KENWOOD

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VHF/UHF FM TRANSCEIVER

TK-2180/TK-3180

SERVICE MANUAL

ADDENDUM

KENWOOD

Kenwood Corporation

B51-8731-00 (N) PDF

MPT Trunking Version

Use this service manual together with the following service manuals.

- TK-2180 service manuals (B51-8689-00, B51-8710-00 and B51-8725-00)
- TK-3180 service manuals (B51-8690-00, B51-8699-00, B51-8711-00 and B51-8726-00)

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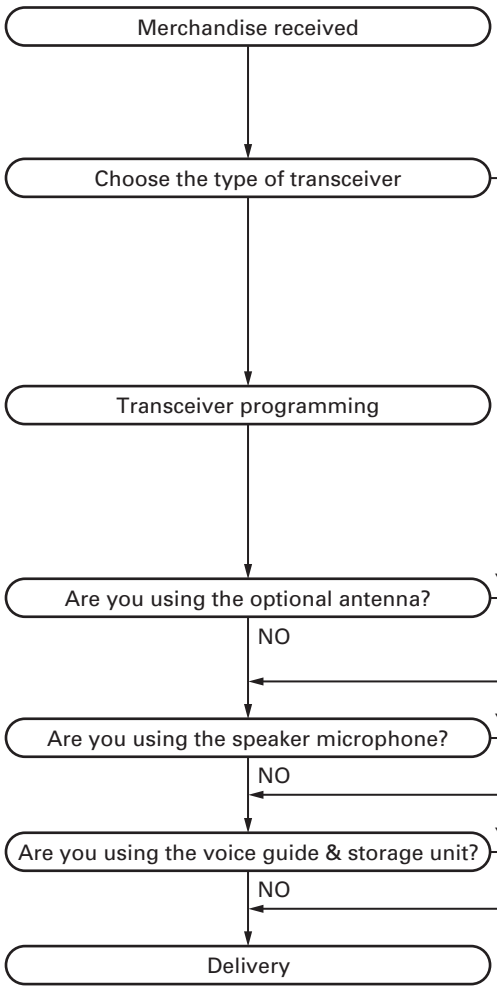
This product uses Lead Free solder.

SYSTEM SET-UP



Frequency range (MHz)	RF power	Type	12-key
TX/RX 136~174	5W	TK-2180 K	No
TX/RX 136~174	5W	TK-2180 K2	Yes
TX/RX 136~174	5W	TK-2180 E	Yes
TX/RX 450~520	5W	TK-3180 K	No
TX/RX 400~470	5W	TK-3180 K2	No
TX/RX 450~520	5W	TK-3180 K3	Yes
TX/RX 400~470	5W	TK-3180 K4	Yes
TX/RX 400~470	5W	TK-3180 E	Yes

A personal computer (IBM PC or compatible), programming interface (KPG-36), and programming software (KPG-96D) are required for programming.
(The frequency, and signalling data are programmed for the transceiver.)

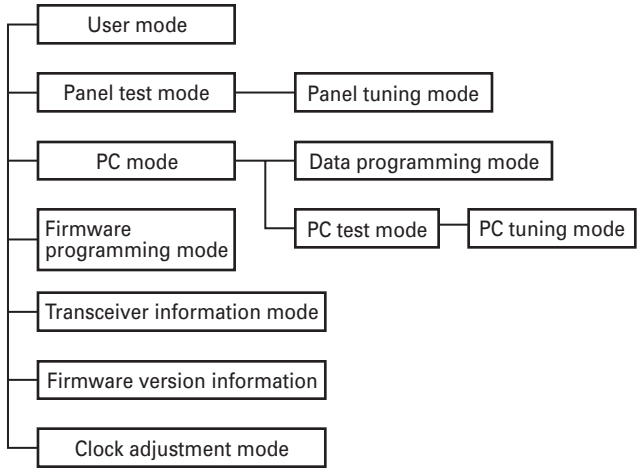
KRA-22 or KRA-26 : TK-2180
KRA-23 or KRA-27 : TK-3180
Helical antenna
(Option)

KMC-25
(Option)

VGS-1
(Option)

REALIGNMENT

1. Modes



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 (IBM compatible).
Data programming mode	Used to read and write frequency data and other features to and from the transceiver.
PC test mode	Used to check the transceiver using the PC. This feature is included in the FPU. See panel tuning.
Firmware programming mode	Used when changing the main program of the flash memory.
Transceiver information mode	Used to confirm the MPT ESN, firmware version and transceiver serial number.
Firmware version information	Used to confirm the internal firmware version.
Clock adjustment mode	Used by the dealer to adjust date and time.

2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
Panel test mode	[A] + Power ON
PC mode	Received commands from PC
Panel tuning mode	[Panel test mode] + [S]
Firmware programming mode	[S] + Power ON
Transceiver information mode	[B] + Power ON
Firmware version information	[Side1] + Power ON
Clock adjustment mode	[C] + Power ON

3. Panel Test Mode

Setting method refer to ADJUSTMENT.

4. Panel Tuning Mode

Setting method refer to ADJUSTMENT.

5. PC Mode

5-1. Preface

The transceiver is programmed by using a personal computer, programming interface (KPG-36) and programming software (KPG-96D).

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

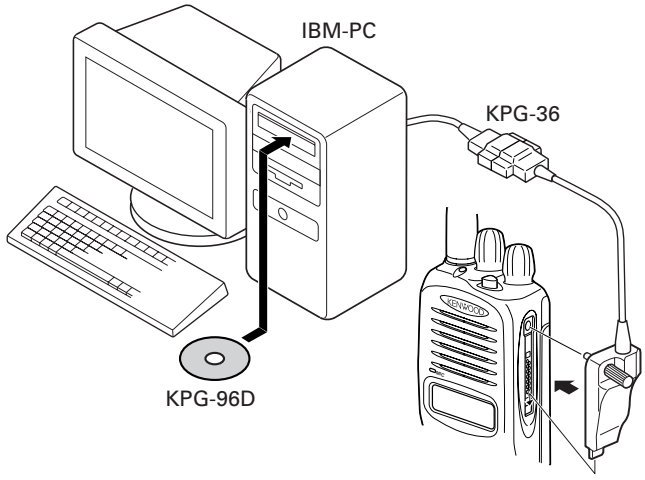


Fig. 1

5-2. Connection procedure

1. Connect the transceiver to the personal computer with the interface cable.
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 transceiver, the red LED is lights.
   When data receiving to transceiver, the green LED is lights.

Note:

The data stored in the personal computer must match model type, when it is written into the flash memory.

REALIGNMENT

5-3. KPG-36 description (PC programming interface cable: Option)

The KPG-36 is required to interface the transceiver to the computer. It has a circuit in its D-subconnector (25-pin) case that converts the RS-232C logic level to the TTL level.

The KPG-36 connects the universal connector of the transceiver to the computers RS-232C serial port.

5-4. Programming software KPG-96D description

The KPG-96D is the programming software for the transceiver. This software runs under MS-Windows 98, ME, Windows 2000 or XP on an IBM-PC or compatible machine.

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

6. Firmware Programming Mode

6-1. Preface

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

6-2. Connection procedure

Connect the transceiver to the personal computer (IBM PC or compatible) with the interface cable (KPG-36). (Connection is the same as in the PC Mode.)

6-3. Programming

1. Start up the firmware programming software (Fpro.exe).
2. Set the communications speed (normally, 115200 bps) and communications port in the configuration item.
3. Set the firmware to be updated by File name item.
4. Turn the transceiver power ON with the [S] switch held down. Then, the orange LED on the transceiver lights and "PROG 115200" 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 [PG] display is blinking.
7. If writing ends successfully, the checksum is calculated and a result is displayed.
8. If you want to continue programming other transceivers, repeat steps 4 to 7.

Note:

This mode cannot be entered if the Firmware Programming mode is set to Disable in the Programming software.

6-4. Function

1. If you press the [Side2] switch (under of left side) while "PROG 115200" is displayed, the display changes to "PROG 19200" to indicate that the write speed is low speed (19200 bps). If you press the [Side2] switch again while "PROG 19200" is displayed, the display changes to "PROG 38400". If you press the [Side2] switch again while "PROG 38400" is displayed, the display changes to "PROG 57600". If you press the [Side2] switch again while "PROG 57600" is displayed, the display returns to "PROG 115200".
2. If you press the [Side1] switch (top of left side) while "PROG 115200" is displayed, the checksum is calculated, and a result is displayed. If you press the [Side1] switch again while the checksum is displayed, "PROG 115200" is redisplayed.

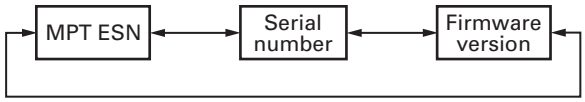
Note:

Normally, write in the high-speed mode.

7. Transceiver Information Mode

Use this function to comfirm the MPT ESN, the firmware version and the transceiver serial number.

1. Press and hold the [B] key for 2 seconds while turning the power ON.
2. Use the [Selector] to select the confirmation items.
3. To exit the transceiver information mode, turn the transceiver power OFF.

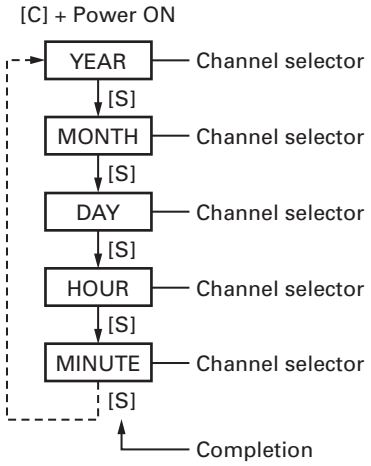


8. Firmware Version Information

Turn the transceiver ON with the [Side1] switch held down. Then, the version is displayed during holding the [Side1] switch.

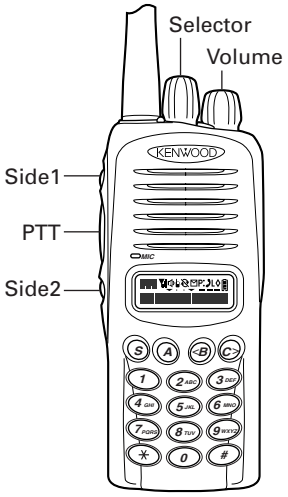
9. Clock Adjustment Mode

9-1. Flow chart of operation



ADJUSTMENT

Controls



Panel Test Mode

■ Test mode operation features

This transceiver has a test mode. ***To enter test mode, press [A] key and turn power on. Hold [A] key until frequency version appears on LCD.*** Test mode can be inhibited by programming. To exit test mode, switch the power on again. The following functions are available in test mode.

■ Key operation

Key	"FNC" not appears	
	Function	Display
[S]	Shifts to Panel tuning mode	-
[A]	Function on	"FNC" appears
[B]	MSK 1200bps and 2400bps	2400bps : ✉ icon appears
[C]	Test signaling CH up	Signaling No.
[Selector]	Test frequency CH up/down	Channel No.
[Side1]	Squelch on/off	🔇
[Side2]	Narrow//Wide	Narrow : "n" Wide : "w"
[PTT]	Transmit	-
[0] to [9] and [#],[*]	Use as the DTMF keypad. If a key is pressed during transmission, the DTMF corresponding to the key that was presses is sent.	-

Key	"FNC" appears	
	Function	Display
[S]	High power / Low power	Low : L icon appears
[A]	Function off	-
[B]	Compander on/off	On : ☎ icon appears
[C]	Beat shift on/off	On : ◊ icon appears
[Selector]	Test frequency CH up/down	-
[Side1]	Squelch level 0	On : P• icon appears
[Side2]	LCD all lights	LCD all point appears
[PTT]	Transmit	-
[0] to [9] and [#],[*]	Function off	-

Note:

If a [S], [A], [B], [C] key is pressed during transmission, the DTMF corresponding to the key that was pressed is sent.

• LED indicator

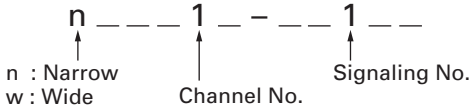
Red LED Lights during transmission. Blinks at the low battery voltage warning.

Green LED Lights when there is carrier.

• Sub LCD indicator

"FNC" Appears at function on.

• LCD display in panel test mode



ADJUSTMENT

■ Frequency and Signaling

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

• Test frequency

136~174MHz (TK-2180)

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	177.95000	177.90000
8~16	-	-

450~520MHz (TK-3180 K,K3)

CH	RX (MHz)	TX (MHz)
1	485.05000	485.10000
2	450.05000	450.10000
3	519.95000	519.90000
4	485.00000	485.00000
5	485.20000	485.20000
6	485.40000	485.40000
7~16	-	-

400~470MHz (TK-3180 K2,K4,E)

CH	RX (MHz)	TX (MHz)
1	435.05000	435.10000
2	400.05000	400.10000
3	469.95000	469.90000
4	435.00000	435.00000
5	435.20000	435.20000
6	435.40000	435.40000
7~16	-	-

• Test signaling

No.	RX	TX
1	None	None
2	None	100Hz Square Wave
3	Skip	
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 : 023N	DQT : 023N
9	DQT : 754I	DQT : 754I
10	Skip	
11	None	DTMF Code 9
12	Skip	
13	Skip	
14	None	Single Tone : 1000Hz
15	Skip	
16	None	MSK
17	MSK : Preamble : 0xAAAA Sync : 0x23EB Data : 0x230960C6AAAA CRC : 0xC4D7	MSK : Preamble : 0xAAAA Sync : 0x23EB Data : 0x230960C6AAAA CRC : 0xC4D7

Panel Tuning Mode

■ Preparations for tuning the transceiver

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

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

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

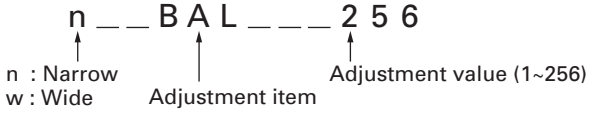
■ Transceiver tuning (To place transceiver in tuning mode)

Press [S] key, now in tuning mode. Use [B] key to write tuning data through tuning modes, and [Selector] to adjust tuning requirements (1 to 256 appears on LCD).

Use [C] key to select the adjustment item through tuning modes. Use [A] key to adjust 3 or 5 reference level adjustments, and use [Side2] key to switch between Wide/Narrow.

Channel appears on LCD. Set channel according to tuning requirements.

• LCD display in panel tuning mode



ADJUSTMENT

■ Key operation

Key	Function	
	Push	Hold (1 second)
[S]	End of panel tuning mode	-
[A]	To enter 3 or 5 reference level adjustments	-
[B]	Writes the adjustment value	-
[C]	Go to next adjustment item	Back to last adjustment item
[Selector]	Adjustment value up/down	
[Volume]	Volume level up/down	
[Side1]	Squelch on/off	-
[Side2]	Selects Narrow, Wide	-

■ 3 or 5 reference level adjustments frequency

136~174MHz (TK-2180)

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

450~520MHz (TK-3180 K,K3)

Tuning point	RX (MHz)	TX (MHz)
Low	450.05000	450.10000
Low'	469.05000	467.60000
Center	485.05000	485.10000
High'	502.55000	502.60000
High	519.95000	519.90000

400~470MHz (TK-3180 K2,K4,E)

Tuning point	RX (MHz)	TX (MHz)
Low	400.05000	400.10000
Low'	427.05000	417.60000
Center	435.05000	435.10000
High'	452.55000	452.60000
High	469.95000	469.90000

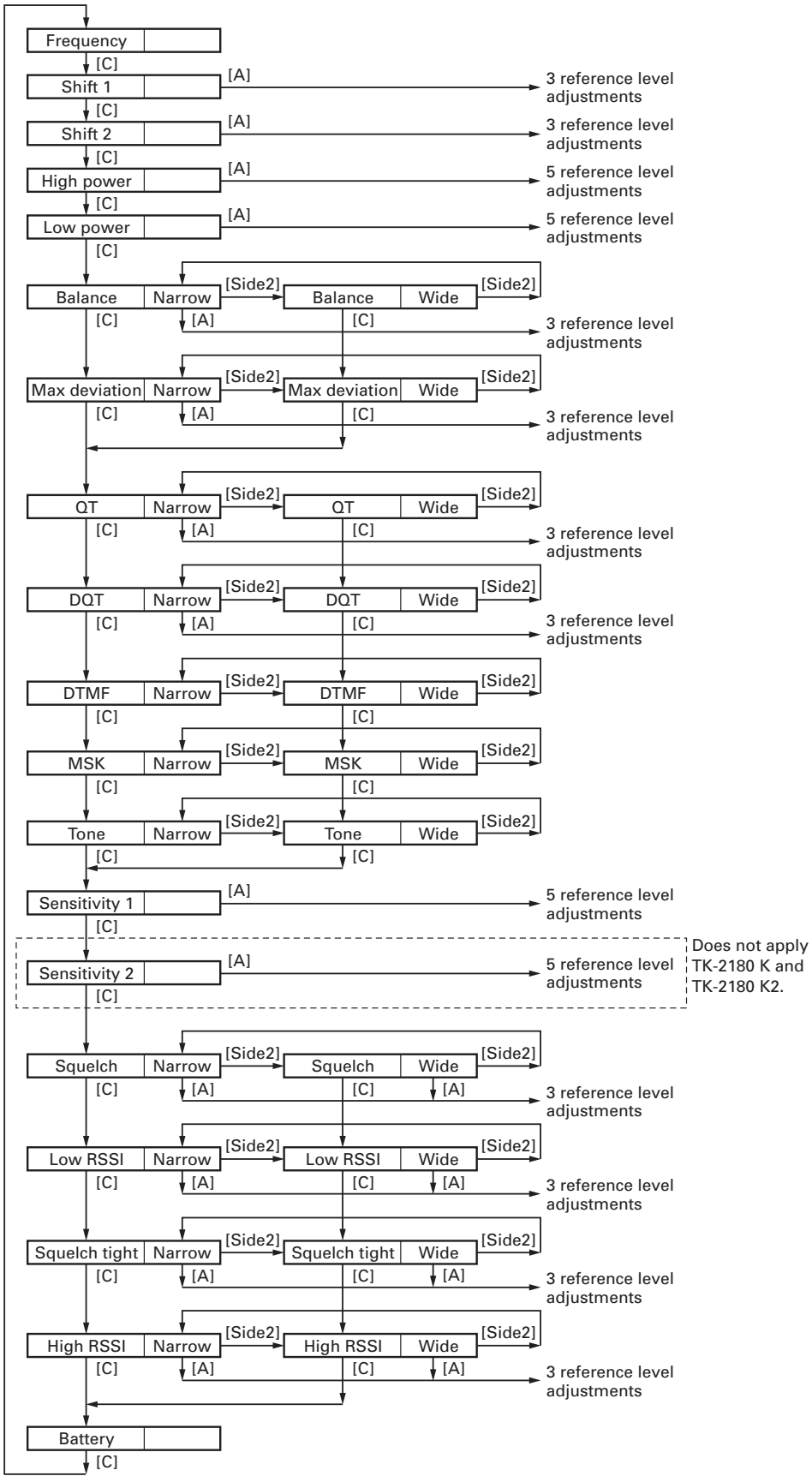
■ Adjustment item and Display

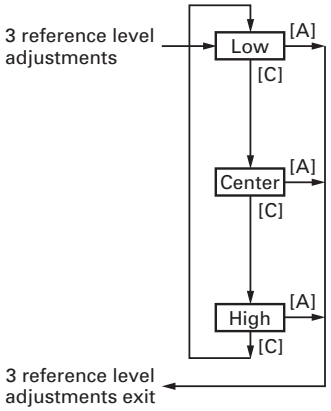
(✳✳✳ : 1~256, Only MSK : 1~64)

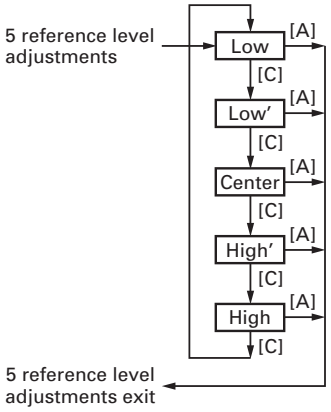
Order	Adjustment item	Display
1	Frequency	FREQ ✳✳✳
2	Shift 1	SHFT1 ✳✳✳
3	Shift 2	SHFT2 ✳✳✳
4	High power	HPWR ✳✳✳
5	Low power	LPWR ✳✳✳
6	Balance	BAL ✳✳✳
7	Max deviation	DEV ✳✳✳
8	QT	QT ✳✳✳
9	DQT	DQT ✳✳✳
10	DTMF	DTMF ✳✳✳
11	MSK	MSK ✳✳
12	Tone	TONE ✳✳✳
13	Sensitivity 1	SENS1 ✳✳✳
14	Sensitivity 2	SENS2 ✳✳✳
15	Squelch	SQL ✳✳✳
16	Low RSSI	LRSSI ✳✳✳
17	Squelch tight	SQLT ✳✳✳
18	High RSSI	HRSSI ✳✳✳
19	Battery	BATT ✳✳✳

ADJUSTMENT

■ Flow chart







ADJUSTMENT

Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range	136 to 174MHz (TK-2180), 400 to 520MHz (TK-3180)
	Modulation	Frequency modulation and external modulation
	Output	–127dBm/0.1μV to greater than –47dBm/1mV
2. Power Meter	Input Impedance	50Ω
	Operation Frequency	136 to 174MHz or more (TK-2180), 400 to 520MHz or more (TK-3180)
	Measurement Capability	Vicinity of 10W
3. Deviation Meter	Frequency Range	136 to 174MHz (TK-2180), 400 to 520MHz (TK-3180)
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. High Sensitivity Frequency Counter	Frequency Range	10Hz to 1000MHz
	Frequency Stability	0.2ppm or less
7. Ammeter		5A
8. AF Volt Meter (AF VTVM)	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. 8Ω Dummy Load		Approx. 8Ω, 3W
12. Regulated Power Supply		5V to 10V, approx. 5A
		Useful if ammeter equipped

■ Universal connector

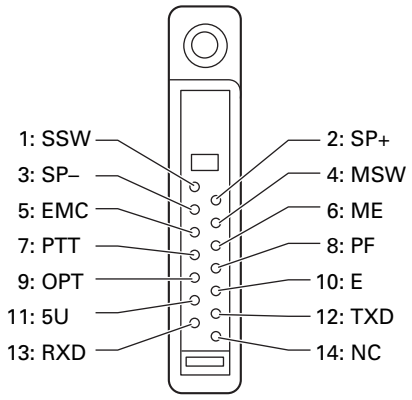
Use the interface cable (KPG-36) for PC tuning or the lead wire with plug (E30-3287-18) and screw (N08-0535-08) for panel tuning. Connect the plug to the universal connector of the radio and tighten the screw.

The lead wire with plug (E30-3287-18) and screw (N08-0535-08) terminals are as follows. Numbers are universal connector terminal numbers.

Caution

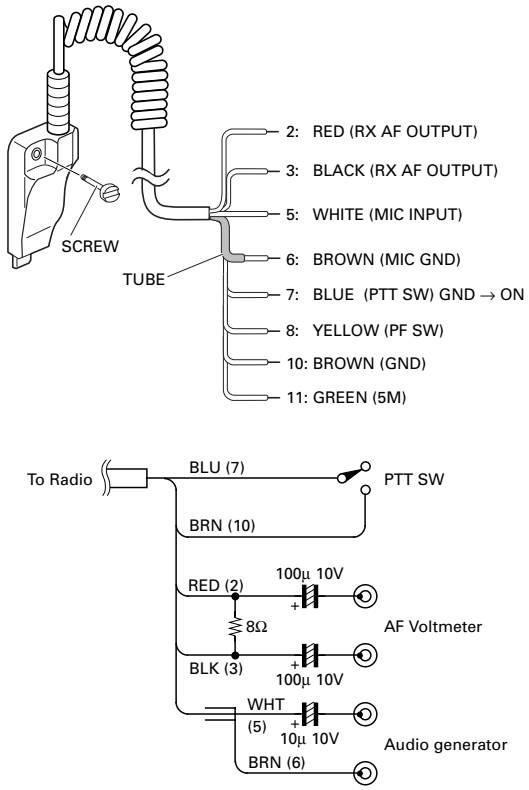
1. When connecting the plug to the universal connector of the radio, a short circuit may occur. To prevent this, be sure to turn the radio POWER switch off.
2. Since the RX AF output is a BTL output, there is a DC component. Isolate this with a capacitor or transformer as shown in the figure.
3. Do not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

• Universal connector



ADJUSTMENT

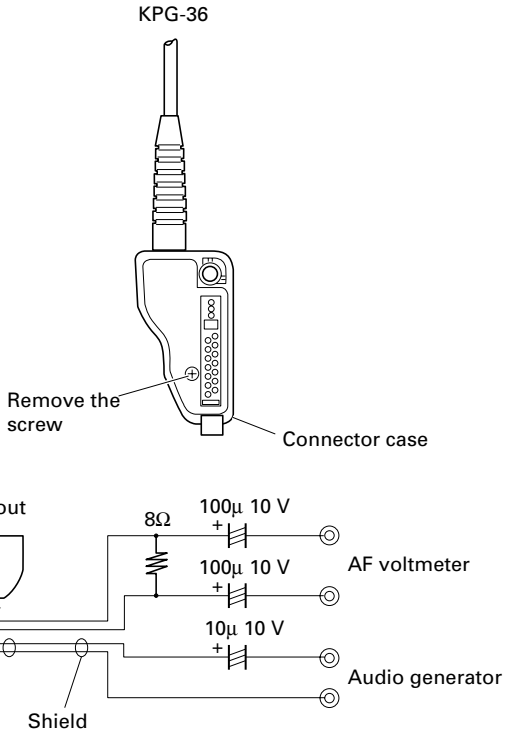
• Panel tuning



• 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.



TK-2180 Common Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) BATT terminal voltage : 7.5V 2) SSG standard modulation [Wide] MOD : 1kHz, DEV : 3kHz [Narrow] MOD : 1kHz, DEV : 1.5kHz							
2. VCO lock voltage • RX	**[Panel test mode]** 1) CH-Sig : 7-1	Power meter DVM	Panel TX-RX	ANT CV	TX-RX	TC2	4.20V	±0.1V
	2) CH-Sig : 2-1						Check	0.7V or more
• TX	**[Panel tuning mode] LPWR*** 3) CH-Sig : 7-1 PTT : ON				TX-RX	TC1	4.20V	±0.1V
	4) CH-Sig : 2-1 PTT : ON						Check	0.7V or more

* TX can be continued on unlock condition in panel tuning mode.

ADJUSTMENT

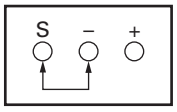
TK-2180 Transmitter Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Frequency adjust	1) Adj item : [FREQ] Adjust : [✳✳✳] PTT : ON	f. counter	Panel	ANT	Panel	Selector knob	Center frequency ±40Hz	Note : After replacing the TCXO (X1) align frequency.
2. Frequency shift 1 adjust	1) Adj item : [SHFT1] Adjust : [✳✳✳] 2) Adj item : [L SHFT1] → [C SHFT1] → [H SHFT1] Adjust : [✳✳✳] PTT : ON						[L SHFT1] Low frequency+1.25kHz [C SHFT1] Center frequency+1.25kHz [H SHFT1] High frequency+1.25kHz	±40Hz
3. Frequency shift 2 adjust	1) Adj item : [SHFT2] Adjust : [✳✳✳] 2) Adj item : [L SHFT2] → [C SHFT2] → [H SHFT2] Adjust : [✳✳✳] PTT : ON						[L SHFT2] Low frequency+2.5kHz [C SHFT2] Center frequency+2.5kHz [H SHFT2] High frequency+2.5kHz	±40Hz
4. High power adjust	1) Adj item : [HPWR] Adjust : [✳✳✳] 2) Adj item : [L HPWR] → [L' HPWR] → [C HPWR] → [H' HPWR] → [H HPWR] Adjust : [✳✳✳] PTT : ON	Power meter Ammeter					5.0W	±0.1W 2.0A or less
5. High power check	**[Panel test mode]** 1) CH-Sig : 1-1 PTT : ON						Check	4.5~5.5W 2.1A or less
	2) CH-Sig : 2-1 PTT : ON							
	3) CH-Sig : 3-1 PTT : ON							
6. Low power adjust	1) Adj item : [LPWR] Adjust : [✳✳✳] 2) Adj item : [L LPWR] → [L' LPWR] → [C LPWR] → [H' LPWR] → [H LPWR] Adjust : [✳✳✳] PTT : ON				Panel	Selector knob	1.0W	±0.1W 1.0A or less
7. Low power check	**[Panel test mode]** 1) CH-Sig : 1-1 Set low power (Push [S]) PTT : ON						Check	0.7~1.4W 1.2A or less
	2) CH-Sig : 2-1 PTT : ON							
	3) CH-Sig : 3-1 PTT : ON							

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
8. DQT balance adjust • Narrow	1) Adj item : [n BAL] Adjust : [✳✳✳] Deviation meter filter LPF : 3kHz HPF : OFF 2) Adj item : [nL BAL] → [nC BAL] → [nH BAL] Adjust : [✳✳✳] PTT : ON	Deviation meter Oscilloscope AG AF VTVM	Panel	ANT Universal connector	Panel	Selector knob	Make the demodulation waves into square waves.	
• Wide	3) Adj item : [w BAL] Adjust : [✳✳✳] PTT : ON							
9. Max DEV adjust • Narrow	1) Adj item : [n DEV] Adjust : [✳✳✳] AG : 1kHz/125mV at MIC terminal Deviation meter filter LPF : 15kHz HPF : OFF 2) Adj item : [nL DEV] → [nC DEV] → [nH DEV] Adjust : [✳✳✳] PTT : ON						2.10kHz (According to the larger +, –)	±50Hz
• Wide	3) Adj item : [w DEV] Adjust : [✳✳✳] PTT : ON						4.4kHz (According to the larger +, –)	±50Hz
10. MIC sensitivity check	**[Panel test mode]** 1) CH-Sig : 1-1 DEV : 1.5kHz (Narrow) 3.0kHz (Wide) Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						Check	AG : 1kHz/6.7mV~18.3mV at MIC terminal
11. QT deviation adjust • Narrow	1) Remove the panel tuning cable assembly from the universal connector. Adj item : [n QT] Adjust : [✳✳✳] Deviation meter filter LPF : 3kHz HPF : OFF 2) Adj item : [nL QT] → [nC QT] → [nH QT] Adjust : [✳✳✳] PTT : ON	Power meter Deviation meter Oscilloscope AG AF VTVM	Panel	ANT Universal connector	Panel	Selector knob	0.35kHz	±50Hz
• Wide	3) Adj item : [w QT] Adjust : [✳✳✳] PTT : ON						0.75kHz	±50Hz
12. DQT deviation adjust • Narrow	1) Adj item : [n DQT] Adjust : [✳✳✳] Deviation meter filter LPF : 3kHz HPF : OFF 2) Adj item : [nL DQT] → [nC DQT] → [nH DQT] Adjust : [✳✳✳] PTT : ON						0.35kHz	±50Hz

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
• Wide	3) Adj item : [w DQT] Adjust : [✳✳✳] PTT : ON	Power meter Deviation meter Oscilloscope AG AF VTVM	Panel	ANT Universal connector	Panel	Selector knob	0.75kHz	±50Hz
13. DTMF deviation adjust • Narrow	1) Adj item : [n DTMF] Adjust : [✳✳✳] Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						1.25kHz	±0.1kHz
• Wide	2) Adj item : [w DTMF] Adjust : [✳✳✳] PTT : ON						2.5kHz	±0.1kHz
14. MSK deviation adjust • Narrow	1) Adj item : [n MSK] Adjust : [✳✳] Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						1.5kHz	±0.1kHz
• Wide	2) Adj item : [w MSK] Adjust : [✳✳] PTT : ON						3.0kHz	±0.1kHz
15. TONE deviation adjust • Narrow	1) Adj item : [n TONE] Adjust : [✳✳✳] Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						1.5kHz	±0.1kHz
• Wide	2) Adj item : [w TONE] Adjust : [✳✳✳] PTT : ON						3.0kHz	±0.1kHz
16. BATT detection writing	1) Adj item : [BATT] Adjust : [✳✳✳] PTT : ON	Power meter DVM	Panel	ANT BATT terminal	Panel		After pressing the PTT switch, confirm that one predetermined numeric in the range 1 to 256 appears and then press [B] key. That numeric will be stored in memory.	BATT terminal voltage : 5.8V
17. BATT detection check	**[Panel test mode]** 1) CH-Sig : 1-1 BATT terminal voltage : 6.6V Connect "S" terminal to GND. PTT : ON						Check	The transceiver can transmit without causing the LED to blink.
	2) BATT terminal voltage : 5.8V Connect "S" terminal to GND. PTT : ON							The transceiver should not transmit and LED blinking.

ADJUSTMENT

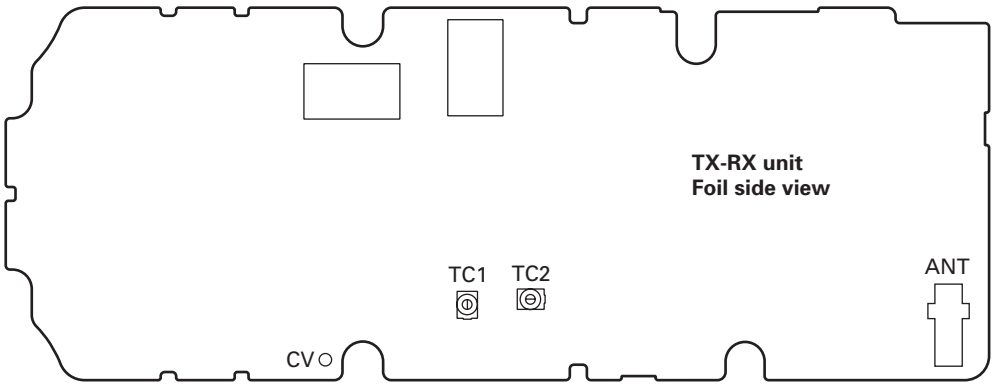
TK-2180 Receiver Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Sensivity 2 fixed value write (**E** type only)	1) Adj item : [L SENS2] → [L' SENS2] → [C SENS2] → [H' SENS2] → [H SENS2]	SSG AF VTVM Oscilloscope	Panel	ANT Universal connector	Panel	Selector knob		Write the value as followings [L SENS2] : "1" [L' SENS2] : "20" [C SENS2] : "70" [H' SENS2] : "70" [H SENS2] : "70"
2. Sensitivity 1 adjust	1) Adj item : [SENS1] Adjust : [✳✳✳] 2) Adj item : [L SENS1] → [L' SENS1] → [C SENS1] → [H' SENS1] → [H SENS1] Adjust : [✳✳✳] SSG output : –119dBm (0.25μV) **K,K2** : –118dBm (0.28μV) **E** (MOD : 1kHz/±1.5kHz)						Adjust for 12dB SINAD	Rotate the selector knob and increase the adjustment value starting from "1" to obtain SINAD 12dB.
3. Sensitivity check	**[Panel test mode]** 1) CH-Sig : 1-1 SSG output Wide : –118dBm (0.28μV) **K,K2** : –117dBm (0.32μV) **E** (MOD : 1kHz/±3kHz) Narrow : –118dBm (0.28μV) **K,K2** : –117dBm (0.32μV) **E** (MOD : 1kHz/±1.5kHz)						Check	12dB SINAD or more
4. Squelch (Preset) adjust • Narrow	1) Adj item : [n SQL] Adjust : [✳✳✳] SSG output : –118dBm (0.28μV) (MOD : 1kHz/±1.5kHz)				Panel	Selector knob	After input signal from SSG, press [B] key. That numeric will be stored in memory.	After adjusting SQL, check SQL open/close. SSG –118dBm : Open SSG OFF : Close [nC SQL] MOD 1kHz/±1.5kHz [wC SQL] MOD 1kHz/±3.0kHz
	2) Adj item : [nL SQL] → [nC SQL] → [nH SQL] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w SQL] Adjust : [✳✳✳] SSG output : –118dBm (0.28μV) (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL SQL] → [wC SQL] → [wH SQL] Adjust : [✳✳✳]							
5. Low RSSI adjust • Narrow	1) Adj item : [n LRSSI] Adjust : [✳✳✳] SSG output : –118dBm (0.28μV) (MOD : 1kHz/±1.5kHz)						After input signal from SSG, press [B] key. That numeric will be stored in memory.	
	2) Adj item : [nL LRSSI] → [nC LRSSI] → [nH LRSSI] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w LRSSI] Adjust : [✳✳✳] SSG output : –118dBm (0.28μV) (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL LRSSI] → [wC LRSSI] → [wH LRSSI] Adjust : [✳✳✳]							

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
6. Squelch (Tight) adjust • Narrow	1) Adj item : [n SQLT] Adjust : [✳✳✳] SSG output : –113dBm (0.5µV) (MOD : 1kHz/±1.5kHz)	SSG AF VTVM Oscilloscope	Panel	ANT Universal connector	Panel	Selector knob	After input signal from SSG, press [B] key. That numeric will be stored in memory.	After adjusting SQL, check SQL open/close. SSG –113dBm : Open SSG OFF : Close [nC SQLT] MOD 1kHz/±1.5kHz [wC SQLT] MOD 1kHz/±3.0kHz
	2) Adj item : [nL SQLT] → [nC SQLT] → [nH SQLT] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w SQLT] Adjust : [✳✳✳] SSG output : –113dBm (0.5µV) (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL SQLT] → [wC SQLT] → [wH SQLT] Adjust : [✳✳✳]							
7. High RSSI adjust • Narrow	1) Adj item : [n HRSSI] Adjust : [✳✳✳] SSG output : –70dBm (MOD : 1kHz/±1.5kHz)						After input signal from SSG, press [B] key. That numeric will be stored in memory.	
	2) Adj item : [nL HRSSI] → [nC HRSSI] → [nH HRSSI] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w HRSSI] Adjust : [✳✳✳] SSG output : –70dBm (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL HRSSI] → [wC HRSSI] → [wH HRSSI] Adjust : [✳✳✳]							

TK-2180 Adjustment Points



ADJUSTMENT

TK-3180 Common Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) BATT terminal voltage : 7.5V 2) SSG standard modulation [Wide] MOD : 1kHz, DEV : 3kHz [Narrow] MOD : 1kHz, DEV : 1.5kHz							
2. VCO lock voltage • RX	**[Panel test mode]** 1) CH-Sig : 3-1	Power meter DVM	Panel TX-RX	ANT CV	TX-RX	TC2	4.20V **K,K3** 4.30V **K2,K4,E**	±0.1V **K,K3** ±0.05V **K2,K4,E**
	2) CH-Sig : 2-1						Check	0.7V or more **K,K3** 0.6V or more **K2,K4,E**
• TX	**[Panel tuning mode] LPWR*** 3) CH-Sig : 3-1 PTT : ON				TX-RX	TC1	4.20V **K,K3** 4.30V **K2,K4,E**	±0.1V **K,K3** ±0.05V **K2,K4,E**
	4) CH-Sig : 2-1 PTT : ON						Check	0.7V or more **K,K3** 0.6V or more **K2,K4,E**

* TX can be continued on unlock condition in panel tuning mode.

TK-3180 Transmitter Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Frequency adjust	1) Adj item : [FREQ] Adjust : [✳✳✳] PTT : ON	f. counter	Panel	ANT	Panel	Selector knob	Center frequency ±80Hz	Note : After replacing the TCXO (X1) align frequency.
2. Frequency shift 1 adjust	1) Adj item : [SHFT1] Adjust : [✳✳✳] 2) Adj item : [L SHFT1] → [C SHFT1] → [H SHFT1] Adjust : [✳✳✳] PTT : ON						[L SHFT1] Low frequency+5.00kHz [C SHFT1] Center frequency+5.00kHz [H SHFT1] High frequency+5.00kHz	±80Hz
3. Frequency shift 2 adjust	1) Adj item : [SHFT2] Adjust : [✳✳✳] 2) Adj item : [L SHFT2] → [C SHFT2] → [H SHFT2] Adjust : [✳✳✳] PTT : ON						[L SHFT2] Low frequency+6.25kHz [C SHFT2] Center frequency+6.25kHz [H SHFT2] High frequency+6.25kHz	±80Hz
4. High power adjust	1) Adj item : [HPWR] Adjust : [✳✳✳] 2) Adj item : [L HPWR] → [L' HPWR] → [C HPWR] → [H' HPWR] → [H HPWR] Adjust : [✳✳✳] PTT : ON	Power meter Ammeter					5.0W	±0.1W 2.3A or less
5. High power check	**[Panel test mode]** 1) CH-Sig : 1-1 PTT : ON						Check	4.5~5.5W 2.4A or less
	2) CH-Sig : 2-1 PTT : ON							
	3) CH-Sig : 3-1 PTT : ON							

ADJUSTMENT

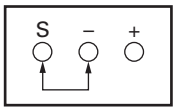
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
6. Low power adjust	1) Adj item : [LPWR] Adjust : [✳✳✳] 2) Adj item : [L LPWR] → [L' LPWR] → [C LPWR] → [H' LPWR] → [H LPWR] Adjust : [✳✳✳] PTT : ON	Power meter Ammeter	Panel	ANT	Panel	Selector knob	1.0W	±0.1W 1.2A or less
7. Low power check	**[Panel test mode]** 1) CH-Sig : 1-1 Set low power (Push [S]) PTT : ON						Check	0.7~1.4W 1.2A or less
	2) CH-Sig : 2-1 PTT : ON							
	3) CH-Sig : 3-1 PTT : ON							
8. DQT balance adjust • Narrow	1) Adj item : [n BAL] Adjust : [✳✳✳] Deviation meter filter LPF : 3kHz HPF : OFF 2) Adj item : [nL BAL] → [nC BAL] → [nH BAL] Adjust : [✳✳✳] PTT : ON	Deviation meter Oscilloscope AG AF VTVM	Panel	ANT Universal connector	Panel	Selector knob	Make the demodulation waves into square waves.	
• Wide	3) Adj item : [w BAL] Adjust : [✳✳✳] PTT : ON							
9. Max DEV adjust • Narrow	1) Adj item : [n DEV] Adjust : [✳✳✳] AG : 1kHz/125mV at MIC terminal Deviation meter filter LPF : 15kHz HPF : OFF 2) Adj item : [nL DEV] → [nC DEV] → [nH DEV] Adjust : [✳✳✳] PTT : ON						2.10kHz (According to the larger +, –)	±50Hz
• Wide	3) Adj item : [w DEV] Adjust : [✳✳✳] PTT : ON						4.4kHz (According to the larger +, –)	±50Hz
10. MIC sensitivity check	**[Panel test mode]** 1) CH-Sig : 1-1 DEV : 1.5kHz (Narrow) 3.0kHz (Wide) Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						Check	AG : 1kHz/6.7mV~18.3mV at MIC terminal

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
11. QT deviation adjust • Narrow	1) Remove the panel tuning cable assembly from the universal connector. Adj item : [n QT] Adjust : [✳✳✳] Deviation meter filter LPF : 3kHz HPF : OFF 2) Adj item : [nL QT] → [nC QT] → [nH QT] Adjust : [✳✳✳] PTT : ON	Power meter Deviation meter Oscilloscope AG AF VTVM	Panel	ANT Universal connector	Panel	Selector knob	0.35kHz	±50Hz
• Wide	3) Adj item : [w QT] Adjust : [✳✳✳] PTT : ON						0.75kHz	±50Hz
12. DQT deviation adjust • Narrow	1) Adj item : [n DQT] Adjust : [✳✳✳] Deviation meter filter LPF : 3kHz HPF : OFF 2) Adj item : [nL DQT] → [nC DQT] → [nH DQT] Adjust : [✳✳✳] PTT : ON						0.35kHz	±50Hz
• Wide	3) Adj item : [w DQT] Adjust : [✳✳✳] PTT : ON						0.75kHz	±50Hz
13. DTMF deviation adjust • Narrow	1) Adj item : [n DTMF] Adjust : [✳✳✳] Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						1.25kHz	±0.1kHz
• Wide	2) Adj item : [w DTMF] Adjust : [✳✳✳] PTT : ON						2.5kHz	±0.1kHz
14. MSK deviation adjust • Narrow	1) Adj item : [n MSK] Adjust : [✳✳] Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						1.5kHz	±0.1kHz
• Wide	2) Adj item : [w MSK] Adjust : [✳✳] PTT : ON						3.0kHz	±0.1kHz
15. TONE deviation adjust • Narrow	1) Adj item : [n TONE] Adjust : [✳✳✳] Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						1.5kHz	±0.1kHz
• Wide	2) Adj item : [w TONE] Adjust : [✳✳✳] PTT : ON						3.0kHz	±0.1kHz

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
16. BATT detection writing	1) Adj item : [BATT] Adjust : [✳✳✳] PTT : ON	Power meter DVM	Panel	ANT BATT terminal	Panel		After pressing the PTT switch, confirm that one predetermined numeric in the range 1 to 256 appears and then press [B] key. That numeric will be stored in memory.	BATT terminal voltage : 5.8V
17. BATT detection check	**[Panel test mode]** 1) CH-Sig : 1-1 BATT terminal voltage : 6.6V Connect "S" terminal to GND. PTT : ON						Check	The transceiver can transmit without causing the LED to blink.
	2) BATT terminal voltage : 5.8V Connect "S" terminal to GND. PTT : ON							The transceiver should not transmit and LED blinking.



TK-3180 Receiver Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Sensitivity fixed value write **K,K3**	1) Adj item : [H SENS1]	SSG	Panel	ANT	Panel	Selector knob		Write the value to "150"
	2) Adj item : [L SENS2] → [L' SENS2] → [C SENS2] → [H' SENS2]	AF VTVM Oscilloscope		Universal connector				Write the value as followings [L SENS2] : "1" [L' SENS2] : "27" [C SENS2] : "49" [H' SENS2] : "63"
K2,K4,E	1) Adj item : [H' SENS1] → [H SENS1]							Write the value as followings [H' SENS1] : "100" [H SENS1] : "256"
	2) Adj item : [L SENS2] → [L' SENS2] → [C SENS2]							Write the value as followings [L SENS2] : "1" [L' SENS2] : "20" [C SENS2] : "40"
2. Sensitivity 2 adjust **K,K3**	1) Adj item : [H SENS2] Adjust : [✳✳✳] SSG output : –119dBm (0.25μV) (MOD : 1kHz/±1.5kHz)						Adjust for 12dB SINAD	Rotate the selector knob and increase the adjustment value starting from "1" to obtain SINAD 12dB.
K2,K4,E	1) Adj item : [H SENS2] → [H' SENS2] Adjust : [✳✳✳] SSG output : –119dBm (0.25μV) **K2,K4** : –118dBm (0.28μV) **E** (MOD : 1kHz/±1.5kHz)							

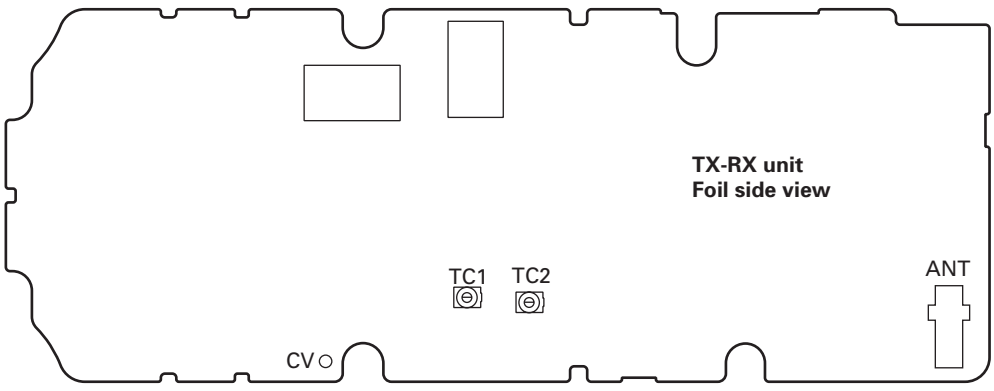
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. Sensitivity 1 adjust **K,K3**	1) Adj item : [SENS1] Adjust : [✳✳✳] 2) Adj item : [L SENS1] → [L' SENS1] → [C SENS1] → [H' SENS1] Adjust : [✳✳✳] SSG output : –119dBm (0.25µV) (MOD : 1kHz/±1.5kHz)	SSG AF VTVM Oscilloscope	Panel	ANT Universal connector	Panel	Selector knob		Rotate the selector knob and decrease the adjustment value starting from "256" to obtain SINAD 12dB.
K2,K4,E	1) Adj item : [SENS1] Adjust : [✳✳✳] 2) Adj item : [L SENS1] → [L' SENS1] → [C SENS1] → SSG output : –119dBm (0.25µV) **K2,K4** : –118dBm (0.28µV) **E** (MOD : 1kHz/±1.5kHz)							
4. Sensitivity check	**[Panel test mode]** 1) CH-Sig : 1-1 SSG output Wide : –118dBm (0.28µV) **K~K4** : –117dBm (0.32µV) **E** (MOD : 1kHz/±3kHz) Narrow : –118dBm (0.28µV) **K~K4** : –117dBm (0.32µV) **E** (MOD : 1kHz/±1.5kHz)						Check	12dB SINAD or more
5. Squelch (Preset) adjust • Narrow	1) Adj item : [n SQL] Adjust : [✳✳✳] SSG output : –118dBm (0.28µV) (MOD : 1kHz/±1.5kHz)				Panel	Selector knob	After input signal from SSG, press [B] key. That numeric will be stored in memory.	After adjusting SQL, check SQL open/close. SSG –118dBm : Open SSG OFF : Close [nC SQL] MOD 1kHz/±1.5kHz [wC SQL] MOD 1kHz/±3.0kHz
	2) Adj item : [nL SQL] → [nC SQL] → [nH SQL] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w SQL] Adjust : [✳✳✳] SSG output : –118dBm (0.28µV) (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL SQL] → [wC SQL] → [wH SQL] Adjust : [✳✳✳]							
6. Low RSSI adjust • Narrow	1) Adj item : [n LRSSI] Adjust : [✳✳✳] SSG output : –118dBm (0.28µV) (MOD : 1kHz/±1.5kHz)						After input signal from SSG, press [B] key. That numeric will be stored in memory.	
	2) Adj item : [nL LRSSI] → [nC LRSSI] → [nH LRSSI] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w LRSSI] Adjust : [✳✳✳] SSG output : –118dBm (0.28µV) (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL LRSSI] → [wC LRSSI] → [wH LRSSI] Adjust : [✳✳✳]							

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. Squelch (Tight) adjust • Narrow	1) Adj item : [n SQLT] Adjust : [✳✳✳] SSG output : –113dBm (0.5µV) (MOD : 1kHz/±1.5kHz)	SSG AF VTVM Oscilloscope	Panel	ANT Universal connector	Panel	Selector knob	After input signal from SSG, press [B] key. That numeric will be stored in memory.	After adjusting SQL, check SQL open/close. SSG –113dBm : Open SSG OFF : Close [nC SQLT] MOD 1kHz/±1.5kHz [wC SQL] MOD 1kHz/±3.0kHz
	2) Adj item : [nL SQLT] → [nC SQLT] → [nH SQLT] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w SQLT] Adjust : [✳✳✳] SSG output : –113dBm (0.5µV) (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL SQLT] → [wC SQLT] → [wH SQLT] Adjust : [✳✳✳]							
8. High RSSI adjust • Narrow	1) Adj item : [n HRSSI] Adjust : [✳✳✳] SSG output : –70dBm (MOD : 1kHz/±1.5kHz)						After input signal from SSG, press [B] key. That numeric will be stored in memory.	
	2) Adj item : [nL HRSSI] → [nC HRSSI] → [nH HRSSI] Adjust : [✳✳✳]							
• Wide	3) Adj item : [w HRSSI] Adjust : [✳✳✳] SSG output : –70dBm (MOD : 1kHz/±3.0kHz)							
	4) Adj item : [wL HRSSI] → [wC HRSSI] → [wH HRSSI] Adjust : [✳✳✳]							

TK-3180 Adjustment Points



TK-2180/3180

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