



KENWOOD

Listen to the Future

TK-90

Modification Information (MOD)

Version:	2.00
Last Updated:	March, 2007
Language:	English
Type:	M

Kenwood Corporation

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Revision history

Date	Description
2006.9	1) Pin numbers in Figure 1-2 External Antenna Tuner Connector were corrected. 2) A step of configuration in the section 3.2.3 Configuration using KPG-102D was added.
2007.3	1) Added 2.11 ALE Unit (KPE-2). 2) Added 3.4 Changing the Configuration for Connecting other External Antenna Tuner to the Transceiver. 3) Changed the version number from 1.00 to 2.00.

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1 TERMINAL FUNCTIONS

This section describes Input/Output ports of the transceiver.

1.1 External Terminals Specifications

The transceiver has terminals for connecting external devices on the front panel and rear panel.

1.1.1 8-pin Mic Connector

The 8-pin Mic connector is located on the front panel of the transceiver. A microphone can be connected to this connector. Configuration data can be written to the transceiver or read from the transceiver by connecting the transceiver to a PC with KPG-102D by using the KPG-46 cable.

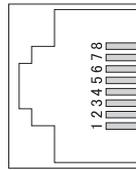


Figure 1-1 8-pin Mic Connector

Table 1-1 Assigning Signals to the 8-pin Mic Connector

Pin Number	Signal Name	Input/ Output	Description	Electrical Specifications
1	BLC	Output	MIC backlight control	Light On: $H \geq 4.7 \text{ V}$, Light Off: $L \leq 0.4 \text{ V}$
2	SB	Output	Switched 13.6 V for MIC	DC 13.6 V $\pm 15\%$, 200 mA typical
3	GND	-	GND	-
4	PTT/TXD1	Input/ Output	MIC standby signal (PTT)/ Data output for KPG-102D	47k Ω pulled-up to 5 V TX: $L \leq 0.8 \text{ V}$, RX: $H \geq 4.2 \text{ V}$ Serial data, TTL level
5	ME	-	MIC GND	-
6	MIC	Input	MIC signal input	Z input: 600 Ω
7	RXD0	Input	Data input for KPG-102D	4.7k Ω pulled-up to 5 V Serial data, TTL level
8	DM	Input/ Output	MIC data detection	47k Ω pulled-up to 5 V Serial data, TTL level

1 TERMINAL FUNCTIONS

1.1.2 External Antenna Tuner Connector

The external antenna tuner connector is located on the rear panel of the transceiver. An external antenna tuner can be connected to this connector. (Refer to [2.9 External Antenna Tuner \(KAT-1\)](#) on page 20.)

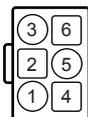


Figure 1-2 External Antenna Tuner Connector

Table 1-2 Assigning Signals to the External Antenna Tuner

Pin Number	Signal Name	Input/ Output	Description	Electrical Specifications
1	GND	-	GND	-
2	TT	Input/ Output	External antenna tuner control (TTI/ TTO)	Serial data, TTL level
3	GND	-	GND	-
4	NC	-	-	-
5	TS	Input/ Output	External antenna tuner control (TSI/ TSO)	Serial data, TTL level
6	14S	Output	Switched 13.6 V for External Antenna	DC 13.6 V \pm 15%, 2.0 A maximum

1.1.3 3.5 mm External Speaker Connector

3.5 mm external speaker connector is located on the rear panel of the transceiver. By changing output level of external speaker connector, a headphone can be connected to this connector. (Refer to [2.4 Headphone \(HS-6\)](#) on page 10.)



Figure 1-3 3.5 mm External Speaker Connector

Table 1-3 Assigning Signals to the 3.5 mm External Speaker Connector

Pin Name	Signal Name	Input/ Output	Description	Electrical Specifications
Chip	SP	Output	External Speaker Audio Signal output	10 Vp-p maximum (AC-coupled)
Sleeve	GND	-	GND	-

1.2 Internal Terminals Specifications

The transceiver has terminals for connecting external devices and optional devices on the PCB.

The connector locations on the PCB are as follows. Refer to the Service Manual for pin assignment for each connector.

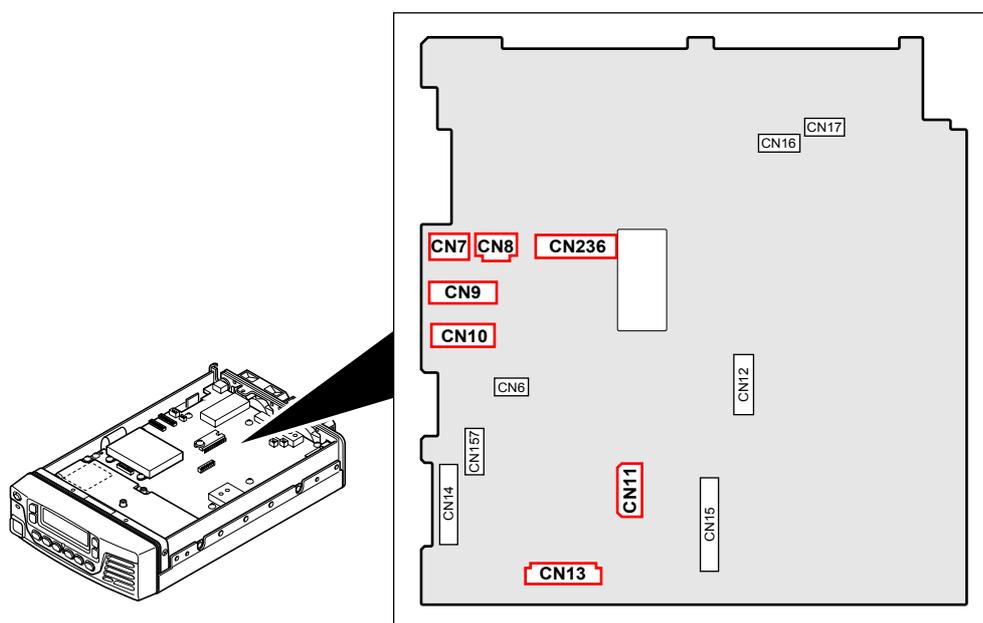


Figure 1-4 PCB

1.2.1 Front Panel Connector (CN236)

The front panel connector (CN236) can be used for connecting the front panel.

This connector can be used to install the Single Control Head Remote Kit (KRK-5) to the transceiver. (Refer to 2.8 Single Control Head Remote Kit (KRK-5) on page 17.)

Table 1-4 Assigning Signals to the Front Panel Connector (CN236)

Pin Number	Signal Name	Input/Output	Description	Electrical Specifications
1	SPG	-	Internal Speaker GND	-
2	SP	Output	Internal Speaker Audio Signal output	10 V _{p-p} maximum (AC-coupled)
3	SB	Output	Switched 13.6 V for MIC, KPG-46	DC 13.6 V \pm 15%, 200 mA typical
4	TXD0	Output	Data output for Panel CPU	Serial data, TTL level (Buffer output)
5	PS	Input	Power switch signal	47k Ω pulled-up to 5 V On: L \leq 0.8 V
6	RXD0	Input	Data input for Panel CPU	Serial data, TTL level (to Buffer IC)
7	PSENS	Input	Panel connect check	100k Ω pulled-up to 5 V Connected: L 0.8 V
8	8D	Output	Switched common 8 V for Display unit	8 V typical, 100 mA typical
9	GND	-	GND	-
10	MIC	Input	MIC signal input	Z input: 600 Ω
11	ME	-	MIC GND	-

1 TERMINAL FUNCTIONS

1.2.2 KCT-31 Connector (CN7, CN8)

The KCT-31 Connector (CN7, CN8) can be used to connect the interface cable (KCT-31) to the transceiver. (Refer to 2.5 Interface Cable (KCT-31) on page 11.)

Table 1-5 Assigning Signals to the KCT-31 Connector (CN7, CN8)

Connector Pin Number	Signal Name	Input/ Output	Description	Electrical Specifications	
CN7	1	NC	-	-	
	2	GND	-	GND	
	3	SB	Output	Switched 13.6 V for KCT-31	DC 13.6 V \pm 15%, 10 mA typical
CN8	1	NC	-	-	
	2	RXD1	Input	Data input for PC control	47k Ω pulled-up to 5 V Serial data, TTL level
	3	TXD1	Output	Data output for PC control	Serial data, TTL level

1.2.3 KCT-39 Connector (CN9, CN10)

The KCT-39 Connector (CN9, CN10) can be used to connect the cable (KCT-39) used for connecting external devices to the transceiver. (Refer to 2.6 Connection Cable (KCT-39) on page 13.)

Table 1-6 Assigning Signals to the KCT-39 Connector (CN9, CN10)

Connector Pin Number	Signal Name	Input/ Output	Description	Electrical Specifications	
CN9	1	KEY	Input	CW key down signal	47k Ω pulled-up to 5 V Key down: L \leq 0.8 V, Key up: H \geq 4.2 V
	2	NC	-	-	-
	3	GND	-	GND	-
	4	NC	-	-	-
	5	TXD1	Output	Data output for ACC	Serial data, TTL level
	6	RXD1	Input	Data input for ACC	47k Ω pulled-up to 5 V Serial data, TTL level
	7	RTK	Input	RTTY key signal (Mark/ Space)	47k Ω pulled-up to 5 V Key down: L \leq 0.8 V, Key up: H \geq 4.2 V
	8	DPTT	Input	Data standby signal	47k Ω pulled-up to 5 V TX: L \leq 0.8 V, RX: H \geq 4.2 V
	9	GND	-	GND	-
	10	AUX1	Input/ Output	AUX control	Default None, 47k Ω pulled-up to 5 V L \leq 0.8 V, H \geq 4.2 V (Input) 0.2 mA maximum, H \geq 4.7 V, L \leq 0.4 V (Output)
	11	AUX2			
	12	AUX3			
CN10	1	IGN	Input	Ignition signal	100k Ω terminated Ignition On: H \geq 8.0 V, Ignition Off: L \leq 6.0 V
	2	DI	Input	Data signal input for ACC	Z input: 10k Ω (AC-coupled)
	3	DEO	Output	Detected (data) signal output for ACC	Z output: 600 Ω (AC-coupled)
	4 to 11	NC	-	-	-

1.2.4 VGS-1 Connector (CN11)

The VGS-1 Connector (CN11) can be used to connect the VGS-1 unit to the transceiver. (Refer to 2.10 Voice Guide & Storage Unit (VGS-1) on page 22.)

Table 1-7 Assigning Signals to the VGS-1 Connector (CN11)

Pin Number	Signal Name	Input/Output	Description	Electrical Specifications
1	VBSY	Input	VGS busy signal	47kΩ pulled-up to 5 V Busy On: $H \geq 4.2$ V, Busy Off: $L \leq 0.8$ V
2	VPLY	Input	VGS play signal	47kΩ pulled-up to 5 V $H \geq 4.2$ V, $L \leq 0.8$ V, Playback start: $L \rightarrow H$
3	SO	-	NC	-
4	DATA	Output	Data signal output for VGS	Data
5	CLK	Output	Clock	Clock
6	VEN	Output	VGS enable	Enable
7	USEL	-	NC	-
8	VRST	Output	VGS reset signal	$H \geq 4.7$ V, $L \leq 0.4$ V Reset: $L \rightarrow H$
9	DGND	-	Digital GND	-
10	GND	-	GND	-
11	VAI	Input	VGS audio input	2.5 Vp-p maximum, Z input ≥ 10 kΩ (AC-coupled)
12	VAO	Output	VGS audio output	100 mVp-p maximum, Z output ≤ 300 Ω (AC-coupled)
13	AND	-	Analog GND	-
14	5D	Output	Switched 5 V for VGS	5 V typical, 80 mA maximum
15 to 26	NC	-	-	-

1.2.5 SC20-455 Connector (CN13)

The SC20-455 Connector (CN13) can be used to connect the Voice Scrambler board (SC20-455) to the transceiver. (Refer to 3.1 Voice Scrambler Board on page 29.)

Table 1-8 Assigning Signals to the SC20-455 Connector (CN13)

Pin Number	Signal Name	Input/Output	Description	Electrical Specifications
1	TXAO	Output	MIC signal output	1.0 Vp-p maximum, Z output ≤ 300 Ω (AC-coupled)
2	RXAO	Output	Detected signal output	1.0 Vp-p maximum, Z output ≤ 300 Ω (AC-coupled)
3	INDI	-	NC	-
4	CODE8	Output	Scrambler code 4 bit	Bit "1": $H \geq 4.7$ V, Bit "0": $L \leq 0.4$ V
5	CODE4	Output	Scrambler code 3 bit	Bit "1": $H \geq 4.7$ V, Bit "0": $L \leq 0.4$ V
6	CODE2	Output	Scrambler code 2 bit	Bit "1": $H \geq 4.7$ V, Bit "0": $L \leq 0.4$ V
7	CODE1	Output	Scrambler code 1 bit	Bit "1": $H \geq 4.7$ V, Bit "0": $L \leq 0.4$ V
8	RXAI	Input	Detected signal input	1.0 Vp-p maximum, Z input ≥ 10 kΩ (AC-coupled)
9	SCR	Output	Scrambler control signal	On: $L \leq 0.4$ V, Off: $H \geq 4.7$ V
10	TXC	Output	TX control signal	TX: $H \geq 4.7$ V, RX: $L \leq 0.4$ V
11	8D	Output	Switched common 8 V for SC20-455	8 V typical, 100 mA maximum
12	GND	-	GND	-

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Pin Number	Signal Name	Input/Output	Description	Electrical Specifications
13	TXAI	Input	MIC signal input	1.0 Vp-p maximum, Z input $\geq 10k\Omega$ (AC-coupled)
14	NC	-	-	-

2 INSTALLING OPTIONAL DEVICES

This section describes how to connect various optional devices to the transceiver.

2.1 Removing Covers

Covers must be removed before installing an optional device onto the transceiver.

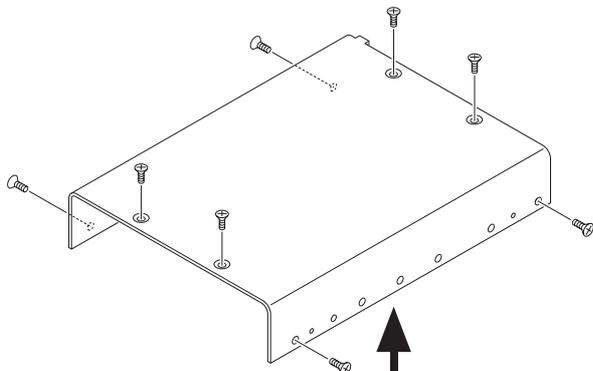
Follow the procedure below to remove covers from the transceiver.



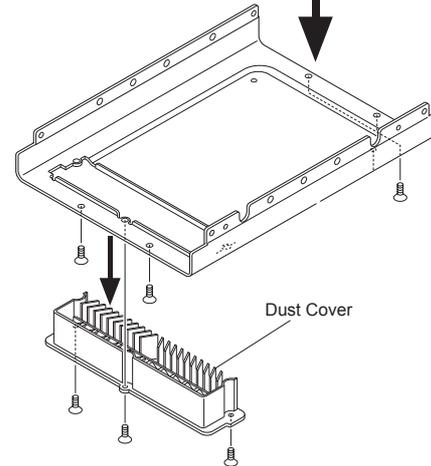
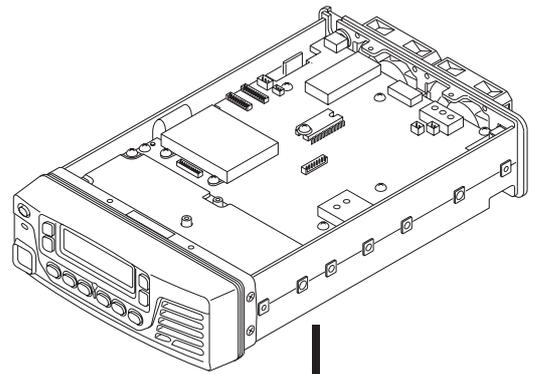
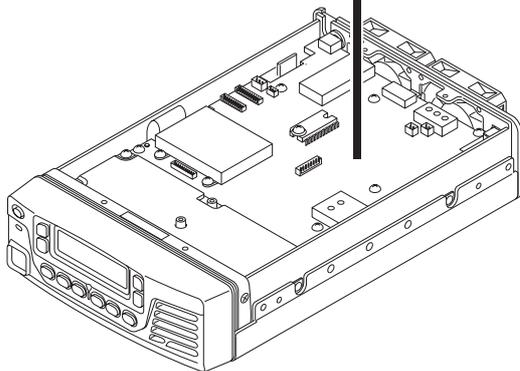
WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove 4 screws on the top panel and 4 screws on the side panel to remove the top cover.



2. Remove 4 screws on the bottom cover and 3 screws on the dust cover to remove the bottom cover and dust cover.



2.2 Removing the TX-RX PCB

The TX-RX PCB must be removed when performing the soldering work on the rear side of the TX-RX PCB in the transceiver.

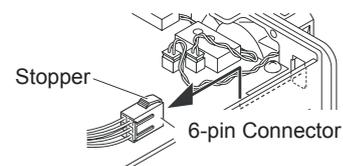
Follow the procedure below to remove the TX-RX PCB from the transceiver.



WARNING

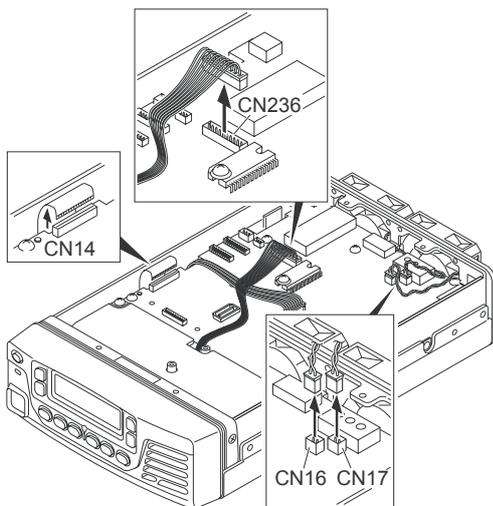
NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. ([Refer to 2.1 Removing Covers on this page.](#))
2. Remove the 6-pin connector from the rear panel. Remove the connector from inside of the chassis by pushing the stopper using a screwdriver or a similar tool.



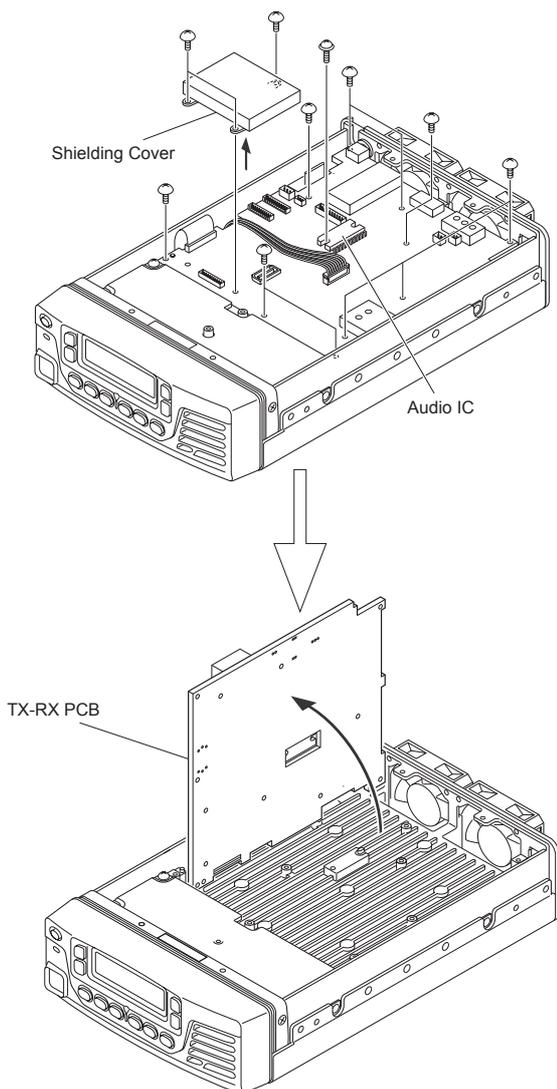
2 INSTALLING OPTIONAL DEVICES

- Remove connectors (CN16, CN17, CN236), and a cable (CN14).



- Remove 13 screws on the TX-RX PCB and 1 screw on the Audio IC.

Remove the shield cover, and then pull up the TX-RX PCB as shown on the diagram.



2.3 IF Filter (KIF-2, YF-107C)

An optional IF filter (KIF-2, YF-107C) can be installed in the transceiver. (Refer to FUNC 19 IF FILTER.)

The following 2 optional IF filters are available.

- KIF-2 (2.7 kHz SSB filter)
- YF-107C (500 Hz CW filter)

One of the IF filters can be installed in the transceiver.

2.3.1 Description

- KIF-2
This filter can be used to communicate in SSB (LSB or USB) Mode and for data communications.
- YF-107C
This filter can be used to communicate in CW Mode.

2.3.2 Product Dimensions and Weight

The dimensions and weight of KIF-2 and YF-107C are as follows.

Table 2-1 Product Dimensions and Weight

Height	15 mm
Width	38 mm
Depth	12 mm
Weight	60 g

2.3.3 Electrical Specifications

■ KIF-2

Table 2-2 Electrical Specifications (KIF-2)

No.	Item	Description
1	Nominal Frequency	10.695 MHz
2	Terminal Impedance	800Ω/ 2pF (including floating capacitance in the measuring circuit)
3	Operational Temperature Range	-20°C to +60°C
4	6 dB Pass Bandwidth	Above ±1350 Hz
5	Center Frequency Deviation	Less than ±150 Hz at 6 dB
6	Ripple	Less than 2.0 dB
7	Insertion Loss	Less than 7 dB ± 2 dB
8	20 dB Attenuation Bandwidth	Less than ±2.2 kHz
9	60 dB Attenuation Bandwidth	Less than ±3.1 kHz
10	Guaranteed Attenuation	Above 80 dB in the range from ±6 kHz to ±1 MHz

■ YF-107C

Table 2-3 Electrical Specifications (YF-107C)

No.	Item	Description
1	Nominal Frequency	10.695 MHz
2	Terminal Impedance	800Ω/ 2pF (including floating capacitance in the measuring circuit)
3	Operational Temperature Range	-20°C to +60°C
4	6 dB Pass Bandwidth	Above 500 Hz
5	Center Frequency Deviation	Less than ±100 Hz at 6 dB
6	Ripple	Less than 2.0 dB
7	Insertion Loss	9 dB ±3 dB
8	60 dB Attenuation Bandwidth	Less than 1200 Hz
9	Guaranteed Attenuation Amount	Above 80 dB in the range from ±2 kHz to 1 MHz

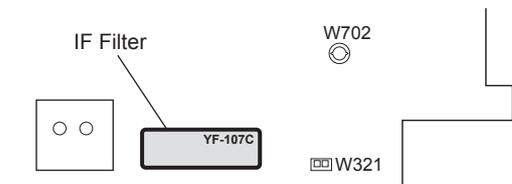
2.3.4 Installing the IF Filter



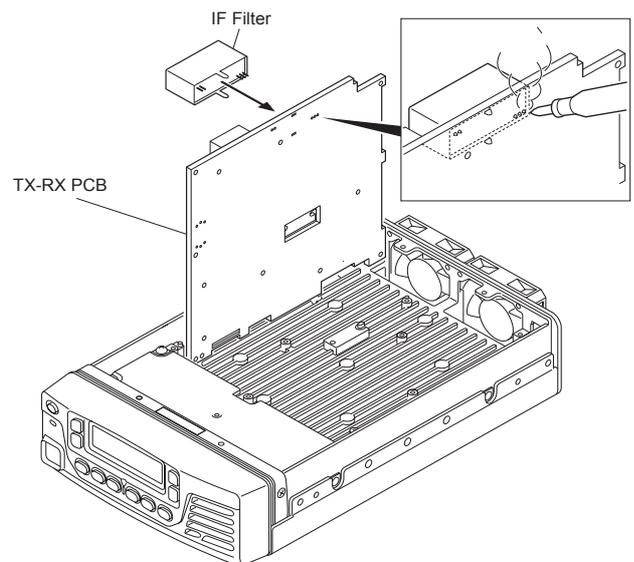
NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the TX-RX PCB. (Refer to 2.2 Removing the TX-RX PCB on page 7.)
3. Install the IF filter (KIF-2 or YF-107C) on the TX-RX PCB. Install the IF filter as shown in the following figure.

If YF-107C is installed:

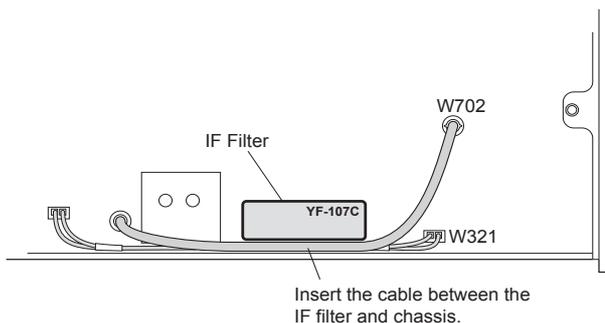


4. Solder ports (7 places) of the IF filter.



2 INSTALLING OPTIONAL DEVICES

Cables from W702 and W321 should be routed as shown in the following figure.



CAUTION

DO NOT PINCH THE W702 CABLE BETWEEN UPPER CASE COVER AND IF FILTER.

5. Connect all connectors and cables and install the TX-RX PCB and top cover.

2.3.5 Configuration using KPG-102D

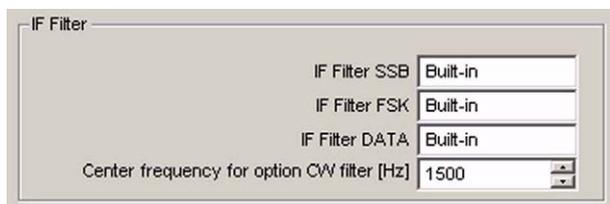
1. Run KPG-102D.

Read current configuration data from the transceiver or use existing saved configuration data when supplementing the information about IF filter to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.

2. Select the **Edit** pulldown menu > "Optional Features" and click the **Receive/Transmit** tab.

Configure functions in the **IF Filter** frame corresponding to the IF filter installed in the transceiver. Refer to FPRG 5.2.3 Receive/Transmit Tab for the details of configuration.

Note: "Built-in" must be selected when using the built-in IF filter. "Optional" must be selected when using the KIF-2 or YF-107C IF filter.



3. Write configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

2.4 Headphone (HS-6)



WARNING

- **A HEADPHONE WITH IMPEDANCE ABOVE 4Ω MUST BE USED WHEN USING A HEADPHONE OTHER THAN HS-6.**
- **IF A HEADPHONE, SUCH AS HS-6, IS USED WITHOUT LOWERING THE TRANSCEIVER AUDIO OUTPUT LEVEL, LOUD AUDIO CAN BE SUDDENLY EMITTED FROM THE HEADPHONE WHICH MAY DAMAGE YOUR HEARING. THE AUDIO OUTPUT LEVEL MUST BE LOWERED BY CHANGING THE CIRCUIT OF THE TRANSCEIVER WHEN USING A HEADPHONE SUCH AS HS-6.**

The transceiver supports the optional headphone (HS-6).

HS-6 can be used by connecting it to the external speaker connector on the rear panel of the transceiver.

The audio output level must be lowered when using the HS-6 since the default audio output level is too high for HS-6.

Follow the procedure below to change the output level of the external speaker connector on the transceiver.

Note: The audio output level of internal speaker is also changed by converting the circuit.

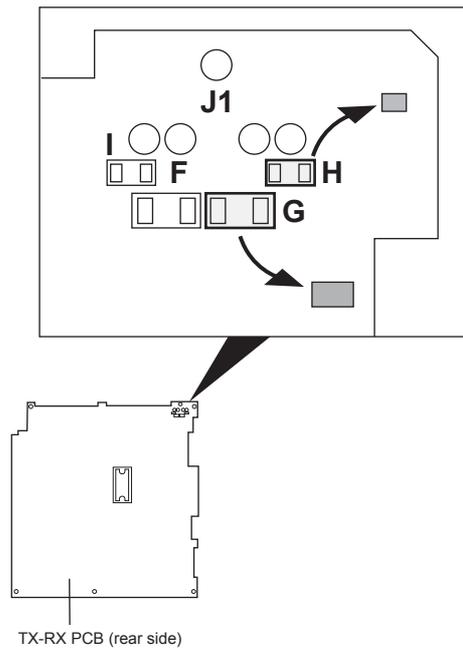
2.4.1 Changing the Output Level of External Speaker Connector



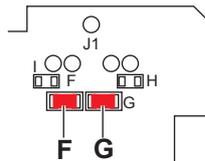
WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

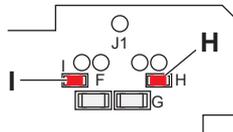
1. Remove the top cover. ([Refer to 2.1 Removing Covers on page 7.](#))
2. Remove the TX-RX PCB ([Refer to 2.2 Removing the TX-RX PCB on page 7.](#))
3. Remove the following parts from the TX-RX PCB (rear side).
 - Resistor G (0Ω)
 - Capacitor H (0.01 μF)



4. Install the chip resistor (3216 type) (120Ω , Part Number: RK73EB2E121J) at F and G.



5. Install the chip capacitor (2125 type) ($2.2\ \mu\text{F}$, Part Number: CK73FB1A225K) at H and I.



6. Connect all connectors and cables and install the TX-RX PCB and top cover.

Note: Output level can be reduced to 30 mW by changing a circuit of external speaker connector.

2.5 Interface Cable (KCT-31)

The KCT-31 interface cable is used for connecting the transceiver to a PC.

2.5.1 Description

KCT-31 is an interface cable used for operating in data communications modes.

Various functions can be controlled with PC commands by connecting the transceiver to a PC by using the KCT-31 cable. (Refer to FUNC Appendix 1: PC Command.)

2.5.2 Product Dimensions and Weight

The dimensions and weight of the KCT-31 cable are as follows.

Table 2-4 Product Dimensions and Weight

Cable Length	1 m
Weight	60 g

2.5.3 Appearance

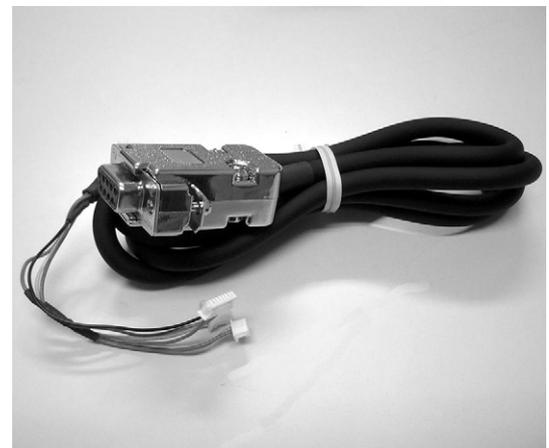


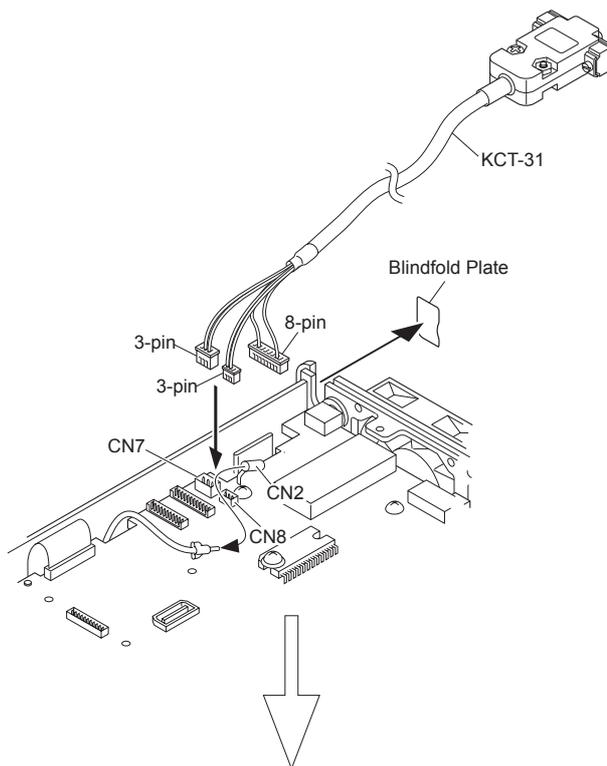
Figure 2-1 Appearance of KCT-31

2.5.4 Signal Assignment

The following signals can be assigned to each pin of the D-sub 9-pin connector.

Table 2-5 D-sub 9-pin Connector Signal Assignment

Pin Number	Signal Name	Description
1	NC	-
2	RD	Receive Data (RXD)
3	SD	Transmit Data (TXD)
4	ER	Data Port Ready (DTR)
5	SG	GND
6	DR	Data Set Ready (DTR)
7	RS	Transmission Request (RTS)
8	CS	Enables Transmission
9	NC	-



2.5.5 Connecting the KCT-31 Cable

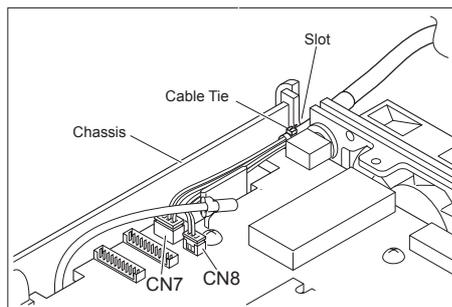


NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the blindfold plate from the rear panel.
3. Connect 2 3-pin connectors of the KCT-31 cable to CN7 and CN8 on the TX-RX PCB.

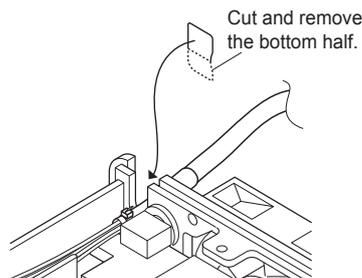
Connect the larger connector to CN7 and smaller connector to CN8. (Refer to 1.2.2 KCT-31 Connector (CN7, CN8) on page 4.)

After connecting the KCT-31 cable, dress the cable along the transceiver chassis and through the separated area at the rear to ensure the Cable Tie is in place.



Note:

- ◆ The 8-pin connector of KCT-31 is not used.
- ◆ Disconnect the coaxial cable from CN2 temporarily to connect the KCT-31 cable easily.
- ◆ The KCT-31 cable can be used with the KCT-39 cable at the same time. (Refer to 2.6 Connection Cable (KCT-39) on page 13.)
- ◆ The lower half of the blindfold plate must be cut off when connecting only 1 optional cable. Attach the upper half of the blindfold plate to the initial position after connecting the optional cable.



4. Replace the top cover.

2.5.6 Configuration using KPG-102D

For data communications between the transceiver and a PC, connect the transceiver and the PC together by using the KCT-31 cable, configure the transceiver COM port correctly and write configuration data to the transceiver.

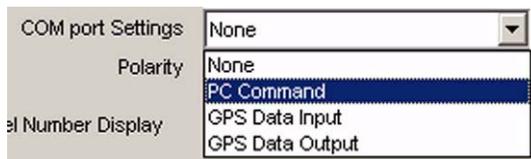
Follow the procedure below to configure the transceiver for data communications.

1. Run KPG-102D.

Read current configuration data from the transceiver or use existing saved configuration data when supplementing the information about data communications to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.

2. Select the **Edit** pulldown menu > “Optional Features” and click the **Common Page** tab.

Select “PC Command” from the **COM port Settings** dropdown list. Refer to FPRG 5.2.1 Common Page Tab for the details of configuration.



3. Write configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

2.6 Connection Cable (KCT-39)

The KCT-39 cable allows connection of external devices to a transceiver.

2.6.1 Description

KCT-39 is a cable to connect an external device to the transceiver.

The CW Key and the Ignition Sense cable can be connected to the transceiver by using the KCT-39 cable.

2.6.2 Product Dimensions and Weight

The dimensions and weight of the KCT-39 cable are as follows.

Table 2-6 Product Dimensions and Weight

Length	439 mm
Weight	25 g

2.6.3 Appearance



Figure 2-2 KCT-39 Cable

2.6.4 Signal Assignment

The following signals can be assigned to the KCT-39 cable connector.

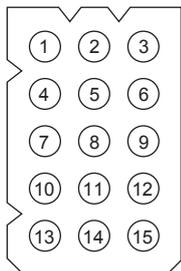


Figure 2-3 KCT-39 Connector

Table 2-7 KCT-39 Connector Signal Assignment

Pin Number (KCT-39)	Signal Name	Pin Number (Transceiver)	Description
1	KEY	CN9-1	CW key down signal
2	IGN	CN10-1	Ignition signal
3	GND	CN9-3	GND
4	DEO	CN10-3	Detected (data) signal output for ACC
5	DI	CN10-2	Data signal input for ACC
6	DPTT	CN9-8	Data standby signal
7	RTK	CN9-7	RTTY key signal
8	GND	CN9-9	GND
9	AUX3	CN9-12	AUX control 3
10	AUX1	CN9-10	AUX control 1
11	AUX2	CN9-11	AUX control 2
12	NC	-	-
13	NC	-	-
14	RXD ^{*1}	CN9-6	Data input for ACC
15	TXD ^{*1}	CN9-5	Data output for ACC

*1 The jumper resistor must be changed when using RXD and TXD ports on the KCT-39 cable.

2.6.5 Supplied Accessories

Table 2-8 Supplied Accessories

No.	Name	Part No.
1	Housing	1625-15P1
2	Cushion	C13-1968-x1
3	Terminal	1855T
4	Cushion	G13-2083-x4

2.6.6 Changing the Jumper for Connecting TXD and RXD

TXD and RXD lines are configured for the KCT-31 side by default. (Refer to 2.5 Interface Cable (KCT-31) on page 11.)

Jumper resistors must be moved to connect the terminals of the KCT-39.

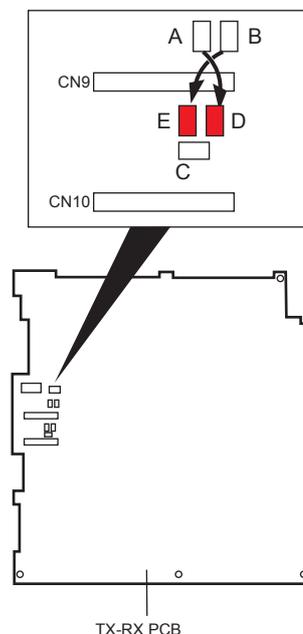
Follow the procedure below to move the jumper resistors.



WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the jumper resistor (R857) at A on the TX-RX PCB and install the resistor at D.
3. Remove the jumper resistor (R858) at B on the TX-RX PCB and install the resistor at E.



Note: The TXD and RXD lines can be changed as below, corresponding to the installation position of the jumper resistors. The TXD line can be selected only from A or D. The RXD line can be selected only from B, C or E.

Table 2-9 Jumper for Connecting TXD and RXD

Positions on the TX-RX PCB	Jumper Resistor	Function
A	R857	TXD line for KCT-31
B	R858	RXD line for KCT-31
C	\$R859	RXD line for GPS 15L-W (Refer to 3.2 GPS Receiver (GPS 15L-W) on page 31.)
D	\$R861	TXD line for KCT-39
E	\$R862	RXD line for KCT-39

2.6.7 Configuration using KPG-102D

Functions can be assigned to AUX 1 to AUX 3 by using KPG-102D and writing configuration data to the transceiver.

Follow the procedure below to assign functions to AUX 1 to AUX 3.

1. Run KPG-102D.

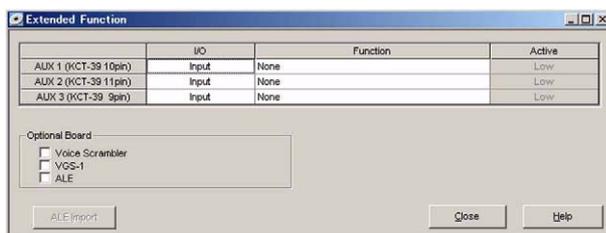
Read current configuration data from the transceiver or use existing saved configuration data when supplementing the information about Function Assignment to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.

2. Select the **Edit** pulldown menu > "Extended Function".

The **Extended Function** window appears on the display.

Functions can be assigned to AUX 1 (KCT-39 Pin 10), AUX 2 (KCT-39 Pin 11) and AUX 3 (KCT-39 Pin 9).

Refer to FPRG 5.9 Extended Function Window for the details of configuration.



3. Write configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

2.6.8 Connecting the KCT-39 Cable



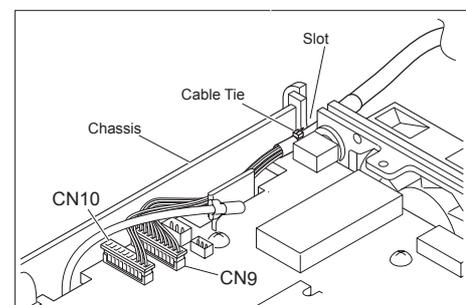
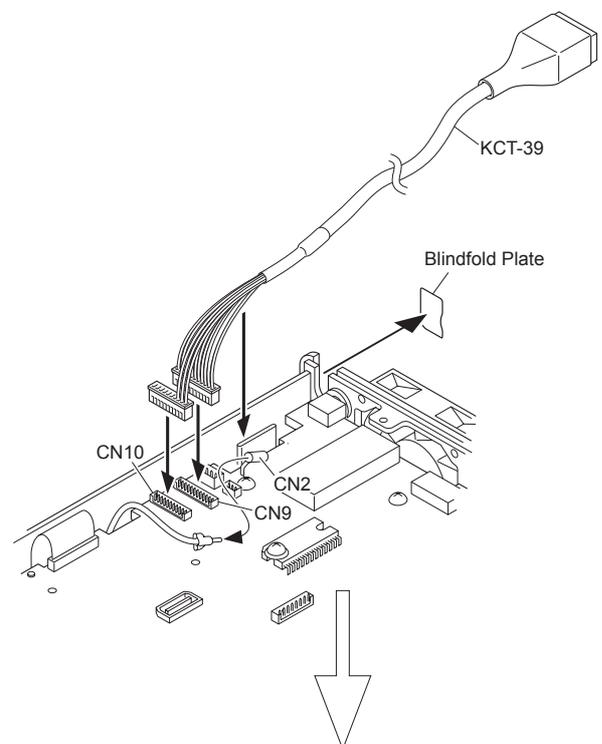
WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the blindfold plate from the rear panel.
3. Connect 2 connectors of the KCT-39 cable to CN9 and CN10 on the TX-RX PCB.

Connect the 12-pin connector to CN9 and 11-pin connector to CN10. (Refer to 1.2.3 KCT-39 Connector (CN9, CN10) on page 4.)

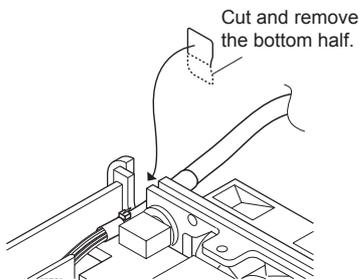
After connecting the KCT-39 cable, dress the cable along the transceiver chassis and through the separated area at the rear to ensure the cable tie is in place.



2 INSTALLING OPTIONAL DEVICES

Note:

- ◆ Disconnect the coaxial cable from CN2 to connect the KCT-39 cable easily.
- ◆ The KCT-39 cable can be used with the KCT-31 cable. (Refer to [2.5 Interface Cable \(KCT-31\)](#) on page 11.)
- ◆ The lower half of the blindfold plate must be cut off when connecting only 1 optional cable. Attach the upper half of the blindfold plate to the initial position after connecting the optional cable.



4. Reinstall the top cover.

2.7 Ignition Sense Cable (KCT-18)

KCT-18 is the cable used for connecting the transceiver to an Ignition port of a vehicle.

2.7.1 Description

KCT-18 is a cable to connect the transceiver to an ignition terminal.

Ignition Sense can be used to automatically turn the transceiver ON/OFF in conjunction with the status of the Ignition Sense port of a vehicle.

2.7.2 Product Dimensions and Weight

The dimensions and weight of the KCT-18 cable are as follows.

Table 2-10 Product Dimensions and Weight

Length	3.2 m
Weight	70 g (including a fuse)

2.7.3 Appearance



Figure 2-4 KCT-18 Cable

2.7.4 Supplied Accessories

Table 2-11 Supplied Accessories

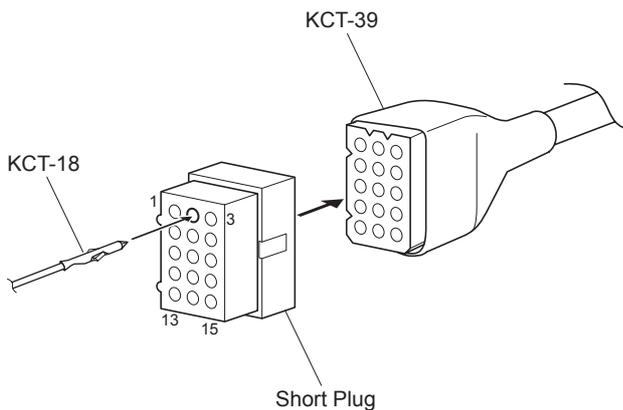
No.	Name	Part No.
1	Fuse (3 A, Blade type)	F06-3026-x5

2.7.5 Connecting the KCT-18



NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Connect the KCT-39 cable to the transceiver. (Refer to 2.6 Connection Cable (KCT-39) on page 13.)
2. Insert the lead from the KCT-18 cable into Pin 2 (IGN) of the short plug that attaches to the KCT-39 cable.
3. Connect the short plug to the KCT-39 cable.



2.8 Single Control Head Remote Kit (KRK-5)

Connect the KRK-5 Single Control Head Remote Kit to the transceiver.

2.8.1 Description

KRK-5 is a kit to use a front panel as a remote controller head unit.

The front panel can be used by connecting it to the transceiver with the KCT-22 cable.

The front panel of KRK-5 is compliant with all 11 items in MIL-810 C, D and E.

2.8.2 Product Dimensions and Weight

The dimensions and weight of KRK-5 are as follows.

Table 2-12 Product Dimensions and Weight

Item	Main Panel		Rear Panel	
	A	B	A	B
Width	179 mm	179 mm	179 mm	187 mm
Depth	36.5 mm	51 mm	24 mm	32.25 mm
Height	60 mm	60 mm	60 mm	60 mm
Weight	250 g		150 g	

A: Dimensions without projections

B: Dimensions including projections

2.8.3 Appearance (KRK-5 Installed)



Figure 2-5 Installed KRK-5

Note: There are 3 types of KCT-22 (see Table 2-13). The cable length varies depending on the KCT-22 type.

2 INSTALLING OPTIONAL DEVICES

Table 2-13 KCT-22 Variations

Type	Length
KCT-22 (M)	8 feet
KCT-22 (M2)	17 feet
KCT-22 (M3)	25 feet

2.8.4 Supplied Accessories

Table 2-14 Supplied Accessories

No.	Name	Part No.
1	Rubber Cap	B09-0393-x4
2	Instruction Manual	B62-0993-x0
3	Ground Wire	E30-3085-x5
4	Square Plug	E59-0404-x5
5	Mounting Bracket	J21-4354-x4
6	Angle	J29-0648-x3
7	Band	J61-0307-x5
8	Dressed Screw	N08-0526-x4
9	Screw Set	N99-0361-x5

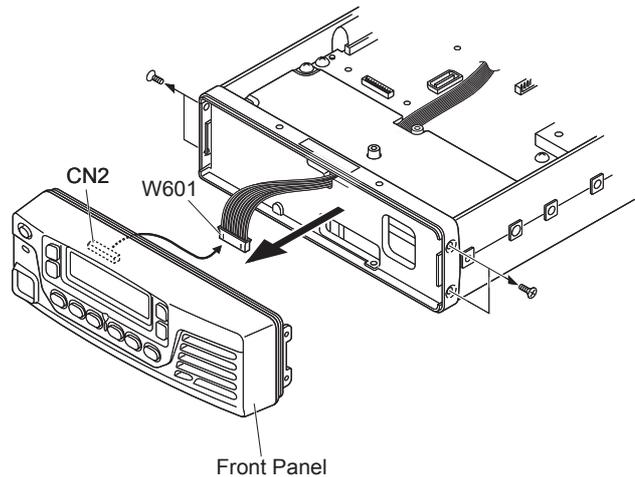
2.8.5 Installing the KRK-5



WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

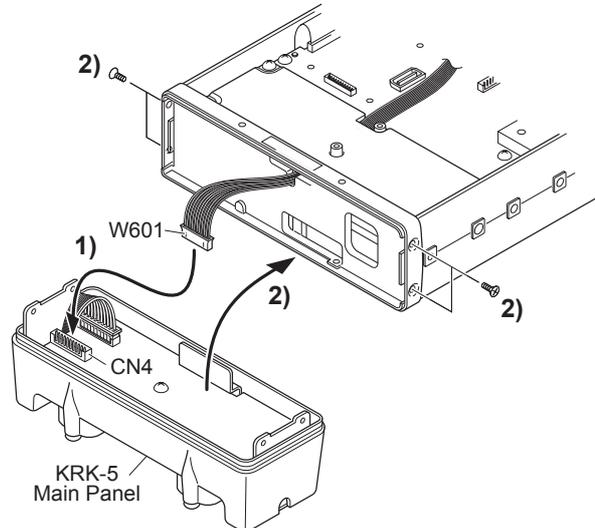
1. Remove the top and bottom covers. (Refer to 2.1 Removing Covers on page 7.)
2. Remove 2 screws at each side of the front panel, and then detach the front panel.
Remove the connector (W601) connected to the transceiver.



CAUTION

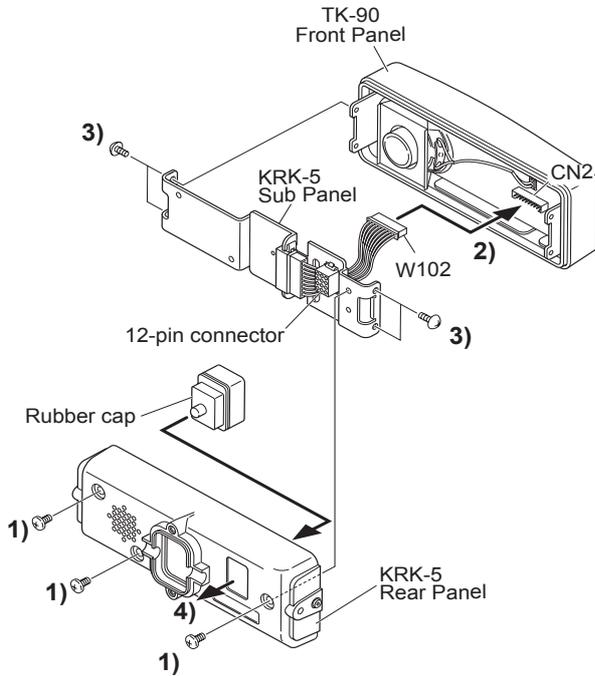
REMOVE THE FRONT PANEL SLOWLY. OTHERWISE, CONNECTORS AND PCB CABLE MAY BE DAMAGED.

3. Connect the main panel of the KRK-5 to the transceiver. Follow the procedure below to install the main panel of the KRK-5.
 - 1) Connect the connector (W601) on the transceiver to the connector (CN4) on the KRK-5 main panel.
 - 2) Insert the KRK-5 main panel onto the transceiver and fix the panel by using 4 screws removed in step 2.



4. Install the front panel removed in step 2 into the rear panel of the KRK-5. Follow the procedure below to install the rear panel of the KRK-5.
 - 1) Remove 3 screws on the rear panel of KRK-5, and then remove the sub panel of the KRK-5.
 - 2) Connect the 11-pin connector (W102) on the sub panel of the KRK-5 to the connector (CN2) on the front panel.
The 12-pin connector (W103) is not used and does not need to be connected.

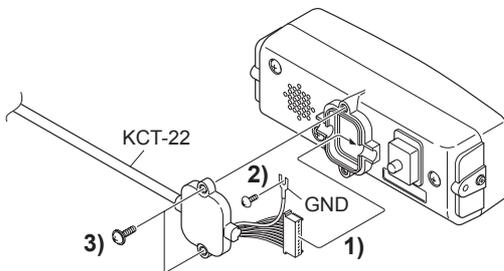
- 3) Fix the sub panel of the KRK-5 to the front panel by using 2 screws at each side.
- 4) Install the rubber cap to the rear panel of the KRK-5. The 12-pin connector is not used.
- 5) Fix the rear panel of the KRK-5 to the front panel of the KRK-5 by using 3 screws that are removed in step 1).



5. Connect the KCT-22 cable to the rear panel of the KRK-5. Follow the procedure below to connect the KCT-22 cable to the KRK-5.

- 1) Connect the connector of the KCT-22 cable to the connector on the rear panel of the KRK-5.
- 2) Connect the ground terminal of the control cable to the rear panel of the KRK-5 by using 1 screw.
- 3) Attach the cover to the rear panel of the KRK-5 and fix the cover by using 2 screws.

The waterproof packing must be securely inserted when installing the cover.



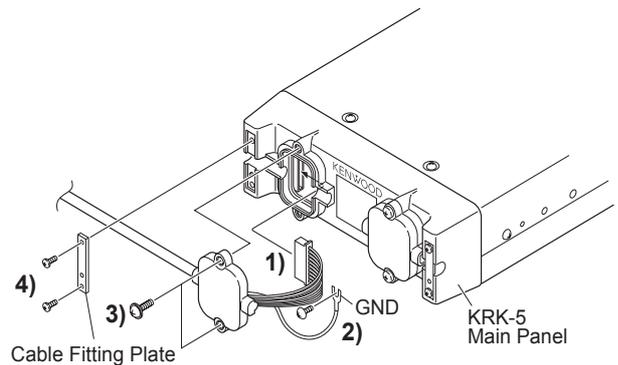
DO NOT PINCH A CABLE WHILE ATTACHING A CASE COVER.

Note: This cable can be extended to right or left depending on the transceiver installation position.

6. Connect the KCT-22 cable to the main panel of the KRK-5.

Follow the procedure below to connect the KCT-22 cable to the main panel of the KRK-5.

- 1) Connect the connector of the KCT-22 cable to the connector on the main panel of the KRK-5.
- 2) Connect the ground of the KCT-22 cable to the main panel of the KRK-5 by using 1 screw.
- 3) Install the cover onto the main panel of the KRK-5 and fix the cover by using 2 screws. The waterproof packing must be securely inserted when installing the cover.
- 4) Place the cable fitting plate by using 2 screws and fix the cable.



DO NOT PINCH A CABLE WHILE ATTACHING A CASE COVER.

Note: This cable can be extended to right or left depending on the transceiver installation position.

7. Reinstall the top and bottom covers.

The bottom cover must be installed first and then reinstall the top cover.

2.9 External Antenna Tuner (KAT-1)

Connect the KAT-1 External Antenna Tuner to the transceiver.

2.9.1 Description

KAT-1 is an external antenna tuner for a wire antenna on HF band.

By connecting the KAT-1 to a transceiver, antennas can be tuned by operating the transceiver.

2.9.2 Features

- The operating frequency range is from 1.6 MHz to 30 MHz (guaranteed standard operating frequency range is from 1.8 MHz to 30 MHz.)
- An antenna can be tuned over a wide range of impedance. Typically, an antenna can be tuned for operation on 1.8 MHz when using a wire with a length of 12 m.
- The KAT-1 is equipped with 14 channel memories in a FIFO (First In First Out) buffer. Memory channels will be retained for approximately a week.
- The KAT-1 is equipped with a protection circuit for excessive input when tuning the antenna.

2.9.3 Product Dimensions and Weight

The dimensions and weight of the KAT-1 are as follows.

Table 2-15 Product Dimensions and Weight

Item	Body	
	A	B
Width	258 mm	258 mm
Depth	378 mm	433 mm
Height	80 mm	90 mm
Weight	2.8 kg	

A: Dimensions without projections

B: Dimensions including projections

2.9.4 Appearance

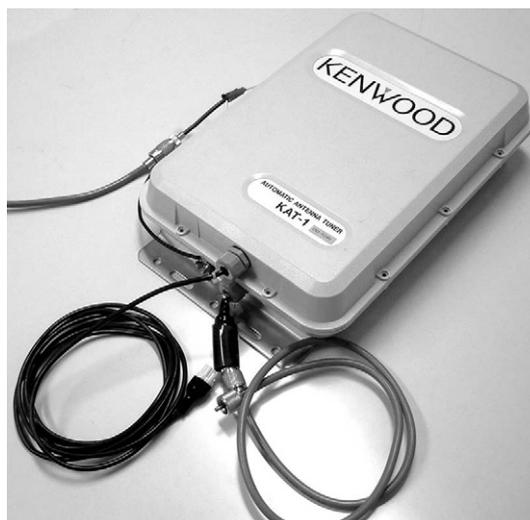


Figure 2-6 KAT-1 Antenna Tuner

2.9.5 General Specifications

Table 2-16 General Specifications

No.	Item	Description
1	Frequency Range (Guaranteed Range)	1.6 MHz to 30 MHz (1.8 MHz to 30 MHz)
2	Power Voltage	DC 13.6 V ± 15% (Negative Ground)
3	Operable Temperature Range	-30°C to +60°C
4	Antenna Impedance at Transmitter	50Ω
5	Antenna Conditions	<ul style="list-style-type: none"> • Wire Antenna <ul style="list-style-type: none"> • 12 m to 23 m (The distance from the insulator to the end of the antenna is 50 cm.) • 1.8 MHz to 30 MHz • Whip Antenna <ul style="list-style-type: none"> • 2.5 m (The distance from the insulator to the base part of the antenna is 50 cm.) • 3.5 MHz to 30 MHz

2.9.6 Standard

Table 2-17 Standard

No.	Item	Description
1	Maximum Transmit Power	120 W (Mark signal is transmitted for 1 minute, Space signal is transmitted for 2 minutes in CW Mode.)
2	SWR when it is tuned	Less than 2.0 or 1.5 (switchable)
3	Tuning Power	8 W to 15 W (in CW Mode)
4	Tuning Duration	Within 15 seconds (Approximately 0.5 seconds when using the memory)
5	Duration to Retain Memory Channels	7 days (after the battery is fully recharged) or more
6	Consumption Current	Less than 2.0 A

2.9.7 Signal Assignment

External Terminals

Table 2-18 External Terminals

No.	Signal Name	Description
1	ANT	Antenna Terminal (Wing nut)
2	GND	Ground Terminal (Wing Nut)
3	RF	RF Input Terminal (Cable Bushing)
4	Control	Control Terminal (Cable Bushing)

Internal Terminals

Table 2-19 Internal Terminals

No.	Signal Name	Description
1	RF IN	RF Input Terminal (SO-239)
2	+13.6 V	DC Power Connection Terminal
3	GND	Ground Terminal
4	TS	Control (TS signal) Terminal
5	TT	Control (TT signal) Terminal
6	ANT.C	Antenna Current Terminal

2.9.8 Supplied Accessories

Table 2-20 Supplied Accessories

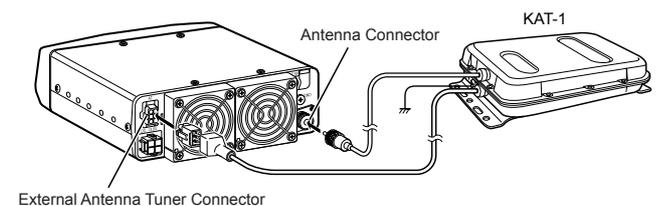
No.	Name	Part Number	Qty.
1	Retaining Bracket	J21-4300-x8	2
2	U-type Bolt	N09-2095-x8	2
3	Hexagon Bolt	N09-2096-x8	4
4	Tapping Screw	N99-0344-x8	4
5	Nut		8
6	Spring Washer		8
7	Flat Washer		12
8	Insulating Cover		F09-0427-x8
9	Instruction Manual	B62-0563-x0	1
10	6-pin Connector	E09-0672-x8	1
11	Connector Pin	E23-0646-x8	6
12	Rubber Grommet	G53-0592-x8	1
13		G53-0597-x8	1

2.9.9 Installing the KAT-1



NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Connect 2 cables of the KAT-1 to the transceiver.
Cables are connected to the external antenna tuner and the antenna connector on the rear panel of the transceiver.
2. Connect the earth cable of the KAT-1.



The connection to the KAT-1 is automatically detected when the transceiver is turned ON.

Refer to Function Reference for how to tune the antenna by using the KAT-1.

2.9.10 Configuration using KPG-102D

Antenna Tuner is assigned to the [Δ] key in default configuration. The **Antenna Tuner** key can be assigned to other keys by using KPG-102D. You must write configuration data to the transceiver if you wish to assign Antenna Tuner to other keys.

Follow the procedure below to assign Antenna Tuner to a key.

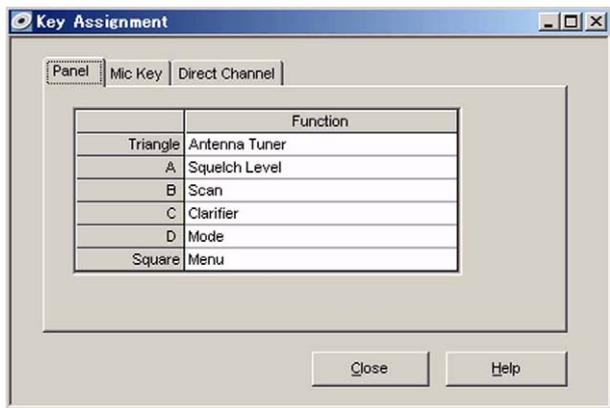
1. Run KPG-102D.

Read current configuration data from the transceiver or use existing saved configuration data when supplementing the information about Key Assignment to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.

2. Select the **Edit** pulldown menu > "Key Assignment".

The **Key Assignment** window appears on the display.

Antenna Tuner can be assigned to a key in the **Panel** or **Mic Key** tab. Refer to FPRG 5.3 Key Assignment Window for the details of configuration.



3. Write configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

2.10 Voice Guide & Storage Unit (VGS-1)

Install the VGS-1 optional board to record and play back audio, or use the board for the Voice Guide function.

2.10.1 Description

VGS-1 is the optional board used to record and play voice messages and use the voice annunciation function.

2.10.2 Features

- Recording or playing back audio
- Audio is digitized and temporarily stored to the SRAM. Audio data can be played back or stored to the flash memory.
- Voice Annunciation with fixed (recorded) voice data
- Compatible with 3.3 V and 5 V dual I/O voltage (only 5 V is required for the power voltage.)

2.10.3 Product Dimensions and Weight

The dimensions and weight of the VGS-1 are as follows.

Table 2-21 Product Dimensions and Weight

Length	33 mm
Width	23 mm
Thickness	42 mm (reference value)
Weight	20 g

2.10.4 Electrical Specifications

■ General Specifications

Table 2-22 General Specifications

No.	Item	Specifications	
1	Supply Voltage	Standard	5.0 V
		Range	4.5 V to 5.5 V
2	Temperature Range	Working	-30 to +60°C
3	Load Impedance	Audio output	10kΩ
		Audio input	10kΩ
		I/O port	47kΩ

■ Signal Assignment

Table 2-23 Signal Assignment

No.	Name	Description	Input/Output	Remarks
1	BUSY	Busy state	Output	Active High* ¹
2	PLAY	Play state	Output	Active High* ¹
3	SO	Serial Data Output	Output	* ¹
4	SI	Serial Data Input	Input	H: 2.2 V to SV* ² L: less than 0.5 V
5	CLK	Clock	Input	H: 2.2 V to SV* ² L: less than 0.5 V
6	EN	Enable	Input	H: 2.2 V to SV* ² L: less than 0.5 V
7	USEL	UART speed select	Input	H: 115200 bps L: 19200 bps
8	RST	Reset	Input	H: 2.2 V to SV* ² L: less than 0.5 V
9	DGND	Digital GND	-	-
10	AGND	Analog GND	-	-
11	AO	Audio Output	Output	3.0 Vp-p maximum/ 300Ω
12	AI	Audio Input	Input	100 mVp-p maximum/10kΩ
13	AGND	Analog GND	-	-
14	5C	Supply Voltage	Output	4.5 V to 5.5 V
15 to 26	Reserved	Reserved	Reserved	No internal connection.

*¹ Normally H = 3.3 V. Pulled up to 5 V externally H = 5 V

*² Supply Voltage
Signal timing is specified in Software Specification.

■ DC Characteristics

Table 2-24 DC Characteristics

	Min.	Typ.	Max.	Unit	Condition
Supply Voltage	4.5	5	5.5	V	-
Current (14-pin)	-	21	-	mA	Normal Operation
	-	44	-		Flash ROM Erase
	-	2.5	-		Standby

■ Output Characteristics

● Conditions

- The signal source having the output impedance 600Ω provides the sinewave of 30 mVrms 1 kHz from the AI (Pin 12) to the AGND (Pin 13).
- Power Voltage: 5 V ±0.1 V
- Terminate the AO port (Pin 11) and AGND (Pin 10) at 10kΩ.

● Characteristics

- S/N while playing back the audio: 40 dB or more
- Distortion while playing back the audio: Less than 8%

2.10.5 Supplied Accessories

Table 2-25 Supplied Accessories

No.	Name	Part Number
1	Instruction Manual	B62-1741-x0
2	Cushion A	G13-1974-x4
3	Cushion B	G13-1992-x4
4	Cushion C	G13-1993-x4
5	Cushion D	G13-1994-x4
6	Cushion E	G13-1995-x4
7	Spacer	J30-1292-x4

2.10.6 Installing the VGS-1 Unit

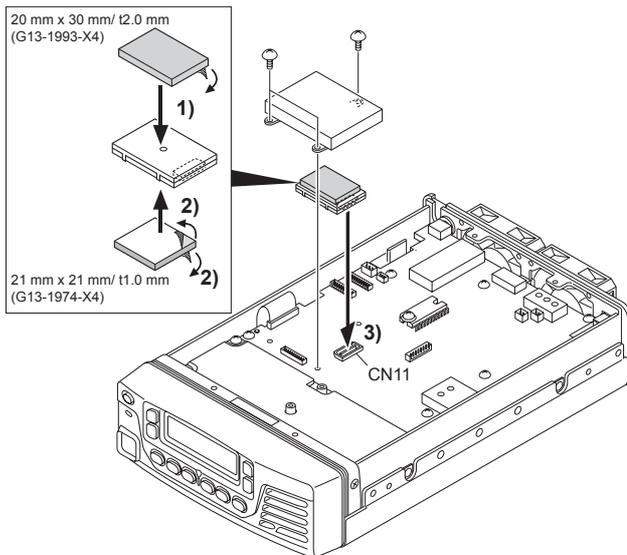


NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the shield cover from the TX-RX PCB by removing 3 screws.
3. Install the VGS-1 unit in the TX-RX PCB.

Follow the procedure below to install the VGS-1 unit on the TX-RX PCB.

- 1) Attach the cushion tape (Part Number: G13-1993-x4, 20 mm x 30 mm/ t2.0 mm) to the upper surface of the VGS-1.
- 2) Attach the cushion tape (Part Number: G13-1974-x4, 21 mm x 21 mm/ t1.0 mm) to the lower surface of the VGS-1 and peel off the protective sheet of tape.
- 3) Connect the VGS-1 unit to the connector (CN11) on the TX-RX PCB. Fix the VGS-1 unit by lightly pressing down the upper side of the VGS-1 unit.



4. Reinstall the shield cover and top cover.

2.10.7 Configuration using KPG-102D

Configure the VGS-1 information by using KPG-102D and write configuration data to the transceiver after installing the VGS-1.

Follow the procedure below to configure the VGS-1.

Note: This function cannot be used and power is not supplied to the VGS-1 if VGS-1 is disabled by using KPG-102D.

1. Run KPG-102D.
Read current configuration data from the transceiver or use existing saved configuration data when supplementing the VGS-1 information to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.
2. Select the **Edit** pulldown menu > "Extended Function".
The **Extended Function** window appears on the display.
3. Check the **VGS-1** checkbox in the **Optional Board** frame.



4. Configure the VGS-1 functions.
Various functions can be configured by using the **VGS-1** tab in the **Optional Features** window. Refer to FPRG 5.2.6 VGS-1 Tab for how to configure various functions.
5. Write configuration data to the transceiver.
Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

2.11 ALE Unit (KPE-2)

The ALE Unit (KPE-2) can be installed in the transceiver.

Note: The ALE function is available for a transceiver having firmware version 2.00 or later.

2.11.1 Description

KPE-2 is an ALE unit for the TK-90 transceiver. Various ALE (Automatic Link Establishment) functions can be used by installing KPE-2 in the transceiver.

2.11.2 Features

- Built-in ALE functions compliant with MIL-STD-188/ 141A protocol are available.
- KPE-2 can make or receive an Individual Call, Net Call, and AllCall.
- KPE-2 can send and receive AMD Messages since KPE-2 is equipped with the Automatic Message Display (AMD) function.
- KPE-2 is equipped with 100 channels dedicated especially for the ALE functions.

2.11.3 Product Dimensions and Weight

The dimensions and weight of KPE-2 are as follows.

Table 2-26 Product Dimensions and Weight

Depth	84.8 mm
Width	49.8 mm
Height	10.4 mm
Weight	46 g

2.11.4 Electrical Specifications

■ General Specifications

Table 2-27 General Specifications

Parameter	Specifications
Supply Voltage	Standard 5.0 V, Range 4.5 V to 5.5 V
Temperature Range	Working -20°C to 60°C
Load Impedance	AI (output): $\leq 600\Omega$ AO (input): $\geq 10k\Omega$

■ Terminal Specifications

Table 2-28 Terminal Specifications

No.	Signal Name*1	I/O*2	Function*2	Specifications*2
1	GND	-	GND	-
2	AO	Input	Audio input	1 Vp-p typ, $Z_{in} \geq 10k\Omega$ (AC-couple)
3	AI	Output	Audio output	1 Vp-p typ, $Z_{out} \leq 600\Omega$ (AC-couple)
4	5BTT	Input	5 V for battery charge	5 V typ, 5 mA max
5	A5A	Input	Power Supply (5 V)	5 V typ, 150 mA max
6	NC	-	-	-
7	DGND	-	Digital GND	-
8	BRDAT	Output	Reserve	-
9	BRCLK	Output	Reserve	-
10	ALE2	-	Reserve	-
11	ALE1	-	Reserve	-
12	ASENS	Output	ALE unit detection	Short to DGND
13	RSV1	Input	Reserve	47k Ω pull-up to 5 V
14	BAUD	Input	Default Baud rate	47k Ω pull-up to 5 V 9600 bps: $H \geq 4.7$ V, 19200 bps: $L \leq 0.4$ V
15	BIO	Input	Reserve	47k Ω pull-down
16	ABKC	Input	Backup request	$H \geq 4.7$ V, $L \leq 0.4$ V, Backup Request: $H \rightarrow L$
17	ABSY	Output	Busy signal	Busy: $H \geq 4.2$ V, No busy: $L \leq 0.8$ V
18	DCD	Output	Data carrier detection	FSK detect: $H \geq 4.2$ V, FSK no detect: $L \leq 0.8$ V
19	ARDY	Output	Ready signal	Ready: $H \geq 4.2$ V, Not ready: $L \leq 0.8$ V
20	RSV2	Output	Reserve	-
21	APTT	Output	ALE standby signal	TX: $L \leq 0.8$ V, RX: $H \geq 4.2$ V
22	TXC	Input	TX control signal	47k Ω pull-up to 5 V TX: $H \geq 4.7$ V, RX: $L \leq 0.4$ V
23	RTS	Input	Reserve	47k Ω pull-up to 5 V
24	CTS	Output	Reserve	-
25	TXD	Input	Data input	47k Ω pull-up to 5 V Serial data, TTL level
26	RXD	Output	Data output	Serial data, TTL level

*1 Names of signals correspond to CN15 of the TK-90 transceiver.

*2 Information on Input/ Output, functions and its specifications are for the ALE unit.

2.11.5 Cautions for using KPE-2

KPE-2 has a built-in lithium battery. If the ALE unit is installed in the transceiver, the internal battery will be charged as long as the DC cable is connected to the power source even though the transceiver is turned OFF. Note the following precautions regarding the internal battery.

- It will take approximately 30 hours to fully charge the internal battery if the battery is completely discharged or replaced.
- The data in memory will be retained for approximately 6 months with the battery fully charged even if the power source is disconnected.

If one of the following events occurs even if the above conditions are satisfied, the internal battery must be replaced.

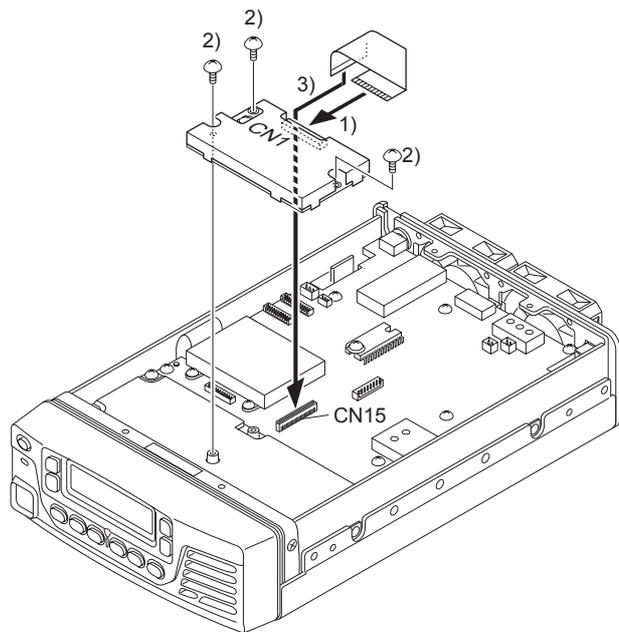
- The accumulated LQA score is initialized.
- The reception stack for AMD messages is initialized.
- "-- : --" appears on the clock display.

2.11.6 Installing KPE-2



YOU MUST TURN THE TRANSCEIVER OFF FIRST BEFORE INSTALLING KPE-2 IN THE TRANSCEIVER.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Install KPE-2 in the transceiver.
Follow the procedure to install KPE-2 in the transceiver.
 - 1) Connect the flat cable to KPE-2. The shorter side of the cable must be connected to KPE-2 with the contacting part upward.
 - 2) Install KPE-2 on the shielding plate by using 3 screws in front of the TX-RX PCB.
 - 3) Connect the flat cable to the connector (CN15).



3. Reinstall the top cover.

2.11.7 Configuration by using KPG-102D

After installing KPE-2, the configuration data can be configured and written to the transceiver by using KPG-102D.

Follow the procedure below to configure ALE information and write the information to the transceiver.

1. Run KPG-102D.
The configuration data must be read from the transceiver or prepared prior to adding ALE information to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read the configuration data from the transceiver.
Note: KPG-102D version 2.00 or later is required to configure KPE-2.
2. Select "Extended Function" from the **Edit** pulldown menu. The **Extended Function** window appears.
3. Check the **ALE** checkbox in the **Optional Board** frame.



4. Configure the ALE functions.
The ALE functions can be configured by selecting the **Edit** pulldown menu > "ALE". Refer to FPRG 5.5 ALE for the details of configuration.
5. Write the configuration data to the transceiver.
Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write the configuration data to the transceiver.

2.11.8 Updating the KPE-2 Firmware

This section describes how to update the firmware of KPE-2.

The firmware of KPE-2 can be written without uninstalling KPE-2 from the transceiver if the firmware is updated in the future.

To update the firmware of KPE-2, ALE Firmware Version Information and ALE Firmware Programming must be enabled by using KPG-102D. Refer to FPRG 5.5 ALE for details of configuration.

To update the firmware, you must run the "Fpro.exe" program which is already installed in the KPG-102 folder. Refer to the service manual for details.

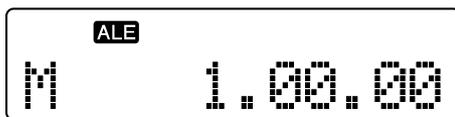
■ Transceiver Operation

● Updating the Firmware

1. Turn the transceiver ON while pressing the [V] key.
"WAIT ..." appears on the main display.



Then, the firmware version number of KPE-2 installed in the transceiver appears on the main display.



Note: If the firmware has not been written to the transceiver properly, "NO SYSTEM" appears on the main display

2. Release the [V] key.

The transceiver enters ALE Firmware Programming Mode.

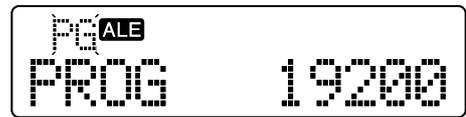


Note:

- ◆ The communication baud rate is fixed at 19,200 bps and this configuration cannot be changed.
- ◆ If ALE Firmware Programming is disabled, the transceiver starts up with normal mode.

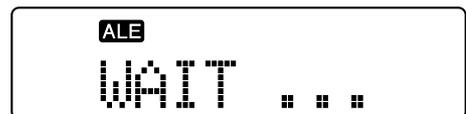
3. FPRO starts transferring data to KPE-2.

When the transceiver finishes receiving data from FPRO, "PG" appears on the sub-display and then the LED will flash green.



4. FPRO finishes transferring data.

The transceiver calculates the checksum. "WAIT ..." appears on the main display while the transceiver is calculating the checksum.



When the transceiver finishes calculating the checksum of transferred data, the checksum appears on the main display and then the LED will light red.



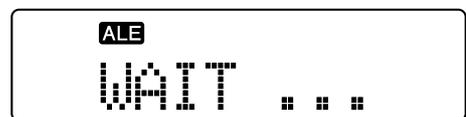
Note: If the firmware has not been transferred successfully, "NO SYSTEM" appears on the main display, and then the LED will flash red. In this case, turn the transceiver OFF and ON. Then, try to write the firmware again.

5. Turn the transceiver OFF.

● Confirming the Checksum

1. Press the [A] key after completing step 2 in "● Updating the Firmware".

The transceiver calculates the checksum. "WAIT ..." appears on the main display while the transceiver is calculating the checksum.



The checksum appears on the main display when the transceiver finishes calculating the checksum.



Note: If the firmware has not been written to the transceiver properly, "NO SYSTEM" appears on the main display

2 INSTALLING OPTIONAL DEVICES

2. Press the **[A]** key while the checksum appears on the main display.

The display returns to the baud rate display.



3 INSTALLING THIRD PARTY OPTIONAL DEVICES

This section describes how to connect third party optional devices to the transceiver.



CAUTION

SPECIFICATIONS OF THIRD PARTY OPTIONAL DEVICES MAY CHANGE FROM TIME TO TIME. YOU MUST CHECK THE LATEST SPECIFICATIONS OF THE OPTIONAL DEVICE BEFORE INSTALLING THE DEVICE.

3.1 Voice Scrambler Board

An optional board, such as a Voice Scrambler board, can be installed in the transceiver. This section describes how to install the Transcript Voice Scrambler board (SC20-455) in the transceiver.

SC20-455 can be installed in the transceiver and it can be connected by soldering the cable from the board to solder pads on the TX-RX PCB. The SC20-455 can be connected to connector (CN13) on the TX-RX PCB by using the cable with connector.

Contact Transcript for details of SC20-455.

■ Required Items to Install the SC20-455

- Transceiver
- SC20-455
- Cable with connector (E37-0808-x5) (for connecting to solder pads)
- Cushion (CR Sponge)

Cushion manufactured by Inoac (C-4255),
45 mm x 30 mm/ t5.0 mm

A: Cushion with a double-sided adhesive tape on one side

B: Cushion with a double-sided adhesive tape on both sides

3.1.1 Assigning Signals from SC20-455

The cable must be replaced with the cable with connector (E37-0808-x5) when connecting the SC20-455 to the connector (CN13) on the TX-RX PCB.

Follow the procedure below to replace the cable.

1. Disconnect 13 cables connected to the SC20-455.
2. Connect the cable with connector (E37-0808-x5) as shown in the following table.
3. Change the input/ output levels of the SC20-455. The SC20-455 board must be changed to configure the following values for RX and TX terminals.

RX side: 400 mVp-p to 1 Vp-p

TX side: 150 mVp-p to 400 mVp-p

Change the input/ output levels of the SC20-455 described in the instruction manual.

Table 3-1 Connecting the E37-0808-x5

SC20-455		E37-0808-25		CN13	
Pin Number	Function	Pin Number	Cable Color	Pin Number	Function
1	TXIN	1	YELLOW	1	TXAO
2	RXIN	2	ORANGE	2	RXAO
3	Indicator	3	BLUE	3	INDI
4	Binary Code Select 8	4	PURPLE	4	CODE8
5	Binary Code Select 4	5	WHITE/ RED	5	CODE4
6	Binary Code Select 2	6	WHITE/ BROWN	6	CODE2
7	Binary Code Select 1	7	WHITE/ GREEN	7	CODE1
8	RXOUT	8	WHITE/ YELLOW	8	RXAI
9	Scramble (L Enable)	9	BROWN	9	SCR
10	PTT (L TX Mode)	10	WHITE	10	PTT
11	V+	11	GREEN	11	8D
12	GND	12	GREY	12	GND
13	TXOUT	13	RED	13	TXAI
		14	BLACK	14	NC

Note: A wire from pin 14 (BLACK) is not connected to the SC20-455.

3.1.2 Installing the SC20-455



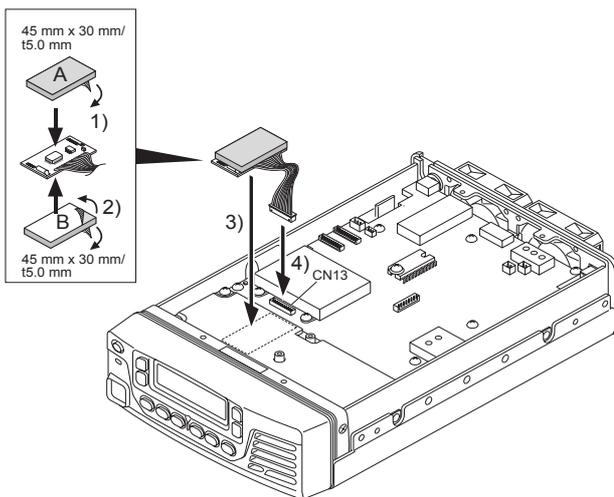
WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

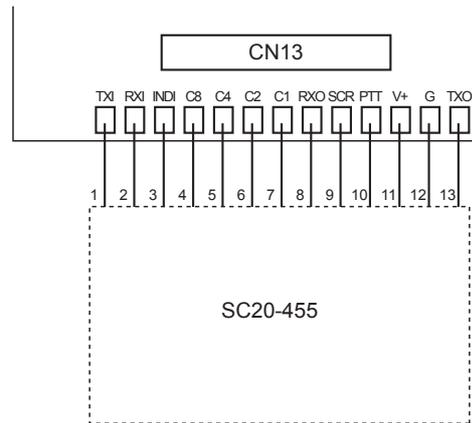
1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Install the SC20-455 on the TX-RX PCB.

Follow the procedure below to install the SC20-455 on the TX-RX PCB.

- 1) Install cushion A on the upper surface of the SC20-455.
- 2) Install cushion B on the bottom surface of the SC20-455 and peel off the protective paper.
- 3) Install the SC20-455 to the left side from center on the shielding plate in front of the TX-RX PCB.
- 4) Connect the SC20-455 to the connector (CN13) on the TX-RX PCB using the cable with connector (E37-0808-x5) that was connected to the SC20-455 in the previous section.



- 5) Solder the cable (cable without connector) to the SC20-455 to the solder pad on the TX-RX PCB.
Connect the SC20-455 to the transceiver as shown in the following figure.



Note: The CN13 solder pad can be used for soldering the cable from SC20-455. Other optional devices cannot be soldered on the solder pad. Also, matching pin names for SC20-455 are printed on the solder pads (CN13) on the PC board.

3. Reinstall the top cover.

3.1.3 Configuration using KPG-102D

You can configure Voice Scrambler information by using KPG-102D and write configuration data to the transceiver after installing the Voice Scrambler board.

Follow the procedure below to configure Voice Scrambler information and write configuration data to the transceiver.

1. Run KPG-102D.

Read configuration data from the transceiver or use existing saved configuration data when supplementing the Voice Scrambler information to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.

2. Select "Extended Function" from the **Edit** pulldown menu.

The **Extended Function** window appears on the display.

3. Check the **Voice Scrambler** checkbox in the **Optional Board** frame.



4. Configure the Voice Scrambler.

Voice Scrambler can be configured for each channel. Refer to FPRG 5.1.10 Channel Edit Window for the details of configuration.

In the **Key Assignment** window, assign the Scrambler to a function key according to need. Refer to FPRG 5.3 Key Assignment Window for the details of configuration.

5. Write configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

3.2 GPS Receiver (GPS 15L-W)

The internal-type GPS receiver can be installed in the transceiver. This section describes how to install the Garmin GPS receiver (GPS 15L-W) in the transceiver.

Contact Garmin for details of the GPS 15L-W.

■ Required Items to Install the GPS 15L-W

- Transceiver
- GPS 15L-W
- Cushion (CR Sponge)

Cushion manufactured by Inoac (C-4255),
45 mm x 30 mm/ t3.0 mm

A: Cushion with a double-sided adhesive tape on one side

B: Cushion with a double-sided adhesive tape on both sides

Note: GPS 15L-W is connected to the transceiver on a TTL level.

3.2.1 Repositioning Resistor to Connect RXD

Resistor B is installed by the factory default setting. This enables the RXD line to be routed to the KCT-31. (Refer to 2.5 Interface Cable (KCT-31) on page 11.)

The resistor must be moved to the location C in order to feed the signal from GPS 15L-W to the I/O port.

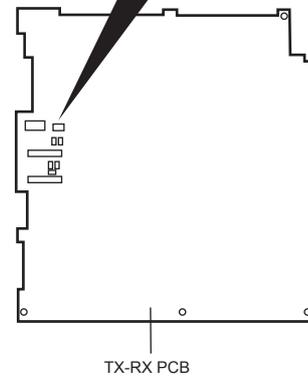
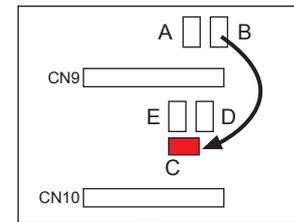
Follow the procedure below to move the resistor.



WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the resistor (R858) from B on the TX-RX PCB and install the resistor at C.



3.2.2 Installing the GPS 15L-W



WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

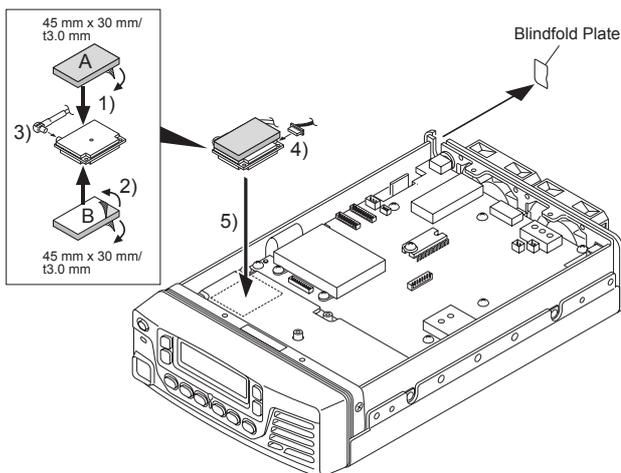
1. Remove the top cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove the blindfold plate from the rear panel.
3. Install the GPS 15L-W on the TX-RX PCB.

Follow the procedure below to install the GPS 15L-W.

- 1) Install cushion A on the top surface of the GPS 15L-W.
- 2) Install cushion B on the bottom surface of the GPS 15L-W and peel off the protective paper.
- 3) Connect the cable of the GPS antenna to the GPS 15L-W.
- 4) Connect the cable with connector to the GPS 15L-W.

3 INSTALLING THIRD PARTY OPTIONAL DEVICES

- 5) Install the GPS 15L-W to the left side of center on the flat space in front of the TX-RX PCB.



4. Solder the cables from connector to the solder pad on the TX-RX PCB.

Insert the connector to the GPS 15L-W.

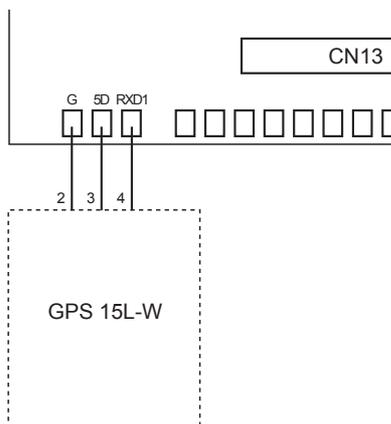


Table 3-2 Connecting the GPS 15L-W

GPS 15L-W			Solder Pad Name on the TK-90 PCB	
Pin Number	Signal Name			
1	Backup Power			
2	Ground	—		G
3	Power	—		5D
4	Port1 Data output	—		RXD1
5	Port1 Data input			
6	RF Bias			
7	PPS			
8	Port2 Data input			

Note: Pins 1, 5 to 8 of the GPS 15L-W are not used.

5. Position the GPS antenna cable connected to the GPS 15L-W through the separated area on the rear panel and dress the cable to lay along the chassis.
6. Reinstall the top cover.

Note: The GPS 15L-W can be also installed with the Voice Scrambler board.

3.2.3 Configuration using KPG-102D

Configure the GPS information and write configuration data to the transceiver by using KPG-102D after installing the GPS unit.

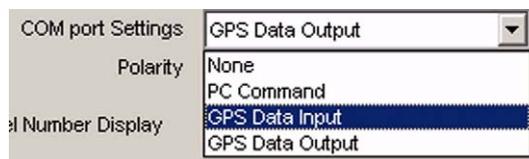
Follow the procedure below to configure the GPS information and write configuration data to the transceiver.

1. Run KPG-102D.

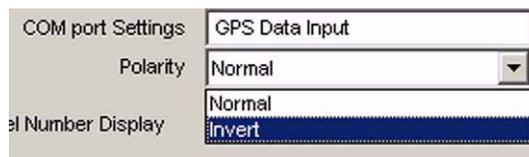
Read configuration data from the transceiver or use existing saved configuration data when supplementing the GPS information to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read configuration data from the transceiver.

2. Select "Optional Features" from the **Edit** pulldown menu and click the **Common Page** tab.

Select "GPS Data Input" from the **COM port Settings** dropdown list. Refer to FPRG 5.2.1 Common Page Tab for the details of configuration.



3. Select "Invert" from the **Polarity** dropdown list.



4. Configure the GPS functions.

Refer to FPRG 5.6 GPS Window for the details of configuration.

5. Write configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write configuration data to the transceiver.

3.3 GPS Receiver (GPS 35-HVS)

A GPS receiver (GPS 35-HVS) can be connected to the transceiver using the KCT-31 cable. (Refer to [2.5 Interface Cable \(KCT-31\) on page 11.](#))

Contact Garmin for details of GPS 35-HVS.

■ Required Items to Install the GPS 35-HVS

- Transceiver
- GPS 35-HVS
- D-sub 9-pin connector (male)
- An external power source

Note: GPS 35-HVS is connected to the transceiver via a RS232C serial interface.

3.3.1 Connecting to KCT-31



WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Connect the D-sub 9-pin connector (male) to the GPS 35-HVS.

Connect the GPS 35-HVS to pins 2 and 5 of the KCT-31 cable. Connect the terminals as shown below.

Table 3-3 Connecting the GPS Receiver (GPS 35-HVS) to the KCT-31 Cable

KCT-31 D-sub 9-pin (Female)			GPS 35-HVS
Pin Number	Signal Name		
1	NC		
2	RD		TXD1 (White)
3	SD		
4	ER		
5	SG		GND (Black)
6	DR		
7	RS		
8	CS		
9	NC		

3.3.2 Connecting to the Transceiver



WARNING

NEVER SUPPLY DC POWER SOURCES TO THE TRANSCEIVER DURING THE WORK.

1. Connect the KCT-31 cable to the transceiver. (Refer to [2.5 Interface Cable \(KCT-31\) on page 11.](#))
2. Connect the D-sub 9-pin connector (male) connected to the GPS 35-HVS to the D-sub 9-pin connector (female).
3. Connect the power line of GPS 35-HVS to the power source.

A port for connecting the power for GPS 35-HVS (6 V to 40 V DC) is not provided as a solder pad in the TK-90. Therefore, the power must be separately supplied. Contact Garmin for the power source requirements.

3.3.3 Configuration using KPG-102D

Refer to [3.2.3 Configuration using KPG-102D on page 32](#) for instructions on how to configure by using KPG-102D.

3.4 Changing the Configuration for Connecting other External Antenna Tuner to the Transceiver

This section describes how to change the configuration for using other external tuner that requires DC power control.

Due to the change of the configuration, the DC power supply for the antenna tuner starts supplying the DC source when the transceiver starts tuning, and the DC power supply for the antenna tuner stops supplying the DC source when the frequency changes or the **Antenna Tuner** key is pressed.

DC power control for other external tuners is supported only by a transceiver having firmware version 2.00 or later.

KAT-1 cannot be used after the configuration is changed since the transceiver is controlled by a third-party external tuner.

3.4.1 Creating the Power Control Circuit

This section describes a typical example for creating a power control circuit.

Create a similar power control circuit as illustrated in the following circuit diagrams.

- **Cable A with a Connector:**
Cut off a length of cable with 2-pin connector approximately 20 cm from the external antenna tuner connector split cable (E37-1228-05).
- **Cable B with a Connector:**
Cut off a length of cable with 3-pin connector approximately 10 cm from the external antenna tuner connector split cable (E37-1228-05). The unused portion of blue cable must be cut at the end with the connector.

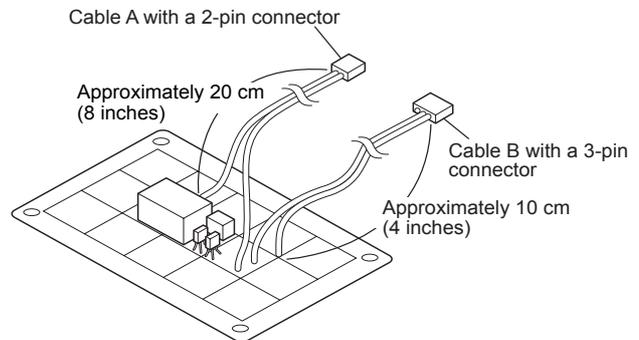


Figure 3-2 Power Control Circuit for an External AT (Example)



CAUTION

YOU MUST INSULATE THE SOLDER POINTS TO PREVENT EACH PART FROM SHORTING OUT.

3.4.2 Installing the Power Control Circuit



WARNING

YOU MUST TURN THE TRANSCEIVER OFF FIRST BEFORE INSTALLING KPE-2 IN THE TRANSCEIVER.

1. Remove the top and bottom covers, and the dust cover. (Refer to 2.1 Removing Covers on page 7.)
2. Remove 9 screws from the bottom shielding cover.

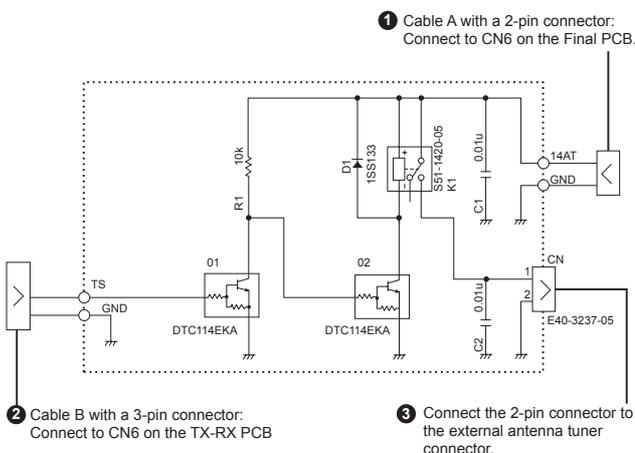
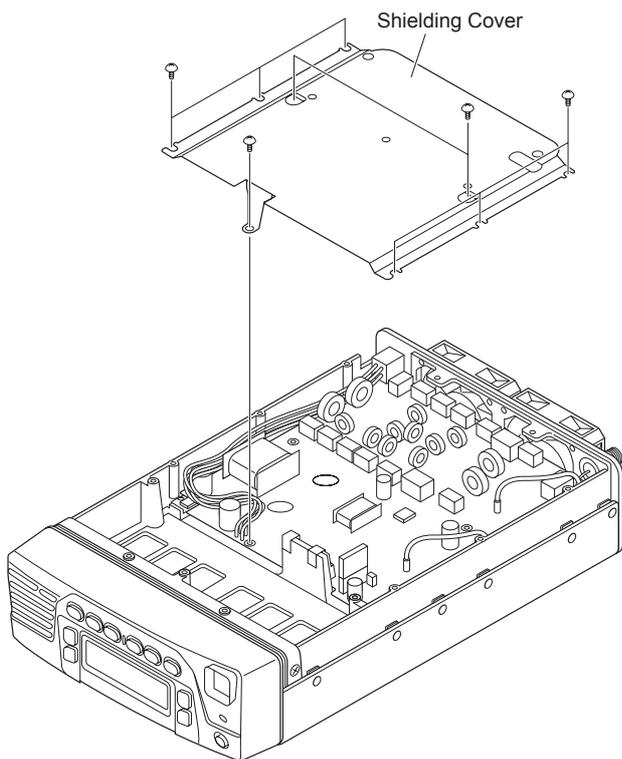
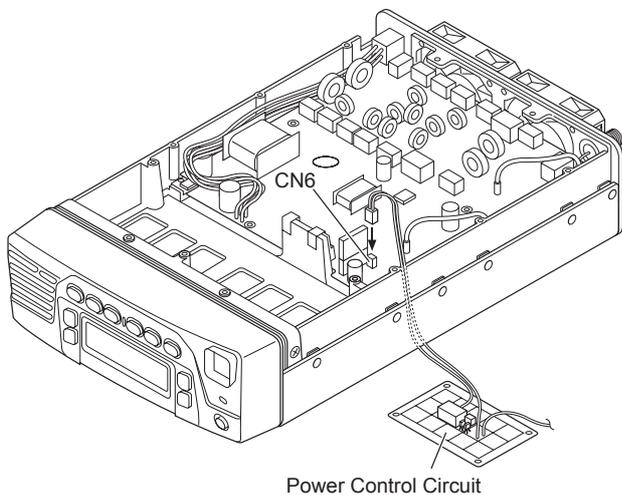


Figure 3-1 Diagram of the Power Control Circuit for an External AT (Example)

A cable with a connector (E37-1228-05) must be prepared in advance to create cables A and B. These cables are used for the power control circuit for the external tuner.

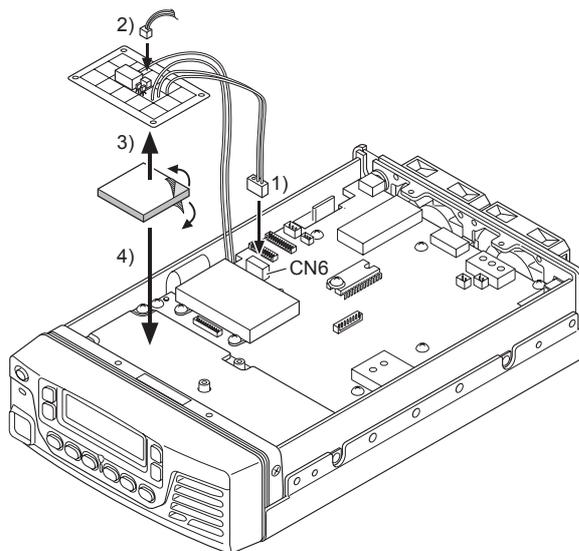


3. Remove the 2-pin connector from the external antenna tuner connector connected to CN6 on the Final PCB.
4. Feed the cable A with a connector on the power control circuit from the TX-RX PCB side through the hole and then connect the connector to CN6 on the Final PCB. (❶ on Figure 3-1.)



5. Remove the 3-pin connector from the external antenna tuner connector connected to CN6 on the TX-RX PCB.
The cable with the 2-pin connector must be tied by using a retainer band, etc. in order to secure the loosened cable with 3-pin connector.

6. Install the power control circuit.
Follow the procedure below to install the power control circuit in the transceiver.
 - 1) Connect the cable B with a connector on the power control circuit to CN6 on the TX-RX PCB. (❷ on Figure 3-1.)
 - 2) Connect the 2-pin connector to the external antenna tuner connector that was removed in step 3 to the connector on the power control circuit. (❸ on Figure 3-1.)
 - 3) Attach the double-sided adhesive tape to the bottom side of the power control circuit PCB.
 - 4) Install the power control circuit on the shielding plate in front of the TX-RX PCB.



CAUTION
AVOID A SHORT-CIRCUIT BETWEEN THE POWER CONTROL CIRCUIT AND SHIELD PLATE.

7. Reinstall the shielding plate, shielding cover, dust cover, and top and bottom covers.

3.4.3 DC Power Control of an External Antenna Tuner by using the TS Signal

The DC power of an external antenna tuner is controlled by the TS signal in the following manner.

Table 3-4 DC Power Control by an External Antenna Tuner using the TS Signal

Status	“  ” icon state	TS Signal of an External AT Terminal*1
The antenna tuner is bypassed (THRU Mode).	The “  ” icon does not appear.	H
While the antenna tuner is tuning.	The “  ” icon blinks.	L
The antenna tuner has been completely tuned.	The “  ” icon appears.	L

3 INSTALLING THIRD PARTY OPTIONAL DEVICES

*1 Terminal Specifications of the TS Signal: The TS signal is pulled up to 5 V DC at 10kΩ.

3.4.4 Configuration by using KPG-102D

If the power of the other antenna tuner connected to the transceiver is controlled, configuration of the antenna tuner control must be enabled by using KPG-102D and the configuration data must be written to the transceiver.

Follow the procedure below to enable configuration of the antenna tuner control and write the configuration data to the transceiver.

1. Run KPG-102D.

The configuration data must be read from the transceiver or prepared prior to adding antenna tuner control information to the current configuration data. Refer to FPRG 6.1 Read Data from the Transceiver Window for instructions on how to read the configuration data from the transceiver.

Note: KPG-102D version 2.00 or later is required to configure the antenna tuner control.

2. Select "Optional Features" from the **Edit** pulldown menu, and then click the **Receive/Transmit** tab.
3. Check the **Antenna Tuner Control** checkbox.



You must configure Manual Antenna Tuning Duration, Auto Antenna Tuning Duration and other ALE functions if necessary. Refer to the Field Programming Reference for details of configuration.

4. Write the configuration data to the transceiver.

Refer to FPRG 6.2 Write Data to the Transceiver Window for instructions on how to write the configuration data to the transceiver.