36X) for PC tuning or the lead wire with plug (E30-3287-28) and screw (N08-0535-08) for panel tuning. Connect the plug to the universal connector of the transceiver and tighten the screw.

The lead wire with plug (E30-3287-28) and screw (N08-0535-08) terminals are as follows. Numbers are universal connector terminal numbers.

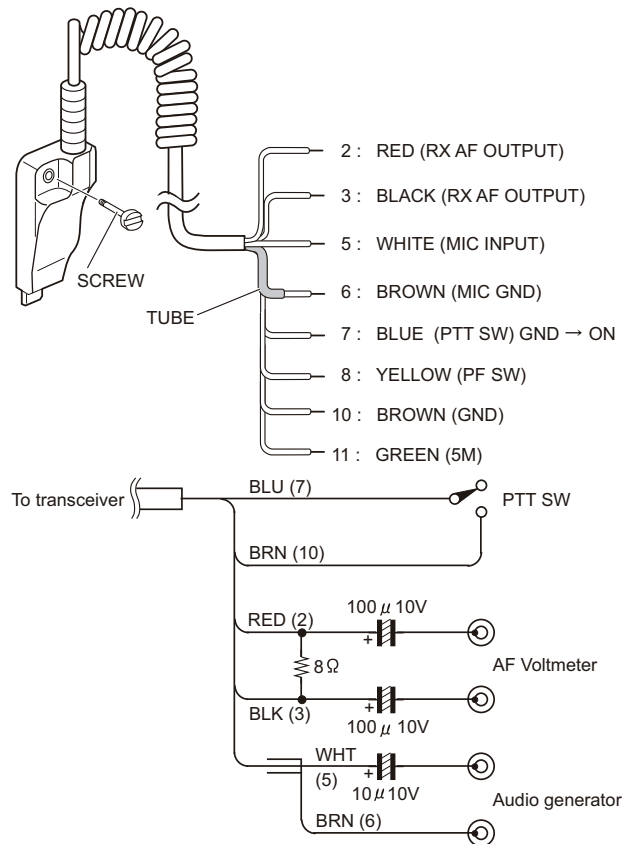
Caution

- (1) When connecting the plug to the universal connector of the transceiver, a short circuit may occur. To prevent this, be sure to turn the transceiver POWER switch off.
- (2) Since the RX AF output is a BTL output, there is a DC component. Isolate this with a capacitor or transformer as shown in the figure.
- (3) Do not connect an instrument between red or black and GND.

• *Universal connector

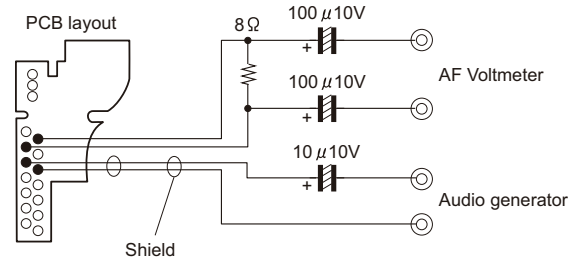
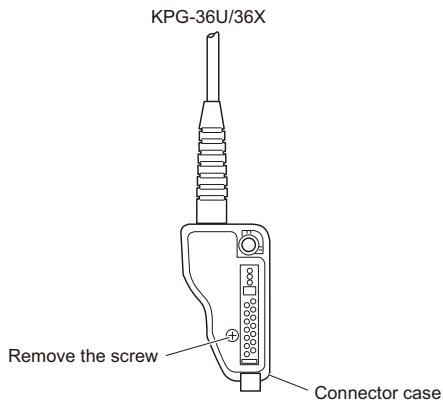


• *Panel tuning



Note: Pin 1 (SSW) and Pin 4 (MSW) are connected to Pin 10 (GND) to active External SP and External MIC.

- *PC tuning
Connect the wires to the PCB in the connector case of interface cable.
For output the wires out of the connector case, need to process the connector case.



4.7 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 33°C.	±0.5ppm ±77.5Hz@ 155.1MHz
2. High power check (Battery voltage: 7.5V)	1)CH-Sig: 1-1 PTT: ON TA: OFF	1)Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	5.0W~7.0W 2.3A or less
	2)CH-Sig: 2-1 PTT: ON TA: OFF	2)Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	5.0W~7.0W 2.3A or less
	3)CH-Sig: 3-1 PTT: ON TA: OFF	3)Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	5.0W~7.0W 2.3A or less
3. Low power check (Battery voltage: 7.5V)	1)CH-Sig: 1-1 PTT: ON TA: OFF	1)Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	0.71W~1.41W 1.2A or less
	2)CH-Sig: 2-1 PTT: ON TA: OFF	2)Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	0.71W~1.41W 1.2A or less
	3)CH-Sig: 3-1 PTT: ON TA: OFF	3)Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	0.71W~1.41W 1.2A or less

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 VM	Panel	ANT Univer- sal con- nector			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 VM Oscilloscope Distortion meter 8Ω Dummy load	Panel	ANT Universal connector			Check	12dB SINAD or more

4.8 Common Section

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Ter- minal	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. Receive Assist	1) Adj item: [RAST] Adjust:[****] 2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3] Adjust:[****] Press [O] key to store the adjustment value.	1) Adj item: [Receive Assist] 2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3] Press [Apply All] button to store the adjustment value.				Panel	[Panel tuning mode] [▲], [▼], [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.	2.0V±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 point have been adjusted. Note: The assist adjustment value must be between from 340 to 3550.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. Transmit Assist	<p>1) Adj item: [TAST] Adjust:[****]</p> <p>2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3]</p> <p>Adjust:[****] PTT: ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [Transmit Assist]</p> <p>2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3]</p> <p>PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>				Panel	[Panel tuning mode] [▲], [▼], [PC test mode] [←], [→]	<p>[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.</p> <p>[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.</p> <p>Note: Confirm the VCO lock voltage approximately 3 seconds after the adjustment value is changed.</p>	<p>2.0V±0.1V</p> <p>[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.</p> <p>[Manual Adjustment] Press [Apply All] button to store the adjustment value after all adjustment point have been adjusted.</p> <p>Note: The assist adjustment value must be between from 340 to 3550.</p>
4. Frequency	<p>*The Frequency adjustment can be performed only in PC test mode.</p>	<p>1) Adj item: [Frequency] SSG output: -20dBm (22.4mV) (CW (without modulation))</p> <p>Caution: Perform the frequency adjustment under the following conditions.</p> <ul style="list-style-type: none"> • Temperature range of +20°C to +33°C (+68.0°F to +91.4°F). (The temperature is displayed on the Frequency adjustment screen of the KPG-D1/D1N and the LCD of the transceiver.) • Use an accuracy of 0.003ppm for the SSG. (Use a standard oscillator if necessary.) 	SSG	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼], [PC test mode] [←], [→]	<p>[PC test mode] Press [Start] button of "Auto Tuning". Press [Apply] button to store the adjustment value after the automatic adjustment has finished.</p>	<p>[PC test mode] "IF20" value = Within 0±10 digits. The value of "IF20" will become around "0" after the adjustment has finished.</p> <p>Remark: "Frequency" is adjusted under receiving condition with SSG.</p>

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. RTC Corre- cition	1) Adj item: [RTC] Adjust:[****] Press [O] key to store the ad- justment val- ue.	1) Adj item: [RTC Correction] Data: {****} Press [Apply] button to store the adjust- ment value.	Fre- quency Counter	Panel	TEST POINT (CN709 or CN710)		[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	[Panel tuning mode] Press [O] key to store the adjustment value. [PC test mode] Press [Apply] button to store the adjustment value.	Remaks: Change the adjust- ment value so that the frequency cur- rently displayed on "Crystal Oscillation Frequency" on the PC window and the frequency currently displayed on the frequency counter are in agreement.

4.9 Transmitter Section

Item	Condition		Measurement			Adjustment			Specifica- tions /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Ramp up Offset	1) Adj item: [RAMPU] Adjust:[****] PTT : ON Press [O] key to store the adjust- ment value.	1) Adj item: [Ramp Up Offset] Press [Transmit] button. Press [Apply] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	[PC test mode] [Automatic Adjust- ment] 1) Press [Tune Rump Offset] button. 2) Press [Apply All] but- ton to store the adjust- ment value after the automatic adjustment has finished. [Manual Adjustment] 1) Set the adjustment value to "1". 2) Increase the adjust- ment value slowly while monitoring the offset monitor value. 3) Set the adjustment value when the offset monitor value exceed "50".	

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
2. Ramp down Offset	1) Adj item: [RAMPD] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Ramp Down Offset] Press [Transmit] button. Press [Apply] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	[PC test mode] [Automatic Adjustment] 1) Press [Tune Ramp Offset] button. 2) Press [Apply All] button to store the adjustment value after the automatic adjustment has finished. [Manual Adjustment] 1) Set the adjustment value to "1". 2) Increase the adjustment value slowly while monitoring the offset monitor value. 3) Set the adjustment value when the offset monitor value exceed "20".	
3. High transmit power (Battery voltage : 7.5V)	1) Adj item: [An H_PWR] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [High Transmit Power] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	6.0W	±0.1W 2.3A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
4. Medium transmit power (Battery voltage : 7.5V)	1) Adj item: [An M_PWR] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Medium Transmit Power] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	5.0W Note: Medium transmit power is the purpose of the custom power (adjustment). This power must be lower than High transmit power. In the production, this Medium transmit power is adjusted at 5.0W.	±0.1W 2.3A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. Low transmit power (Battery voltage: 7.5V)	1) Adj item: [An L_PWR] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Low Transmit Power] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	1.0W	±0.1W 1.2A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
6. Balance *1	1) Adj item: [An BAL] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Balance] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→] (a supplementary explanation: Another way to adjust is ready. (Same as TK-5210, the old model of NX-5200). Press [AUX(Orange)] key to switch the tone to 100Hz square wave. Then, make the demodulation waveform shown on oscilloscope into square shape.)	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.
*1 : Refer to the "4.9.1 Necessary Deviation adjustment item for each signaling and mode" table. Balance adjustment is common with the adjustment of all signaling deviations.									
7. Maximum Deviation *2 [Analog Wide]	1) Adj item: [Aw ADEV] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Maxmum Deviation (Analog Wide)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→] [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	Write fixed value "503" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 4150Hz and 4250Hz. Deviation meter LPF: 15kHz HPF: OFF	4150~4250Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow] *2	1) Adj item: [An ADEV] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Maxmum Deviation (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "503" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 2050Hz and 2150Hz. Deviation meter LPF: 15kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	2050~2150Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
*2 : Refer to the "4.9.1 Necessary Deviation adjustment item for each signaling and mode" table. Regarding Maximum Deviation (Analog), it is common with the adjustment of all analog signalings.									
8. P25 High Deviation	1) Adj item: [P1 PDEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [P25 High Deviation] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "505" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 2771Hz and 2883Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	2771~2883Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
9. P25 H-CPM Deviation	1) Adj item: [P2 P2DEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [P25 H-CPM Deviation] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "485" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 3090Hz and 3215Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	3090~3215Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
10. NXDN High Deviation [NXDN Narrow]	1) Adj item: [Nn NDEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [NXDN High Deviation (NXDN Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "505" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 2995Hz and 3117Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	2995~3117Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
[NXDN Very Narrow]	1) Adj item: [Nv NDEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [NXDN High Deviation (NXDN Very Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "495" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 1331Hz and 1363Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	1311~1363Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
11. QT Deviation *3 [Analog Wide]	1) Adj item: [Aw QT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Wide)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.75kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	1) Adj item: [An QT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [QT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.35kHz±0.05 kHz
12. DQT Deviation *3 [Analog Wide]	1) Adj item: [Aw DQT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Wide)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 405 (Reference value)	0.75kHz±0.05 kHz
[Analog Narrow]	1) Adj item: [An DQT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [DQT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 405 (Reference value)	0.35kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
13. LTR Deviation *3 [Analog Wide]	1) Adj item: [Aw LTR] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Wide)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.00kHz±0.05 kHz
[Analog Narrow]	1) Adj item: [An LTR] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.75kHz±0.05 kHz
14. DTMF Deviation *3 [Analog Wide]	1) Adj item: [Aw DTMF] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Wide)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	2.50kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	<p>1) Adj item: [An DTMF] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [DTMF Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.25kHz±0.05 kHz
15. Single Tone Deviation *3 [Analog Wide]	<p>1) Adj item: [Aw TONE] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [Single Tone Deviation (Analog Wide)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	3.00kHz±0.05 kHz
[Analog Narrow]	<p>1) Adj item: [An TONE] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [Single Tone Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.50kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
16. MSK Deviation *3 [Analog Wide]	1) Adj item: [Aw MSK] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Wide)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	3.00kHz±0.05 kHz
[Analog Narrow]	1) Adj item: [An MSK] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.50kHz±0.05 kHz
17. CWID Deviation *3 [Analog Narrow]	1) Adj item: [An CWID] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [CWID Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.00kHz±0.10 kHz

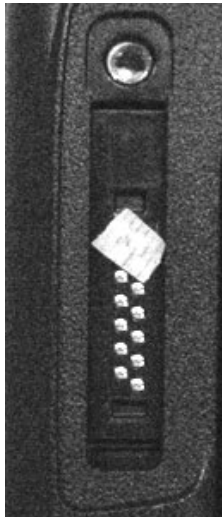
*3: Refer to the "4.9.1 Necessary Deviation adjustment item for each signaling and mode" table.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
18. Battery Warning Level writing	1) Adj item: [BATT] Adjust:[***] PTT: ON	1) Adj item: [Battery Warning Level] Press [Transmit] button.	Power meter DVM	Panel	ANT BATT terminal			<p>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.</p> <p>[Panel tuning mode] Press [O] key to store the adjustment value.</p> <p>[PC test mode] Press [Apply] button to store the adjustment value.</p>	
19. 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.

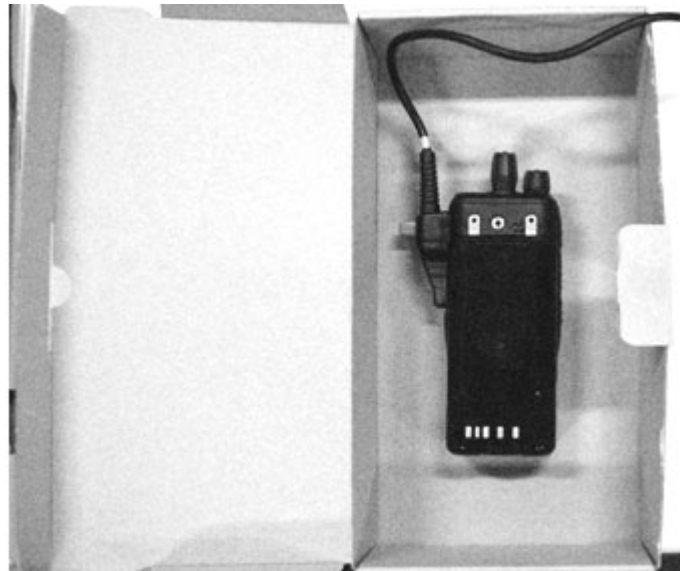
Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
20. Internal Microphone Gain	* The Internal Microphone Gain adjustment can be performed only in PC test mode.	<p>1) Adj item: [Internal Microphone Gain]</p> <p>Press [Apply] button to store the adjustment value.</p> <p>Caution: Setup the transceiver as follows if executing the adjustment.</p> <p>1. Before connecting KPG-36U/36X to the transceiver, mask the 1st pin (SSW) and the 4th pin (MSW) of the 14-pin universal connector with tape.</p> <p>2. After connecting KPG-36 to the transceiver, place the transceiver in the packaging of the NX-5x00 Portable transceiver.</p> <p>Place the transceiver in the middle of the packaging with the LCD facing down.</p>				Panel		<p>[PC test mode]</p> <p>[Automatic Adjustment]</p> <p>1) Press [Front Microphone Tuning - Start] button.</p> <p>2) Press [Apply] button to store the adjustment value after the automatic adjustment has finish.</p> <p>*If check is required</p> <p>[Automatic check]</p> <p>1) Press [Front/Rear Microphone Check - Start] button. The OK/NG result is displayed.</p>	

Image

- Universal connector with tape



- Packaging with the LCD facing down



4.9.1 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 (Analog Wide)", this signaling is composed of three elements [Balance, Maximum Deviation (Analog Wide) and QT Deviation (Analog Wide)]. Please adjust Balance and Maximum Deviation (Analog Wide) before adjusting QT Deviation (Analog Wide).

Mode	Signaling	Necessary adjustment and order		
		Wide	Narrow	Very Narrow
Analog	Audio	1. Balance adjust 2. Maximum Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow]	-
	QT	1. Balance adjust 2. Maximum Deviation [Analog Wide] 3. QT Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. QT Deviation [Analog Narrow]	-
	DQT	1. Balance adjust 2. Maximum Deviation [Analog Wide] 3. DQT Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. DQT Deviation [Analog Narrow]	-
	LTR	1. Balance adjust 2. Maximum Deviation [Analog Wide] 3. LTR Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. LTR Deviation [Analog Narrow]	-
	DTMF	1. Balance adjust 2. Maximum Deviation [Analog Wide] 3. DTMF Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. DTMF Deviation [Analog Narrow]	-
	2TONE	1. Balance adjust 2. Maximum Deviation [Analog Wide] 3. Single TONE Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. Single TONE Deviation [Analog Narrow]	-
	MSK (Fleet sync)	1. Balance adjust 2. Maximum Deviation [Analog Wide] 3. MSK Deviation [Analog Wide]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. MSK Deviation [Analog Narrow]	-
P25	-	1. Balance adjust 2. P25 High Deviation 3. P25 High Deviation (H-CPM)	-	
NXDN	Audio	-	1. Balance adjust 2. Maximum Deviation [NXDN Narrow]	1. Balance adjust 2. Maximum Deviation [NXDN Very Narrow]
	CWID	-	-	1. Balance adjust 2. Maximum Deviation [NXDN Very Narrow] 3. CWID Deviation [NXDN Very Narrow]

- Balance is common with all the above deviation adjustments. If Balance (Transmitter Section 6) has already adjusted, please skip Step1 and adjust from Step2.
- Maximum Deviation (Analog Wide/Narrow) is common with all the analog signaling deviations and CWID Deviation (NXDN Very Narrow). If Balance and Maximum Deviation (Analog Wide /Narrow) (Transmitter Section 7) have already adjusted, please skip Step2 and adjust from Step3.

4.10 Receiver Section

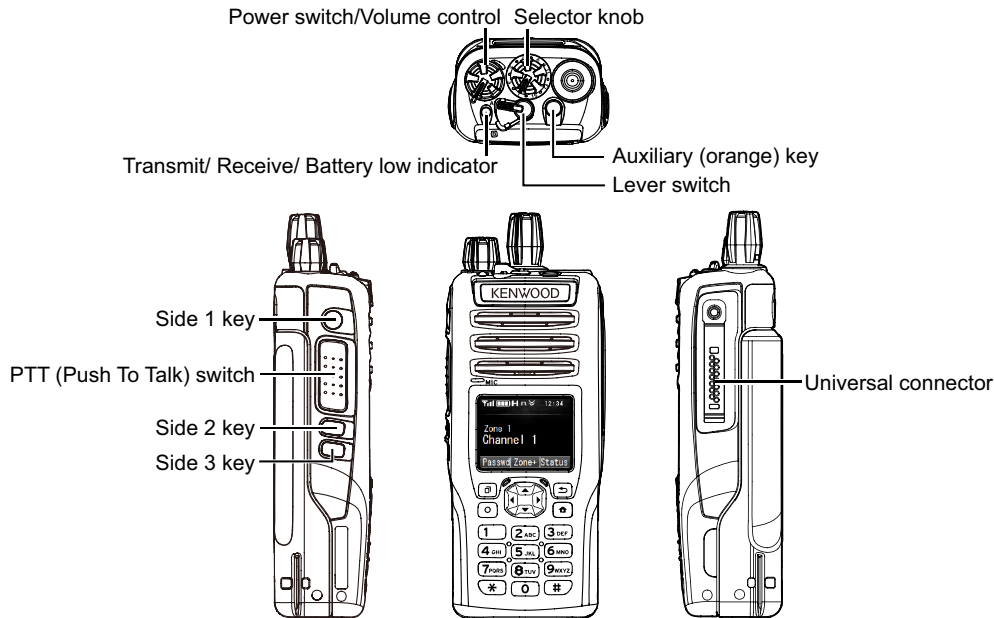
Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. AF level setting	[Panel test mode] 1) CH-Sig: 1-1 SSG output: -47dBm (1mV) (MOD: 1kHz/ ±1.5kHz)	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 SSG output: -47dBm (1mV) (MOD:1kHz/ ±1.5kHz)	SSG DVM AF VM Dummy load	Panel	ANT Uni- versal con- nector	Panel	Vol- ume knob	Turn the Volume knob to obtain 0.90V AF output.	0.90V ±0.1V
2. Sensitivity 1	1) Adj item: [An SENS1] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[***] Press [O] key to store the adjust- ment value.	1) Adj item: [Sensitivity 1] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Apply All] button to store the adjustment value.	SSG AF VM Dummy load	Panel	ANT Uni- versal con- nector	Panel	[Panel tuning mode] [▲], [▼], [PC test mode] [←], [→]	Write the value as follow- ings. [Low1]: 50 (Fixed) [Low3]: 90 (Fixed) [Center2]: 125 (Fixed) [High1]: 160 (Fixed) [High3]: 200 (Fixed)	
3. Sensitivity 2	1) Adj item: [An SENS2] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[***] Press [O] key to store the adjust- ment value.	1) Adj item: [Sensitivity 2] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Apply All] button to store the adjustment value.	SSG AF VM Dummy load	Panel	ANT Uni- versal con- nector	Panel	[Panel tuning mode] [▲], [▼], [PC test mode] [←], [→]	Write the value as follow- ings. [Low1]: 40 (Fixed) [Low3]: 100 (Fixed) [Center2]: 155 (Fixed) [High1]: 190 (Fixed) [High3]: 240 (Fixed)	
4. RSSI reference	1) Adj item: [An RRSS1] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level -3dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [RSSI Reference (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level -3dB (MOD: 1kHz/±1.5kHz)	SSG Distor- tion meter Oscillo- scope	Panel	ANT Uni- versal con- nector	Panel	[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.		

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equip-ment	Unit	Ter-minal	Unit	Parts	Method	
5. Open Squelch [Analog Wide]	1) Adj item: [Aw SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±3kHz)	1) Adj item: [Open Squelch (Analog Wide)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/±3kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Narrow]	1) Adj item: [An SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [Open Squelch (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±1.5kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[P25 (C4FM)]	1) Adj item: [P1 SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 1kHz/ ±2.2kHz)	1) Adj item: [Open Squelch (P25 C4FM)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 1kHz/ ±2.2kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[P25 (LSM)]	1) Adj item: [P1 SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±3.3kHz)	1) Adj item: [Open Squelch (P25 LSM)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±3.3kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[NXDN Narrow]	1) Adj item: [Nn SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 400Hz/ ±2.5kHz)	1) Adj item: [Open Squelch (NXDN Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 400Hz/ ±2.5kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[NXDN Very Narrow]	1) Adj item: [Nv SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 400Hz/ ±1.2kHz)	1) Adj item: [Open Squelch (NXDN Very Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 400Hz/ ±1.2kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equip-ment	Unit	Ter-minal	Unit	Parts	Method	
6. Low RSSI	1) Adj item: [An LRSSI] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -118dBm (0.28μV) (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [Low RSSI (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -118dBm (0.28μV) (MOD: 1kHz/ ±1.5kHz)	SSG	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
7. High RSSI	1) Adj item: [An HRSSI] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -80dBm (22.4μV) (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [High RSSI (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -80dBm (22.4μV) (MOD: 1kHz/ ±1.5kHz)	SSG	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
8. Tight Squelch [Analog Wide]	1) Adj item: [Aw SSQLT] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±3kHz)	1) Adj item: [Tight Squelch (Ana- log Wide)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/±3kHz)	SSG Distor- tion meter Oscillo- scope	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Narrow]	1) Adj item: [An SSQLT] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [Tight Squelch (Ana- log Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±1.5kHz)	SSG Distor- tion meter Oscillo- scope	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

4.11 E, E2 TYPE Controls



4.11.1 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 an 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.

4.12 Panel Test Mode

4.12.1 Test mode operation features

This transceiver has a test mode. To enter test mode, press and hold the [↶] key while turning the transceiver power ON or press the [☐] key and select the "Panel Test". 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.

- When the panel test mode is activated, the channel selected with the [Selector] knob and the last used signaling number are displayed. When it is activated for the first time, the signaling number is 1.
- If test signaling 10 (P25 Phase1), 7 (P25 Phase2) and 7 (NXDN Mode) is selected, the result of Bit Error Rate (BER) calculation is displayed on the LCD.

4.12.2 Key operation

Key	"FNC" not appears on the sub LCD display	
	Function	Display
[Selector]	-	-
[▲]	Push: Test channel up Hold: Test channel up continuously	Channel No.
[▼]	Push: Test channel down Hold: Test channel down continuously	Channel No.
[◀]	Push: Squelch level up *1 Hold: Squelch off	Squelch level Squelch off: [🔊] icon appears

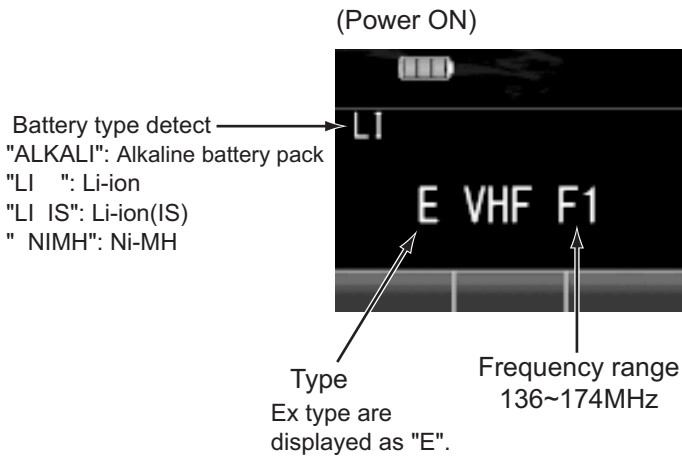
Key	"FNC" not appears on the sub LCD display	
	Function	Display
[◀]	Push: Squelch level up *1 Hold: Squelch off	Squelch level Squelch off: [🔊] icon appears
[▶]	Wide 5k/Wide 4k /Narrow/Very Narrow *2	Wide 5k: "w" Wide 4k: "s" Narrow: "n" Very Narrow: "v"
[Side1]	-	-
[Side2]	-	-
[Side3]	Push: Microphone (Front MIC/Rear MIC) select	Rear MIC: [🔊] icon appears
[☐]	Shift to panel tuning mode	-
[↶]	Function on	"FNC" appears on the sub LCD display
[○]	MSK 1200bps and 2400bps *1	2400bps: [☑] icon appears
[🏠]	Push: Test signaling up Hold: Test signaling up continuously	Signaling No.
[AUX (Orange)]	-	-
[PTT]	Transmit	-
[0] to [9] and [#], [*]	-	-

*1: When the mode is selected as Analog, this function is enabled.

*2: When the Mode is selected as P25, bandwidth is fixed to Narrow.

Key	"FNC" appears on the sub LCD display	
	Function	Display
[Selector]	-	-
[▲]	Talk Around on/off	On: icon appears
[▼]	Analog/Phase1/Phase2/ NXDN	Analog: "A" P25 phase1: "P1" P25 phase2: "P2" NXDN: "N"
[◀]	-	-
[▶]	Key/LCD check	The position of the selector knob, etc., appear.
[Side1]	Function off	-
[Side2]	Function off	-
[Side3]	P25 Modulation Type (C4FM/LSM) *3	LSM : icon appears
	High power/Low power	High: "H" Medium: "M" Low: "L"

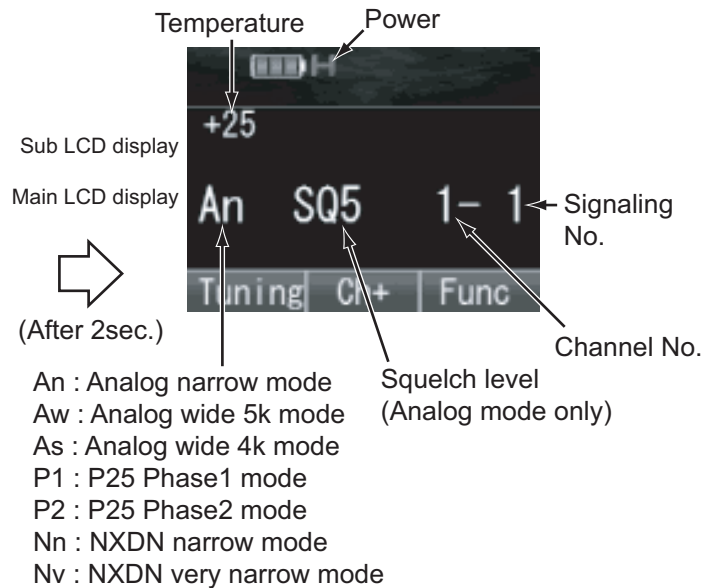
• LCD display in panel test mode



Key	"FNC" appears on the sub LCD display	
	Function	Display
	Function off	-
	Compander on/off	On: icon appears
	Function off	-
[AUX (Orange)]	For production	-
[PTT]	Transmit	-
[0] to [9] and [#], [*]	Function off	-

*3: When the mode is selected as P25, this function is enabled.

- **LED indicator**
 Red LED Lights during transmission.
 Green LED Lights when there is carrier.
- **Sub LCD indicator**
 "FNC" Appears at function on.



4.12.3 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.

(1) 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	-	-

(2) Test signaling

■Analog mode signaling

No.	RX	TX
1	None	None
2	None	Square Wave
3	LTR Data	LTR Data
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 Decode (CODE: 159D)	DTMF Encode (CODE: 159D)
11	None	DTMF Encode (CODE: 9)
12	2-tone Decode (A: 304.7Hz, B: 3106.0Hz)	2-tone Encode (A: 304.7Hz, B: 3106.0Hz)
13	Single Tone Decode (979.9Hz)	Single Tone Encode (979.9Hz)
14	None	Single Tone Encode (1000Hz)
15	None	MSK PN9
16	MSK Decode	MSK Encode

■P25 Phase1 signaling

No.	RX	TX
1	NAC 293	NAC 293
2	NAC 023	NAC 023
3	NAC 5EA	NAC 5EA
4	None	PN9
5	NAC 293	Symbol Rate Pattern
6	NAC 293	1/3 Deviation Pattern
7	NAC 293	0 Continuous Pattern
8	NAC 293	Fidelity Pattern
9	None	FSW+PN9
10	NAC 293	1011Hz Tone Test Pattern
11	Tone Pattern	1011Hz Tone Test Pattern
12	Silence Pattern	Silence Pattern
13	Audio Test Pattern	NAC293 + Audio Test Pattern
14	Vocoder Loop	None

■P25 Phase2 signaling

No.	RX	TX
1	STTP-OB-1031-0	STTP-IB1031-1+Audio
2	None	PN9 Phase2
3	STTP-OB-1031-1	Symbol Rate Pattern Phase2
4	STTP-OB-1031-1	1/3 Deviation Pattern Phase2
5	STTP-OB-1031-1	0 Continuous Pattern

No.	RX	TX
6	STTP-OB-1031-1	0 Burst Pattern
7	STTP-OB-1031	Symmetrical STTP-IB1031-1
8	Tone Pattern (Half rate)	STTP-IB1031-1
9	Silence Pattern (Half Rate)	STP-IB-1 + Silence Pattern (Half Rate)
10	Audio Test Pattern (Half Rate)	STTP-IB1031-1 + Audio Test Pattern (Half Rate)
11	Codec Loop	STTP-IB1031-1 + Codec Loop
12	Vocoder Loop (Half Rate)	STTP-IB1031-1 + Vocoder Loop (Half Rate)





■NXDN Mode signaling




No.	RX	TX
1	RAN1	RAN1
2	None	PN9
3	RAN1	Maximum Deviation Pattern
7	FSW + PN9	FSW + PN9
9	Tone Pattern (1031Hz)	Tone Pattern (1031Hz)

RAN: Radio Access Number
 PN9: Pseudo-Random Pattern
 No.7, 9 Item: PC test mode only

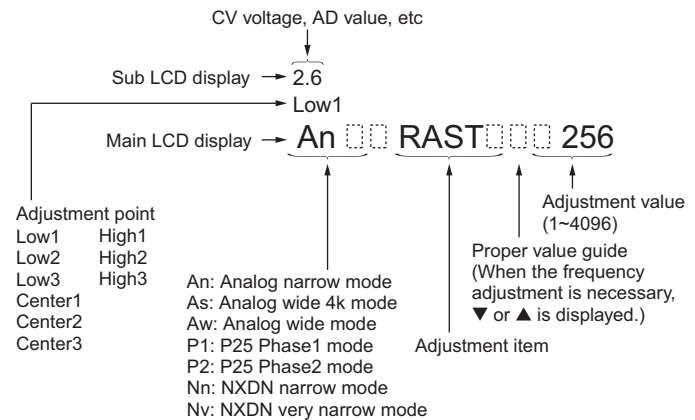
4.13 Panel Tuning Mode

4.13.1 Transceiver tuning (To enter tuning mode)





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

Use the [] key to select the adjustment item through tuning modes. Use the [] key to adjust 5, 9 or 17 reference level adjustments, and use the [] key to switch between Wide/Narrow.

- LCD display in panel tuning mode



4.13.2 Key operation

Key	Function	
	Push	Hold (1 second)
[Selector]	-	
[▲]	Adjustment value up	Continuation up
[▼]	Adjustment value down	Continuation down
[◀]	Auto adjustment start	-
[▶]	Wide 5k/Wide 4k/ Narrow/P25/NXDN	-
[Side1]	-	
[Side2]	-	
[Side3]	-	
[]	Shift to panel test mode	-
[]	To enter 5,9 or 17 refer- ence level adjustments	-
[]	Writes the adjustment value	-
[]	Go to next adjustment item	Back to last adjustment item (At the time of 5, 9 or 17 point adjustment: Ad- justment point change)
[AUX (Orange)]	Output tone pattern change of balance ad- justment (A change is possible only during bal- ance adjustment.)	-
[PTT]	Transmit	
[0] to [9] and [#],[*]	-	

4.13.3 5 or 9 reference level adjustments frequency

High Transmit Power, Medium Transmit Power, Low Transmit Power, Balance, Maximum Deviation , P25 High Deviation, P25 H-CPM Deviation, NXDN High Deviation, QT Deviation, DQT Deviation, LTR Deviation, DTMF Deviation, Single Tone Deviation, MSK Deviation, CW ID Deviation, Sensitivity 1, Sensitivity 2, RSSI Reference, Open Squelch, Low RSSI, High RSSI, Tight Squelch

Tuning point	Display	RX (MHz)	TX (MHz)
1	Low 1	136.05000	136.10000
2	Low 3	145.55000	145.60000
3	Center 2	155.05000	155.10000
4	High 1	164.55000	164.60000
5	High 3	173.95000	173.90000

Receive Assist, Transmit Assist

Tuning point	Display	RX (MHz)	TX (MHz)
1	Low 1	136.05000	136.10000
2	Low 2	140.80000	140.85000
3	Low 3	145.55000	145.60000
4	Center 1	150.30000	150.35000
5	Center 2	155.05000	155.10000
6	Center 3	159.80000	159.85000
7	High 1	164.55000	164.60000
8	High 2	169.30000	169.35000
9	High 3	173.95000	173.90000

4.13.4 Adjustment item supplement

Adjustment Item	Description
Receive Assist	The lock voltage of VCO (Receive) is adjusted. This item must be adjusted before all adjustment items for receiver section are adjusted.
Transmit Assist	The lock voltage of VCO (Transmit) is adjusted. This item must be adjusted before all adjustment items for transmitter section are adjusted.
Frequency	Frequency 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.
Ramp Offset	Adjust this item to the optimal Ramp voltage.
High Transmit Power	High Transmit Power is adjusted.
Medium Transmit Power	Medium Transmit Power is adjusted.
Low Transmit Power	Low Transmit Power is adjusted.
Balance	The transmit modulation 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 (P25/NXDN)	Maximum Deviation of P25/NXDN 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.
QT Deviation	QT deviation is adjusted.

Adjustment Item	Description
DQT Deviation	DQT deviation is adjusted.
LTR Deviation	LTR deviation is adjusted.
DTMF Deviation	DTMF deviation is adjusted.
Single Tone Deviation	The deviation of Single Tone used in "2-tone" is adjusted.
MSK Deviation	MSK tone deviation is adjusted.
CWID Deviation	CWID tone deviation is adjusted. CWID is used to inform the others who is transmitting on a 6.25-kHz spacing channel. (In FCC rule, Analog mode or CWID is required for each channel-spacing.)
Sensitivity 1	Band-Pass Filter is adjusted. The performance of Receive Sensitivity is improved.
Sensitivity 2	Band-Pass Filter is adjusted. The performance of Receive Sensitivity is improved.

Adjustment Item	Description
RSSI Reference	The minimum RSSI level for scan stop is adjusted.
Open Squelch	The squelch level at level "1" is adjusted.
Low RSSI	RSSI display level "1" is adjusted.
High RSSI	Both "Low RSSI" and "High RSSI" must be adjusted. (The curve data of RSSI level is applied.)
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.
Internal Microphone Gain	Internal Microphone Gain is adjusted. This item can be adjusted only in PC Test Mode.

4.13.5 Adjustment item and Display

Order	Adjustment item	Main LCD display	Sub LCD display	Aw	As	An	P1	P2	Nn	Nv	Adjust item Number
				(Analog Wide 5k)	(Analog Wide 4k)	(Analog Narrow)	(P25 Phase1)	(P25 Phase2)	(NXDN Narrow)	(NXDN Very Narrow)	
				Adjustment range							
1	Receive Assist	RAST	(CV voltage)	9 point ADJ							Common Section 2
				1 ~ 4096							
2	Transmit Assist	TAST	(CV voltage)	9 point ADJ							Common Section 3
				1 ~ 4096							
3	RTC Correction	RTC	-	-							Common Section 5
				-2.00~-0.01 ,0.00 ,+0.01~+2.00							
4	Ramp Up Offset	RAMPU	(ADC measurement value)	-							Transmitter Section 1
				1~1024							
5	Ramp Down Offset	RAMPD	(ADC measurement value)	-							Transmitter Section 2
				1~1024							
6	High Transmit Power	H_PWR	-	-	-	5	-	-	-	-	Transmitter Section 3
				1~1024							
7	Medium Transmit Power	M_PWR	-	-	-	5	-	-	-	-	Transmitter Section 4
				1~1024							
8	Low Transmit Power	L_PWR	-	-	-	5	-	-	-	-	Transmitter Section 5
				1~1024							
9	Balance	BAL	(Encode frequency)	-	-	5	-	-	-	-	Transmitter Section 6
				1~1024							
10	Maximum Deviation	ADEV	-	5	5	5	-	-	-	-	Transmitter Section 7
				1~1024							
11	P25 High Deviation	PDEV	-	-	-	-	5	-	-	-	Transmitter Section 8
				1~1024							
12	P25 H-CPM Deviation	P2DEV	-	-	-	-	-	5	-	-	Transmitter Section 9
				1~1024							

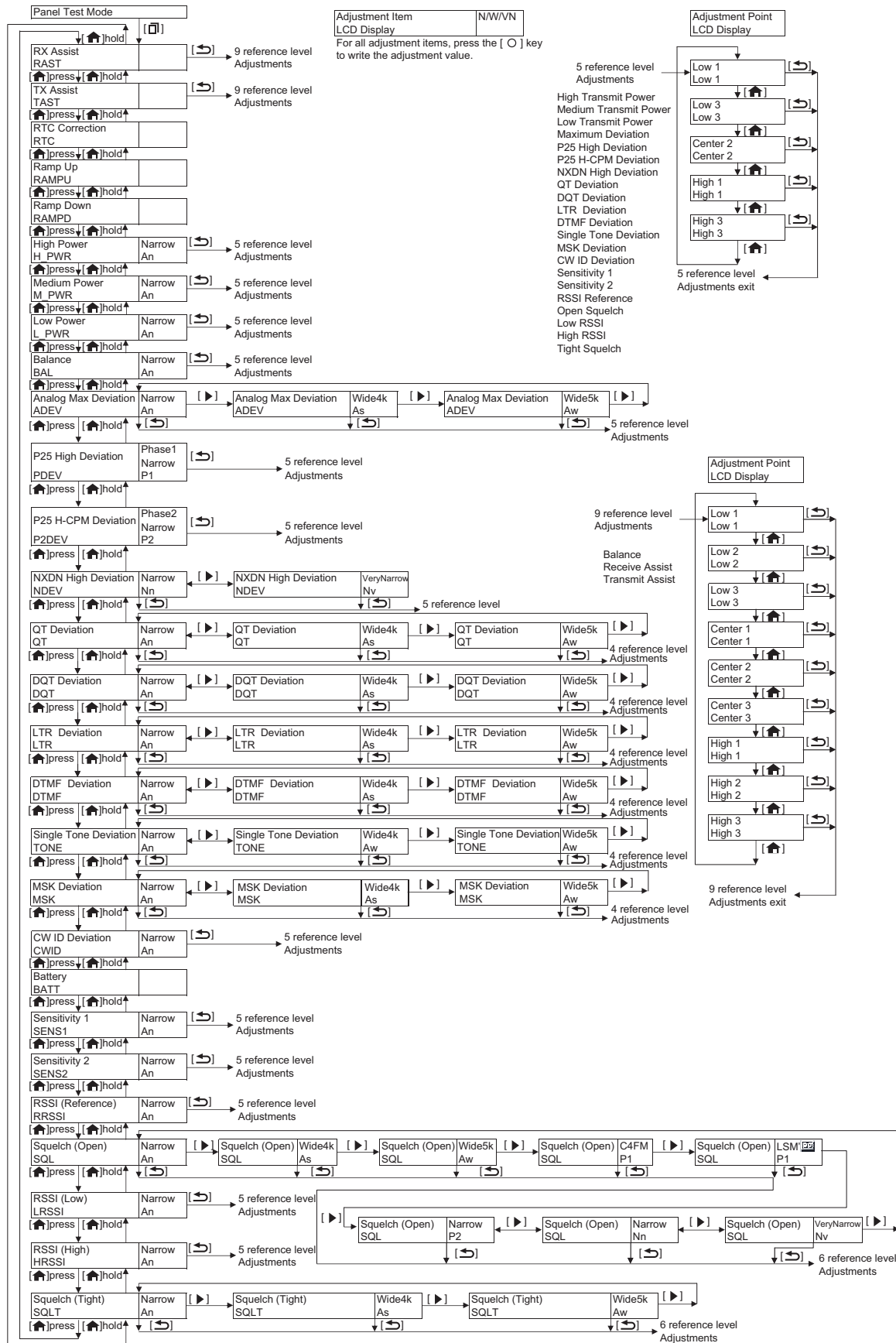
Order	Adjustment item	Main LCD display	Sub LCD display	Aw	As	An	P1	P2	Nn	Nv	Adjust item Number
				(Analog Wide 5k)	(Analog Wide 4k)	(Analog Narrow)	(P25 Phase1)	(P25 Phase2)	(NXDN Narrow)	(NXDN Very Narrow)	
Adjustment range											
13	NXDN High Deviation	NDEV	-	-	-	-	-	-	5	5	Transmitter Section 10
				1~1024							
14	QT Deviation	QT	-	5	5	5	-	-	-	-	Transmitter Section 11
				1~1024							
15	DQT Deviation	DQT	-	5	5	5	-	-	-	-	Transmitter Section 12
				1~1024							
16	LTR Deviation	LTR	-	5	5	5	-	-	-	-	Transmitter Section 13
				1~1024							
17	DTMF Deviation	DTMF	-	5	5	5	-	-	-	-	Transmitter Section 14
				1~1024							
18	Single Tone Deviation	TONE	-	5	5	5	-	-	-	-	Transmitter Section 15
				1~1024							
19	MSK Deviation	MSK	-	5	5	5	-	-	-	-	Transmitter Section 16
				1~1024							
20	CW ID Deviation	CWID	-	-	-	5	-	-	-	-	Transmitter Section 17
				1~1024							
21	Battery Warning Level	BATT	(BATT measurement value)	1point ADJ							Transmitter Section 18
				1~256							
22	Internal Microphone Gain	INMIC	-	-	-	-	-	-	-	-	Transmitter Section 20
				-250~250							
23	Sensitivity 1	SENS1	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 2
				1~256							
24	Sensitivity 2	SENS2	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 3
				1~256							
25	RSSI Reference	RRSSI	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 4
				1~256							
26	Open Squelch	SQL	(ASQDET measurement value)	5	5	5	5 *1	-	5	5	Receiver Section 5
				1~256							
27	Low RSSI	LRSSI	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 6
				1~256							
28	High RSSI	HRSSI	(RSSI measurement value)	-	-	5	-	-	-	-	Receiver Section 7
				1~256							
29	Tight Squelch	SQLT	(ASQDET measurement value)	5	5	5	-	-	-	-	Receiver Section 8
				1~256							

*1: When P25 Phase1 is selected, in C4FM and LSM, there is an adjustment item, respectively.

4.13.6 Panel tuning mode flow chart

Note:

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



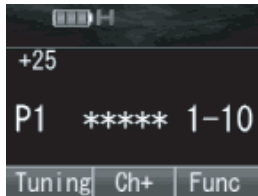
4.14 BER (Bit Error Rate) Measurement

- (1) The Panel Test Mode is used to measure the BER (Refer "4.2.1 Test mode operation features").
- (2) Select "10" (P25 Phase1), "7" (P25 Phase2) and "7" (NXDN Mode) for test signaling (Refer to "4.2.3 Frequency and Signaling" (2) Test signaling).

Note:

"7" (NXDN Mode) can be selected only by PC test mode.

- (3) Select a bandwidth (Narrow/Very Narrow) by pressing the [▶] key. When P25 Phase1 or P25 Phase2 is selected, it is not necessary to select a bandwidth.
- (4) Select a test frequency ("4.2.3 Frequency and Signaling" (2) Test signaling Test frequency).

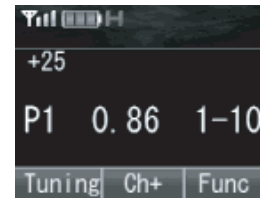


- (5) Measure the BER (Bit Error Rate) using the digital radio tester.

Enter a standard input signal into the transceiver as a standard tone test pattern for P25, FSW+PN9 for NXDN.

- (6) Adjust the input signal level to achieve the standard bit error rate (BER).

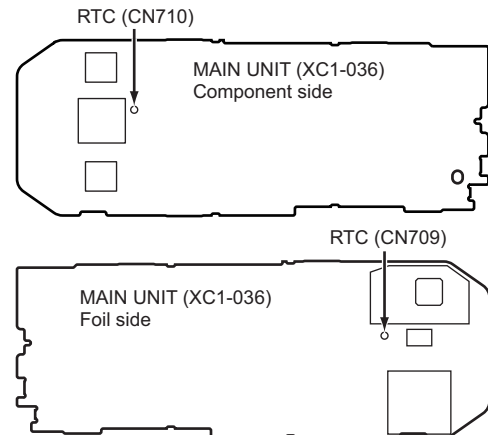
(For example, if the BER is 0.86%, the display shows "0.86".)



Note:

"4", "9" (P25 Phase1), "2" (P25 Phase2) is for production.

4.15 Adjustment points



4.16 Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range	100 to 900MHz
	Modulation	Frequency modulation and external modulation
	Output	-127dBm/0.1uV to greater than -20dBm/22.4mV
	When performing the Frequency adjustment, the following accuracy is necessary.	
	• 0.003ppm	
	Use a standard oscillator for adjustments, if necessary.	
2. Power Meter	Input Impedance	50Ω
	Operation Frequency	100 to 900MHz
	Measurement Capability	Vicinity of 10W
3. Deviation Meter	Frequency Range	100 to 900MHz
4. Digital Volt Meter (DVM)	Measuring Range	10mV to 10V DC
	Input Impedance	High input impedance for minimum circuit loading
5. Oscilloscope		DC through 30MHz
6. Frequency Counter	Frequency Range	10Hz to 1000MHz
	Frequency Stability	0.2ppm or less
	To measure the oscillating frequency of the internal clock 32766.00Hz~32770.00Hz for RTC Correction Resolution 0.01Hz is better for accuracy adjustment.	
7. Ammeter		5A
8. AF Volt Meter (AF VM)	Frequency Range	50Hz to 10kHz
	Voltage Range	1mV to 10V
9. Audio Generator (AG)	Frequency Range	50Hz to 5kHz or more
	Output	0 to 1V
10. Distortion Meter	Capability	3% or less at 1kHz
	Input Level	50mV to 10Vrms
11. Spectrum Analyzer	Measuring Range	DC to 1GHz or more
12. 8Ω Dummy Load		Approx. 8Ω, 3W
13. Regulated Power Supply		5V to 10V, approx. 3A, Useful if ammeter equipped

* The test equipment which is not used for adjustment is contained in this table.

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.

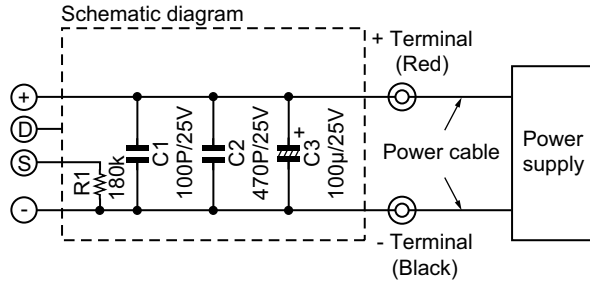
KENWOOD part No.: W05-1123-00

Battery Jig (W3F-0001-00)

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

Note:

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



Universal connector

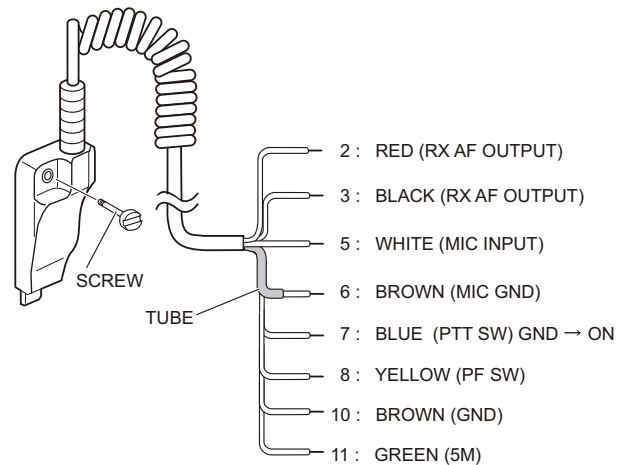
Use the interface cable (KPG-36U/36X) for PC tuning or the lead wire with plug (E30-3287-28) and screw (N08-0535-08) for panel tuning. Connect the plug to the universal connector of the transceiver and tighten the screw.

The lead wire with plug (E30-3287-28) and screw (N08-0535-08) terminals are as follows. Numbers are universal connector terminal numbers.

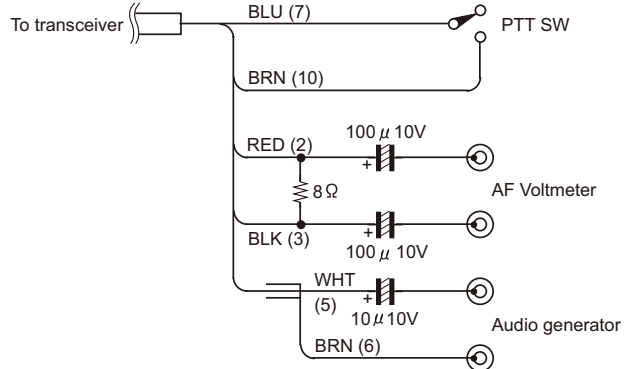
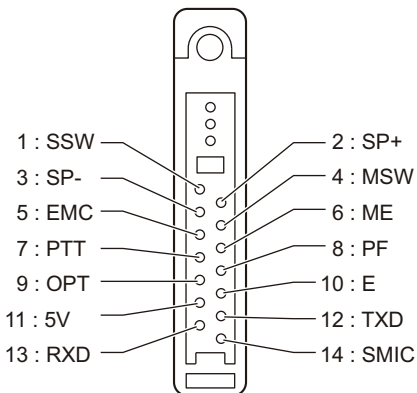
Caution

- (1) When connecting the plug to the universal connector of the transceiver, a short circuit may occur. To prevent this, be sure to turn the transceiver POWER switch off.
- (2) Since the RX AF output is a BTL output, there is a DC component. Isolate this with a capacitor or transformer as shown in the figure.
- (3) Do not connect an instrument between red or black and GND.

***Panel tuning**

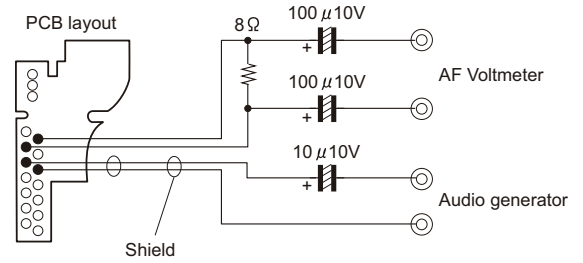
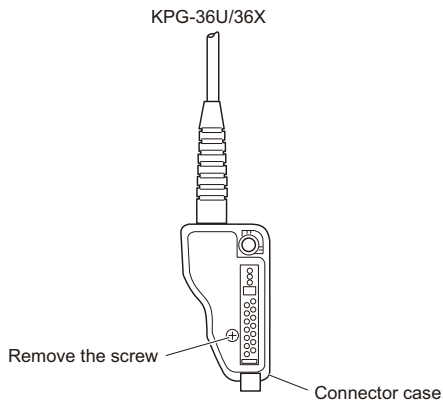


***Universal connector**



Note: Pin 1 (SSW) and Pin 4 (MSW) are connected to Pin 10 (GND) to active External SP and External MIC.

- *PC tuning
Connect the wires to the PCB in the connector case of interface cable.
For output the wires out of the connector case, need to process the connector case.



4.17 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 33°C.	±0.5ppm ±77.5Hz@ 155.1MHz
2. High power check (Battery voltage: 7.5V)	1)CH-Sig: 1-1 PTT: ON TA: OFF	1)Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	5.0W~7.0W 2.3A or less
	2)CH-Sig: 2-1 PTT: ON TA: OFF	2)Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	5.0W~7.0W 2.3A or less
	3)CH-Sig: 3-1 PTT: ON TA: OFF	3)Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	5.0W~7.0W 2.3A or less
3. Low power check (Battery voltage: 7.5V)	1)CH-Sig: 1-1 PTT: ON TA: OFF	1)Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	0.71W~1.41W 1.2A or less
	2)CH-Sig: 2-1 PTT: ON TA: OFF	2)Test Channel Channel: 2 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	0.71W~1.41W 1.2A or less
	3)CH-Sig: 3-1 PTT: ON TA: OFF	3)Test Channel Channel: 3 Test Signaling Mode: Analog Signaling: 1 PTT: Press [Transmit] button.	Power meter Ammeter	Panel	ANT			Check	0.71W~1.41W 1.2A or less

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 VM	Panel	ANT Univer- sal con- nector			Adjust AG input to get a standard MOD.	12.5mV ±5.8mV
5. Sensitivity check	1)CH-Sig: 1-1 SSG output Wide5k: -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 Wide5k: -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 VM Oscilloscope Distortion meter 8Ω Dummy load	Panel	ANT Universal connector			Check	12dB SINAD or more

4.18 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								

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
2. Receive Assist	1) Adj item: [RAST] Adjust:[****] 2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3] Adjust:[****] Press [O] key to store the adjustment value.	1) Adj item: [Receive Assist] 2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3] Press [Apply All] button to store the adjustment value.				Panel	[Panel tuning mode] [▲], [▼] [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.	2.0V±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 point have been adjusted. Note: The assist adjustment value must be between from 340 to 3550.
3. Transmit Assist	1) Adj item: [TAST] Adjust:[****] 2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3] Adjust:[****] PTT: ON Press [O] key to store the adjustment value.	1) Adj item: [Transmit Assist] 2) Adj item: [Low1]→ [Low2]→ [Low3]→ [Center1]→ [Center2]→ [Center3]→ [High1]→ [High2]→ [High3] PTT: Press [Transmit] button. Press [Apply All] button to store the adjustment value.				Panel	[Panel tuning mode] [▲], [▼] [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.	2.0V±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 point have been adjusted. Note: The assist adjustment value must be between from 340 to 3550.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. Frequency	*The Frequency 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 +33°C (+68.0°F to +91.4°F). (The temperature is displayed on the Frequency adjustment screen of the KPG-D1 and the LCD of the transceiver.) • Use an accuracy of 0.003ppm for the SSG. (Use a standard oscillator if necessary.)	SSG	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	[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±10 digits. The value of "IF20" will become around "0" after the adjustment has finished. Remark: "Frequency" is adjusted under receiving condition with SSG.
5. RTC Correction	1) Adj item: [RTC] Adjust:[****] Press [O] key to store the adjustment value.	1) Adj item: [RTC Correction] Data: {****} Press [Apply] button to store the adjustment value.	Frequency Counter	Panel	TEST POINT (CN709 or CN710)		[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	[Panel tuning mode] Press [O] key to store the adjustment value. [PC test mode] Press [Apply] button to store the adjustment value.	Remarks: Change the adjustment value so that the frequency currently displayed on "Crystal Oscillation Frequency" on the PC window and the frequency currently displayed on the frequency counter are in agreement.

4.19 Transmitter Section

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Ramp up Offset	1) Adj item: [RAMPU] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Ramp Up Offset] Press [Transmit] button. Press [Apply] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	<p>[PC test mode] [Automatic Adjustment] 1) Press [Tune Rump Offset] button. 2) Press [Apply All] button to store the adjustment value after the automatic adjustment has finished.</p> <p>[Manual Adjustment] 1) Set the adjustment value to "1". 2) Increase the adjustment value slowly while monitoring the offset monitor value. 3) Set the adjustment value when the offset monitor value exceed "50".</p>	
2. Ramp down Offset	1) Adj item: [RAMPD] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Ramp Down Offset] Press [Transmit] button. Press [Apply] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	<p>[PC test mode] [Automatic Adjustment] 1) Press [Tune Rump Offset] button. 2) Press [Apply All] button to store the adjustment value after the automatic adjustment has finished.</p> <p>[Manual Adjustment] 1) Set the adjustment value to "1". 2) Increase the adjustment value slowly while monitoring the offset monitor value. 3) Set the adjustment value when the offset monitor value exceed "20".</p>	
3. High transmit power (Battery voltage : 7.5V)	1) Adj item: [An H_PWR] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [High Transmit Power] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	6.0W	±0.1W 2.3A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. Medium transmit power (Battery voltage : 7.5V)	1) Adj item: [An M_PWR] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Medium Transmit Power] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	5.0W Note: Medium transmit power is the purpose of the custom power (adjustment). This power must be lower than High transmit power. In the production, this Medium transmit power is adjusted at 5.0W.	±0.1W 2.3A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
5. Low transmit power (Battery voltage : 7.5V)	1) Adj item: [An L_PWR] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Low Transmit Power] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Power meter Ammeter	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	1.0W	±0.1W 1.2A or less [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
6. Balance *1	1) Adj item: [An BAL] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Balance] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [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. (a supplementary explanation: Another way to adjust is ready. (Same as TK-5210, the old model of NX-5200). Press [AUX(Orange)] key to switch the tone to 100Hz square wave. Then, make the demodulation waveform shown on oscilloscope into square shape.)	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.
*1 : Refer to the "4.19.1 Necessary Deviation adjustment item for each signaling and mode" table. Balance adjustment is common with the adjustment of all signaling deviations.									

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. Maximum Deviation *2 [Analog Wide 5k]	1) Adj item: [Aw ADEV] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Maxmum Deviation (Analog Wide 5k)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value “503” for each adjustment point. Transmit at each adjustment point and check that the deviation is between 4150Hz and 4250Hz. Deviation meter LPF: 15kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	4150~4250Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
[Analog Wide 4k] *2	1) Adj item: [As ADEV] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Maxmum Deviation (Analog Wide 4k)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value “503” for each adjustment point. Transmit at each adjustment point and check that the deviation is between 3310Hz and 3410Hz. Deviation meter LPF: 15kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	3310~3410Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
[Analog Narrow] *2	1) Adj item: [An ADEV] Adjust:[****] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [Maxmum Deviation (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value “503” for each adjustment point. Transmit at each adjustment point and check that the deviation is between 2050Hz and 2150Hz. Deviation meter LPF: 15kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	2050~2150Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

*2 : Refer to the “4.19.1 Necessary Deviation adjustment item for each signaling and mode” table.
Regarding Maximum Deviation (Analog), it is common with the adjustment of all analog signalings.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
8. P25 High Deviation	<p>1) Adj item: [P1 PDEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [P25 High Deviation] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "505" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 2771Hz and 2883Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	2771~2883Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
9. P25 H-CPM Deviation	<p>1) Adj item: [P2 P2DEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [P25 H-CPM Deviation] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "485" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 3090Hz and 3215Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	3090~3215Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
10. NXDN High Deviation [NXDN Narrow]	<p>1) Adj item: [Nn NDEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [NXDN High Deviation (NXDN Narrow)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "505" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 2995Hz and 3117Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	2995~3117Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[NXDN Very Narrow]	<p>1) Adj item: [Nv NDEV] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [NXDN High Deviation (NXDN Very Narrow) Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write fixed value "495" for each adjustment point. Transmit at each adjustment point and check that the deviation is between 1331Hz and 1363Hz. Deviation meter LPF: 3kHz HPF: OFF [Panel tuning mode] PTT: ON [PC test mode] PTT: Press [Transmit] button	1311~1363Hz [PC test mode] Press [Apply All] button to store the adjustment value after all adjustment points have been adjusted.
11. QT Deviation *3 [Analog Wide 5k]	<p>1) Adj item: [Aw QT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [QT Deviation (Analog Wide 5k)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.75kHz±0.05 kHz
[Analog Wide 4k]	<p>1) Adj item: [As QT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [QT Deviation (Analog Wide 4k)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.60kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	<p>1) Adj item: [An QT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [QT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.35kHz±0.05 kHz
12. DQT Deviation *3 [Analog Wide 5k]	<p>1) Adj item: [Aw DQT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [DQT Deviation (Analog Wide 5k)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 405 (Reference value)	0.75kHz±0.05 kHz
[Analog Wide 4k]	<p>1) Adj item: [As DQT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [DQT Deviation (Analog Wide 4k)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 405 (Reference value)	0.60kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	<p>1) Adj item: [An DQT] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [DQT Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 405 (Reference value)	0.35kHz±0.05 kHz
13. LTR Deviation *3 [Analog Wide 5k]	<p>1) Adj item: [Aw LTR] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [LTR Deviation (Analog Wide 5k)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.00kHz±0.05 kHz
[Analog Wide 4k]	<p>1) Adj item: [As LTR] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [LTR Deviation (Analog Wide 4k)] Deviation meter LPF: 3kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.90kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	1) Adj item: [An LTR] Adjust:[****] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [LTR Deviation (Analog Narrow)] Deviation meter LPF: 3kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	0.75kHz±0.05 kHz
14. DTMF Deviation *3 [Analog Wide 5k]	1) Adj item: [Aw DTMF] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Wide 5k)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	2.50kHz±0.05 kHz
[Analog Wide 4k]	1) Adj item: [As DTMF] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [DTMF Deviation (Analog Wide 4k)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	2.00kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	<p>1) Adj item: [An DTMF] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [DTMF Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.25kHz±0.05 kHz
15. Single Tone Deviation *3 [Analog Wide 5k]	<p>1) Adj item: [Aw TONE] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [Single Tone Deviation (Analog Wide 5k)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	3.00kHz±0.05 kHz
[Analog Wide 4k]	<p>1) Adj item: [As TONE] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [Single Tone Deviation (Analog Wide 4k)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	2.40kHz±0.05 kHz

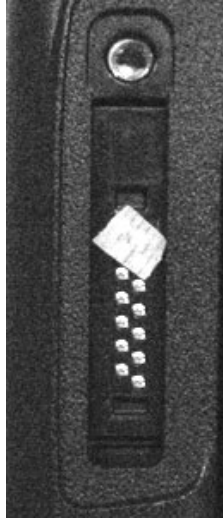
Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	<p>1) Adj item: [An TONE] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [Single Tone Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.50kHz±0.05 kHz
16. MSK Deviation *3 [Analog Wide 5k]	<p>1) Adj item: [Aw MSK] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [MSK Deviation (Analog Wide 5k)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	3.00kHz±0.05 kHz
[Analog Wide 4k]	<p>1) Adj item: [As MSK] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.</p>	<p>1) Adj item: [MSK Deviation (Analog Wide 4k)] Deviation meter LPF: 15kHz HPF: OFF</p> <p>2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.</p>	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	2.40kHz±0.05 kHz

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Narrow]	1) Adj item: [An MSK] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [MSK Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.50kHz±0.05 kHz
17. CWID Deviation *3 [Analog Narrow]	1) Adj item: [An CWID] Adjust:[****] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[****] PTT : ON Press [O] key to store the adjustment value.	1) Adj item: [CWID Deviation (Analog Narrow)] Deviation meter LPF: 15kHz HPF: OFF 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Transmit] button. Press [Apply All] button to store the adjustment value.	Deviation meter Oscilloscope	Panel	ANT	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as followings. 513 (Reference value)	1.00kHz±0.10 kHz
*3: Refer to the "4.19.1 Necessary Deviation adjustment item for each signaling and mode" table.									
18. Battery Warning Level writing	1) Adj item: [BATT] Adjust:[***] PTT: ON	1) Adj item: [Battery Warning Level] 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 [O] key to store the adjustment value. [PC test mode] Press [Apply] button to store the adjustment value.	

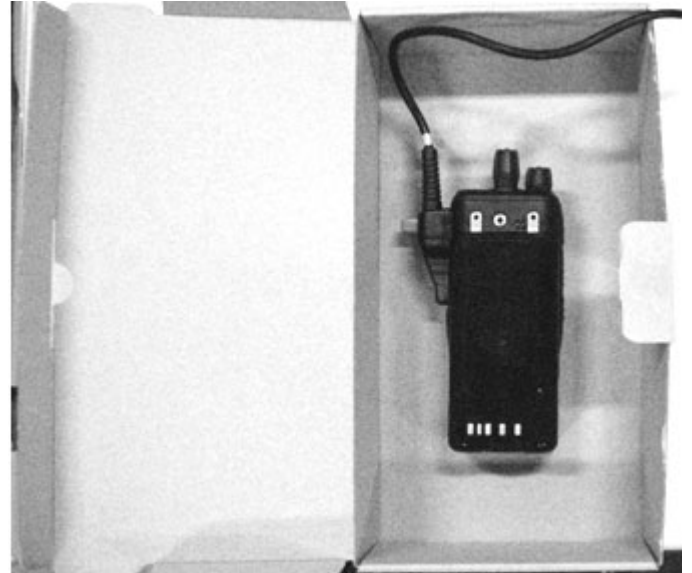
Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
19. Battery Warning Level check	[Panel test mode] 1) CH-Sig: 1-1 BATT terminal voltage: 6.0V while transmitting	1)Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 BATT terminal voltage: 6.0V while transmitting						Check	The transceiver can transmit with causing the LED to blink.
20. Internal Microphone Gain	* The Internal Microphone Gain adjustment can be performed only in PC test mode.	1) Adj item: [Internal Microphone Gain] Press [Apply] button to store the adjustment value. Caution: Setup the transceiver as follows if executing the adjustment. 1. Before connecting KPG-36U/36X to the transceiver, mask the 1st pin (SSW) and the 4th pin (MSW) of the 14-pin universal connector with tape. 2. After connecting KPG-36 to the transceiver, place the transceiver in the packaging of the NX-5x00 Portable transceiver. Place the transceiver in the middle of the packaging with the LCD facing down.				Panel		[PC test mode] [Automatic Adjustment] 1) Press [Front Microphone Tuning - Start] button. 2) Press [Apply] button to store the adjustment value after the automatic adjustment has finish. *If check is required [Automatic check] 1) Press [Front/Rear Microphone Check - Start] button. The OK/NG result is displayed.	

Image

- Universal connector with tape



- Packaging with the LCD facing down



4.19.1 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 (Analog Wide 5k)”, this signaling is composed of three elements [Balance, Maximum Deviation (Analog Wide 5k) and QT Deviation (Analog Wide 5k)]. Please adjust Balance and Maximum Deviation (Analog Wide 5k) before adjusting QT Deviation (Analog Wide 5k).

Mode	Signaling	Necessary adjustment and order			
		Wide 5k	Wide 4k	Narrow	Very Narrow
Analog	Audio	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow]	-
	QT	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k] 3. QT Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k] 3. QT Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. QT Deviation [Analog Narrow]	-
	DQT	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k] 3. DQT Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k] 3. DQT Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. DQT Deviation [Analog Narrow]	-
	LTR	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k] 3. LTR Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k] 3. LTR Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. LTR Deviation [Analog Narrow]	-
	DTMF	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k] 3. DTMF Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k] 3. DTMF Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. DTMF Deviation [Analog Narrow]	-
	2TONE	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k] 3. Single TONE Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k] 3. Single TONE Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. Single TONE Deviation [Analog Narrow]	-
	MSK (Fleet sync)	1. Balance adjust 2. Maximum Deviation [Analog Wide 5k] 3. MSK Deviation [Analog Wide 5k]	1. Balance adjust 2. Maximum Deviation [Analog Wide 4k] 3. MSK Deviation [Analog Wide 4k]	1. Balance adjust 2. Maximum Deviation [Analog Narrow] 3. MSK Deviation [Analog Narrow]	-
	P25	-		1. Balance adjust 2. P25 High Deviation 3. P25 High Deviation (H-CPM)	-
NXDN	Audio	-		1. Balance adjust 2. Maximum Deviation [NXDN Narrow]	1. Balance adjust 2. Maximum Deviation [NXDN Very Narrow]
	CWID	-		-	1. Balance adjust 2. Maximum Deviation [NXDN Very Narrow] 3. CWID Deviation [NXDN Very Narrow]

- Balance is common with all the above deviation adjustments. If Balance (Transmitter Section 6) has already adjusted, please skip Step1 and adjust from Step2.
- Maximum Deviation (Analog Wide 5k/Wide 4k/Narrow) is common with all the analog signaling deviations. If Balance and Maximum Deviation (Analog Wide 5k/Wide 4k/Narrow) (Transmitter Section 7) have already adjusted, please skip Step2 and adjust from Step3.

4.20 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)	1) Test Channel Channel: 1 Test Signaling Mode: Analog Signaling: 1 SSG output: -47dBm (1mV) (MOD:1kHz/ ±1.5kHz)	SSG DVM AF VM Dummy load	Panel	ANT Uni- versal con- nector	Panel	Vol- ume knob	Turn the Volume knob to obtain 0.90V AF output.	0.90V ±0.1V
2. Sensitivity 2	1) Adj item: [An SENS2] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Adjust:[***] Press [O] key to store the adjust- ment value.	1) Adj item: [Sensitivity 2] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] Press [Apply All] button to store the adjustment value.	SSG AF VM Dummy load	Panel	ANT Uni- versal con- nector	Panel	[Panel tuning mode] [▲], [▼] [PC test mode] [←], [→]	Write the value as follow- ings. [Low1]: 45 (Fixed) [Low3]: 100 (Fixed) [Center2]: 150 (Fixed) [High1]: 190 (Fixed) [High3]: 240 (Fixed)	
3. Sensitivity 1	1) Adj item: [An SENS2] Adjust:[***] 2) Adj item: [Low1]→ [Low5]→ [Center3]→ [High2]→ [High6] SSG output: -118dBm (0.28μv) (MOD: 1kHz/±1.5kHz) Adjust:[***]	1) Adj item: [Sensitivity 2] 2) Adj item: [Low1], [Low5], [Center3], [High2], [High6] SSG output: -118dBm (0.28μv) (MOD: 1kHz/±1.5kHz) Press [Apply All] button to store the adjustment value.	SSG Distor- tion meter Oscil- lo- scope	Panel	ANT Uni- versal con- nector	Panel		Write the value as follow- ings. Increase the adjustment value from 1 get 12dB SI- NAD.	
4. RSSI reference	1) Adj item: [An RRSS] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level -3dB (MOD: 1kHz/±1.5kHz)	1) Adj item: [RSSI Reference (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level -3dB (MOD: 1kHz/±1.5kHz)	SSG Distor- tion meter Oscillo- scope	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. Open Squelch [Analog Wide 5k]	1) Adj item: [Aw SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±3kHz)	1) Adj item: [Open Squelch (Analog Wide 5k)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/±3kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] 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: [As SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low5]→ [Center3]→ [High2]→ [High6] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±2.4kHz)	1) Adj item: [Open Squelch (Analog Wide 4k)] 2) Adj item: [Low1]→ [Low5]→ [Center3]→ [High2]→ [High6] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±2.4kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Narrow]	1) Adj item: [An SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [Open Squelch (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±1.5kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

Item	Condition		Measurement			Adjustment			Specifications/Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[P25 (C4FM)]	1) Adj item: [P1 SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 1kHz/ ±2.2kHz)	1) Adj item: [Open Squelch (P25 C4FM)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 1kHz/ ±2.2kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[P25 (LSM)]	1) Adj item: [P1 SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±3.3kHz)	1) Adj item: [Open Squelch (P25 LSM)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 1kHz/ ±3.3kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[NXDN Narrow]	1) Adj item: [Nn SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 400Hz/ ±2.5kHz)	1) Adj item: [Open Squelch (NXDN Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -1dB (MOD: 400Hz/ ±2.5kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

Item	Condition		Measurement			Adjustment			Specifications /Remarks
	Panel tuning mode	PC test mode	Test-equip-ment	Unit	Ter- minal	Unit	Parts	Method	
[NXDN Very Narrow]	1) Adj item: [Nv SQL] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 400Hz/ ±1.2kHz)	1) Adj item: [Open Squelch (NXDN Very Nar- row)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow -3dB (MOD: 400Hz/ ±1.2kHz)	SSG Distortion meter Oscillo- scope	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
6. Low RSSI	1) Adj item: [An LRSSI] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -118dBm (0.28μV) (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [Low RSSI (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -118dBm (0.28μV) (MOD: 1kHz/ ±1.5kHz)	SSG	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
7. High RSSI	1) Adj item: [An HRSSI] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -80dBm (22.4μV) (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [High RSSI (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: -80dBm (22.4μV) (MOD: 1kHz/ ±1.5kHz)	SSG	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
8. Tight Squelch [Analog Wide 5k]	1) Adj item: [Aw SQLT] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±3kHz)	1) Adj item: [Tight Squelch (Ana- log Wide 5k)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/±3kHz)	SSG Distortion meter Oscillo- scope	Panel	ANT Uni- versal con- nector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment val- ue. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

Item	Condition		Measurement			Adjustment			Specifications/Remarks
	Panel tuning mode	PC test mode	Test-equipment	Unit	Terminal	Unit	Parts	Method	
[Analog Wide 4k]	1) Adj item: [As SQLT] Adjust:[***] 2) Adj item: [Low1]→ [Low5]→ [Center3]→ [High2]→ [High6] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±2.4kHz)	1) Adj item: [Tight Squelch (Analog Wide 4k)] 2) Adj item: [Low1]→ [Low5]→ [Center3]→ [High2]→ [High6] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±2.4kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	
[Analog Narrow]	1) Adj item: [An SQLT] Adjust:[***] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±1.5kHz)	1) Adj item: [Tight Squelch (Analog Narrow)] 2) Adj item: [Low1]→ [Low3]→ [Center2]→ [High1]→ [High3] SSG output: 12dB SINAD level at Analog Narrow +6dB (MOD: 1kHz/ ±1.5kHz)	SSG Distortion meter Oscilloscope	Panel	ANT Universal connector	Panel		[Panel tuning mode] After input signal from SSG, press [O] key to store the adjustment value. [PC test mode] After input signal from SSG, press [Apply] button to store the adjustment value.	

SECTION 5 TROUBLESHOOTING

5.1 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:

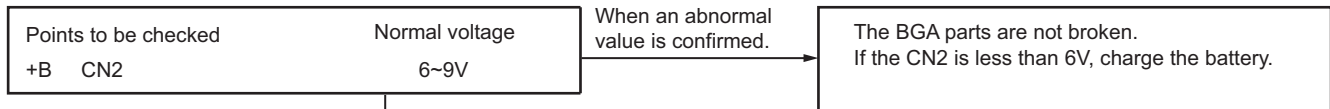
MPU/DSP (IC702), mobile DDR (IC703), Flash memory (IC705)

When the BGA IC is problematic, please bring the printed circuit board (XC1-0331-81/XC1-0360-11) in for service. Various ESN/default adjustment values are written on the printed circuit board for service.

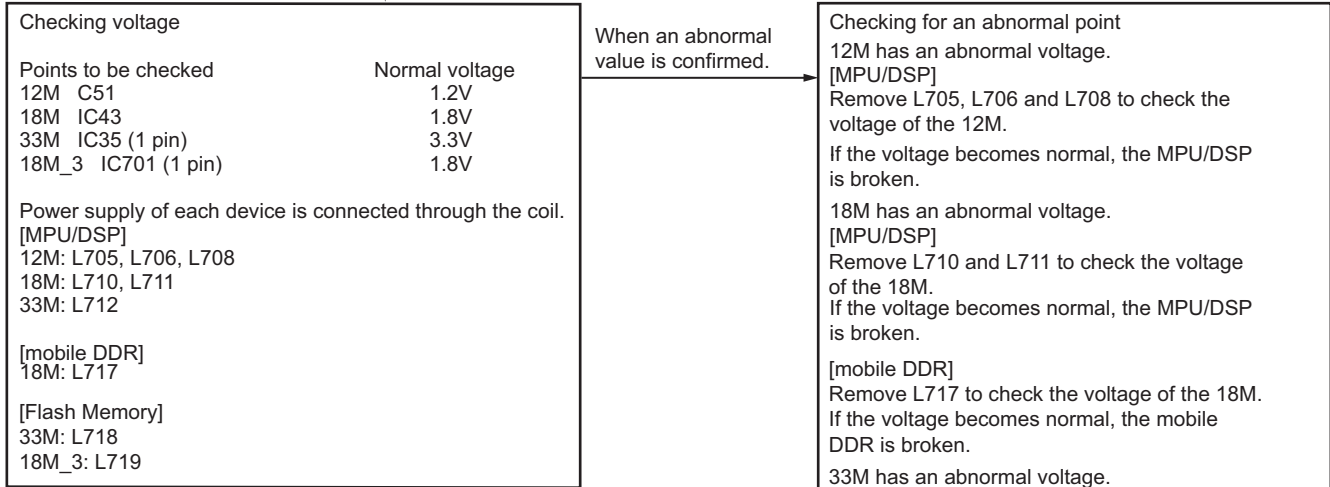
Additionally various ESN stickers are included. (Please refer to "5.4 Replacing Main Unit".)

After the printed circuit board has been readjusted, please attach any ESN stickers to the chassis. When "ESN Validation" is used, you must modify the ESN register.

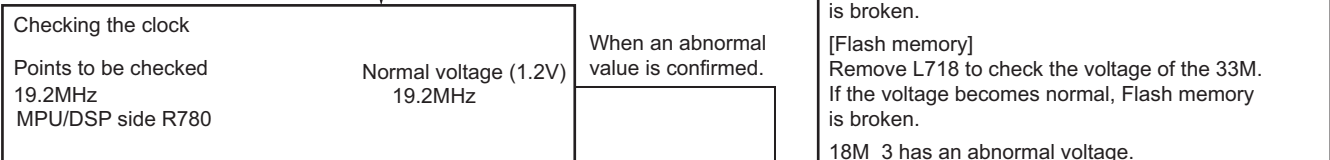
- Checking battery voltage



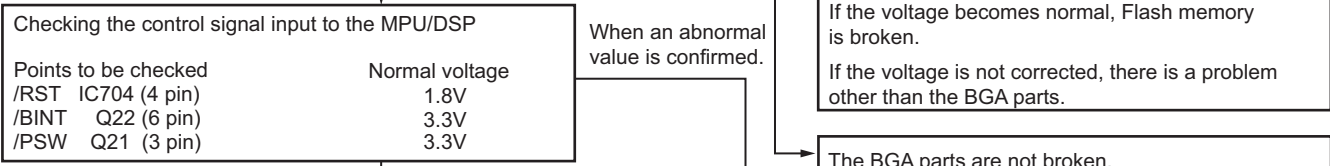
- Checking power supply voltage



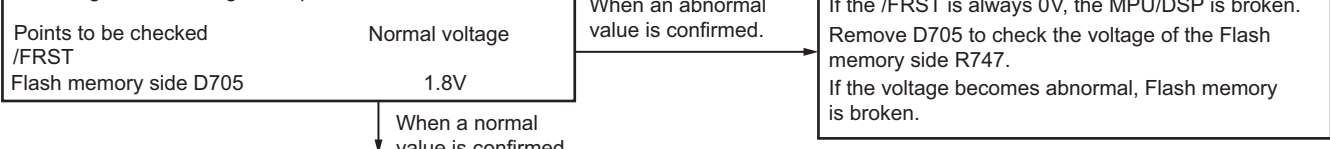
- Checking the clock

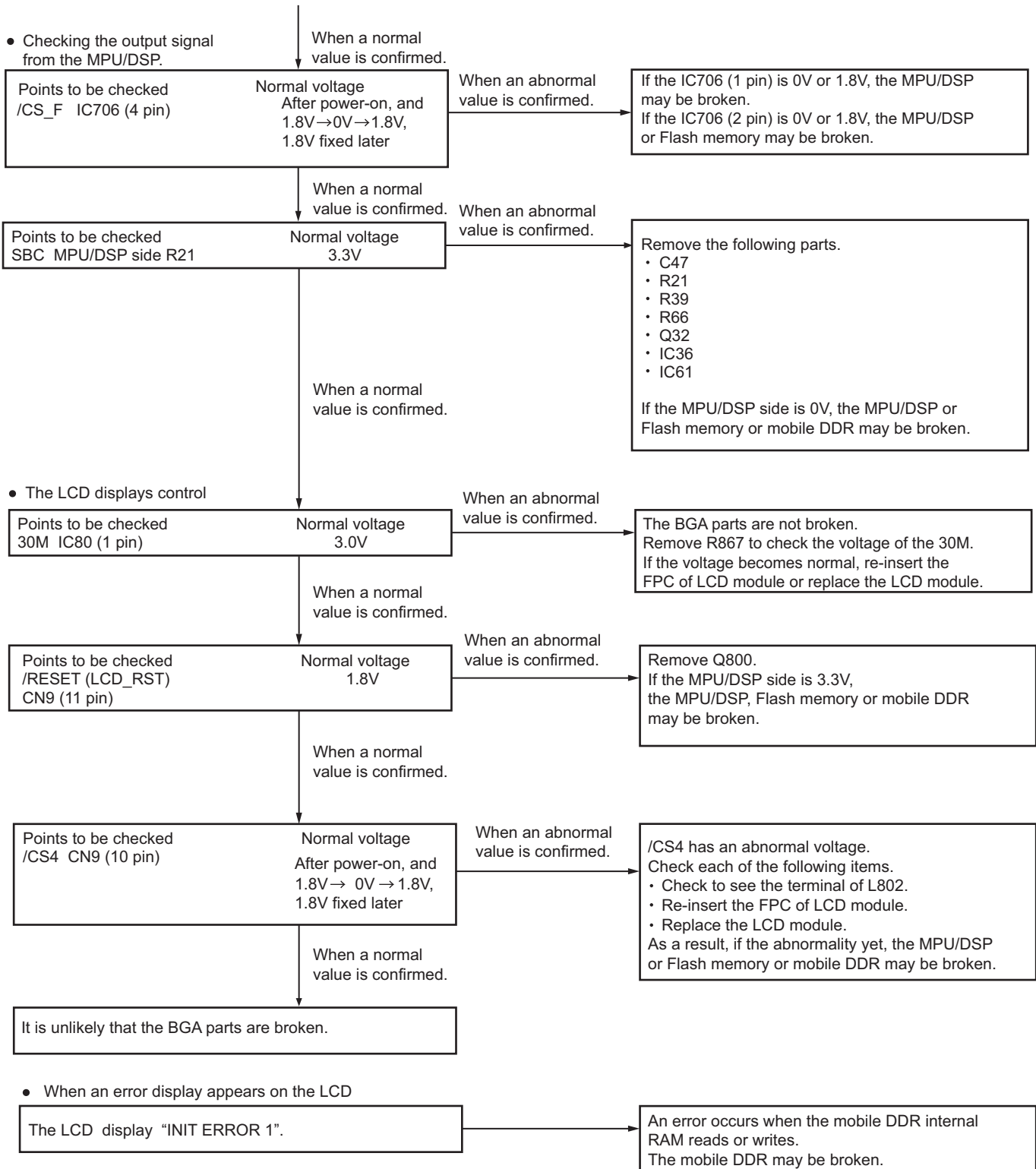


- Checking the Reset/Control signal



- Checking the control signal output from the MPU/DSP





■ Descriptions of signal names

1) /RST	: MPU/DSP reset signal	LOW → Reset
2) /BINT	: Battery final voltage monitoring	LOW → Final voltage
3) /PSW	: Power switch signal	LOW → ON
4) /FRST	: Flash memory reset signal	LOW → Reset
5) /CS_F	: Flash memory chip select signal	LOW → Active
6) SBC	: Switch +B control	HIGH → ON
7) 30M	: LCD module control 3.0V power supply	
8) /RESET (LCD_RST)	: LCD reset signal	LOW → Reset
9) /CS4	: LCD controller chip select signal	LOW → Active

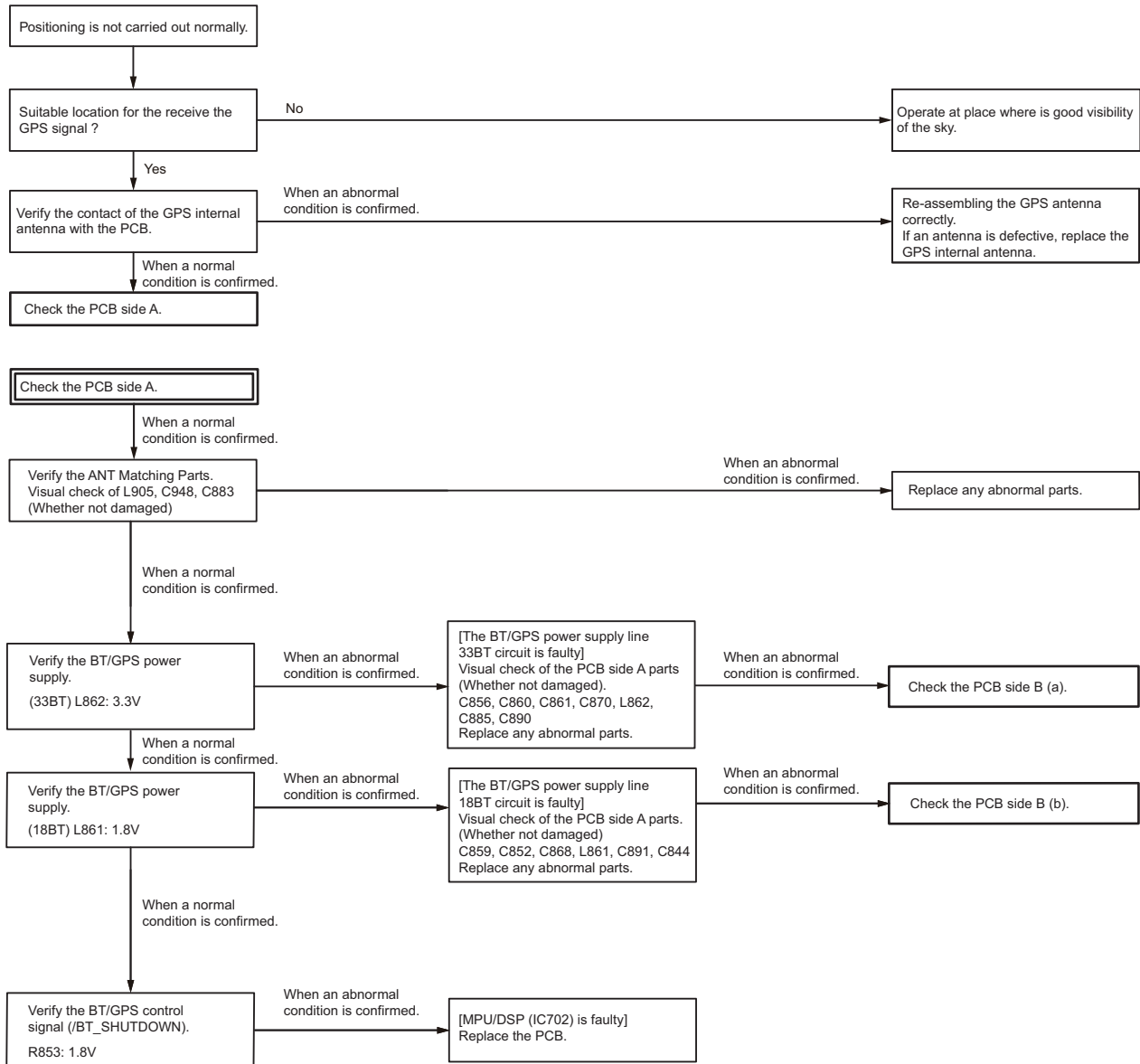
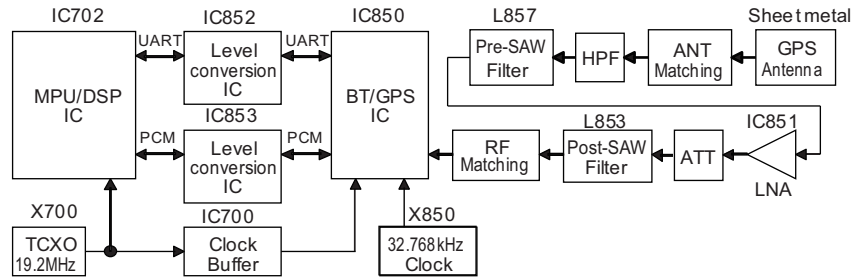
5.2 Failure diagnosis of the GPS section

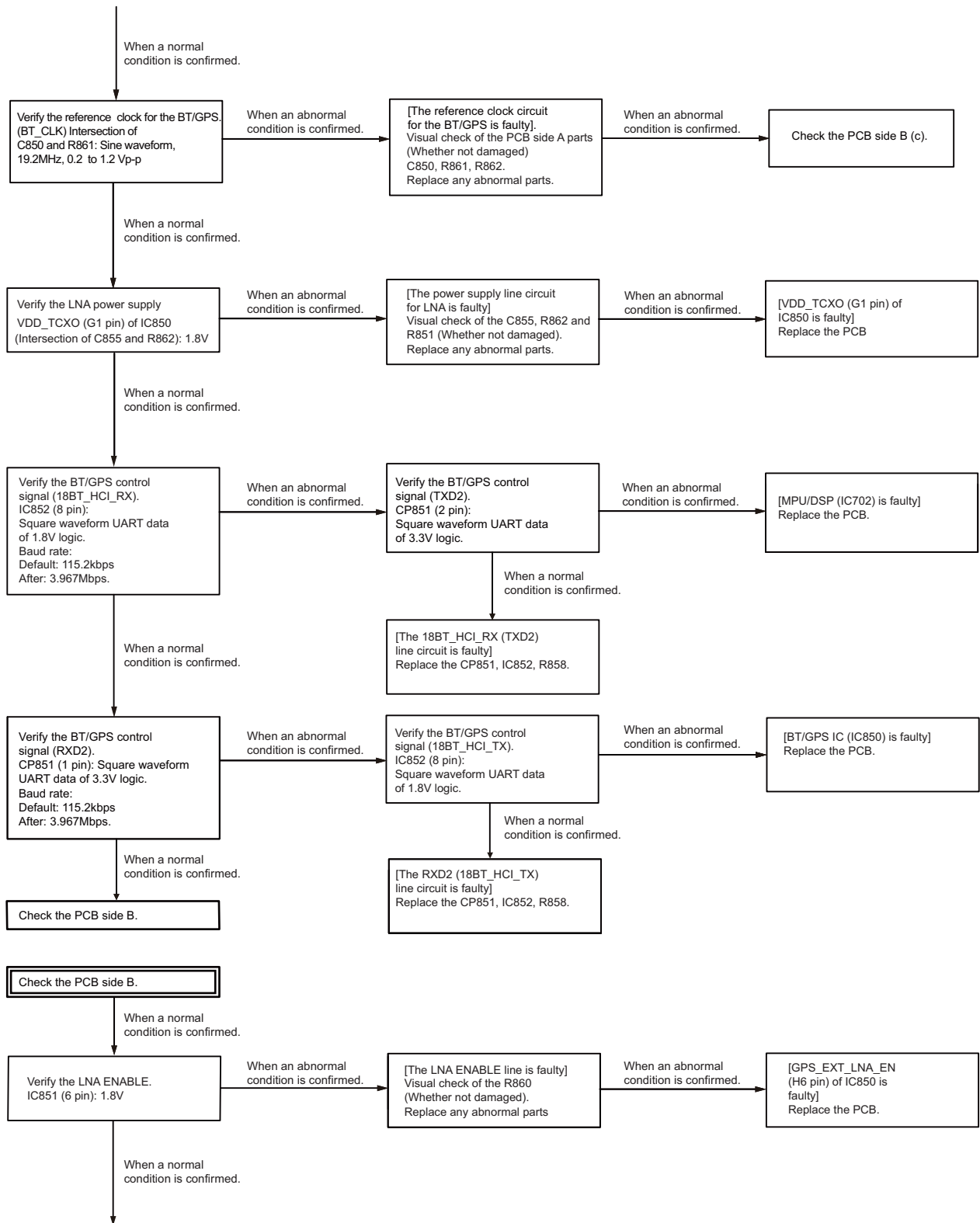
■ Overview:

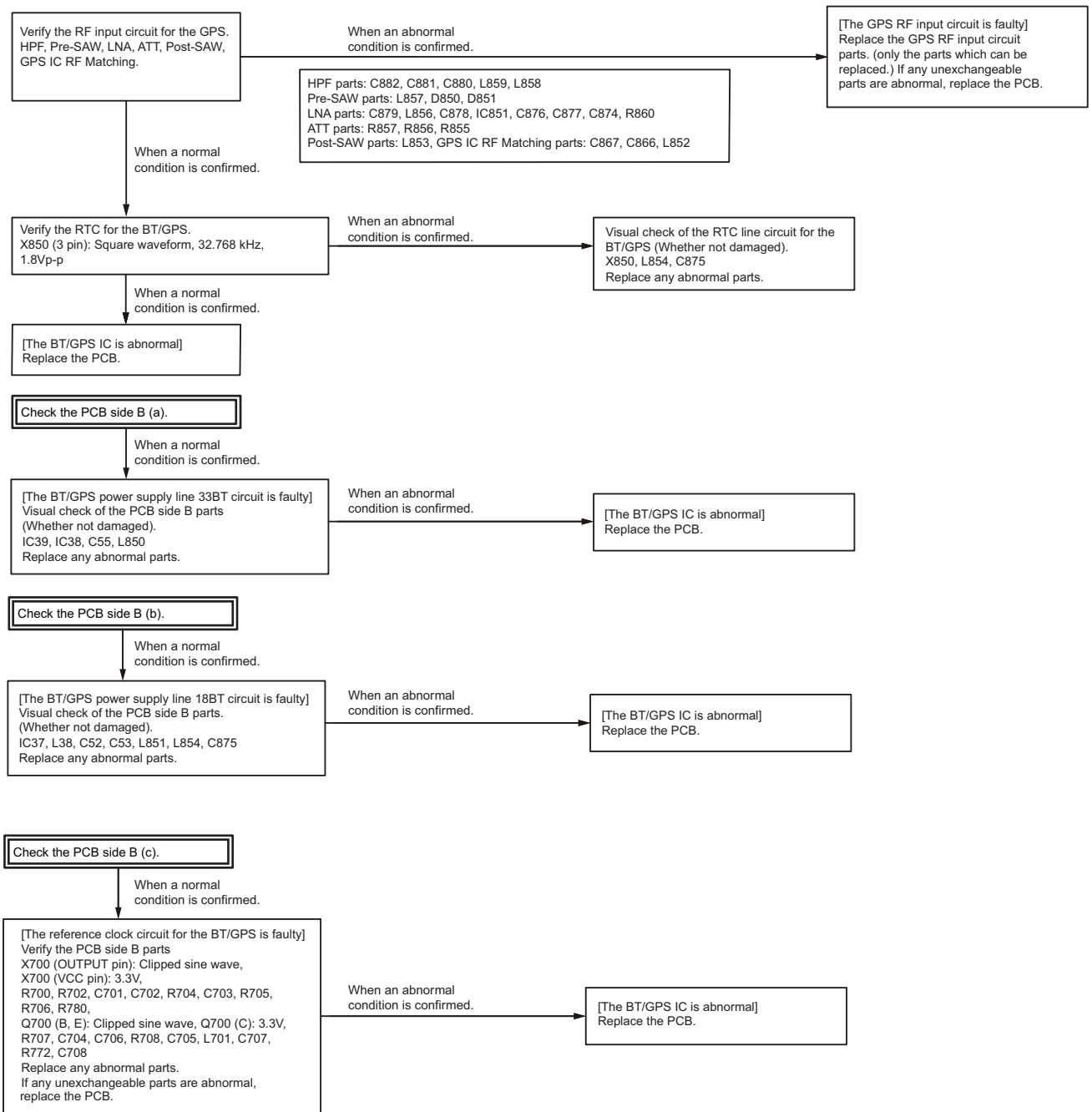
When the GPS function does not operate, use this flowchart to determine the problem.

Major parts for a GPS circuit

- GPS antenna (Connect on CN907)
- LNA IC (IC851)
- Pre-SAW Filter (L857)
- Post-SAW Filter (L853)
- Bluetooth/GPS IC (IC850)
- Level conversion IC (IC852, IC853)
- TCXO 19.2MHz (X700)
- Clock Buffer (IC700)
- 32.768 KHz clock (X850)
- 33BT Regulator (IC38)
- 18BT Regulator (IC37)
- MPU/DSP IC (IC702)







■ Descriptions of signal names

- 1) 33BT: BT/GPS IC 3.3V power supply
- 2) 18BT: BT/GPS IC 1.8V power supply
- 3) TXD2: BT/GPS serial data line connected to UART TX of MPU/DSP IC (MPU/DSP to BT/GPS IC)
- 4) RXD2: BT/GPS serial data line connected to UART RX of MPU/DSP IC (MPU/DSP to BT/GPS IC)
- 5) 18BT_HCI_RX: BT/GPS serial data line connected to UART RX of BT/GPS IC (MPU to BT/GPS IC)
- 6) 18BT_HCI_TX: BT/GPS serial data line connected to UART TX of BT/GPS IC (BT/GPS IC to MPU)
- 7) /BT_SHUTDOWN: BT/GPS active control of MPU/DSP IC (MPU/DSP to BT/GPS IC) High → Active, Low → Reset

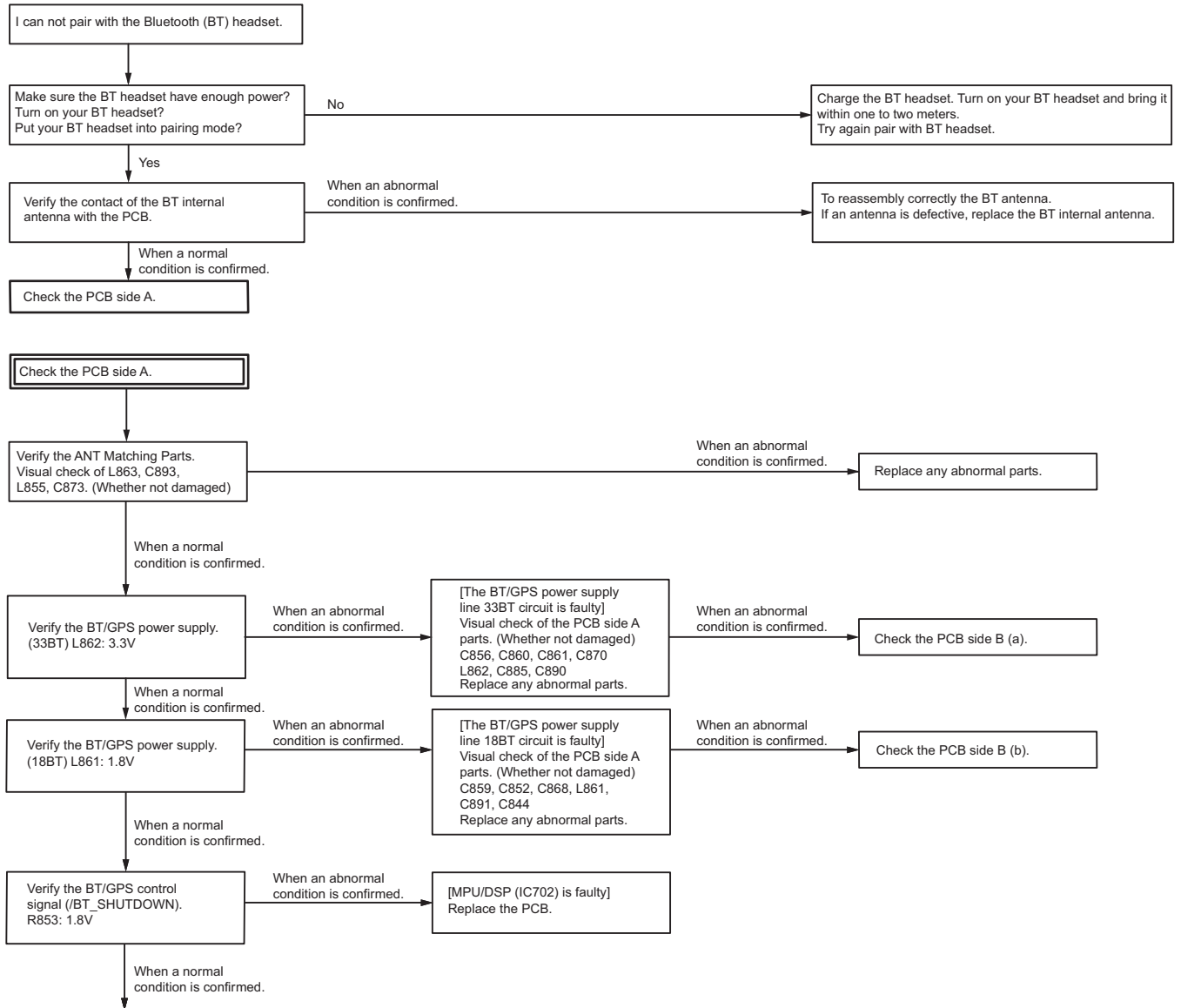
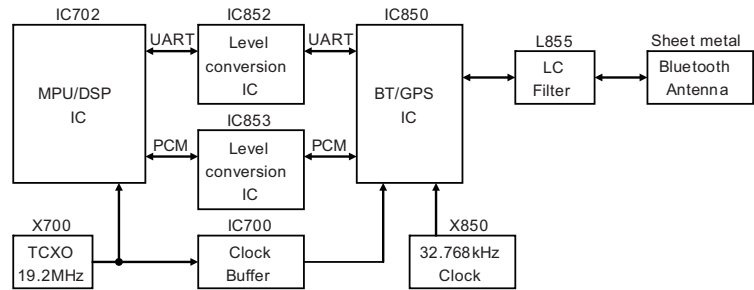
5.3 Failure diagnosis of the Bluetooth section

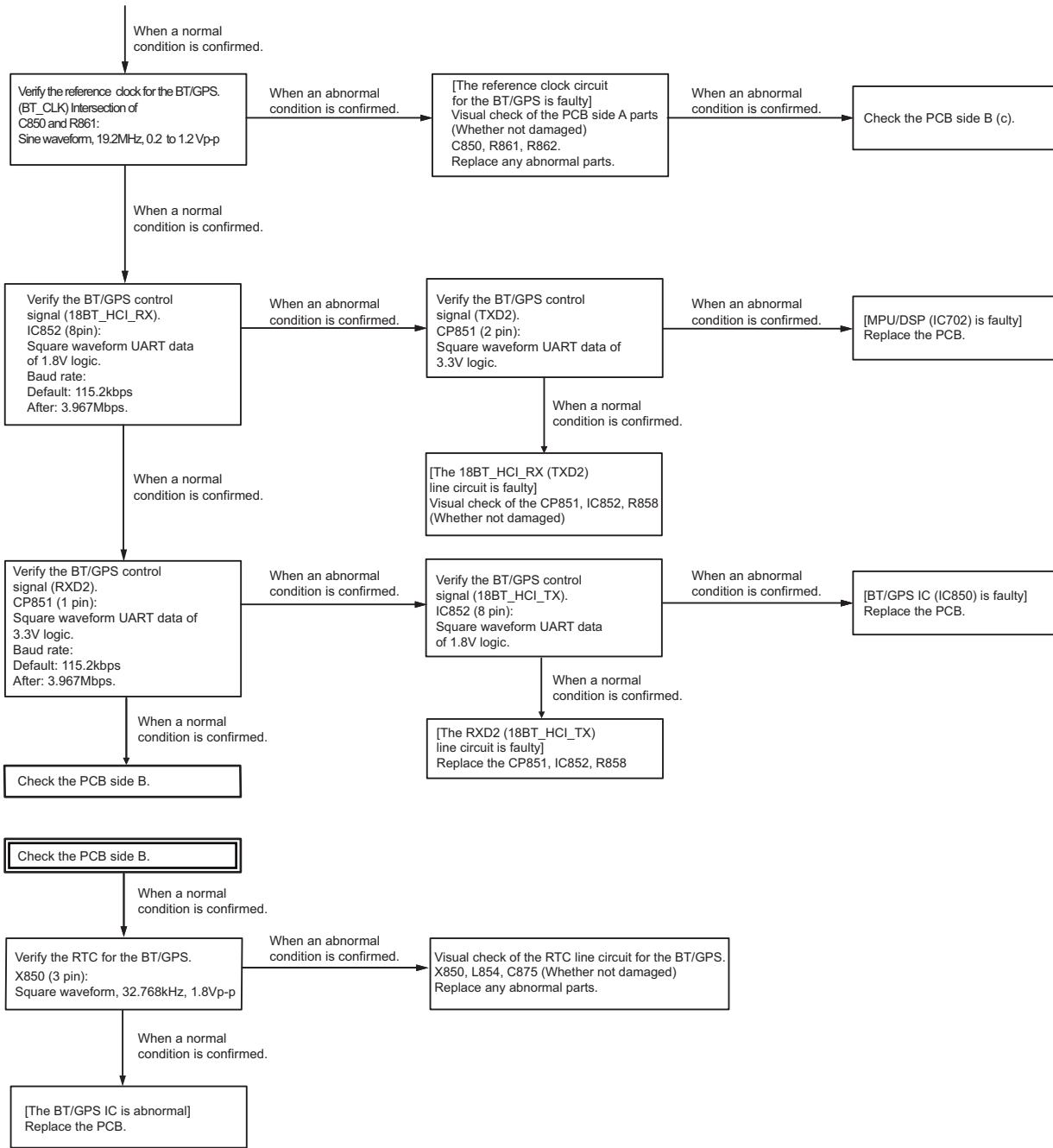
■Overview:

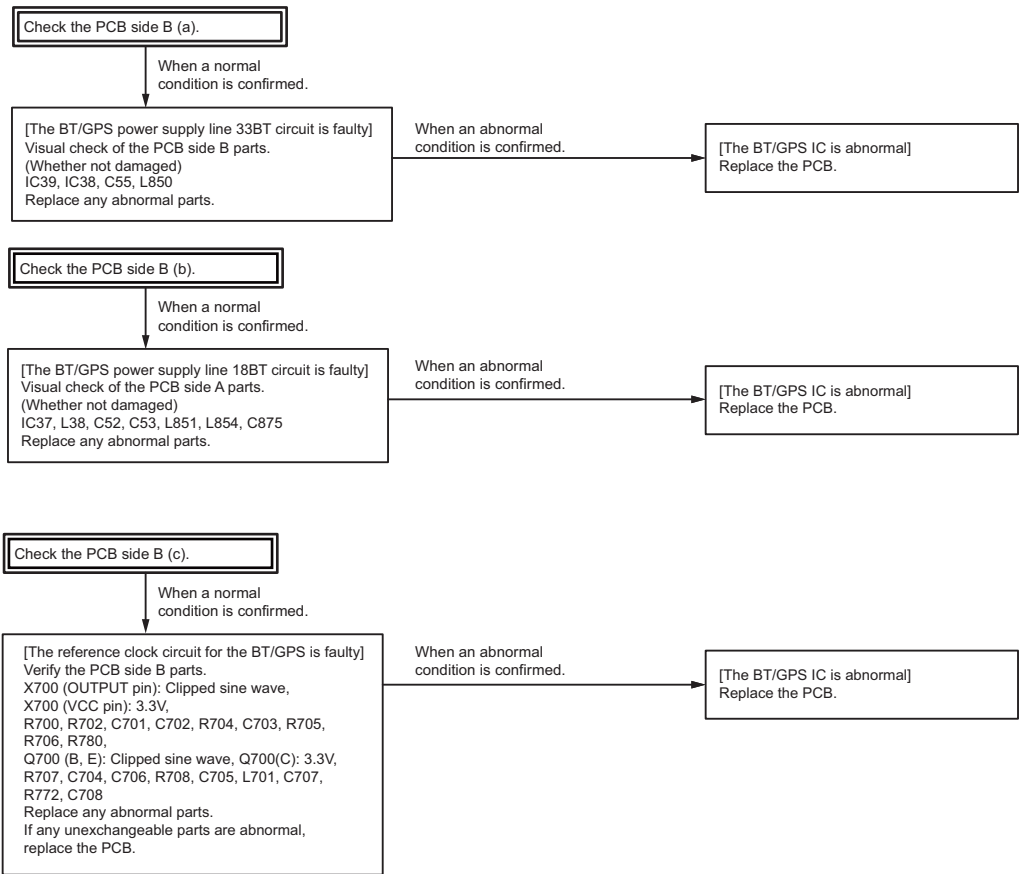
When the Bluetooth function does not operate, use this flowchart to determine the problem.

Major parts for a Bluetooth circuit

- Bluetooth antenna (Connect on CN909)
- LC filter (L855)
- Bluetooth/GPS IC (IC850)
- Level conversion IC (IC852, IC853)
- TCXO 19.2MHz (X700)
- Clock Buffer (IC700)
- 32.768kHz clock (X850)
- 33BT Regulator (IC38)
- 18BT Regulator (IC37)
- MPU/DSP IC (IC702)







■ Descriptions of signal names

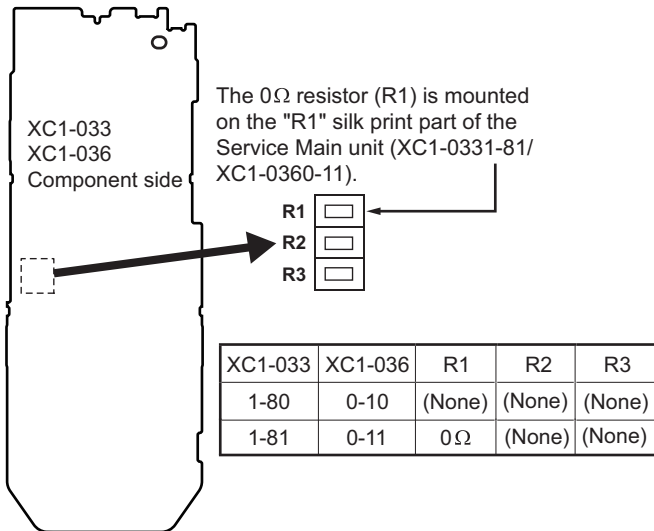
- 1) 33BT: BT/GPS IC 3.3V power supply
- 2) 18BT: BT/GPS IC 1.8V power supply
- 3) TXD2: BT/GPS serial data line connected to UART TX of MPU/DSP IC (MPU/DSP to BT/GPS IC)
- 4) RXD2: BT/GPS serial data line connected to UART RX of MPU/DSP IC (MPU/DSP to BT/GPS IC)
- 5) 18BT_HCI_RX: BT/GPS serial data line connected to UART RX of BT/GPS IC (MPU to BT/GPS IC)
- 6) 18BT_HCI_TX: BT/GPS serial data line connected to UART TX of GPS IC (BT/GPS IC to MPU)
- 7) /BT_SHUTDOWN: BT/GPS active control of MPU/DSP IC (MPU/DSP to BT/GPS IC) High → Active, Low → Reset

5.4 Replacing Main Unit

■Main unit information

Model Name	Original Main unit Number	For Service Main unit Number
NX-5200 (F2,F3,K2,K3)	XC1-0331-80	XC1-0331-81
NX-5200 (K2,K3,E,E2)	XC1-0360-10	XC1-0360-11

■Method of confirming “Original Main unit” and “Service Main unit”



Note:

- The 0Ω resistor (R1, R2, R3) 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 these resistors.
- There is no difference between the schematic diagram of the Service Main unit (XC1-0331-81/XC1-0360-11) and the schematic diagram of the original Main unit (XC1-0331-80/XC1-0360-10). (R1, R2 and R3 are connected with GND (ground) only.)

■Supplied Accessories of “Service Main unit”

Item (Including Parts Number)	Quantity
Main Unit (XC1-033, XC1-036)	1
KENWOOD ESN/ NXDN ESN/ Product Number/ MPT ESN/P25 ESN Label	1

■“Service Main unit” Data

The following data is written on the service unit:

Data Type	Description
Firmware	NX-5200 Firmware.
FPU Data (PC programming mode)	XC1-033/XC1-036 (NX-5200) F2, E2 data.
Various Adjustment Data (PC Test mode)	General adjustment values for the XC1-033/XC1-036 (NX-5200).
KENWOOD ESN	Model name: [XC1-033/XC1-036] NX-5200S Type: F2, K2, E2 The same number as the KENWOOD ESN label is written.
NXDN ESN/ MPT ESN/ Product number/ P25 ESN	The same number as the NXDN ESN/ MPT ESN/Product Number/P25 ESN label is written.

■After Changing the PCB

- After changing the printed circuit board, write the up-to-date Firmware following the instructions in the “2.2 REALIGNMENT - 2.2.6 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.
- Using the KPG-D1/D1N, 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.
- Enter Program> Test Mode, then adjust the various adjustment data (PC Test Mode) as described in the “SECTION 4 ADJUSTMENT”.
- Attach the new labels corresponding to the new printed circuit board. (Refer to the images below for label placement.)
- If necessary, write the FPU data used by the customer with the KPG-D1/D1N.

Note:

- When using the ESN Validation function of NXDN Trunking, the NXDN ESN number changes when the circuit board is changed (the number is written on the circuit board); the NXDN Trunking System cannot be accessed. Use the KPG-110SM on the NXDN Trunking System side to reprogram the NXDN ESN number.
- When a new printed circuit board is used, the KENWOOD ESN changes, as does the Transceiver Information display of the KPG-D1/D1N, but this does not have any effect on the operation of the transceiver.
- If changing to the original ESN, please contact our service center.
- KPG-D1N can't be used for E, E2 types.

■ ESN Label Layout



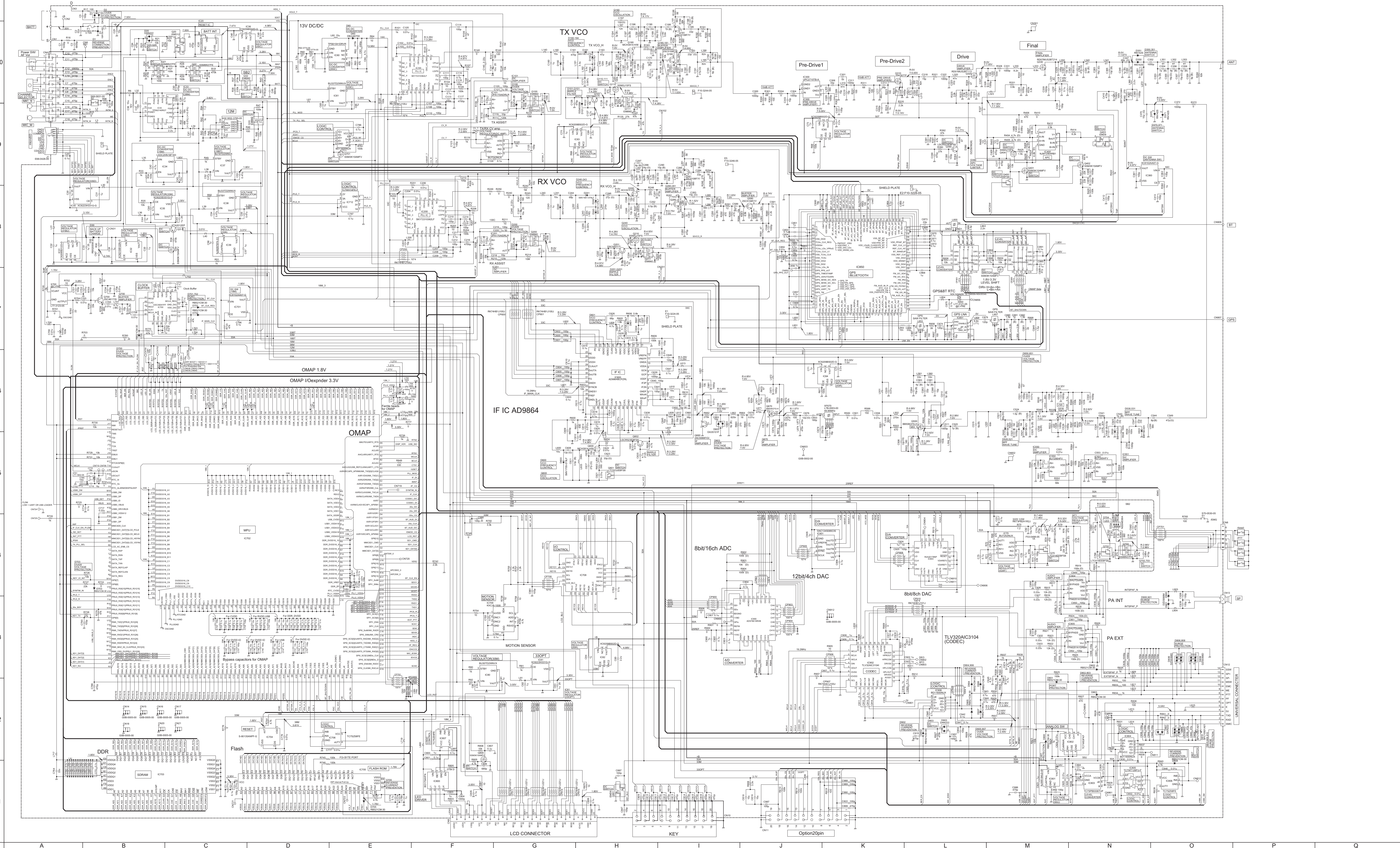
Note:

Cut a UPC code and UPC barcode at dotted line.

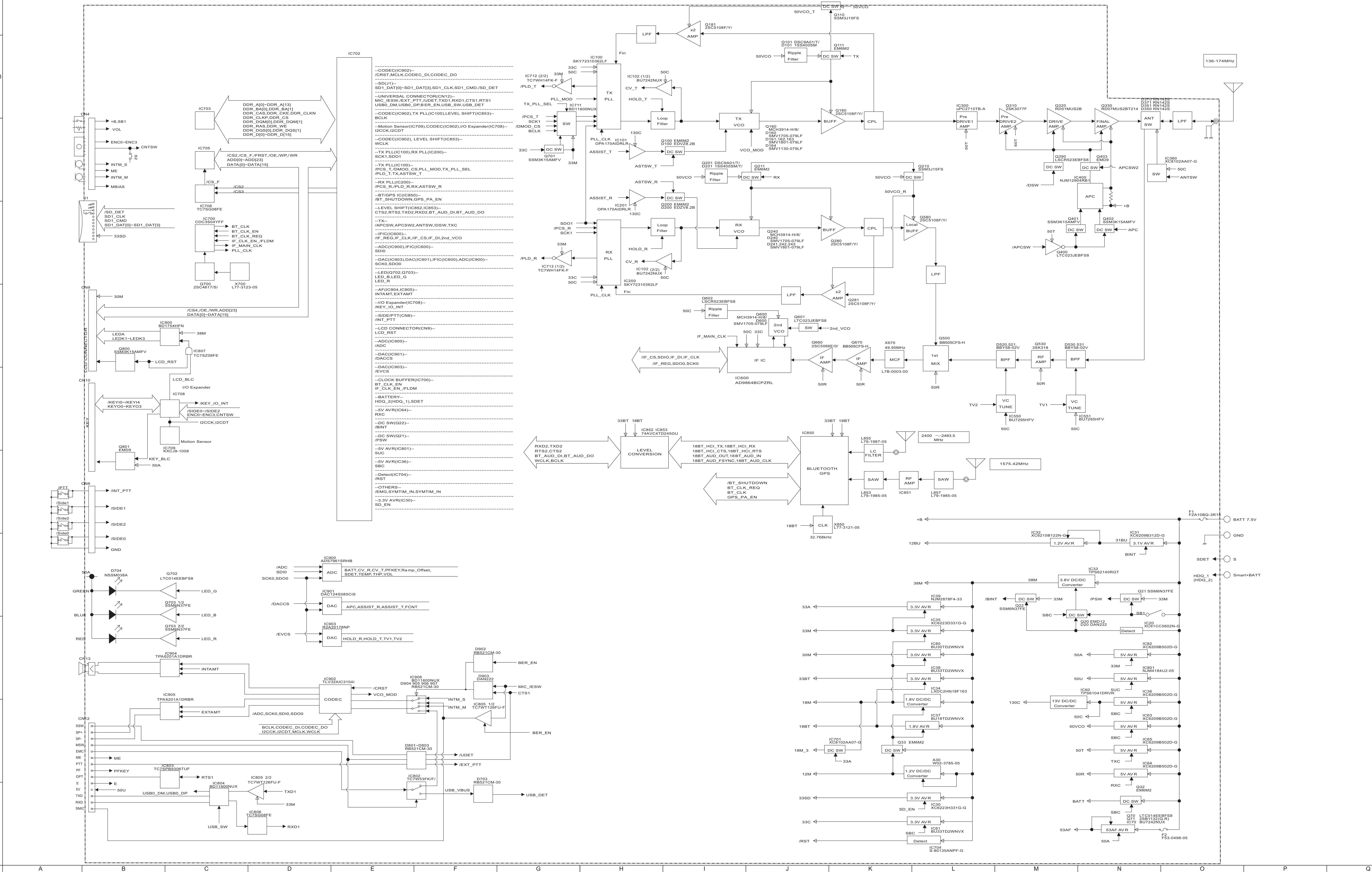
MEMO

SCHEMATIC DIAGRAM

■ MAIN UNIT (XC1-0331-80 (NX-5200(F2), NX-5200(F3), NX-5200(K2), NX-5200(K3)), XC1-0360-10 (NX-5200(K2), NX-5200(K3), NX-5200(E), NX-5200(E2)))



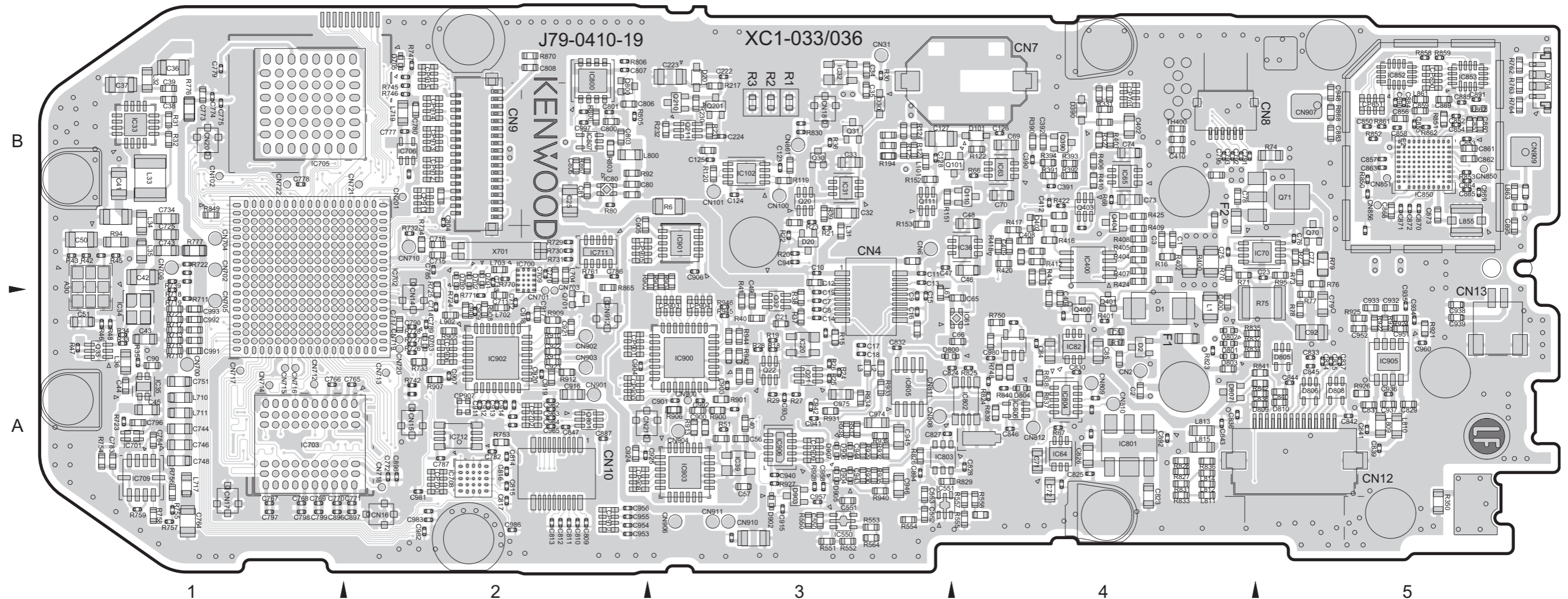
BLOCK DIAGRAM



PRINTED CIRCUIT BOARD

■ MAIN UNIT (XC1-0331-80 (NX-5200(F2), NX-5200(F3), NX-5200(K2), NX-5200(K3)), XC1-0360-10 (NX-5200(K2), NX-5200(K3), NX-5200(E), NX-5200(E2)))

--- Component side view (J79-0410-19) ---



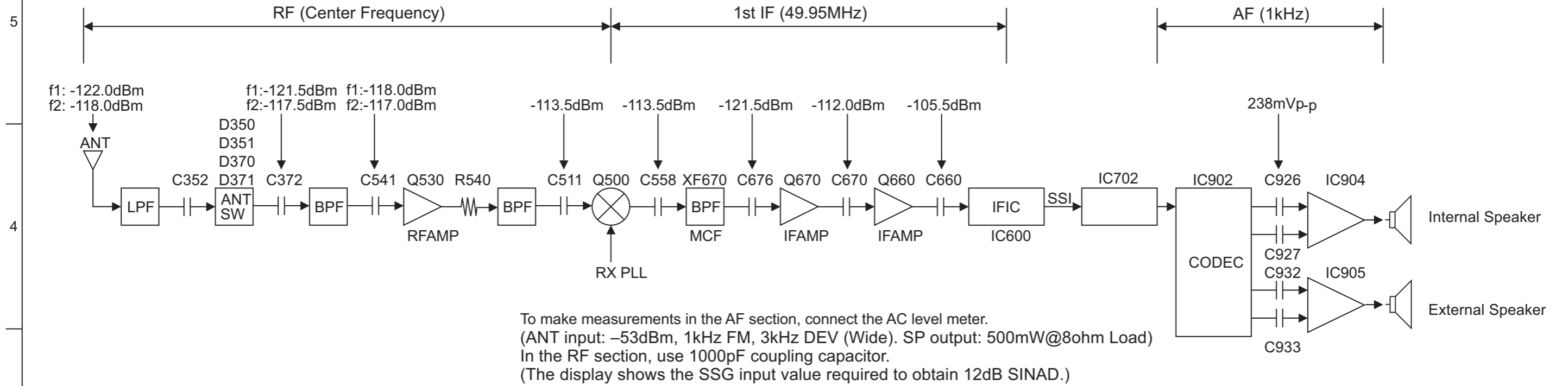
■ MAIN UNIT (XC1-0331-80 (NX-5200(F2), NX-5200(F3), NX-5200(K2), NX-5200(K3)), XC1-0360-10 (NX-5200(K2), NX-5200(K3), NX-5200(E), NX-5200(E2)))

--- Foil side view (J79-0410-19) ---

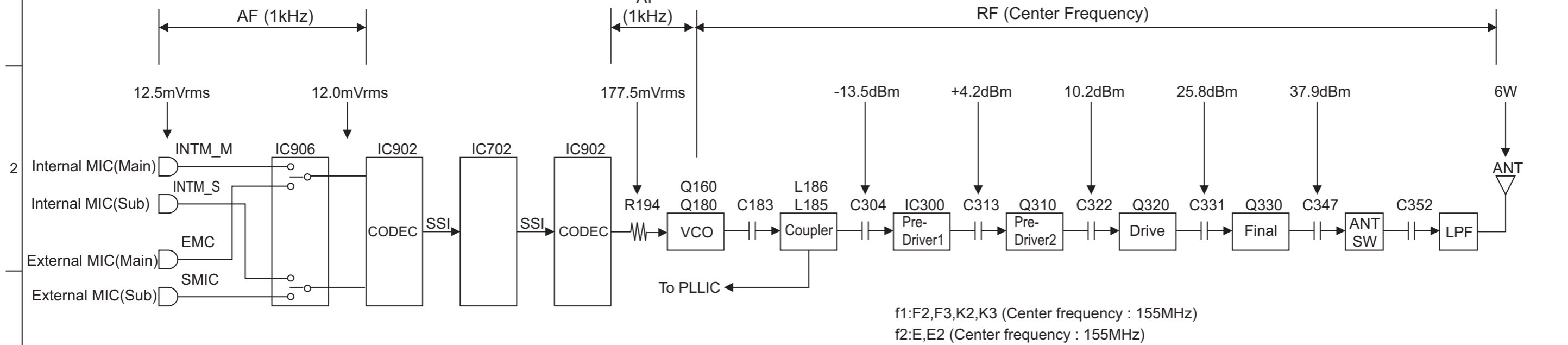


LEVEL DIAGRAM

Receiver section



Transmitter section



PARTS LIST

[NX-5200]

* SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

* BEWARE OF BOGUS PARTS

Parts that do not meet specifications may cause trouble in regard to safety and performance. We recommend that genuine parts be used.

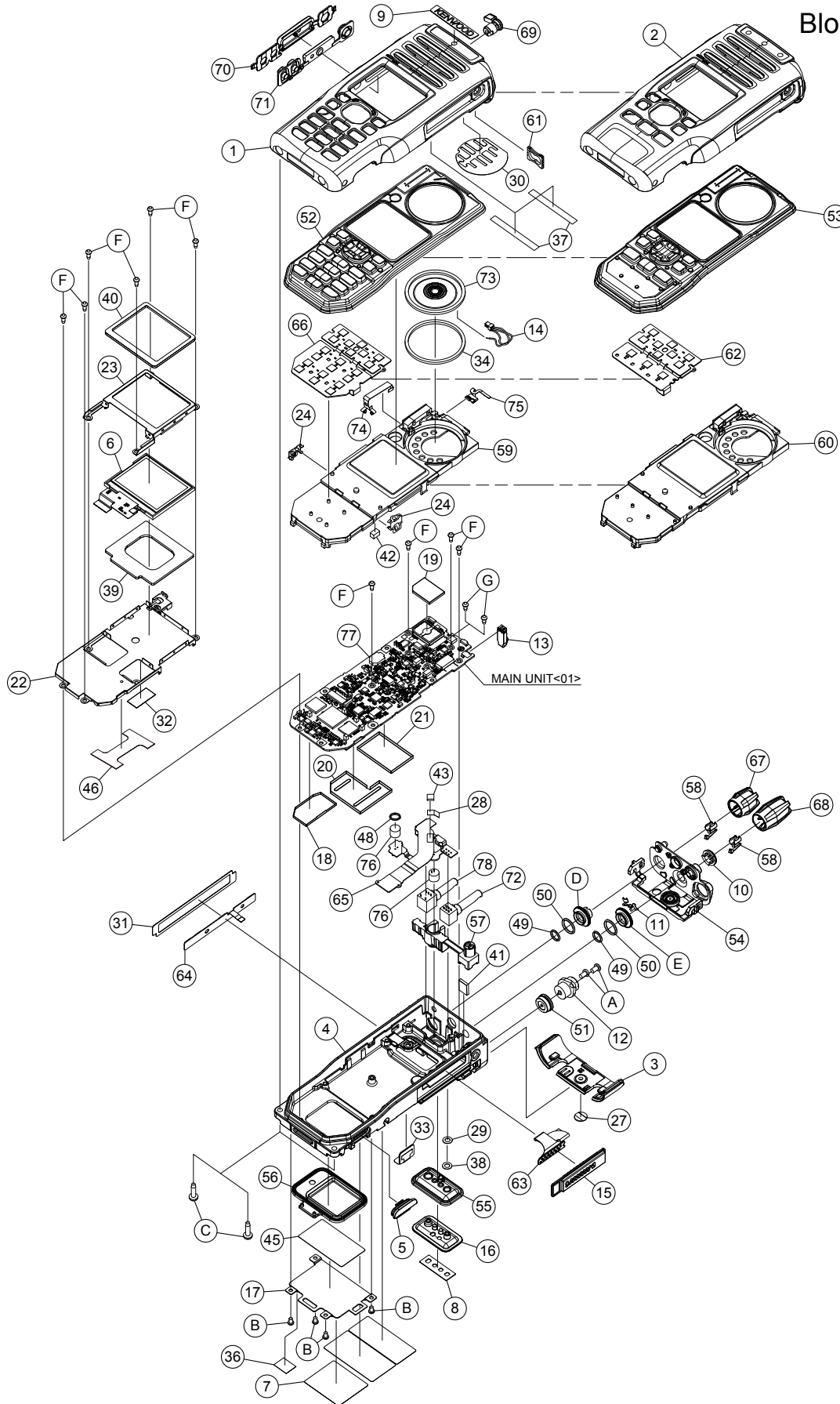
* (x_) in a description column shows the number of the used part.

- Contents -

Exploded view of general assembly and parts list	3-2
Electrical parts list	3-5
Packing materials and accessories parts list	3-15

Exploded view of general assembly and parts list

Block No.M1MM



General assembly

Block No. [M][1][M][M]

△ Symbol No.	Part No.	Part Name	Description	Local
1	A0C-0001-00	PLASTIC CABINET	FULL KEY	F3,K3,E
2	A0C-0002-00	PLASTIC CABINET	STANDARD KEY	F2,K2,E2
3	A8A-0005-00	REAR PANEL		
4	A1A-0005-10	CHASSIS		
5	B0K-0024-00	CAP	SD CARD	
6	B38-0960-05	LCD ASSY	1.74IN	
7	B4B-0006-00	CAUTION STICKER	FCC L,CAUTION	F2,F3,K2,K3
8	B4C-0105-00	TER.STICKER	TERMINAL BLOCK	
9	B4D-0002-00	KENWOOD BADGE		
10	D32-0454-04	STOPPER	16CH	
11	D3C-0001-10	STOPPER	CIRCULAR NUT	
12	E04-0467-15	C.RECEPTACLE-SM	ANT	
13	E2D-0003-00	TERMINAL	ANT	
14	E3H-0007-00	LEAD.WIRE W.C.	SP	
15	E58-0532-05	R.RECEPTACLE	14P	
16	E7C-0001-00	TERMINAL BLOCK		
17	F0G-0005-00	COVER	OP BOARD	
18	F10-3223-05	SHIELDING COVER	BLS/IF	
19	F10-3227-05	SHIELDING COVER	BLS/GPS	
20	F10-3243-15	SHIELDING COVER	BLS/VCO TX	
21	F10-3245-15	SHIELDING COVER	BLS/VCO RX	
22	F1B-0005-00	SHIELDING CASE	OMAP	
23	F1B-0006-00	SHIELDING COVER	LCD	
24	G0B-0031-00	EARTH SPRING	FPC(x2)	
27	G11-4440-04	SHEET	LEAK COVER	
28	G11-4459-04	SHEET	VOL CH FPC	
29	G11-4500-04	SHEET	LEAK	
30	G1A-0001-00	FIBROUS SHEET	SP GRILL	
31	G1B-0016-00	SHEET	PTT	
32	G1B-0031-00	SHEET	LI BATT INSULATING	
33	-----	SHEET	VOID/CABINET	
34	G1B-0045-10	RUBBER CUSHION	SP	
36	-----	SEAL	VOID/OP BOARD	
37	G1B-0074-00	SHEET	CASE(x2)	F2,K2,E2
38	G1B-0087-00	SHEET	CHASSIS LEAK	
39	G1D-0008-00	CUSHION	LCD/BACK	
40	G1D-0009-00	CUSHION	LCD/FRONT	
41	G1D-0010-00	CUSHION	ANT TERMINAL	
42	G1D-0021-00	CUSHION	20KEY CONN	
43	G1D-0025-00	CUSHION	VOL,RO-SW FPC	
45	G1D-0062-00	CUSHION	OP BOARD	
46	F1C-0042-00	CONDUCT SHEET	INTERNAL BEAT	
48	G53-1768-04	PACKING	MAIN ECM O RING	
49	G53-1792-04	PACKING	NUT O RING(x2)	
50	G53-2206-04	O RING	VOL,RO-SW(x2)	
51	G53-2207-04	PACKING	ANT	
52	G5D-0002-20	PACKING	FULL KEY	F3,K3,E
53	G5D-0003-20	PACKING	STANDARD KEY	F2,K2,E2
54	G5D-0005-00	PACKING	TOP	
55	G5D-0006-00	PACKING	TERMINAL BLOCK	
56	G5D-0007-00	PACKING	OP BOARD	
57	G5D-0018-00	PACKING	VOL,RO-SW,2ECM	
58	G09-0443-14	KNOB SPRING	VOL,RO-SW(x2)	
59	J1K-0004-10	HOLDER	FULL KEY	F3,K3,E
60	J1K-0005-10	HOLDER	STANDARD KEY	F2,K2,E2
61	J3K-0003-00	SPACER	2CH	
62	J8C-0001-00	FLEX P.BOARD	STANDARD KEY	F2,K2,E2
63	J87-0056-05	FPC(LEAD FREE)	UNIV.	
64	J87-0057-05	FPC(LEAD FREE)	PTT	
65	J87-0058-05	FPC(LEAD FREE)	VOL,CH,ECM	
66	J87-0059-05	FPC(LEAD FREE)	FULL KEY	F3,K3,E
67	K2K-0011-00	KNOB	VOL	
68	K2K-0012-00	KNOB	16CH	
69	K2K-0013-00	KNOB	2CH	
70	K2K-0014-00	KNOB	PTT	
71	K2K-0015-00	BUTTON KNOB	PTT	
72	S6A-0004-00	ROTARY SWITCH	16CH	
73	T0H-0002-00	SPEAKER	FST 1.5W/2W	
74	T9A-0001-10	ANTENNA ELEMENT	GPS ANT	
75	T9A-0004-10	ANTENNA ELEMENT	BT ANT	
76	T9B-0004-00	MIC ELEMENT	(x2)	
77	W09-0971-05	LITHIUM CELL		
78	R31-0692-05	V RESISTOR	VOL	
A	N09-2438-05	BI.HEAD SCREW	ANT(x2)	
B	N09-2441-25	SPECIAL SCREW	OP BOARD(x4)	
C	N09-6646-05	SPECIAL SCREW	CASE(x2)	
D	N14-1011-00	CIRCULAR NUT	VOL	
E	N14-1012-00	CIRCULAR NUT	RO-SW	
F	N83-2005-48	P.HEAD T.SCREW	UNIT/FIX(x10)	

△ Symbol No.	Part No.	Part Name	Description	Local
G	N84-2004-43	P.HEAD T.SCREW	TERM-BL(+,-)(x2)	
-	XC1-0331-81	SERVICE MAIN UNIT	SERVICE UNIT *Produced in Japan	F2,F3,K2,K3
-	XC1-0360-11	SERVICE MAIN UNIT	SERVICE UNIT *Produced in Malaysia	K2,K3,E,E2

Electrical parts list

MAIN UNIT

**XC1-0331-80(NX-5200_F2,NX-5200_F3,
NX-5200_K2,NX-5200_K3)**

**XC1-0360-10(NX-5200_K2,NX-5200_K3,
NX-5200_E,NX-5200_E2)**

***Note : This part cannot be replaced. There-
fore, this part is not supplied as a service part.**

Block No. [0][1]

△ Symbol No.	Part No.	Part Name	Description	Local
IC20	XC61CC5602N-G	IC		
IC30	XC6223H331G-G	IC		
IC31	XC6209B312D-G	IC		
IC32	XC6215B122N-G	IC		
IC33	TPS62140RGT	IC		
IC34	LXDC2HN18F163	IC		
IC35	XC6223D331G-G	IC		
IC36	XC6209B502D-G	IC		
IC37	BU18TD2WNVX	IC		
IC38	BU33TD2WNVX	IC		
IC39	NJM2878F4-33	IC		
IC60	TPS61041DRVR	IC		
IC61	BU33TD2WNVX	IC		
IC63	XC6209B502D-G	IC		
IC64	XC6209B502D-G	IC		
IC65	XC6209B502D-G	IC		
IC70	BU7242NUX	IC		
IC80	BU30TD2WNVX	IC		
IC81	XC6223H331G-G	IC		
IC82	XC6209B502D-G	IC		
IC100	SKY72310362LF	IC		
IC101	OPA170AIDRLR	IC		
IC102	BU7242NUX	IC		
IC200	SKY72310362LF	IC		
IC201	OPA170AIDRLR	IC		
IC300	UPC2710TB-A	IC		
IC360	XC8102AA07-G	IC		
IC400	NJM12904RB1	IC		
IC550	BU7295HFV	IC		
IC551	BU7295HFV	IC		
IC600	AD9864BPCZRL	IC		
IC700	CDC3S04YFF	IC		
IC701	XC8102AA07-G	IC		
IC702	-----	IC	*Note	
IC703	-----	IC	*Note	
IC704	S-80135ANPF-G	IC		
IC705	-----	IC	*Note	
IC706	TC7SZ08FE	IC		
IC708	-----	IC	*Note	
IC709	KXCJ9-1008	IC		
IC711	BD11600NUX	IC		
IC712	TC7WH14FK-F	IC		
IC800	BD1754HFN	IC		
IC801	NJW4184U2-05	IC		
IC802	TC7W53FKF	IC		
IC803	TC7SPB9306TUF	IC		
IC804	BD11600NUX	IC		
IC805	TC7WT126FU-F	IC		
IC806	TC7SZ08FE	IC		
IC807	TC7SZ08FE	IC		
IC850	-----	IC	*Note	
IC851	-----	IC	*Note	
IC852	74AVC4TD245GU	IC		
IC853	74AVC4TD245GU	IC		
IC900	ADS7961SRHB	IC		
IC901	DAC124S085CIS	IC		
IC902	TLV32AIC3104I	IC		
IC903	R2A20178NP	IC		
IC904	TPA6201A1DRBR	IC		
IC905	TPA6201A1DRBR	IC		
IC906	BD11600NUX	IC		

△ Symbol No. Part No. Part Name Description Local

Q20	EMD12	TRANSISTOR		
Q21	SSM6N37FE	FET		
Q22	SSM6N37FE	FET		
Q30	SSM3K15AMFV	FET		
Q31	KTA2012EP	TRANSISTOR		
Q32	EM6M2	FET		
Q33	EM6M2	FET		
Q70	LTC014EEBFS8	DIGI TRANSISTOR		
Q71	2SB1132(Q,R)	TRANSISTOR		
Q100	EM6M2	FET		
Q101	DSC9A01/TI	TRANSISTOR		
Q110	SSM3J15FS	FET		
Q111	EM6M2	FET		
Q160	MCH3914-H/8/	FET		
Q180	2SC5108F/Y/	TRANSISTOR		
Q181	2SC5108F/Y/	TRANSISTOR		
Q200	EM6M2	FET		
Q201	DSC9A01/TI	TRANSISTOR		
Q210	SSM3J15FS	FET		
Q211	EM6M2	FET		
Q240	MCH3914-H/8/	FET		
Q280	2SC5108F/Y/	TRANSISTOR		
Q281	2SC5108F/Y/	TRANSISTOR		
Q310	2SK3077F	FET		
Q320	RD01MUS2BT113	FET		
Q330	RD07MUS2BT214	FET		
Q390	LSCR523EBFS8	TRANSISTOR		
Q400	LTC023JEBFS8	DIGI TRANSISTOR		
Q401	SSM3K15AMFV	FET		
Q402	SSM3K15AMFV	FET		
Q403	EMD9	TRANSISTOR		
Q404	SSM3J15FS	FET		
Q500	BB506CFS-H	FET		
Q530	3SK318	FET		
Q580	2SC5108F/Y/	TRANSISTOR		
Q600	MCH3914-H/8/	FET		
Q601	LTC023JEBFS8	DIGI TRANSISTOR		
Q602	LSCR523EBFS8	TRANSISTOR		
Q660	2SC5066F/O/	TRANSISTOR		
Q670	BB506CFS-H	FET		
Q700	2SC4617/S/	TRANSISTOR		
Q701	SSM3K15AMFV	FET		
Q702	LTC014EEBFS8	DIGI TRANSISTOR		
Q703	SSM6N37FE	FET		
Q800	SSM3K15AMFV	FET		
Q801	EMD9	TRANSISTOR		
Q850	SSM3K15AMFV	FET		

D1	1SR154-400	DIODE		
D2	DA3S101F	DIODE ARRAY		
D20	DAN222	DIODE ARRAY		
D30	RB520SM-30	DIODE		
D60	DB2J40700	DIODE		
D100	EDZV8.2B	ZENER DIODE		
D101	1SS400SM	DIODE		
D160	SMV1705-079LF	VARI CAP DIODE		
D161	SMV1801-079LF	VARI CAP DIODE		
D162	SMV1801-079LF	VARI CAP DIODE		
D163	SMV1801-079LF	VARI CAP DIODE		
D164	SMV1130-079LF	VARI CAP DIODE		
D200	EDZV8.2B	ZENER DIODE		
D201	1SS400SM	DIODE		
D240	SMV1270-079LF	VARI CAP DIODE		
D241	SMV1801-079LF	VARI CAP DIODE		
D242	SMV1801-079LF	VARI CAP DIODE		
D243	SMV1801-079LF	VARI CAP DIODE		
D350	RN142S	DIODE		
D351	RN142S	DIODE		
D370	RN142S	DIODE		
D371	RN142S	DIODE		
D390	DZ2S056(M)	ZENER DIODE		
D520	BBY58-02V	VARI CAP DIODE		
D521	BBY58-02V	VARI CAP DIODE		
D530	BBY58-02V	VARI CAP DIODE		
D531	BBY58-02V	VARI CAP DIODE		
D600	SMV1705-079LF	VARI CAP DIODE		

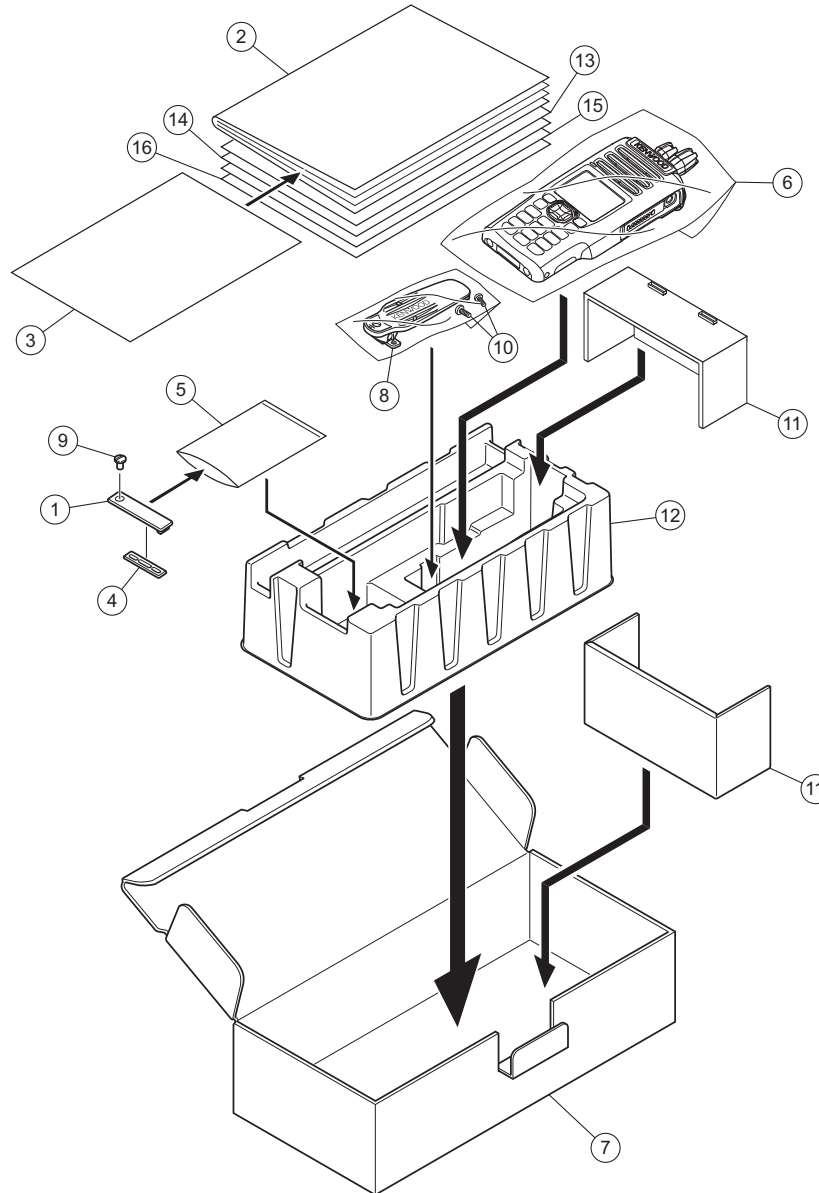
△ Symbol No.	Part No.	Part Name	Description	Local	△ Symbol No.	Part No.	Part Name	Description	Local
D601	SMV1705-079LF	VARI CAP DIODE			C57	CK73HB1A105K	C CAPACITOR	1uF 10V K	
D603	DA3S101F	DIODE ARRAY			C60	CK73GB1A335K	C CAPACITOR	3.3uF 10V K	
D700	RB521CM-30	DIODE			C61	CK73GB1A335K	C CAPACITOR	3.3uF 10V K	
D701	RB521CM-30	DIODE			C62	CK73FB1A475K	C CAPACITOR	4.7uF 10V K	
D702	RB521CM-30	DIODE			C63	CK73HBB1H681K	C CAPACITOR	680pF 50V K	
D703	RB521CM-30	DIODE			C64	CK730FA1H475K	C CAPACITOR	4.7uF 50V K	
D704	NSSM038A	LED			C65	CK73HB1A105K	C CAPACITOR	1uF 10V K	
D705	RB521CM-30	DIODE			C66	CK73HB1A105K	C CAPACITOR	1uF 10V K	
D800	RB521CM-30	DIODE			C69	CK73GXR1C225K	C CAPACITOR	2.2uF 16V K	
D801	RB521CM-30	DIODE			C70	CK73GB1E105K	C CAPACITOR	1uF 25V K	
D802	RB521CM-30	DIODE			C71	CK73GB1E105K	C CAPACITOR	1uF 25V K	
D803	RB521CM-30	DIODE			C72	CK73GXR1C225K	C CAPACITOR	2.2uF 16V K	
D804	RB521CM-30	DIODE			C73	CK73GB1E105K	C CAPACITOR	1uF 25V K	
D805	DZ5S068D	ZENER DIODE			C74	CK73GXR1C225K	C CAPACITOR	2.2uF 16V K	
D806	DZ5S068D	ZENER DIODE			C75	C93-1959-05	C CAPACITOR	0.1uF 16V	
D807	DAN222	DIODE ARRAY			C76	C93-1959-05	C CAPACITOR	0.1uF 16V	
D808	DZ5S068D	ZENER DIODE			C77	CC73HCH1H101J	C CAPACITOR	100pF 50V J	
D809	SPC10501A01	VARISTOR			C78	CK73HBB1H471K	C CAPACITOR	470pF 50V K	
D810	SPC10501A01	VARISTOR			C79	CK73GXR1C225K	C CAPACITOR	2.2uF 16V K	
D850	RN262CS	DIODE			C80	CK73HB0J225K	C CAPACITOR	2.2uF 6.3V K	
D851	RN262CS	DIODE			C81	CK73HB1A105K	C CAPACITOR	1uF 10V K	
D900	DZ2S068M	ZENER DIODE			C82	CK73HB1A105K	C CAPACITOR	1uF 10V K	
D901	DZ2S068M	ZENER DIODE			C83	CK73GB1E105K	C CAPACITOR	1uF 25V K	
D902	RB521CM-30	DIODE			C84	CK73GB1E105K	C CAPACITOR	1uF 25V K	
D903	DAN222	DIODE ARRAY			C85	CK73GXR1C225K	C CAPACITOR	2.2uF 16V K	
D904	RB521CM-30	DIODE			C86	CK73HBB1H681K	C CAPACITOR	680pF 50V K	
D905	RB521CM-30	DIODE			C90	CK73HB1E104K	C CAPACITOR	0.10uF 25V K	
D906	RB521CM-30	DIODE			C92	CK73FB1C106K	C CAPACITOR	10uF 16V K	
D907	RB521CM-30	DIODE			C93	C93-1967-05	C CAPACITOR	470pF 50V	
					C94	C93-1967-05	C CAPACITOR	470pF 50V	
C1	CK73HBB1H102K	C CAPACITOR	1000pF 50V K		C101	CC73HCH1H100B	C CAPACITOR	10pF 50V B	
C2	CC73HCH1H220G	C CAPACITOR	22pF 50V G		C102	CK73HB1H103K	C CAPACITOR	10000pF 50V K	
C3	CK73HBB1H682K	C CAPACITOR	6800pF 50V K		C103	CK73HB1H103K	C CAPACITOR	10000pF 50V K	
C5	CC73HCH1H101J	C CAPACITOR	100pF 50V J		C105	CK73HB1H103K	C CAPACITOR	10000pF 50V K	
C7	C93-1967-05	C CAPACITOR	470pF 50V		C107	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C8	C93-1967-05	C CAPACITOR	470pF 50V		C108	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C9	C93-1967-05	C CAPACITOR	470pF 50V		C110	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C10	C93-1967-05	C CAPACITOR	470pF 50V		C111	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C11	C93-1967-05	C CAPACITOR	470pF 50V		C112	C93-1959-05	C CAPACITOR	0.1uF 16V	
C12	CK73HBB1H682K	C CAPACITOR	6800pF 50V K		C113	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C13	C93-1967-05	C CAPACITOR	470pF 50V		C114	CC73HCH1H101J	C CAPACITOR	100pF 50V J	
C14	C93-1967-05	C CAPACITOR	470pF 50V		C115	C93-1959-05	C CAPACITOR	0.1uF 16V	
C15	C93-1967-05	C CAPACITOR	470pF 50V		C116	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C16	C93-1967-05	C CAPACITOR	470pF 50V		C117	CK73HBB1H472K	C CAPACITOR	4700pF 50V K	
C17	C93-1967-05	C CAPACITOR	470pF 50V		C118	CK73HB1H103K	C CAPACITOR	10000pF 50V K	
C18	C93-1967-05	C CAPACITOR	470pF 50V		C119	CC73HCH1H330G	C CAPACITOR	33pF 50V G	
C19	C93-1967-05	C CAPACITOR	470pF 50V		C120	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C20	CK73HB1E104K	C CAPACITOR	0.10uF 25V K		C121	CK73GB1H105K	C CAPACITOR	1uF 50V K	
C21	CK73HBB1H471K	C CAPACITOR	470pF 50V K		C123	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C22	CC73JCH1H101J	C CAPACITOR	100pF 50V J		C124	C93-1959-05	C CAPACITOR	0.1uF 16V	
C23	C93-1959-05	C CAPACITOR	0.1uF 16V		C125	CC73JCH1H101J	C CAPACITOR	100pF 50V J	
C25	CK73FB1C106K	C CAPACITOR	10uF 16V K		C126	C93-1967-05	C CAPACITOR	470pF 50V	
C30	CK73GB1E105K	C CAPACITOR	1uF 25V K		C127	CS77BP1A4R7M	TA E CAPACITOR	4.7uF 10V M	
C31	CK73HB1A105K	C CAPACITOR	1uF 10V K		C128	C93-1967-05	C CAPACITOR	470pF 50V	
C32	CK73GB1E105K	C CAPACITOR	1uF 25V K		C131	CK73HBB1H102K	C CAPACITOR	1000pF 50V K	
C33	CK73GB1E105K	C CAPACITOR	1uF 25V K		C140	CK73FB1E224K	C CAPACITOR	0.22uF 25V K	
C34	CK73HB1A105K	C CAPACITOR	1uF 10V K		C141	CS77ABE1D100M	TA E CAPACITOR	10uF 20V M	
C35	CK73HB1A105K	C CAPACITOR	1uF 10V K		C160	CK73HB1A105K	C CAPACITOR	1uF 10V K	
C36	CK73FB1C106K	C CAPACITOR	10uF 16V K		C161	CK73HBB1H471K	C CAPACITOR	470pF 50V K	
C37	CK73FB1C106K	C CAPACITOR	10uF 16V K		C163	CC73HCH1H470G	C CAPACITOR	47pF 50V G	
C38	CK73HBB1H332K	C CAPACITOR	3300pF 50V K		C165	CC73HCH1HR75B	C CAPACITOR	0.75pF 50V B	
C39	CK73HB1E104K	C CAPACITOR	0.10uF 25V K		C166	CC73HCH1H130G	C CAPACITOR	13pF 50V G	
C41	CK73FXR0J226M	C CAPACITOR	22uF 6.3V M		C167	CC73HCH1H130G	C CAPACITOR	13pF 50V G	
C42	CK73FB1A475K	C CAPACITOR	4.7uF 10V K		C168	CK73HBB1H102K	C CAPACITOR	1000pF 50V K	
C43	CK73GB0J106K	C CAPACITOR	10uF 6.3V K		C169	C93-1967-05	C CAPACITOR	470pF 50V	
C44	CK73HB1A105K	C CAPACITOR	1uF 10V K		C170	CC73HCH1H0R5B	C CAPACITOR	0.5pF 50V B	
C45	CK73GB1E105K	C CAPACITOR	1uF 25V K		C171	CK73HB1A105K	C CAPACITOR	1uF 10V K	
C46	CK73GB1E105K	C CAPACITOR	1uF 25V K		C173	CC73FSL1H473J	C CAPACITOR	0.047uF 50V J	
C47	C93-1967-05	C CAPACITOR	470pF 50V		C181	CK73HBB1H471K	C CAPACITOR	470pF 50V K	
C48	CK73GXR1C225K	C CAPACITOR	2.2uF 16V K		C182	CK73HBB1H102K	C CAPACITOR	1000pF 50V K	
C49	CK73HBB1H682K	C CAPACITOR	6800pF 50V K		C183	CC73HCH1H220G	C CAPACITOR	22pF 50V G	
C50	CS77PBL1A470M	TA E CAPACITOR	47uF 10V M		C184	CK73HBB1H471K	C CAPACITOR	470pF 50V K	
C51	CK73GB0J106K	C CAPACITOR	10uF 6.3V K		C185	CC73HCH1H220G	C CAPACITOR	22pF 50V G	
C52	CK73HB1A474K	C CAPACITOR	0.47uF 10V K		C186	CC73HCH1H100B	C CAPACITOR	10pF 50V B	
C53	CK73HB1A474K	C CAPACITOR	0.47uF 10V K		C187	CC73HCH1H020B	C CAPACITOR	2pF 50V B	
C54	CK73HB1A474K	C CAPACITOR	0.47uF 10V K		C188	CC73HCH1H070B	C CAPACITOR	7pF 50V B	
C55	CK73HB1A474K	C CAPACITOR	0.47uF 10V K		C189	CC73HCH1H390G	C CAPACITOR	39pF 50V G	
C56	CK73HB1A105K	C CAPACITOR	1uF 10V K		C190	CC73HCH1H150G	C CAPACITOR	15pF 50V G	

△ Symbol No.	Part No.	Part Name	Description	Local	△ Symbol No.	Part No.	Part Name	Description	Local
L38	LB73H0AV-002	CHIP FERRITE			L607	LB73H0AV-003	CHIP FERRITE		
L39	LB73G0BJ-002	CHIP FERRITE			L608	LB73H0AV-003	CHIP FERRITE		
L40	LB73H0AV-002	CHIP FERRITE			L609	L41-1885-53	CHIP INDUCTOR		
L60	L41-1502-70	CHIP INDUCTOR			L610	LK73G0AQ100K	M.CHIP INDUCTOR 10uH		
L61	LB73H0AV-002	CHIP FERRITE			L611	LK73G0AQ100K	M.CHIP INDUCTOR 10uH		
L81	LB73G0AK-001	CHIP FERRITE			L612	L41-2285-53	CHIP INDUCTOR		
L100	LB73H0AV-003	CHIP FERRITE			L613	LB73H0AV-003	CHIP FERRITE		
L101	LB73H0AV-004	CHIP FERRITE			L614	LB73H0AV-003	CHIP FERRITE		
L140	LB73H0AV-003	CHIP FERRITE			L660	LK73G0AQR33K	M.CHIP INDUCTOR 0.33uH		
L160	LK73G0AQ100K	M.CHIP INDUCTOR 10uH			L661	LB73H0AV-002	CHIP FERRITE		
L161	LK73G0AQ3R3K	M.CHIP INDUCTOR 3.3uH			L662	LK73G0AQR82K	M.CHIP INDUCTOR 0.82uH		
L162	LK73G0AQ3R3K	M.CHIP INDUCTOR 3.3uH			L670	LK73G0AQR82K	M.CHIP INDUCTOR 0.82uH		
L163	LK73G0AFR12J	M.CHIP INDUCTOR 0.12uH			L671	LK73G0AQR47K	M.CHIP INDUCTOR 0.47uH		
L164	L41-5675-43	CHIP INDUCTOR			L672	LB73H0AV-002	CHIP FERRITE		
L165	LB73H0AV-004	CHIP FERRITE			L673	LK73G0ASR47J	M.CHIP INDUCTOR 470nH		
L166	LK73G0AQ3R3K	M.CHIP INDUCTOR 3.3uH			L674	LK73G0ASR47J	M.CHIP INDUCTOR 470nH		
L180	LK73H0AMR12J	M.CHIP INDUCTOR 0.12uH			L700	LB73H0AV-003	CHIP FERRITE		
L181	LK73G0AF56NJ	M.CHIP INDUCTOR 56nH			L701	LK73G0AQ4R7K	M.CHIP INDUCTOR 4.7uH		
L182	LK73H0AM5N6S	M.CHIP INDUCTOR 5.6nH			L702	LB73H0AV-002	CHIP FERRITE		
L184	LK73H0AM5N6S	M.CHIP INDUCTOR 5.6nH			L703	LB73H0AV-002	CHIP FERRITE		
L185	LK73H0AM82NJ	M.CHIP INDUCTOR 82nH			L704	LB73H0AV-002	CHIP FERRITE		
L186	LK73H0AM82NJ	M.CHIP INDUCTOR 82nH			L705	LB73G0AM-004	CHIP FERRITE		
L187	LK73H0AM12NJ	M.CHIP INDUCTOR 12nH			L706	L92-1101-05	CHIP FERRITE		
L200	LB73H0AV-003	CHIP FERRITE			L708	L92-1101-05	CHIP FERRITE		
L240	LB73H0AV-003	CHIP FERRITE			L710	LB73G0AK-001	CHIP FERRITE		
L241	LK73G0AQ100K	M.CHIP INDUCTOR 10uH			L711	LB73G0AK-001	CHIP FERRITE		
L242	LK73G0AFR22J	M.CHIP INDUCTOR 0.22uH			L717	LB73G0AK-001	CHIP FERRITE		
L243	LK73G0AFR22J	M.CHIP INDUCTOR 0.22uH			L719	LB73G0AK-001	CHIP FERRITE		
L244	LK73G0AFR27J	M.CHIP INDUCTOR 0.27uH			L800	LB73G0AK-001	CHIP FERRITE		
L245	L41-3375-43	CHIP INDUCTOR			L808	LB73G0AK-001	CHIP FERRITE		
L247	LK73G0AQ3R3K	M.CHIP INDUCTOR 3.3uH			L809	LB73G0AM-004	CHIP FERRITE		
L248	LB73H0AV-004	CHIP FERRITE			L810	LB73G0AM-004	CHIP FERRITE		
L280	LK73H0AM68NJ	M.CHIP INDUCTOR 68nH			L811	LB73H0AV-002	CHIP FERRITE		
L281	LK73G0AF39NJ	M.CHIP INDUCTOR 39nH			L812	LB73H0AV-002	CHIP FERRITE		
L282	L40-3363-71	CHIP INDUCTOR			L813	LB73G0AM-004	CHIP FERRITE		
L284	LK73H0AM4N7S	M.CHIP INDUCTOR 4.7nH			L814	LB73H0AV-002	CHIP FERRITE		
L285	LK73H0AM56NJ	M.CHIP INDUCTOR 56nH			L815	LB73G0AM-004	CHIP FERRITE		
L286	LK73H0AM56NJ	M.CHIP INDUCTOR 56nH			L850	L92-0487-05	CHIP FERRITE		
L287	LK73H0AM10NJ	M.CHIP INDUCTOR 10nH			L851	L92-0487-05	CHIP FERRITE		
L303	LK73G0AF68NJ	M.CHIP INDUCTOR 68nH			L852	LK73H0AM10NJ	M.CHIP INDUCTOR 10nH		
L310	LK73H0AM47NJ	M.CHIP INDUCTOR 47nH			L853	L79-1985-05	FILTER		
L311	LK73H0AM68NJ	M.CHIP INDUCTOR 68nH			L854	L92-0487-05	CHIP FERRITE		
L312	LK73H0AM82NJ	M.CHIP INDUCTOR 82nH			L855	L79-1987-05	FILTER		
L313	LB73G0BD-005	CHIP FERRITE			L856	LK73H0AM6N8J	M.CHIP INDUCTOR 6.8nH		
L320	LK73H0AM47NJ	M.CHIP INDUCTOR 47nH			L857	L79-1985-05	FILTER		
L322	LR79Z0CAR10J	CHIP INDUCTOR 0.1uH			L858	L41-3965-55	CHIP INDUCTOR		
L323	LB73F0AV-002	CHIP FERRITE			L859	L41-3965-55	CHIP INDUCTOR		
L330	LK73G0AF8N2J	M.CHIP INDUCTOR 8.2nH			L861	L92-0487-05	CHIP FERRITE		
L331	LR79Z0DC27N9J	CHIP INDUCTOR 27.9nH			L862	L92-0487-05	CHIP FERRITE		
L332	LB73F0AV-002	CHIP FERRITE			L863	L40-2263-71	CHIP INDUCTOR		
L333	LK73G0AF6N8J	M.CHIP INDUCTOR 6.8nH			L902	LB73H0AV-002	CHIP FERRITE		
L340	LR79Z0DC16N7J	CHIP INDUCTOR 16.7nH			L903	LB73G0AM-004	CHIP FERRITE		
L341	LR79Z0DC22NJ	CHIP INDUCTOR 22nH			L904	LB73G0AM-004	CHIP FERRITE		
L350	LR79Z0DD12N2J	CHIP INDUCTOR 12.2nH							
L351	LR79Z0DD43N6J	CHIP INDUCTOR 43.6nH			A30	W02-3785-05	DC-DC CONVERTER		
L352	LR79Z0DD43N6J	CHIP INDUCTOR 43.6nH			CN1	G0B-0023-00	EARTH SPRING		
L353	LR79Z0DD43N6J	CHIP INDUCTOR 43.6nH			CN3	G0B-0023-00	EARTH SPRING		
L360	LR73Z0AE2R2J	CHIP INDUCTOR 2.2uH			CN4	E40-6970-05	PIN ASSY		
L370	LR79Z0DC45N5J	CHIP INDUCTOR 45.5nH			CN7	J19-5386-05	HOLDER		
L500	LR77Z0AER56J	CHIP INDUCTOR 0.56uH			CN8	E40-6883-05	F.C.CONNECTOR		
L501	LB73G0BD-005	CHIP FERRITE			CN9	E40-6962-05	F.C.CONNECTOR		
L502	LR77Z0AER27J	CHIP INDUCTOR 0.27uH			CN10	E40-6720-05	SOCKET FOR PIN		
L503	L41-1285-53	CHIP INDUCTOR			CN11	E40-6720-05	SOCKET FOR PIN		
L504	L41-2285-14	CHIP INDUCTOR			CN12	E41-3167-05	F.C.CONNECTOR		
L520	L41-6878-14	CHIP INDUCTOR			CN13	E41-1486-05	PIN ASSY		
L530	L41-6878-14	CHIP INDUCTOR			CN14	G0B-0005-00	EARTH SPRING		
L532	L41-6878-14	CHIP INDUCTOR			CN15	G0B-0005-00	EARTH SPRING		
L535	L41-8278-14	CHIP INDUCTOR			CN16	G0B-0005-00	EARTH SPRING		
L580	LK73H0AM33NJ	M.CHIP INDUCTOR 33nH			CN17	G0B-0005-00	EARTH SPRING		
L581	LK73H0AM33NJ	M.CHIP INDUCTOR 33nH			CN18	G0B-0005-00	EARTH SPRING		
L582	LK73G0AF82NJ	M.CHIP INDUCTOR 82nH			CN20	G0B-0005-00	EARTH SPRING		
L600	LK73G0AQ100K	M.CHIP INDUCTOR 10uH			CN21	G0B-0005-00	EARTH SPRING		
L601	LB73H0AV-003	CHIP FERRITE			CN301	E23-1278-05	TERMINAL		
L602	LB73H0AV-003	CHIP FERRITE			CN602	E23-1278-05	TERMINAL		
L603	L41-3988-55	CHIP INDUCTOR			CN603	G0B-0002-00	EARTH SPRING		
L604	LK73G0AFR27J	M.CHIP INDUCTOR 0.27uH			CN912	G0B-0005-00	EARTH SPRING		
L605	LB73H0AV-003	CHIP FERRITE			CP100	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
L606	L41-4798-14	CHIP INDUCTOR			CP200	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	

Symbol No.	Part No.	Part Name	Description	Local
CP600	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP601	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP700	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP701	RK74HB1J101J	NET RESISTOR	100Ω 1/16W J	
CP702	RK74HB1J101J	NET RESISTOR	100Ω 1/16W J	
CP850	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP851	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP900	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP901	RK74HB1J101J	NET RESISTOR	100Ω 1/16W J	
CP903	RK74HB1J101J	NET RESISTOR	100Ω 1/16W J	
CP904	RK74HB1J101J	NET RESISTOR	100Ω 1/16W J	
CP905	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP906	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP907	RK74HA1J100J	NET RESISTOR	10Ω 1/16W J	
CP908	RK74HB1J100J	NET RESISTOR	10Ω 1/16W J	
CP909	RK74HB1J104J	NET RESISTOR	100kΩ 1/16W J	
CP910	RK74HB1J101J	NET RESISTOR	100Ω 1/16W J	
CP911	RK74HB1J221J	NET RESISTOR	220Ω 1/16W J	
CP912	RK74HB1J221J	NET RESISTOR	220Ω 1/16W J	
CP913	RK74HB1J221J	NET RESISTOR	220Ω 1/16W J	
CP914	RK74HB1J221J	NET RESISTOR	220Ω 1/16W J	
CP915	RK74HB1J221J	NET RESISTOR	220Ω 1/16W J	
E1	F10-3224-15	SHIELDING CASE		
E2	F10-3228-05	SHIELDING CASE		F2,F3,K2,K3
E2	F10-3228-15	SHIELDING CASE		E,E2
E3	F10-3244-05	SHIELDING CASE		F2,F3,K2,K3
E3	F10-3244-15	SHIELDING CASE		E,E2
E4	F10-3236-05	SHIELDING CASE		
E5	F10-3246-15	SHIELDING CASE		
F1	FZA10BQ-3R15	FUSE (CC)		
F2	F53-0498-05	FUSE		
J1	E68-0426-05	JACK OTHERS		
OT1	F10-3223-05	SHIELDING COVER		
OT2	F10-3227-05	SHIELDING COVER		
OT3	F10-3243-15	SHIELDING COVER		
OT4	F10-3245-15	SHIELDING COVER		
OT5	H52-1258-02	ITEM CARTON		F2,F3,K2,K3
OT5	H52-2343-04	ITEM CARTON		E,E2
S1	S70-0530-05	TACTILE PUSH SW		
S2	S68-0931-05	PUSH SWITCH		
TH400	ERTJ0V104H	N THERMISTOR		
TH700	ERTJ0V104H	N THERMISTOR		
X700	L77-3123-05	TCXO		
X701	L77-1802-05	QUARTZ CRYSTAL		
X850	L77-3121-05	QUARTZ CRYSTAL		
XF670	L7B-0003-00	MCF		

Packing materials and accessories parts list

Block No.M2MM



Packing and accessories

Block No. [M][2][M][M]

△ Symbol No.	Part No.	Part Name	Description	Block No. [M][2][M][M] Local
1	B0K-0002-00	CAP	ACC	
2	B5A-0049-10	INSTRUCTION MANUAL	ACC	F2,F3,K2,K3
2	B5A-0940-00	INSTRUCTION MANUAL	ACC/9 LANG	E,E2
3	-----	PAMPHLET	SAR(E,F)	F2,F3,K2,K3
3	-----	PAMPHLET	ROHS2	E,E2
4	G5D-0027-00	PACKING	ACC/CAP	
5	-----	PROTECTION BAG	ACC/CAP	
6	-----	PROTECTION BAG	RADIO	
7	H5A-0012-00	ITEM CARTON CASE	*Produced in Japan	F2,F3,K2,K3
7	H5A-0203-00	ITEM CARTON CASE	*Produced in Malaysia	K2,K3,E,E2
8	J29-0730-05	HOOK	ACC/KBH-11	
9	N08-0571-04	DRESSED SCREW	ACC/CAP	
10	N09-6585-15	SPECIAL SCREW	ACC/KBH-11(x2)	
11	H1C-0036-00	PACKING FIXTURE	*Produced in Japan(x2)	F2,F3,K2,K3
11	H1C-0037-00	PACKING FIXTURE	*Produced in Malaysia(x2)	K2,K3,E,E2
12	H1C-0011-00	PACKING FIXTURE		
13	B5A-0327-30	INSTRUCTION MANUAL	WEB/EN	
14	B5A-0328-30	INSTRUCTION MANUAL	WEB/FR	
15	B5A-0329-30	INSTRUCTION MANUAL	WEB/ES	
16	B5A-0330-30	INSTRUCTION MANUAL	QUICK GUIDE	



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