KENWOOD

# *Modification Information (MOD)*

## *For*

# *TK-7160/ TK-8160*

| | |
|---|---|
| *Version:* | *1.01* |
| *Last Updated:* | *August, 2005* |
| *Language:* | *English* |
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# About Copyright



# Revision history

| Date | Description |
|---|---|
| August 5, 2005 | 1) Added details of terminals on Table 1-1 Assigning Signals to 8-pin Connector.<br>2) Added details of terminals on Table 1-2 Assigning Signals to the CN2 Connector.<br>3) Added details of terminals on Table 1-3 Assigning Signals to the CN3 Connector.<br>4) Added Table 1-4 Assigning Signals to the CN4 Connector.<br>5) Added the following chapters;<br>2.6 GPS Unit<br>2.7 Connect GPS35-HVS using KCT-31<br>2.8 Voice Scrambler Board<br>2.9 Voice Scrambler Board (KW21)<br>2.10 ANI Board<br>6) Revised the version from 1.00 to 1.01. |

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# 1 PORT FUNCTIONS

This section describes Input/ Output ports of the transceiver.

## 1.1 8-pin Connector (Mic Connector)

The 8-pin microphone connector is located on the front panel of the TK-7160/ TK-8160. Configuration data can be written into the transceiver or read from the transceiver by connecting the transceiver to a PC with KPG-99D software installed.

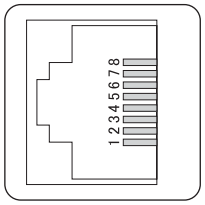



**Figure 1-1 8-pin Connector**

**Table 1-1 Assigning Signals to 8-pin Connector**

| Pin Number | Signal Name | Input/ Output | Items | Description 1 | Description 2 |
|---|---|---|---|---|---|
| 1 | BLC | Output | High/ Low Level<br>Maximum Current<br>Pull-up or None<br>Active High or Low | H = more than 4.2 V<br>L = less than 0.8 V<br>0.2 mA maximum<br>Pulled-up to 5 V<br>Active Low | - |
| 2 | PSB | Output | Output Voltage<br>Maximum Current<br>Switched or Unswitched | 13.6 V (Battery voltage)<br>100 mA maximum<br>Switched battery output | - |
| 3 | GND | - | - | - | - |
| 4 | PTT | Input | High/ Low Level<br>Maximum Current<br>Pull-up<br>Active High or Low | H = more than 4.2 V<br>L = less than 0.8 V<br>0.2 mA maximum<br>Pulled-up to 5 V<br>Active Low | RS232C level/<br>RS232C polarity<br>H = more than 5 V<br>L = less than -5 V<br>Maximum input ±30 V<br>Baud rate = 9600bps<br>Data = 8-bit, Parity = None<br>Stop = 2 |
| 5 | ME | - | - | MIC ground | - |
| 6 | MIC | Input | Input Level/ Deviation<br>Input Impedance<br>DC coupling<br>Frequency Response | 5 mVrms ±5 mV at<br>60% deviation<br>600Ω load<br>DC coupled<br>300 Hz to 3 kHz +6dB/octave<br>(EIA curve) | - |
| 7 | Hook | Input | High/ Low Level<br>Maximum Input Voltage<br>Pull-up<br>Active High or Low | H = more than 4.2 V<br>L= less than 0.8 V<br>±20 V maximum<br>Pulled-up to 5 V<br>Active Low | RS232C level/<br>RS232C polarity<br>H = more than 5 V,<br>L = less than -5 V<br>Maximum input ±30 V<br>Baud rate = 9600bps<br>Data = 8-bit, Parity = None<br>Stop = 2 |
| 8 | DM | Input/ Output | High/ Low Level<br>Maximum Current/<br>Maximum Input Voltage<br>Pull-up<br>Active High or Low | H = more than 4.2 V<br>L = less than 0.8 V<br>±20 V maximum<br>Pulled-up to 5 V<br>Active Low | H = more than 4.2 V<br>L = less than 0.8 V<br>0.2 mA maximum<br>Pulled-up to 5 V<br>Active Low |

# 1.2 Internal Connector

TK-7160/ TK-8160 have 3 connectors for connecting external devices and installing boards (scrambler, etc.).

**Note:** For TK-7160/ TK-8160 with serial numbers lower than 704xxxxx, CN4 is not available.


**Figure 1-2 CN2 Connector**

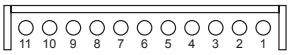



**Figure 1-3 CN3 Connector**

**Table 1-2 Assigning Signals to the CN2 Connector**

| Pin Number | Signal Name | Input/ Output | Items | Description 1 | Description 2 |
|---|---|---|---|---|---|
| 1 | SB | Output | Output Voltage<br>Maximum Current<br>Switched or Unswitched | 13.6 V ±0.5 V<br>100 mA maximum<br>Switched Battery Power Output | - |
| 2 | NC | - | - | - | - |
| 3 | GND | - | - | - | - |
| 4 | DETO | Input/ Output | Output Level at 60% deviation<br>Output Impedance<br>DC Coupling<br>Frequency Response | 260 mV ±50 mV at 1 kHz<br>60% deviation<br>22kΩ load<br>DC coupled<br>+1/-3dB at 0 Hz to 10 kHz | - |
| 5 | FNC1 | Input/ Output | High/ Low Level<br>Maximum Current/ Input Voltage<br>Pull-up<br>Active High or Low | H = more than 4.2 V<br>L = less than 0.8 V<br>±20 V maximum<br>Pulled-up to 5 V<br>Active Low | H = more than 4.2 V<br>L = less than 0.8 V<br>0.2 mA maximum<br>Pulled-up to 5 V<br>Active Low |
| 6 | FNC2 | Input/ Output | - do - | - do - | - do - |
| 7 | FNC3 | Input/ Output | - do - | - do - | - do - |
| 8 | FNC4 | Input/ Output | - do - | - do - | - do - |
| 9 | FNC5 | Input/ Output | - do - | - do - | - do - |
| 10 | FNC6 | Input/ Output | - do - | - do - | - do - |
| 11 | FNC7 | Input/ Output | - do - | - do - | - do - |
| 12 | FNC8 | Input/ Output | - do - | - do - | - do - |

**Table 1-3 Assigning Signals to the CN3 Connector**

| Pin Number | Signal Name | Input/ Output | Items | Description |
|---|---|---|---|---|
| 1 | IGN | Input | High/ Low Level<br>Maximum Input Voltage<br>Pull-up<br>Active High or Low | H = more than 8 V, L = less than 6 V<br>±20 V maximum<br>No pull-up<br>Active High |
| 2 | DATAI | Input | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 500 mVrms ±5 mV at 1 kHz deviation<br>5kΩ load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz |
| 3 | DETO | Output | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 530 mVp-p at 60% Deviation<br>1kΩ load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz |
| 4 | TXAFI | Input | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 200 mV ±50 mVp-p at 1 kHz Deviation<br>22kΩ load<br>DC coupled<br>300 Hz to 3 kHz +6dB/octave (EIA curve) |
| 5 | TXAFO | Output | Output Level/ Deviation<br>Output Impedance<br>DC Coupling<br>Frequency Response | 200 mV ±50 mVp-p at 1 kHz Deviation<br>22kΩ load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz |
| 6 | EMGMIC | Input | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 3 mVrms at 1 kHz Deviation<br>4kΩ load<br>DC coupled<br>300Hz to 3 kHz +6dB/octave (EIA curve) |
| 7 | RXAFO | Output | Output Level at 60% deviation<br>Output Impedance<br>DC Coupling<br>Frequency Response | 500 mVp-p at 1 kHz Deviation<br>50kΩ load<br>DC coupled<br>300 Hz to 3 kHz -6dB/octave (EIA curve) |
| 8 | ALTI | Input | Input Level at 5 W SP output<br>Input Impedance<br>DC coupling<br>Frequency Response | 500 mVp-p at 1kHz Deviation<br>560Ω load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz |
| 9 | RXAFI | Input | Input Level at 60% deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 500 mVp-p at 1 kHz Deviation<br>50kΩ load<br>DC coupled<br>300 Hz to 3 kHz -6dB/octave (EIA curve) |
| 10 | 5C | Output | Output Voltage<br>Maximum Current<br>Switched or Unswitched | 5 V ±0.5 V<br>50 mA maximum<br>Switched 5 V AVR output |
| 11 | 8C | Output | Output Voltage<br>Maximum Current<br>Switched or Unswitched | 8 V ±0.5 V<br>50 mA maximum<br>Switched 8 V AVR output |

**Table 1-4 Assigning Signals to the CN4 Connector**

| Pin Number | Signal Name | Input/ Output | Items | Description 1 | Description 2 |
|---|---|---|---|---|---|
| 1 | GND | - | - | - | - |
| 2 | 8C | Output | Output Voltage<br>Maximum Current<br>Switched or Unswitched | 8 V ±0.5 V<br>50 mA maximum<br>Switched AVR 8 V output | - |
| 3 | FNC5 | Input/ Output | High/Low Level<br>Maximum Current/ Input Voltage<br>Pull-up<br>Active High or Low | H = more than 4.2 V<br>L = less than 0.8 V<br>±20 V maximum<br>Pulled-up to 5 V<br>Active Low | H = more than 4.2 V<br>L = less than 0.8 V<br>0.2 mA maximum<br>Pulled-up to 5 V<br>Active Low |
| 4 | FNC6 | Input/ Output | - do - | - do - | - do - |
| 5 | FNC2 | Input/ Output | - do - | - do - | - do - |
| 6 | FNC7 | Input/ Output | - do - | - do - | - do - |
| 7 | FNC8 | Input/ Output | - do - | - do - | - do - |
| 8 | FNC3 | Input/ Output | - do - | - do - | - do - |

| Pin Number | Signal Name | Input/ Output | Items | Description 1 | Description 2 |
|---|---|---|---|---|---|
| 9 | FNC1 | Input/ Output | - do - | - do - | - do - |
| 10 | NC | - | - | - | - |
| 11 | 5C | Output | Output Voltage<br>Maximum Current<br>Switched or Unswitched | 5 V ±0.5 V<br>50 mA maximum<br>Switched 5 V AVR output | - |
| 12 | TXAFO | Output | Output Level/ Deviation<br>Output Impedance<br>DC Coupling<br>Frequency Response | 200 mV ±50 mVp-p at 1 kHz Deviation<br>22kΩ load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz | - |
| 13 | DATA1 | Input | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 500 mVrms ±5 mV at 1 kHz Deviation<br>5kΩ load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz | - |
| 14 | DETO | Output | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 530 mVp-p at 60% Deviation<br>1kΩ load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz | - |
| 15 | ALTI | Input | Input Level at 5 W SP output<br>Input Impedance<br>DC coupling<br>Frequency Response | 500 mVp-p at 1 kHz Deviation<br>560Ω load<br>DC coupled<br>+1/-3dB at 10 Hz to 10 kHz | - |
| 16 | NC | - | - | - | - |
| 17 | TXAFI | Input | Input Level/ Deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 200 mV ±50 mVp-p at 1 kHz Deviation<br>22kΩ load<br>DC coupled<br>300 Hz to 3 kHz +6dB/octave (EIA curve) | - |
| 18 | RXAFO | Output | Output Level at 60% deviation<br>Output Impedance<br>DC Coupling<br>Frequency Response | 500 mVp-p at 1 kHz Deviation<br>50kΩ load<br>DC coupled<br>300 Hz to 3 kHz -6dB/octave (EIA curve) | - |
| 19 | RXAFI | Input | Input Level at 60% deviation<br>Input Impedance<br>DC Coupling<br>Frequency Response | 500 mVp-p at 1 kHz Deviation<br>50kΩ load<br>DC coupled<br>300 Hz to 3 kHz -6dB/octave (EIA curve) | - |
| 20 | FNC4 | Input/ Output | High/Low Level<br>Maximum Current/ Input Voltage<br>Pull-up<br>Active High or Low | H = more than 4.2 V<br>L = less than 0.8 V<br>±20 V maximum<br>Pulled-up to 5 V<br>Active Low | H = more than 4.2 V<br>L = less than 0.8 V<br>0.2 mA maximum<br>Pulled-up to 5 V<br>Active Low |

**Table 1-5 Function Port Assignment**

| | KDS-100 KGP-2A/ KGP-2B | | Scrambler | | ANI Board | |
|---|---|---|---|---|---|---|
| | Name | I/O | Name | I/O | Name | I/O |
| FNC1 | - | - | - | - | - | - |
| FNC2 | - | - | - | - | - | - |
| FNC3 | Data Channel | Input | TX Relay | Output | Emergency for ANI Board | Output |
| FNC4 | PTT | Input | Scrambler | Output | PTT input | Input |
| FNC5 | Carrier Operated Relay | Out-put | Scrambler Code (1) | Output | Carrier Operated Relay | Output |
| FNC6 | Audio Mute | Input | Scrambler Code (2) | Output | Speaker ON | Input |
| FNC7 | Mic Mute | Input | Scrambler Code (4) | Output | Mic Mute | Input |
| FNC8 | TX Relay | Out-put | Scrambler Code (8) | Output | PTT output | Output |

Port Function is Active Low. (Excluded: Scrambler Code)

# 1.3 Description of Function

FNC1 to FNC8 of CN2 are input/ output ports that can be configured using KPG-99D. These 8 ports are called Function Ports.

Function Ports can be configured in the **Edit** pulldown menu > **Function Port** pulldown menu in KPG-99D.

Port 1 to Port 8 in KPG-99D correspond to FNC1 to FNC 8 of CN2.

## 1.3.1 External Devices

A function can be assigned to Port 1 to Port 8 by using KPG-99D. When a device that you wish to install is selected from External Devices, the appropriate function is automatically assigned to each port (Port 1 to Port 8).

- **None**

  A function can be assigned to Port 1 to Port 8.

- **KDS-100**

  KDS-100 can be configured when a KDS-100 is connected to the TK-7160/ TK-8160.

  Configurations of External Devices and KDS-100 will be the same when Port 3 to Port 8 are configured with the values in the KDS-100 even if "None" is selected from the **External Devices** dropdown list.

- **KGP-2A/ KGP-2B**

  KGP-2A/ KGP-2B can be configured when a KGP-2A/ KGP-2B is connected to the TK-7160/ TK-8160.

  Configurations of External Devices and KGP-2A/ KGP-2B are the same when Port 3 to Port 8 are configured with the values configured in the KGP-2A/ KGP-2B even if "None" is selected from the **External Devices** dropdown list.

- **Scrambler**

  Scrambler Board can be configured when the Scrambler Board is connected to the TK-7160/ TK-8160.

  Configurations of External Devices and Scrambler Board will be the same when Port 1 to Port 8 are configured with the values in the Scrambler Board even if "None" is selected from the **External Devices** dropdown list.

**Note:** The KDS-100 and KGP-2A/ KGP-2B use the same port. The KGP-2A or KGP-2B functions when either is connected while the KDS-100 is selected. On the other hand, the KDS-100 functions when it is connected while the KGP-2A or KGP-2B is selected.
This function is provided to easily identify configuration data and separately configure External Devices.

## 1.3.2 GPS (NMEA Input)

GPS (NMEA Input) is automatically configured for Port 2 when GPS (NMEA) is configured for External Devices (Port 1 to 2). In this case, Port 1 is automatically configured for None and the port is disabled.

When GPS data output is connected to Port 2 using the Connection Cable (KCT-39), GPS functions can be used. In this case, Port 1 is not used.

## 1.3.3 Hook (Input)

Hook (Input) can be assigned to Port 1 to Port 8.

A function port to which Hook (Input) is assigned functions in the same way as microphone (KMC-30/ KMC-32/ KMC-36) hook.

When this port is connected to GND, the port is in On-hook status. When this port is not connected to GND, the port is in Off-hook status.

If both microphone (KMC-30/ KMC-32/ KMC-36) hook and Function Port Hook are connected to GND, the transceiver functions as if the microphone is on-hook.

## 1.3.4 PTT (Input)

PTT (Input) can be assigned to Port 1 to Port 8.

The transceiver transmits when this port is grounded to earth (GND).

This function can be used for the KDS-100 and KGP-2A/ KGP-2B.

The receiving party's transceiver does not emit any data sounds when Data Transmit with QT/DQT is disabled, since the QT/DQT configured for the Channel is not added.

## 1.3.5 Data Channel (Input)

Data Channel (Input) can be assigned to Port 1 to Port 8.

The transceiver stays on a Data Channel while the port logic level is Low.

Data Channel can be configured in the **Optional Features** window > **Common Page 1** tab > **Data Zone-CH** dropdown list.

This function can be used for the KDS-100 and KGP-2A/ KGP-2B.

Since the KDS-100 and KGP-2A/-2B normally send data at a high level via this port, the transceiver sends data using a normal Voice-Channel when establishing communication using a microphone (KMC-30/ KMC-32/ KMC-36).

When data is sent from the KDS-100 and KGP-2A/ KGP-2B, this port must be switched to Low level. With this function, data communications can be established without interfering with other party's communications.

## 1.3.6 Monitor (Input)

Monitor (Input) can be assigned to Port 1 to Port 8.

The transceiver emits the received audio regardless of receiving status while the port logic level is Low.

## 1.3.7 Emergency (Input)

Emergency (Input) can be assigned to Port 1 to Port 8.

When this port is grounded to earth (GND), the transceiver functions in the same way as when the **Emergency** key is pressed.

Prepare and install a foot switch on the floor near the driver's seat and use this switch as an **Emergency** key. When the driver is in an emergency situation, the transceiver starts executing the Emergency operation with a foot switch operation.

The floor-mounted **Emergency** key can be easily connected to the transceiver by using the Connection Cable (KCT-39).

## 1.3.8 Audio Mute (Input)

Audio Mute (Input) can be assigned to Port 1 to Port 8.

The transceiver does not emit the received signal while the port logic level is Low.

This function can be used for the KDS-100 and KGP-2A/ KGP-2B.

### ■ Example

The KDS-100 can make an individual call using FleetSync. Unless the transceiver receives a call, the KDS-100 continues emitting the received audio with this port at Low level. The transceiver mutes even if a carrier or QT/DQT is detected.

## 1.3.9 Mic Mute (Input)

Mic Mute (Input) can be assigned to Port 1 to Port 8.

The transceiver mutes the microphone (KMC-30/ KMC-32/ KMC-36) while the port logic level is Low even if the transceiver is transmitting.

The transceiver mutes the microphone when establishing data communications using external devices so as not to mix voice and data communications audio signals.

This function can be used in the KDS-100 and KGP-2A/ KGP-2B.

### ■ Example

Normally, this port level is High on the KDS-100.

The transceiver transmits when the **PTT** switch is pressed.

When the transceiver sends data, the KDS-100 switches the Mic Mute port level to Low and PTT port level to Low. Then, the transceiver starts transmitting.

In this case, the microphone (KMC-30/ KMC-32/ KMC-36) is muted.

## 1.3.10 Direct Z1-CH1 (Input)

Direct Z1-CH1 (Input) can be assigned to Port 1 to Port 8.

The transceiver jumps to Zone 1 - Channel 1 when the port logic level is Low.

Direct Z1-CH1 (Input) is different from using the **Channel Up** or **Channel Down** key, and Zone - Channel is not stored as the Last Selected Channel.

## 1.3.11 Direct Z1-CH2 (Input)

Direct Z1-CH2 (Input) can be assigned to Port 1 to Port 8.

The transceiver jumps to Zone 1 - Channel 2 when the port logic level is Low.

Direct Z1-CH2 (Input) is different from using the **Channel Up** or **Channel Down** key, and Zone - Channel is not stored as the Last Selected Channel.

## 1.3.12 Direct Z1-CH3 (Input)

Direct Z1-CH3 (Input) can be assigned to Port 1 to Port 8.

The transceiver jumps to Zone 1 - Channel 3 when the port logic level is Low.

Direct Z1-CH3 (Input) is different from using the **Channel Up** or **Channel Down** key, and Zone - Channel is not stored as the Last Selected Channel.

## 1.3.13 Direct Z1-CH4 (Input)

Direct Z1-CH4 (Input) can be assigned to Port 1 to Port 8.

The transceiver jumps to Zone 1 - Channel 4 when the port logic level is Low.

Direct Z1-CH4 (Input) is different from using the **Channel Up** or **Channel Down** key, and Zone - Channel is not stored as the Last Selected Channel.

## 1.3.14 Data PTT (Input)

Data PTT (Input) can be assigned to Port 1 to Port 8.

The transceiver jumps to a Data Channel when the port logic level is Low.

Data Channel can be configured in the **Optional Features** window > **Common Page 1** tab > **Data Zone-CH** dropdown list.

The receiving party's transceiver does not emit any data sounds when Data Transmit with QT/DQT is disabled since the QT/DQT configured for the channel is not valid.

## 1.3.15 Status Message (Input)

Status Message (Input) can be assigned to Port 1 to Port 8.

The transceiver sends a FleetSync Status Message depending on the port logic.

Status Message (Input) can be configured in the **FleetSync** window > **Target** tab.

## 1.3.16 Speaker On (Input)

Speaker On (Input) can be assigned to Port 1 to Port 8.

Speaker Amp is enabled while the port logic level is Low.

## 1.3.17 AUX (Output)

AUX (Output) can be assigned to Port 1 to Port 8.

The logic level can be switched between High and Low by using the **AUX** key.

With this function, a control board prepared by a third party or external devices can be controlled by using the transceiver keys.

## 1.3.18 Tone Operated Relay (Output)

Tone Operated Relay (Output) can be assigned to Port 1 to Port 8.

The port logic level switches to Low when QT/DQT is detected.

The port logic level switches to Low when QT/DQT is detected on a channel where QT/DQT Decode is not configured.

## 1.3.19 Carrier Operated Relay (Output)

Carrier Operated Relay (Output) can be assigned to Port 1 to Port 8.

The port logic level switches to Low when a carrier is detected.

This function can be used for the KDS-100 and KGP-2A/ KGP-2B.

The KDS-100 and KGP-2A/ KGP-2B recognize whether the transceiver is receiving or not by checking the status of this port.

## 1.3.20 TXS (Output)

TXS (Output) can be assigned to Port 1 to Port 8.

The port logic level is Low while the transceiver is transmitting. On the other hand, the logic level is High while the transceiver is receiving.

This function can be used for the KDS-100 and KGP-2A/ KGP-2B.

The KDS-100 and KGP-2A/ KGP-2B recognize the transceiver's status by checking the status of this port.

## 1.3.21 Scrambler Code (Output)

Scrambler Code (Output) can be assigned to Port 1 to Port 8.

A scrambler code can be configured by combining the following 4 codes: Scrambler Code 1 to Scrambler Code 4.

The code selected from KPG-99D or using keys is sent in hexadecimal format from the port assigned to Scrambler Code1 (Output) to Scrambler Code 4 (Output) of Function Port.

**Table 1-6 Scrambler Code**

| Code | Scrambler Code # (Output) | | | |
|---|---|---|---|---|
| | Code 4 | Code 3 | Code 2 | Code 1 |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 1 |
| 3 | 0 | 0 | 1 | 0 |
| 4 | 0 | 0 | 1 | 1 |
| 5 | 0 | 1 | 0 | 0 |
| 6 | 0 | 1 | 0 | 1 |
| 7 | 0 | 1 | 1 | 0 |
| 8 | 0 | 1 | 1 | 1 |
| 9 | 1 | 0 | 0 | 0 |
| 10 | 1 | 0 | 0 | 1 |
| 11 | 1 | 0 | 1 | 0 |
| 12 | 1 | 0 | 1 | 1 |
| 13 | 1 | 1 | 0 | 0 |
| 14 | 1 | 1 | 0 | 1 |
| 15 | 1 | 1 | 1 | 0 |
| 16 | 1 | 1 | 1 | 1 |

0 = Low Level 1 = High Level

## 1.3.22 Scrambler (Output)

Scrambler (Output) can be assigned to Port 1 to Port 8.

This port level is Low if the Scrambler is enabled for the current channel.

## 1.3.23 Emergency for ANI board (Output)

Emergency for ANI board (Output) can be assigned to Port 1 to Port 8.

This port logic level is Low when a key and port configured for Emergency is pressed for a duration longer than the Emergency-key Delay Time.

Emergency-key Delay Time can be configured in the **Emergency Information** window.

This function does not activate if no data is configured for Emergency ID.

## 1.3.24 PTT (Output)

PTT (Output) can be assigned to Port 1 to Port 8.

The port logic level switches to Low when the **PTT** switch is pressed.

## 1.3.25 Status Message (Output)

Status Message (Output) can be assigned to Port 1 to Port 8.

The logic level can be switched between High and Low depending on a received status when the transceiver receives a FleetSync Status Message.

Status Message (Output) can be configured in the **FleetSync** window > **Target** tab.

# 1.4 Description of Functions (Fixed Ports)

This section describes ports other than the Function Port.

## 1.4.1 SB (CN2-Pin1)

This port can be used to output the battery voltage in conjunction with the power.

The current rating is 200 mA. The instantaneous maximum current of this port is approximately 700 mA. Therefore, this port can be used for the KDS-100.

## 1.4.2 GND (CN2-Pin3)

This GND can be used for external devices.

## 1.4.3 IGN (CN3-Pin1)

This input port functions in conjunction with the Ignition.

Refer to 2.3 Ignition Sense Cable for instructions to install the port.

The KCT-39 also has this port.

Note that the port is not used for the KDS-100 and KGP-2A/ KGP-2B.

**Note:** This port outputs voltage regardless of the power status when R95 on the PCB is not removed. Approximately 90% of the battery voltage is output when a load of 39kΩ is applied since the internal resistance is approximately 4.7kΩ.

## 1.4.4 DATAI (CN3-Pin2)

This input port can be used for external signaling devices.

An audio signal input here is transmitted via this port without passing through the Pre-emphasis circuit. The audio signal must not be excessively high level since the audio signal is passed to the modulation control circuit.

The input tone bandwidth is 10 Hz to 3 kHz.

The KCT-39 also has this port.

This port can be used for the KDS-100 and KGP-2A/ KGP-2B.

## 1.4.5 DETO (CN3-Pin3)

This output port can be used for external signaling devices.

The port outputs a demodulated signal that has not passed through the De-emphasis circuit.

The output tone bandwidth is 10 Hz to 3 kHz.

The KCT-39 also has this port.

The port can be used for the KDS-100 and KGP-2A/ KGP-2B.

## 1.4.6 TXAFI (CN3-Pin4)

This port can be used to input a transmit signal for the Scrambler.

The port can be used with the TXAFO port when the Scrambler is used.

## 1.4.7 TXAFO (CN3-Pin5)

This port can be used to output a transmit signal for the Scrambler.

The port can be used with the TXAFI port when the Scrambler is used.

The port outputs the audio signal from the microphone that has not passed through the Pre-emphasis circuit.

AC coupling is required to use this port.

## 1.4.8 EMGMIC (CN3-Pin6)

This port can be used to input an audio signal from the Emergency Microphone.

A bias of 5 V is applied to a condenser microphone. AC coupling may be required depending on type of microphone used.

## 1.4.9 RXAFO (CN3-Pin7)

This port can be used to output received audio for the Scrambler.

The port can be used with the RXAFI port when the Scrambler is used.

The port outputs a demodulated signal (300 Hz to 3 kHz) that bypasses the De-emphasis circuit.

## 1.4.10 ALT (CN3-Pin8)

This port can be used to input an external ALERT TONE.

## 1.4.11 RXAFI (CN3-Pin9)

This port can be used to input the received audio for the Scrambler.

R267 is removed when the Scrambler is used and this port can be used with the RXAFO port.

AC coupling is required to use this port.

## 1.4.12 5C (CN3-Pin10)

This port can be used to output a voltage of 5 V in conjunction with the power.

The current rating is 50 mA.

## 1.4.13 8C (CN3-Pin11)

This port can be used to output a voltage of 8 V in conjunction with the power.

The current rating is 50 mA.

## 2.1 KCT-39

The connection cable (KCT-39) for external devices can be used with the TK-7160/ TK-8160. This section describes how to connect the KCT-39 to the TK-7160/ TK-8160.

### 2.1.1 Description

This product is the connection cable for external devices designed for use with the TK-7160/ TK-8160.

### 2.1.2 Mechanical Specifications

#### ■ Product Dimensions and Weight

**Table 2-1 Product Dimensions and Weight**

| Item | |
|---|---|
| Length | 439 mm (1’ 5”) |
| Weight | 25 g (0.88 oz.) |

#### ■ Cable Specifications

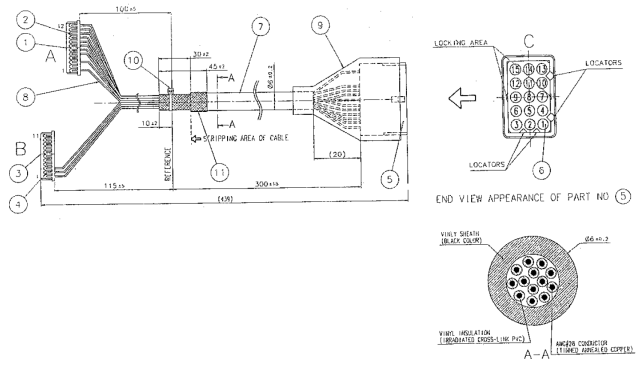



**Figure 2-1 Appearance**

**Table 2-2 Mechanical Parts**

| No. | Part Name | Qty. | Remarks |
|---|---|---|---|
| 1 | Housing | 1 | 51021-1200 (Molex) (White) |
| 2 | Terminal | 10 | 50058-8000 (Molex) |
| 3 | Housing | 1 | 51021-1100 (Molex) (White) |
| 4 | Terminal | 3 | 50058-8000 (Molex) |
| 5 | Housing | 1 | 1625-15R1 (Molex) (White) |
| 6 | Terminal | 13 | 1855TL (Molex) |
| 7 | Cable | 1 | Refer Section A-A Drawing |
| 8 | Vinyl Wire | 13 | UL1571 |
| 9 | Cover | 1 | S21156 (Black) |
| 10 | Lock Cable | 1 | F1BS (White) |
| 11 | SUMI Tube | 1 | UL224- |

**Table 2-3 Wire Type**

| No. | Color | Internal Connector | Name |
|---|---|---|---|
| 1 | RED | CN2-1 | SB |
| 2 | PINK | CN3-1 | IGN |
| 3 | BLACK | CN2-3 | GND |
| 4 | BROWN | CN3-3 | DETO |
| 5 | ORANGE | CN3-2 | DATAI |
| 6 | YELLOW | CN2-8 | FNC4 |
| 7 | GREEN | CN2-7 | FNC3 |
| 8 | BLUE | CN2-9 | FNC5 |
| 9 | PURPLE | CN2-12 | FNC8 |
| 10 | GREY | CN2-10 | FNC6 |
| 11 | WHITE | CN2-11 | FNC7 |
| 12 | NC | NC | |
| 13 | NC | NC | |
| 14 | SKY BLUE | CN2-6 | FNC2 |
| 15 | PALE BLUE | CN2-5 | FNC1 |

## 2.1.3 Supplied Accessories

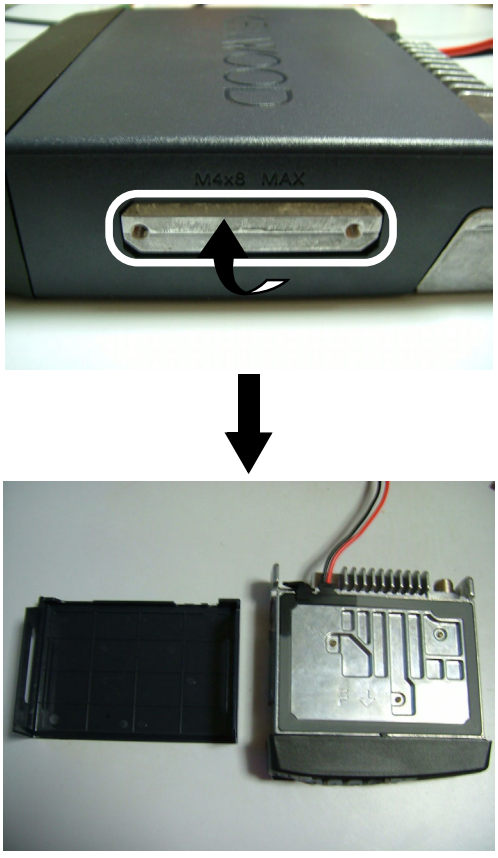
**Table 2-4 Supplied Accessories**

| Part Name | Part Number |
|---|---|
| Housing | 1625-15P1 |
| Cushion | C13-1968-01 |
| Cushion | C13-1968-01 |
| Terminal | 1855T |
| Cushion | G13-2083-04 |

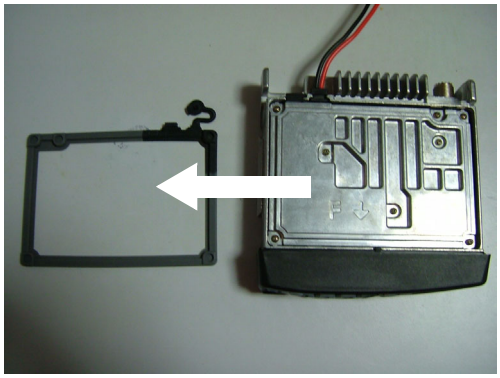
## 2.1.4 Installing the KCT-39

**1.** Remove the top cover of the TK-7160/ TK-8160 transceiver.

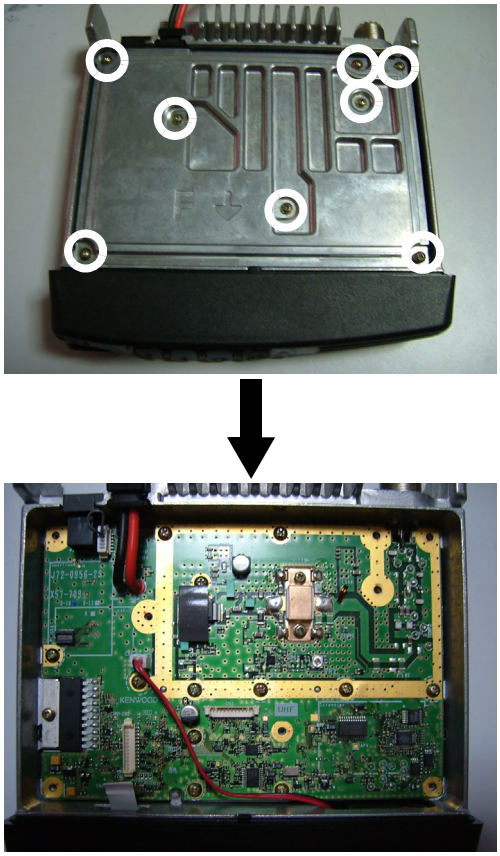
(1) Lift the top cover by widening the 2 side tabs, using a flat-head screw driver or similar. Then, pull upward to remove the top cover from the transceiver body.



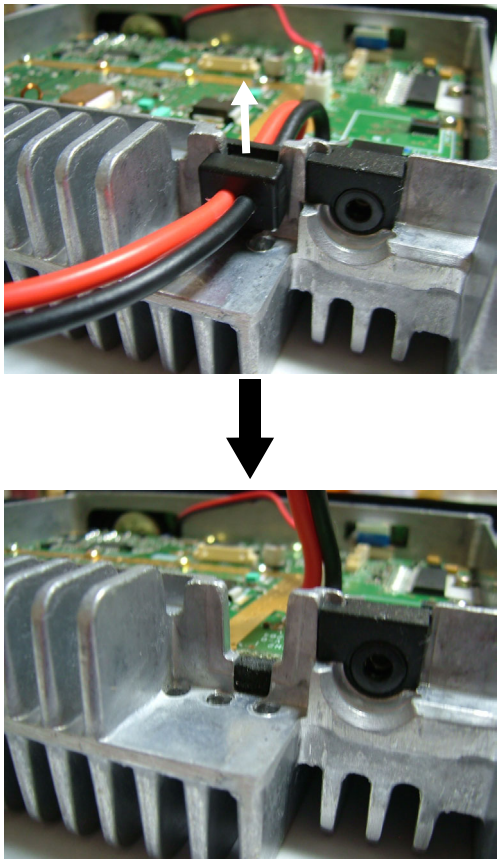

(2) Remove the top rubber packing.



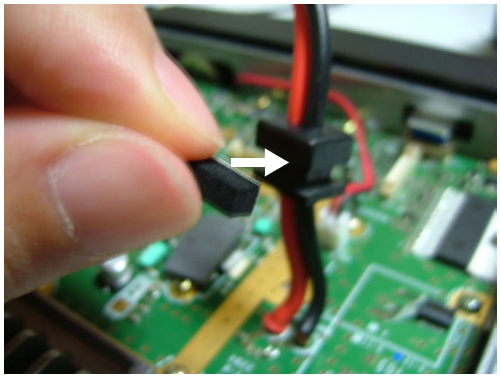
(3) Remove 7 screws and then lift the shielding plate.



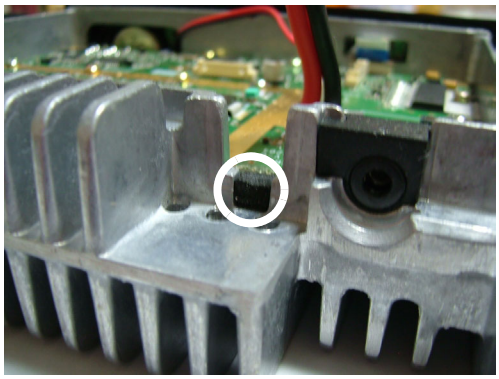
**2.** Disconnect the DC cable in the direction of the arrow in white.



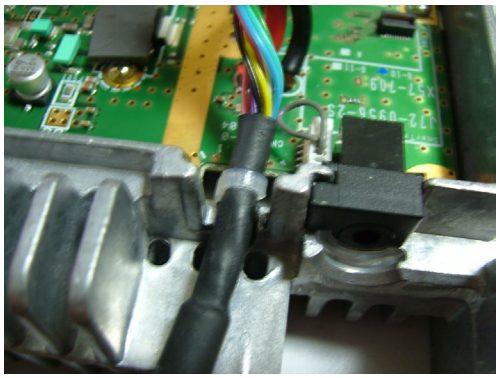
**3.** Attach G13-2083-04 to the DC cable as shown in the figure.



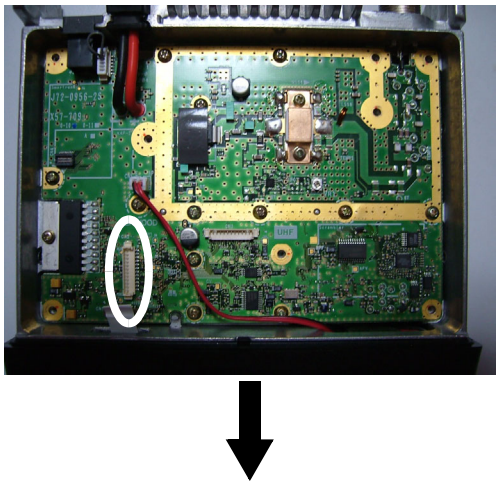
**4.** Cut the cushion part as shown in the figure using scissors or similar, and then attach G13-2084-04.

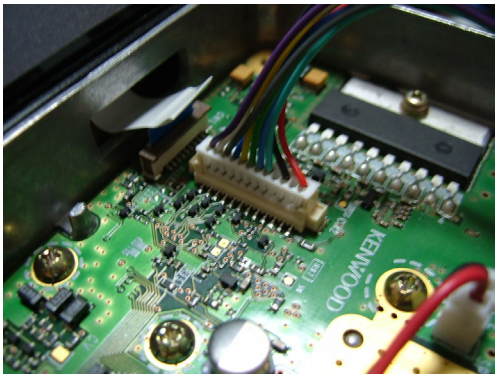


**5.** Dress the KCT-39 cable into the transceiver as shown in the figure.

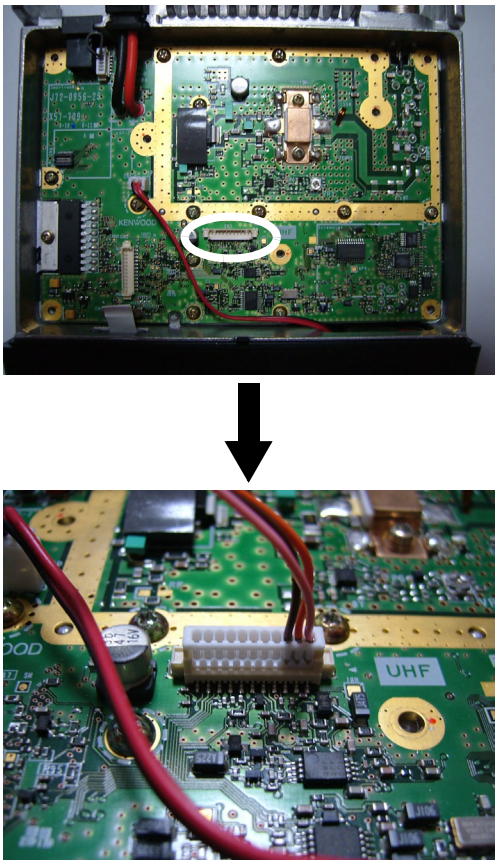


**6.** Connect the A connector of the KCT-39 to CN2 on the TX-RX PCB.





7. Connect the B connector of the KCT-39 to CN3 on the TX-RX PCB.




8. Put the DC cable back into place and install the shielding board, top packing and the top case to the transceiver.

# 2.2 KCT-36

The KCT-36 can be used to extend the connection between TK-7160/ TK-8160 and KDS-100/ KGP-2A/ KGP-2B for 3 m (10'). This section describes the KCT-36.

## 2.2.1 Description

This cable can be used to extend the connection between TK-7160/ TK-8160 and KDS-100/ KGP-2A/ KGP-2B for 3 m (10').

## 2.2.2 Mechanical Specifications

### ■ Product Dimensions and Weight

**Table 2-5 Product Dimensions and Weight**

| Item | |
|---|---|
| Length | 3000 mm (10') |
| Weight | 0.22 kg (7.76 oz.) |

### ■ Cable Specifications

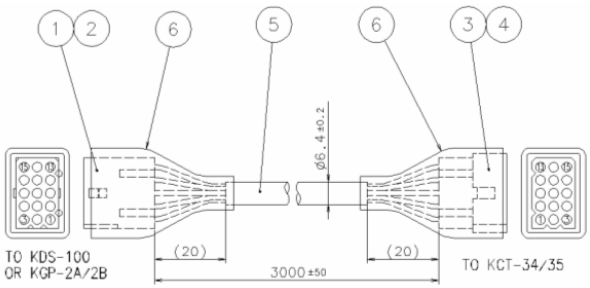



**Figure 2-2 Appearance**

**Table 2-6 Mechanical Parts**

| No. | Part Name | Qty. | Remarks |
|---|---|---|---|
| 1 | RECEPTACLE | 1 | 1625-15R1 (Molex) |
| 2 | TERMINAL | 15 | 1855T (L) (Molex) |
| 3 | PLUG | 1 | 1625-15P1 (Molex) |
| 4 | TERMINAL | 15 | 1854T (L) (Molex) |
| 5 | CABLE | 1 | 14-CONDUCTOR CABLE WITH SPIRAL SHIELDING WIRE (BLACK) |
| 6 | COVER | 2 | - |

**Table 2-7 Wire Type**

| 1625-15R1 | – | 1625-15P1 |
|---|---|---|
| **PIN No.** | **WIRE TYPE** | **PIN No.** |
| 1 | RED | 1 |
| 2 | PINK | 2 |
| 3 | SHIELDING WIRE | 3 |
| 4 | BROWN | 4 |
| 5 | ORANGE | 5 |
| 6 | YELLOW | 6 |
| 7 | GREEN | 7 |
| 8 | BLUE | 8 |
| 9 | PURPLE | 9 |
| 10 | GRAY | 10 |
| 11 | WHITE | 11 |
| 12 | BROWN/WHITE (SPIRAL) | 12 |
| 13 | RED/WHITE (SPIRAL) | 13 |
| 14 | SKY BLUE | 14 |
| 15 | YOUNG GRASS | 15 |

# 2.3 Ignition Sense Cable (KCT-18)

Install the Ignition Sense Cable (KCT-18) in the transceiver.

## 2.3.1 Description

This product is the Ignition Sense Cable for the TK-7160/ TK-8160.

## 2.3.2 Features

(1) Cable length is 3.2 m (10’ 6”).

(2) Mini blade fuse (3 A) is used.

(3) Soft copper wire is used.

## 2.3.3 Mechanical Specifications

### ■ Product Dimensions and Weight

**Table 2-8 Product Dimensions and Weight**

| Item | |
|---|---|
| Length | 3200 mm (10’ 6”) |
| Width | - |
| Thickness | - |
| Weight | 70 g (2.47 oz.) |

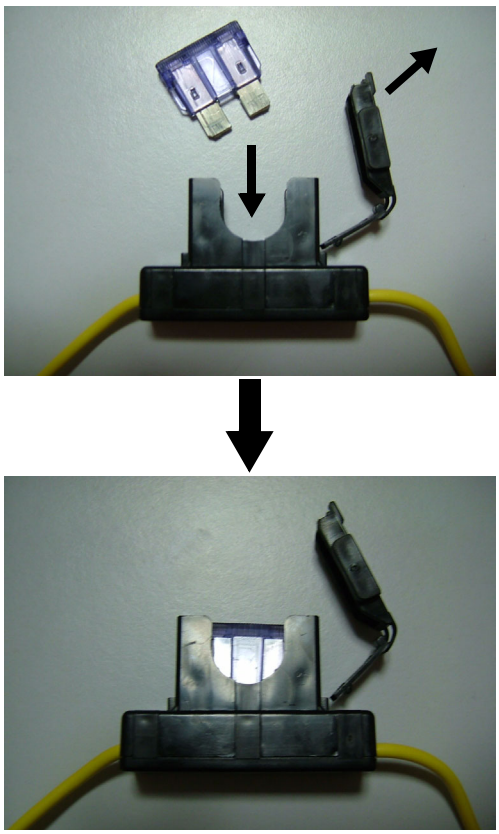
## 2.3.4 Supplied Accessories

**Table 2-9 Supplied Accessories**

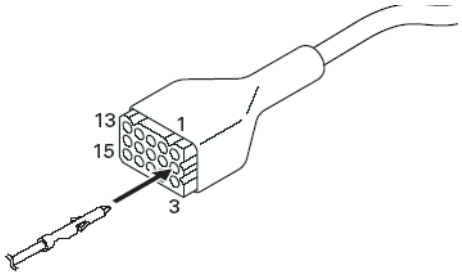
| No. | Name | Part Number | Qty. | Remarks |
|---|---|---|---|---|
| 1 | Mini blade | - | 1 | 3 A |

## 2.3.5 Installing the KCT-18

1. Connect the KCT-39 cable to the transceiver.
   Refer to 2.1 KCT-39 while installing KCT-18.
2. Open the KCT-18 fuse folder and insert the mini blade fuse (3 A).



**3.** Insert KCT-18 into KCT-39.
Insert KCT-18 into the 2nd pin of the KCT-39 cable.




**4.** Connect the other end of the KCT-18 cable to the Ignition Line of the car.

**Note:** Refer to 2.7 Using the Ignition Sense and Other Options when the KCT-18 is used with the KDS-100 or KGP-2A/ KGP-2B.

# 2.4 KDS-100

A data terminal (KDS-100) used for establishing data communications can be connected to the TK-7160/ TK-8160. This section describes how to connect the KDS-100 to the TK-7160/ TK-8160.

## 2.4.1 Description

This transceiver can be configured to work with a data terminal to establish data communications. This transceiver is equipped with serial input/ output ports and data modulation input/ output ports.
TK-x180 series and TK-x60G series transceivers support the KDS-100.

Also, KDS-100 is equipped with DSP (Digital Signal Processing), general purpose serial ports, and general purpose I/O ports. Thus, it has been designed to work with various peripheral devices. Although we provide the FPU (programming software), we do not develop computer software to run on a PC.

There are 2 types of protocols: serial protocol and air protocol. The TK-7160/ TK-8160 support the air protocol.

## 2.4.2 Features

- Full-dot display (240 x 64 dots) with backlight function
- Programmable **PF** keys (Programmable Function keys) with backlight function
- The following external terminals are available.
  - Serial communication terminal
  - I/O control terminal
  - Data modulation I/O terminals
- The following internal terminals are available.
  - Two general purpose serial terminals (RS232C level) (Reserved for future use)
  - PC/ AT keyboard input terminal (Reserved for future use)
  - NMEA0183 GPS receiver connection terminal (Reserved for future use)
  - Input port for differential GPS signal (Reserved for future use)
  - Two clock synchronizer serial input ports (for low-cost card reader) (Reserved for future use)
  - General purpose I/O control ports
  - External SP port (Reserved for future use)
- DSP is installed to support higher speed data communication for future.
- Real time clock
- Battery status memory for data communication
- Tri-color LED for indicating communication port status
- Modem output level adjustment function using commands generated from electronic source (PC & Panel Tune)
- Firmware update function using a flash ROM
- Supports the following protocols:
  - FleetSync serial protocol (for use with conventional transceivers or LTR transceivers supporting FleetSync)
  - Fleet-Sync protocol capable (for use with Non-FleetSync capable LTR/ Conventional transceivers can be interfaced with FleetSync compatible transceivers)
- Internal alarm to notify of message reception
- Additional message functions using FleetSync Short Message and Long Message

## 2.4.3 Mechanical Specifications

### ■ Product Dimensions and Weight

**Table 2-10 Product Dimensions and Weight**

| Item | Body | |
|---|---|---|
| | A | B |
| Width | 187 mm (7.36”) | 187 mm (7.36”) |
| Depth | 42 mm (1.65”) | 46.5 mm (1.83”) |
| Height | 88 mm (3.46”) | 88 mm (3.46”) |
| Weight | 0.50 kg (1.1 lbs) | |

A: Dimensions without projections
B: Dimensions including projections

### ■ Front Panel

- Key Layout: Rubber 9-key having LED backlight
- Display: Full-dot display (240 x 64 dots) with backlight function
- LED: Tri-color LED
- Pigtail connection cable (15-pin Molex)

### ■ Rear Panel

- Screw hole for mobile bracket (M4)
- Connector for external devices

## 2.4.4 Appearance

### ■ Rear Panel

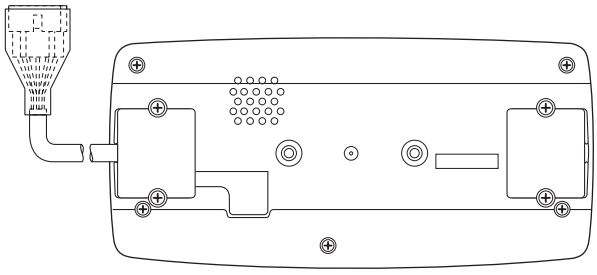


**Figure 2-3 Rear Panel**

### ■ Top Panel

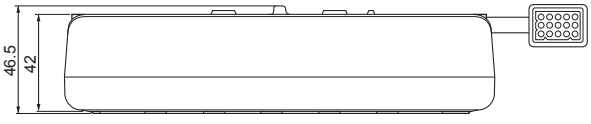



**Figure 2-4 Top Panel**

### ■ Side Panel and Front Panel

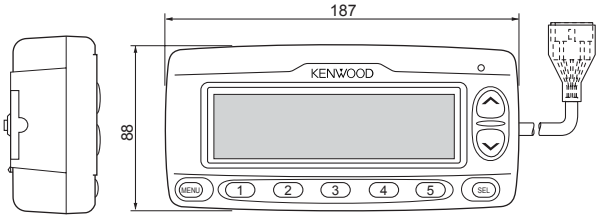



**Figure 2-5 Side Panel and Front Panel**

## 2.4.5 Electrical Specifications

### ■ Circuit

**Table 2-11 Circuit**

| No. | Item | Description |
|---|---|---|
| 1 | Modulation Type | Minimum Shift Keying (MSK) |
| 2 | Baud Rate | 1200/ 2400 bps |

### ■ General Specifications

The transceiver is tested and inspected under standard conditions unless otherwise noted.

**Table 2-12 General Specifications**

| No. | Item | Description |
|---|---|---|
| 1 | Power Voltage | Nominal Power Voltage: DC 13.6 V Negative Ground Voltage Range: DC 10.0 V to 15.7 V |
| 2 | Temperature Range | -20°C to +60°C (-4°F to +140°F) |
| 3 | Measurement Environment | KIS 58-01: The transceiver is measured and tested under product inspection specifications. |
| 4 | Low frequency output | KIS 58-01: The transceiver is measured and tested under product inspection specifications. |
| 5 | Standard load impedance for alarm output | 16Ω |
| 6 | Standard load impedance for modem output | 600Ω |
| 7 | Standard load impedance for modem input | 600Ω |

## ■ Electrical Specifications

**Table 2-13 Electrical Specifications**

| No. | Item | Measurement Requirements | Catalog Specifications |
|---|---|---|---|
| 1 | Initial Level of Modem Output | DO @ 511 random pattern/ 600Ω | - |
| 2 | Modem Output Range | DO @ 1200 Hz/ 600Ω | 100 to 1000 mVrms |
| 3 | Modem Input Level Range | DI @ 1200 Hz/ 600Ω | 100 to 1000 mVrms |
| 4 | Retention Period for Received Data | Lithium Battery fully charged & GPS backup 30 μA | > 2 months |
| 5 | Consumption Current for Storing the Received Data | Without GPS unit | - |
| 6 | Bit Error Rate (1200 bps) | DI 700 mVrms @ 12 dB SINAD | < 0.5% |
| 7 | Bit Error Rate (2400 bps) | DI 700 mVrms @ 12 dB SINAD | < 0.5% |
| 8 | Consumption Current | INT/EXT SP Max. When the INT/ EXT SP are maximum: | < 700 mA |
| 9 | Real-time Clock Accuracy | Frequency Stability (25°C/ 77°F) | - |
| | | Temperature Characteristics -10 to +70°C (+14 to 158°F) 25°C (77°F) standard | - |
| 10 | Mic Sensitivity [Advanced feature] | 700 mVrms @ DO | - |
| 11 | Speaker Output | 1 kHz/16Ω @ Ext SP terminal (Key Control Tone Level "15") | - |

## 2.4.6 Supplied Accessories

**Table 2-14 Supplied Accessories**

| Part Name | Part Number | Qty. |
|---|---|---|
| Instruction Manual | B62-1480-x0 | 1 |
| Bracket | J29-0698-x3 | 1 |
| Bracket | J29-0690-x4 | 1 |
| Dressed Screw | N08-0546-x4 | 2 |
| Screw Set | N99-2025-x5 | 1 |

## 2.4.7 Optional Accessories

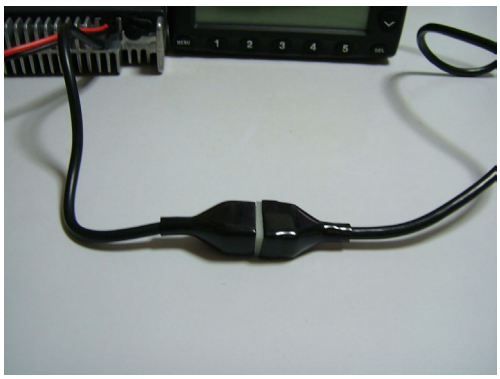
**Table 2-15 Option**

| No. | Model | Name (Specifications) |
|---|---|---|
| 1 | KPG-46 | Programming Interface (8-pin modular) |
| 2 | KPG-71D | Programming Disk |
| 3 | KCT-34 | Transceiver Interface Cable (for 80 series mobile) *1 |
| 4 | KCT-35 | Transceiver Interface Cable (for 60G series mobile) *1 |
| 5 | KCT-36 | Extension Cable *1 |
| 6 | KCT-39 | Connection cable for external devices |

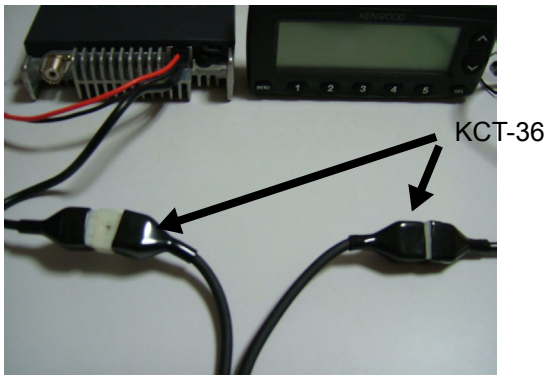
*1 Common option for KGP-2A/ KGP-2B (Modem GPS Receiver/ Controller)

## 2.4.8 Installing the KDS-100

1. Connect the KCT-39 cable to the transceiver.
   Refer to 2.1 KCT-39 while installing the KDS-100.
2. Connect the KCT-39 cable to the KDS-100.



If the KCT-39 and KDS-100 are too far apart, then the KCT-36 must be used to connect them.




3. Turn the transceiver ON.
   In this case, the KDS-100 is automatically turned ON.

## 2.4.9 Configuration using KPG-99D

1. Run KPG-99D.
2. Select the **Program** pulldown menu > "Read Data from the Transceiver". The icon in the toolbar can also be clicked.

   The **Read Data from the Transceiver** window appears on the display.

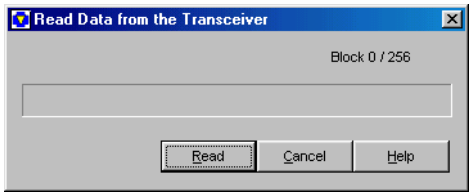



**Figure 2-6 Read Data from the Transceiver Window 1**

3. Click the "Read" button.

   KPG-99D starts reading configuration data from the transceiver.

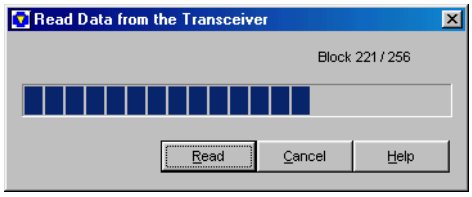



**Figure 2-7 Read Data from the Transceiver Window 2**

4. Select the **Edit** pulldown menu > "Function Port".

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

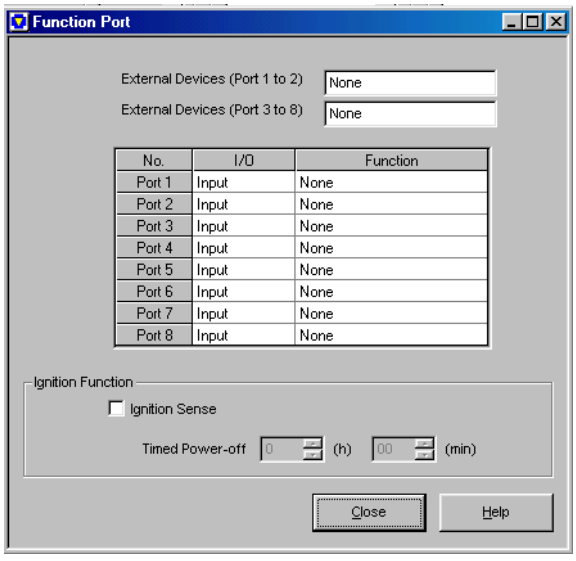



**Figure 2-8 Function Port Window**

5. Select the **External Device (Port 3 to 8)** dropdown list > "KDS-100".

   The necessary functions for the KDS-100 are automatically assigned to each port.

**Note:** Ignition Function cannot be configured.

6. Click the **Program** pulldown menu > "Write Data to the Transceiver".

   The **Write Data to the Transceiver** window appears on the display.

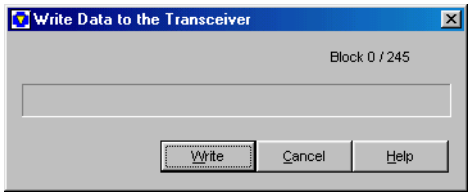



**Figure 2-9 Write Data to the Transceiver Window**

7. Click the "Write" button.

   Configuration data is written to the transceiver.

8. Turn the transceiver ON.

   In this case, the KDS-100 also automatically activates.

**Note:**

- The KDS-100 can be used when "FleetSync Air" is selected from the **Product Information** window > **Signaling Type for Decode** dropdown list.
- KPG-71D is required to configure the KDS-100.
- The port logic state can be configured for the following conditions in the **Edit** pulldown menu > **Optional Features** window > **Radio** dropdown list in the KPG-71D to control the Function Port using the KDS-100.

**Table 2-16 Radio Port Logic Configuration**

| | | |
|---|---|---|
| SQ | Squelch detect input | Active Low |
| DTC | Data TX channel Control output | Active Low |
| TXS/LOK | Transmitter active sense input | Active Low |
| AM | Speaker mute output | Active Low |
| MM | MIC mute output | Active Low |

**Note:** Refer to 2.7 Using the Ignition Sense and Other Options when the KCT-18 is used with the KDS-100 or KGP-2A/ KGP-2B.

## 2.5 KGP-2A/ KGP-2B

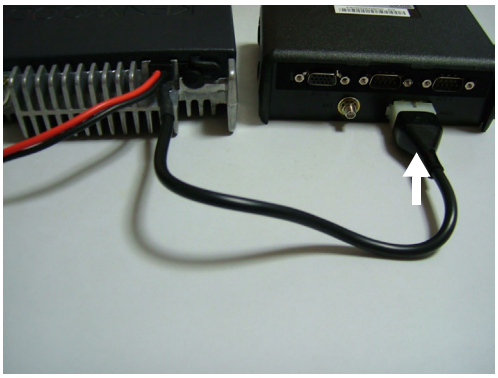
A data terminal (KGP-2A/ KGP-2B) used for establishing data communications can be connected to the TK-7160/ TK-8160. This section describes how to connect the KGP-2A/ KGP-2B to the TK-7160/ TK-8160.

### 2.5.1 Installing the KGP-2A/ KGP-2B

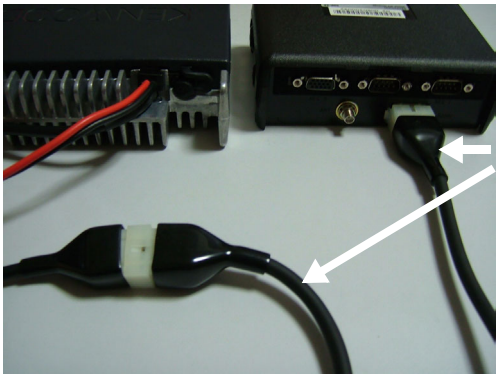
1. Connect the KCT-39 cable to the transceiver.

   Refer to 2.1 KCT-39 while connecting the cable.

2. Connect the KCT-39 cable to the KGP-2A/ KGP-2B.



If the KCT-39 and KGP-2A/ KGP-2B are too far apart, the KCT-36 cable must be used to connect them.




### 2.5.2 Configuration using KPG-99D

1. Run KPG-99D.
2. Select the **Program** pulldown menu > "Read Data from the Transceiver". The icon in the toolbar can also be clicked.

   The **Read Data from the Transceiver** window appears on the display.

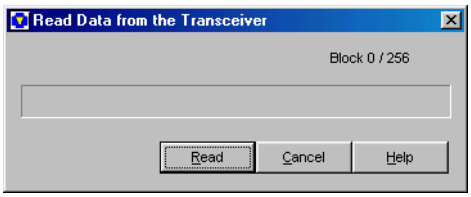



**Figure 2-10 Read Data from the Transceiver Window 1**

3. Click the "Read" button.

   KPG-99D starts reading configuration data from the transceiver.

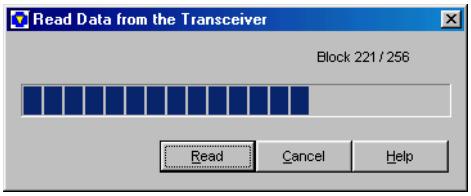



**Figure 2-11 Read Data from the Transceiver Window 2**

4. Click the **Edit** pulldown menu > "Function Port".

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

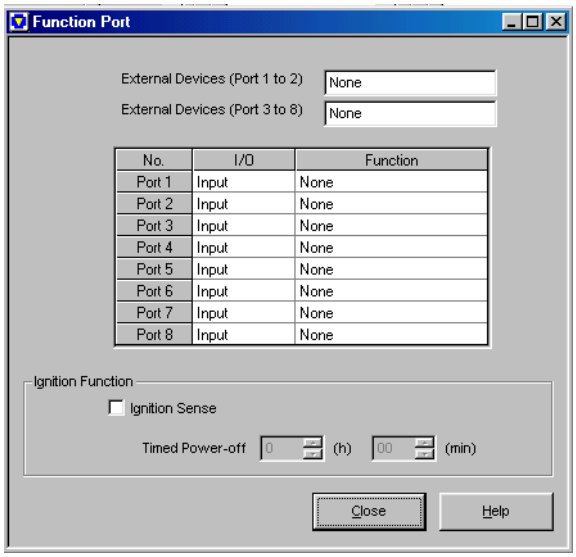



**Figure 2-12 Function Port Window**

5. Select the **External Device (Port 3 to 8)** dropdown list > "KGP-2A/ KGP-2B".

   The necessary functions to use the KGP-2A/ KGP-2B are automatically assigned to each port.

**Note:** In this case, Ignition Function cannot be configured.

6. **Click the Program** pulldown menu > "Write Data to the Transceiver".

   The **Write Data to the Transceiver** window appears on the display.

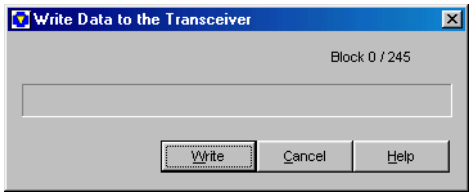



**Figure 2-13 Write Data to the Transceiver Window**

7. Click the "Write" button.

   Configuration data is written to the transceiver.

8. Turn the transceiver ON.

   The KGP-2A/ KGP-2B is automatically turned ON.

**Note:**

- KPG-73D is required to configure the KGP-2A/ KGP-2B.
- Configure the port logic in the following way in the **Edit** pulldown menu > **Hardware Setup** window in the KPG-73D to control the Function Port using the KGP-2A/ KGP-2B.

**Table 2-17 Transceiver Port Logic Configuration**

| | | |
|---|---|---|
| SQ | Squelch detect input | Active Low |
| DISP | TX display Off output | Active Low |
| TXS/LOK | Transmitter active sense input | Active Low |
| AM | Speaker mute output | Active Low |
| MM | MIC mute output | Active Low |

**Note:** Refer to 2.7 Using the Ignition Sense and Other Options when the KCT-18 is used with the KDS-100 or KGP-2A/ KGP-2B.

# 2.6 GPS Unit

A GPS unit can be connected to the TK-7160/ TK-8160 by using the KCT-39 cable. This section describes how to connect a GPS unit to the TK-7160/ TK-8160.

## ■ Required Items to Connect the GPS Unit

- Transceiver
- KCT-39 cable
- GPS unit

**WARNING**

THE TRANSCEIVER MUST BE TURNED OFF AND THE POWER CABLE MUST BE REMOVED BEFORE CONNECTING THE GPS UNIT TO THE TRANSCEIVER.

## 2.6.1 Connecting the GPS Unit

1. Connect the KCT-39 cable to the TK-7160/ TK-8160.

   Refer to MOD 2.1 KCT-39 when connecting the KCT-36 cable to the transceiver.

2. Connect the KCT-39 cable to the GPS unit.

   (1) Connect pin 1 to the power of the GPS unit.

   (2) Connect pin 3 to the GND of the GPS unit.

   (3) Connect pin 14 to Data Out (CMOS level, RS232 polarity, 4800 bps) of the GPS unit.

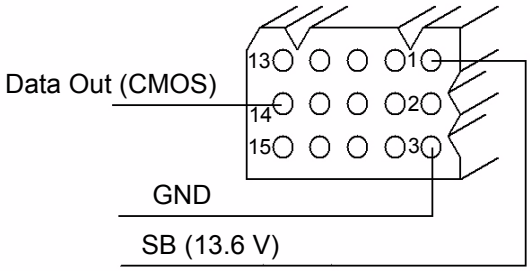



**Figure 2-14 KCT-39 Pin Assignment**

## 2.6.2 Configuration using KPG-99D

ANI Board information can be written to the transceiver by using KPG-99D after connecting the GPS unit. Follow the procedure below to write ANI Board information to the transceiver.

1. Run KPG-99D.
2. Select the **Program** pulldown menu > "Read Data from the Transceiver". The "  " icon in the toolbar can be clicked to read data from the transceiver.

   The **Read Data from the Transceiver** window appears on the display.

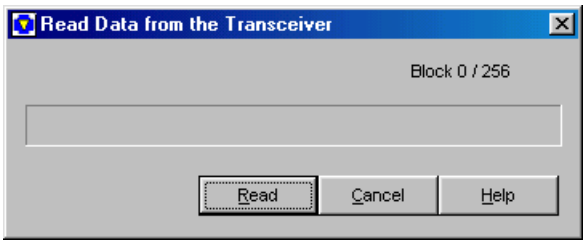



**Figure 2-15 Read Data from the Transceiver Window 1**

**3.** Click the "Read" button.

KPG-99D starts reading configuration data from the transceiver.

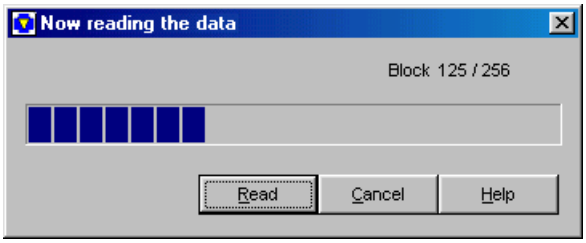



**Figure 2-16 Read Data from the Transceiver Window 2**

**4.** Select the **Edit** pulldown menu > "Function Port".

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

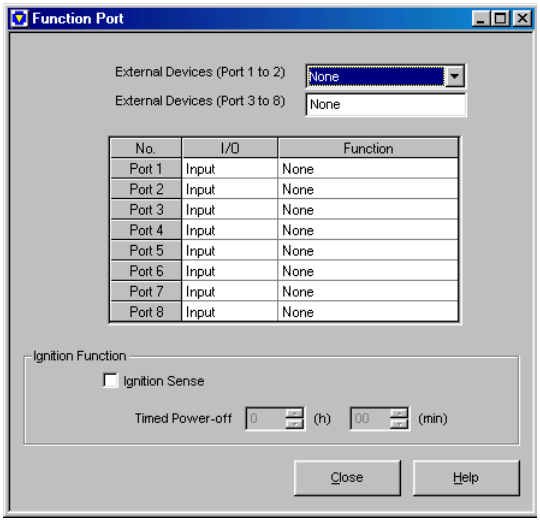



**Figure 2-17 Function Port Window 1**

**5.** Select the **External Devices (Port 1 to 2)** dropdown list > "GPS (NMEA)".

Refer to the instruction manual supplied with the GPS unit for instructions on how to configure the GPS unit.

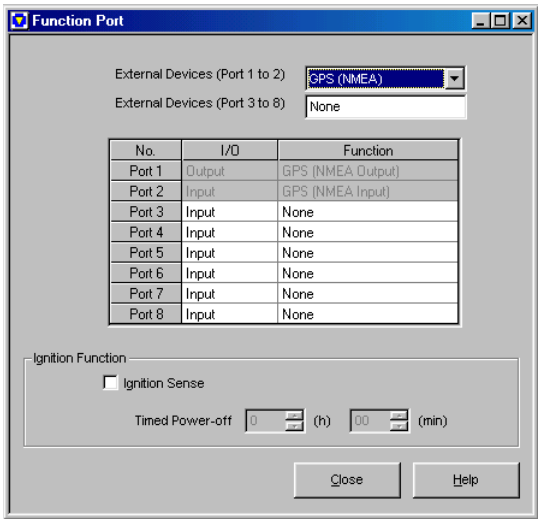



**Figure 2-18 Function Port Window 2**

**6.** Select the **Program** pulldown menu > "Write Data to the Transceiver". The "" icon in the toolbar can be clicked to write data to the transceiver.

The **Write Data to the Transceiver** window appears on the display.

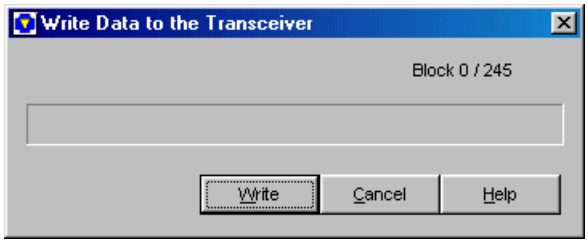



**Figure 2-19 Write Data to the Transceiver Window**

**7.** Click the "Write" button.

The configuration data containing the ANI Board information is written to the transceiver.

## 2.7 Connect GPS35-HVS using KCT-31

This section describes how to connect the GPS35-HVS to the TK-7160/ TK-8160 by using KCT-31.

### ■ Required Items to Connect the GPS35-HVS

- Transceiver
- KCT-31
- GPS35-HVS

> **WARNING**
>
> THE TRANSCEIVER MUST BE TURNED OFF AND THE POWER CABLE MUST BE REMOVED BEFORE INSTALLING THE GPS35-HVS IN THE TRANSCEIVER.

The Garmin GPS35-HVS is a suitable GPS unit for installing in the TK-7160/ TK-8160. GPS35-HVS must output RS232C data at CMOS logic level. A modified KCT-31 is used to convert the RS232C level to CMOS level.

KCT-31 also must be modified to supply 12 V to the GPS35-HVS so that it can be connected to the TK-7160/TK-8160.

> **WARNING**
>
> AFTER MODIFYING THE KCT-31, LABEL IT APPROPRIATELY TO AVOID CONNECTING THE MODIFIED KCT-31 TO A PC OR A LAPTOP COM PORT.

Once the GPS unit is installed in the TK-7160/ TK-8160, the GPS unit can be programmed to send the vehicle location to a TK-X80/ TK-X180 series transceiver that is used as a base unit interfaced to a PC running FleetSync, compatible AVL software.

### 2.7.1 Programming the GPS35-HVS

The GPS35-HVS must be configured using the software supplied by Garmin. In addition, the GPS35-HVS must be powered with 12 V from an external source.

Normally, the D-sub 9-pin connector on the PC side is male, and the D-sub 9-pin connector on the modified KCT-31 side is female. A programming jig (Gender changer) should be made in order to interface to the GPS35-HVS connector.

### 2.7.2 Installing a D-sub 9-pin Connector (male) on the GPS35-HVS

1. Strip and tin the red, black, blue and white wires from the GPS35-HVS.
2. Solder the blue wire to pin 2 of the D-sub 9-pin connector (male).
3. Solder the white wire to pin 3 of the D-sub 9-pin connector (male).
4. Solder the black wire to pin 5 of the D-sub 9-pin connector (male).
5. Solder the red wire to pin 9 of the D-sub 9-pin connector (male).

### 2.7.3 Preparing a Programming Jig

An original programming jig should be made in order to program the GPS35-HVS. Prepare two D-sub 9-pin connectors (female) for the parts.

1. Connect each pin 3 of the D-sub 9-pin connectors (female).
2. Connect each pin 2 of the D-sub 9-pin connectors (female).
3. Label and write "Garmin GPS-35-HVS side only" on one of the two D-sub 9-pin connectors.
4. Connect the black wire to pin 5 of the connector labeled "Garmin GPS-35HVS side only".
5. Connect the red wire to pin 9 of the connector labeled "Garmin GPS-35HVS side only".
6. Connect the black wire to a ground terminal on the 12 V power supply.
7. Connect the red wire to the + terminal on the 12 V power supply.

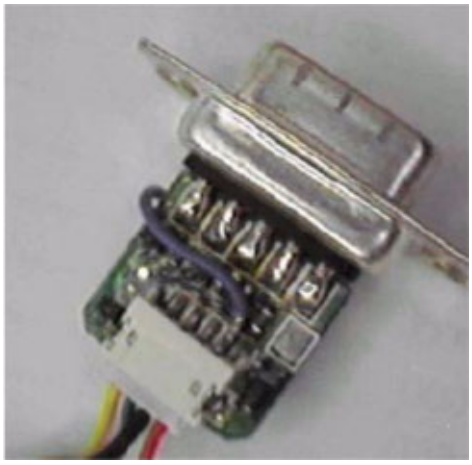
8. Connect the D-sub 9-pin connector to the serial port of a PC that has Garmin Programming Software installed.
9. Execute the Garmin Sensor/ Smart antenna software and click the "Connect" button.
   The connection confirmation message appears as soon as the connection is established. If the confirmation message doesn't appear, inspect the configuration for the COM port. When connection is established, the software configures the baud rate automatically.
10. Program the GPS35-HVS to output both GPS headers ($GPGGA) and ($GPRMC).
    PRMC default values contain some zeros which the transceiver cannot process. Adding the header $PGGA retrieves the initialization data from the GPS unit. All other configurations in the GPS35-HVS should work with default values.
11. Confirm changes of the NMEA data word taken from the GPS35-HVS.
    After confirming configurations, remove programming jigs and modify the KCT-31 cable as below.

## 2.7.4 Modifying the KCT-31

The KCT-31 needs to be modified to supply 12 V to the GPS35-HVC unit. Follow the procedure below to modify the KCT-31.

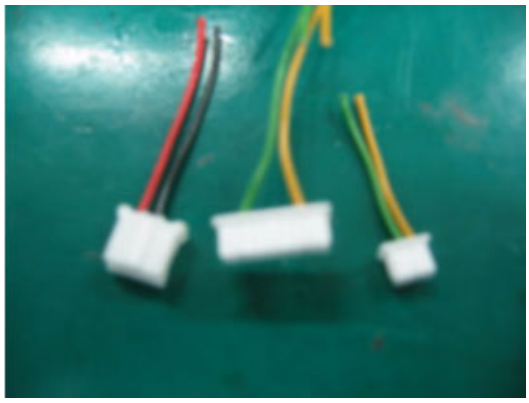
**Note:** The GPS35-HVS must be programmed before installation in the transceiver. Refer to 2.7.3 Preparing a Programming Jig on page 23.

1. Remove the connector cover of the D-sub 9-pin connector.
2. Solder a jumper wire to pin 4 of the connector where the red lead comes through as shown in the figure.
   This is the closest pin to the square grounding pad on the PCB (Refer to the picture below).

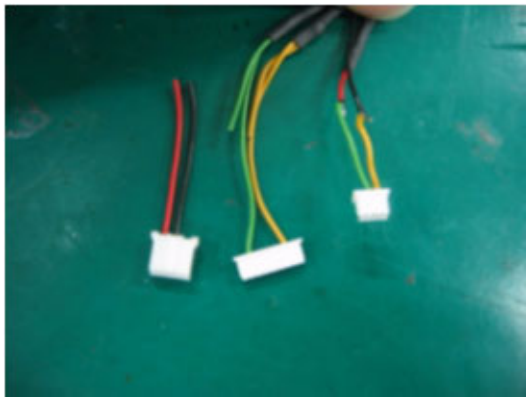


3. Connect the other end of the jumper wire in step 2 to pin 9 of the D-sub connector as shown in the figure below.

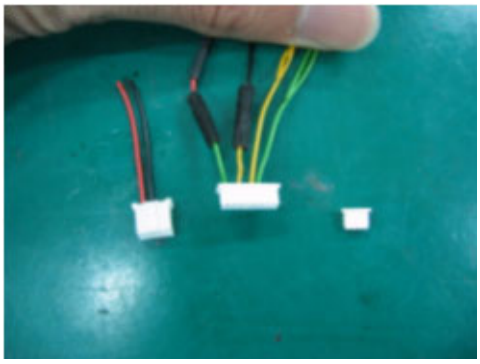
4. Install the connector cover on pin 9 of the D-sub connector.
5. Cut the KCT-31 cable as shown in the figure.



6. Reassemble the cables as shown in the figure.



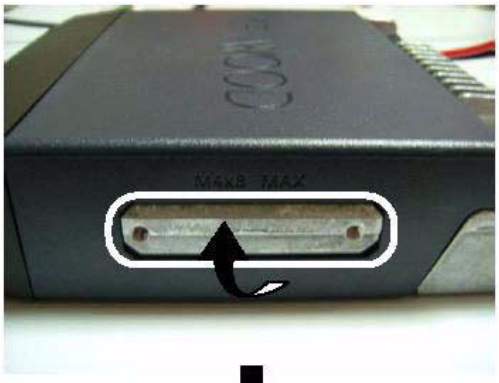
**7.** Re-solder the cables as follows:
Pin 1 to Red
Pin 3 to Black
Pin 5 to Yellow
Pin 6 to Green

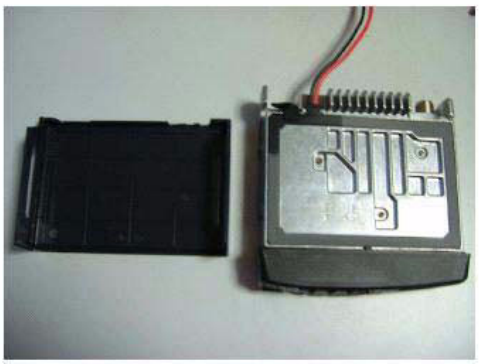


## 2.7.5 Installing the Modified KCT-31

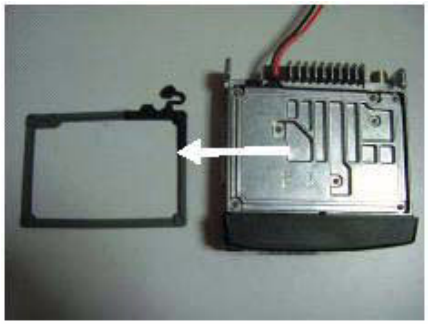
**1.** Extract the top cover of the TK-7160/ TK-8160.

(1) Lift the top cover by widening both tabs using a flat-head screwdriver, etc. Then, pull upward to remove the top cover from the transceiver body.



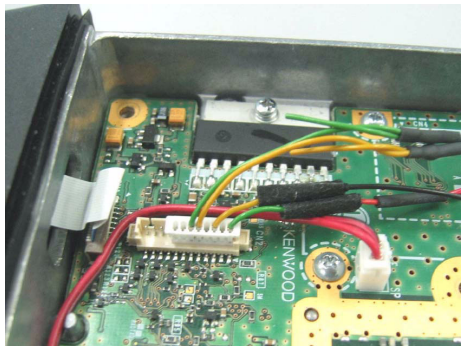


(2) Remove the top rubber packing.



(3) Remove 5 screws and then lift the shielding plate.

**2.** Install the KCT-31 as shown in the figure.



**3.** Re-install the shielding cover, screws and the rubber packing back into place.

### 2.7.6 Configuration using KPG-99D

Refer to 2.6.2 Configuration using KPG-99D on page 21 for configuration using KPG-99D.

## 2.8 Voice Scrambler Board

The Scrambler Board (SC20-460) can be installed in the TK-7160/ TK-8160.

This section describes how to install the Scrambler Board (SC20-460) in the TK-7160/ TK-8160.

### ■ Required Items to Install the Scrambler Board

- Transceiver
- SC20-460
- Double-sided adhesive tape attached to the SC20-460
- Cushion tape

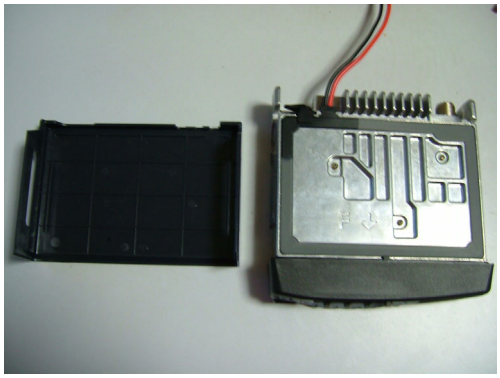
**WARNING**

THE TRANSCEIVER MUST BE TURNED OFF AND THE POWER CABLE MUST BE REMOVED BEFORE INSTALLING THE SCRAMBLER BOARD IN THE TRANSCEIVER.

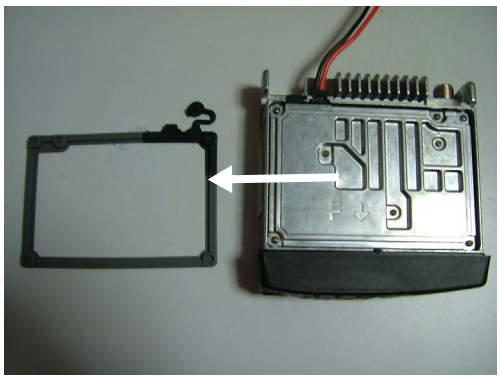
### 2.8.1 Installing the SC20-460

**1.** Remove the top cover of the TK-7160/ TK-8160.

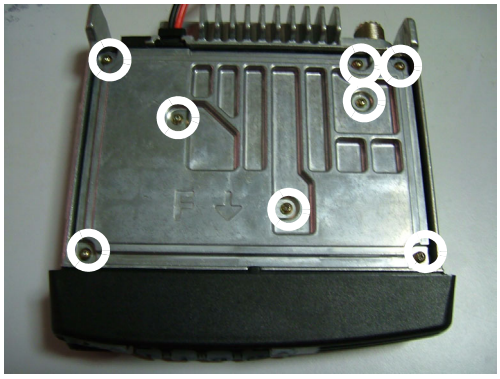
(1) Use a flat-head screwdriver or similar to slightly pry apart the 2 side tabs. Then, pull upward to remove the top cover from the transceiver body.

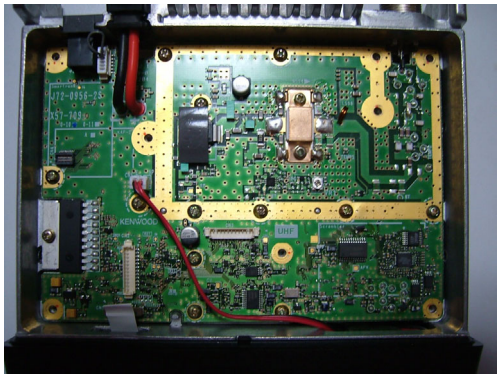



(2) Remove the top rubber packing.



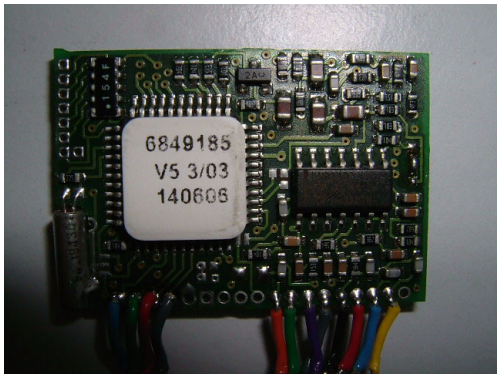
(3) Remove 7 screws and then lift the shielding plate.



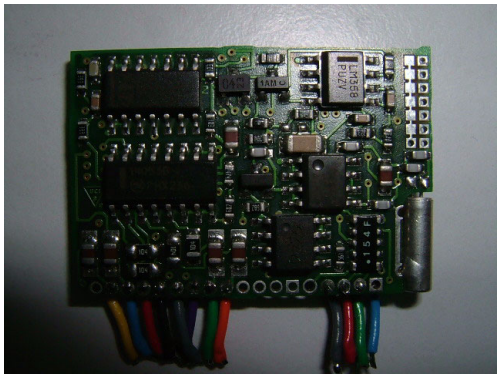


**2.** Modify the Scrambler Board.

(1) The Scrambler Board (SC20-460) is shown in the following figures.

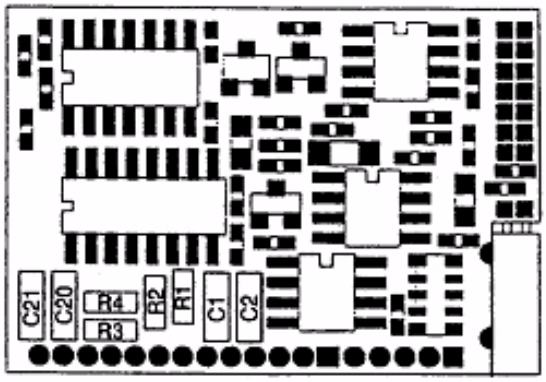



Top View



Bottom View

(2) Adjust the audio level of the SC20-460 by referring to the Installation Manual of the Scrambler Board (SC20-460). C1 and R1 to R5 installed on the back of the board must be replaced with parts having the following values before adjusting the Audio level. (Refer to the SC20-460 Installation Manual for details.)




Bottom View

**Table 2-18 SC20-460 Modification**

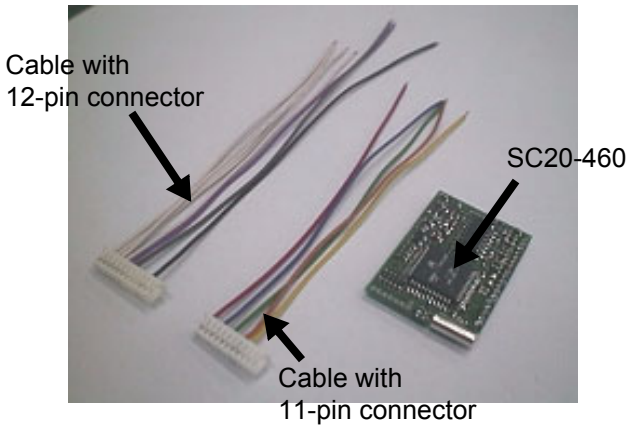
| For RX | For TX |
|---|---|
| Change C1 to 1000 pF | Change R2 to 15kΩ |
| Change R1 to 39kΩ | Change R4 to 15kΩ |
| Change R3 to 330kΩ | |

(3) Change the Scrambler Board configuration using TR30-3060/ TR30-3061 software provided by Transcrypt. The parameters can be changed as below when adjusting Transmit, Receive and De-emphasis.

- Miscellaneous Parameter #1 @ Bit Number 4 (TX De-emphasis):
  Set to default "0".
- Miscellaneous Parameter #1 @ Bit Number 3 (RX De-emphasis):
  Set to default "1".

**Note:** Refer to the system manual supplied with SC20-460.

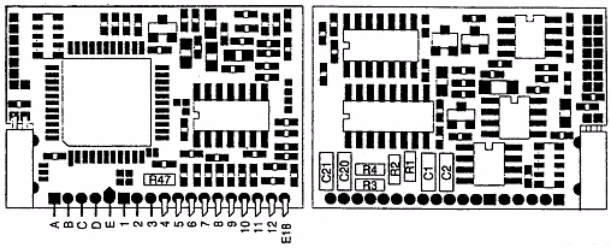
**3.** Prepare a cable with an 11-pin connector (E37-1080-X5) and a cable with a 12-pin connector (E37-1081-X5) for the SC20-460.

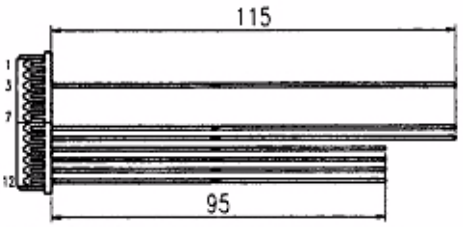



**Note:** E37-1080-X5 (cable with 11-pin connector) and E37-1081-X5 (cable with 12-pin connector) are supplied as SERVICE PARTS.

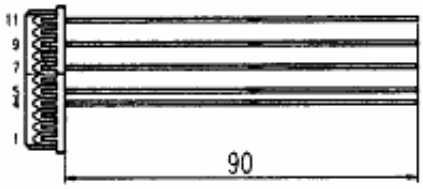
**4.** Solder the E37-1080-X5 (cable with 11-pin connector) and E37-1081-X5 (cable with 12-pin connector) on the Scrambler Board.

Connect the wires as shown in the following figures.



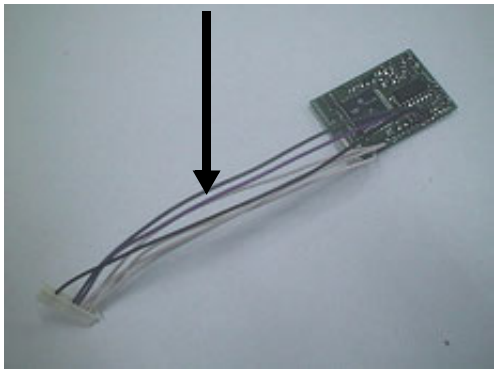



12 pins Lead Wire with Connector
E37-1081-05




11 pins Lead Wire with Connector
E37-1080-05

Cable with 12-pin connector



Cable with 11-pin connector

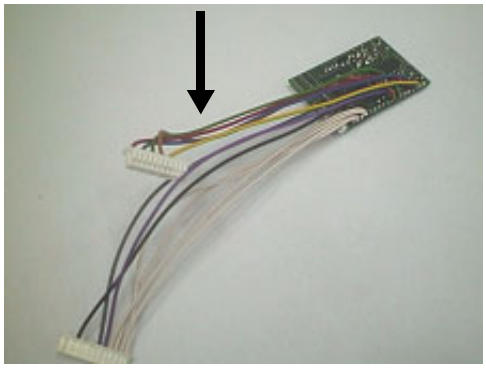
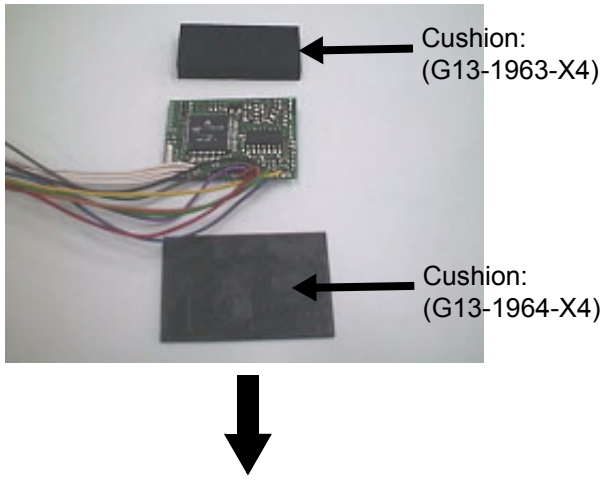


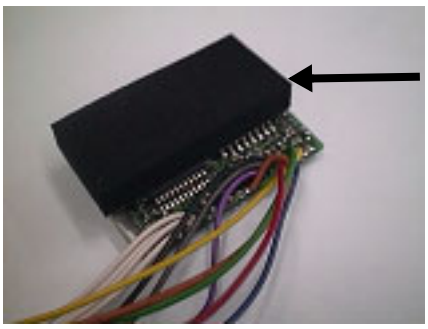
**Table 2-19 Pin Connections**

| SC20-460 Wires | Cable with 12-Pin Connector (A) | Cable with 11-Pin Connector (B) |
|---|---|---|
| A | A-12 | - |
| B | A-11 | - |
| C | A-10 | - |
| D | A-9 | - |
| 5 | - | B-5 |
| 6 | - | B-7 |
| 7 | A-8 | - |
| 8 | A-7 | - |
| 9 | A-3 | - |
| 10 | - | B-11 |
| 11 | - | B-9 |
| 12 | - | B-4 |

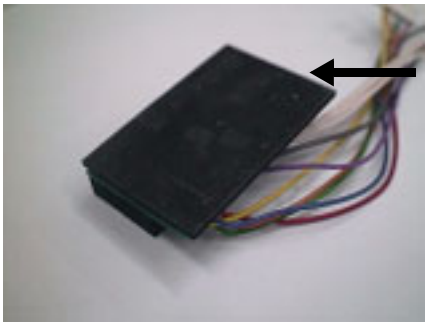
**5.** Install the cushion on the Scrambler Board.

Install a cushion (G13-1963-X4, 33 mm x 15 mm x 5 mm (1.30” x 0.59” x 0.20”)) on the surface of the Scrambler Board and another cushion (G13-1964-X4, 38 mm x 25 mm x 1 mm (1.5” x 0.98” x 0.04”)) on the back of the board.

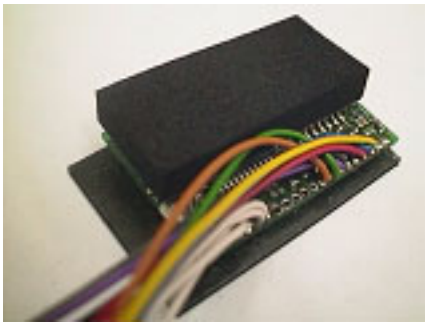




Mount cushion: (G13-1964-X4) on top of SC20-460.



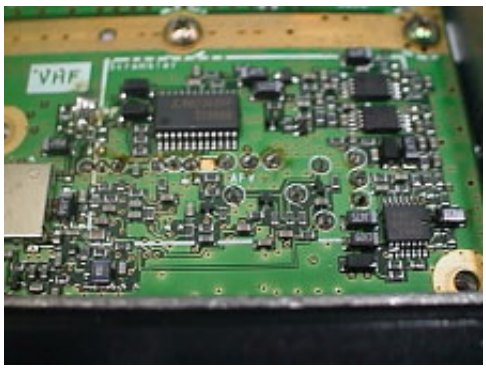
Turn over SC20-460 to bottom and mount cushion: (G13-1964-X4)



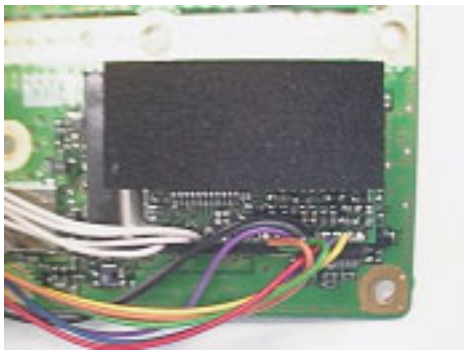
**Note:** G13-1963-X4 and G13-1964-X4 are supplied as SERVICE PARTS.

**6.** Install the Scrambler Board.

Install the Scrambler Board at the location printed on the TX-RX PCB.



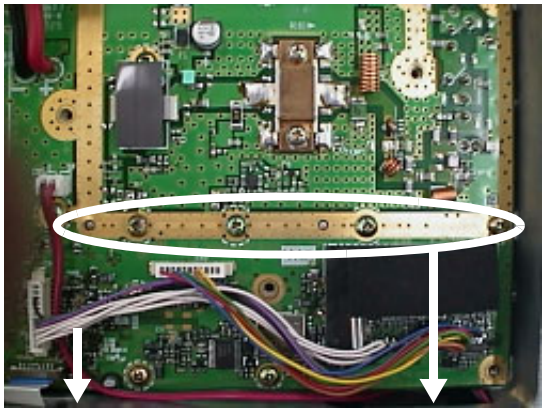
*After installation*



Top View

Side View

**7.** Dress the cables soldered to the Scrambler Board as shown in the following figure.



Speaker wire cable below scrambler wiring

Keep scrambler wiring away from shielding cover.

**Note:**

- The speaker cable wires must be positioned under the Scrambler cables.
- Scrambler cables should not be dressed between the shielding cover and PCB.

**8.** Reassemble the shielding cover, and re-install the screws and packing.

## 2.8.2 Configuration using KPG-99D

ANI Board information can be written to the transceiver by using KPG-99D after installing the board in the transceiver. Follow the procedure below to write ANI Board information to the transceiver.

**1.** Run KPG-99D.

**2.** Select the **Program** pulldown menu > "Read Data from the Transceiver". The "" icon in the tool bar can be clicked to read data from the transceiver.

The **Read Data from the Transceiver** window appears on the display.

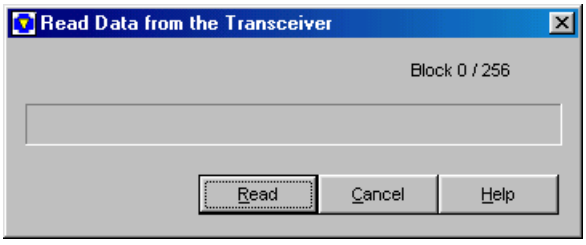



**Figure 2-20 Read Data from the Transceiver Window 1**

**3.** Click the "Read" button.

KPG-99D starts reading configuration data from the transceiver.

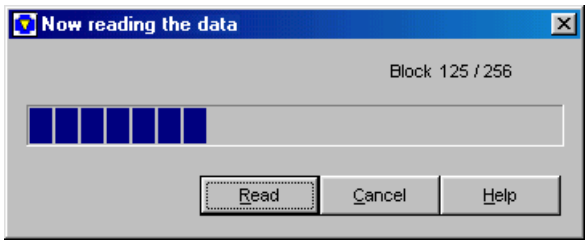



**Figure 2-21 Read Data from the Transceiver Window 2**

**4.** Select the **Edit** pulldown menu > "Function Port".

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

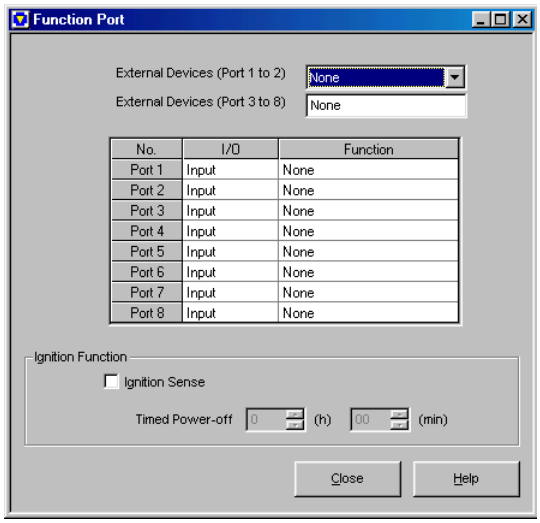



**Figure 2-22 Function Port Window 1**

**5.** Select the **External Devices (Port 3 to 8)** dropdown list > "Scrambler".

Refer to the instruction manual supplied with the Scrambler Board for instructions on how to configure the Scrambler Board.

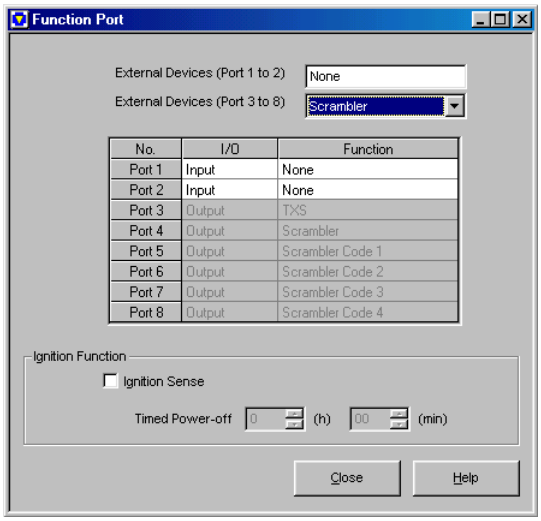



**Figure 2-23 Function Port Window 2**

6. Select the **Program** pulldown menu > "Write Data to the Transceiver". The "" icon in the toolbar can be clicked to write data to the transceiver.

   The **Write Data to the Transceiver** window appears on the display.

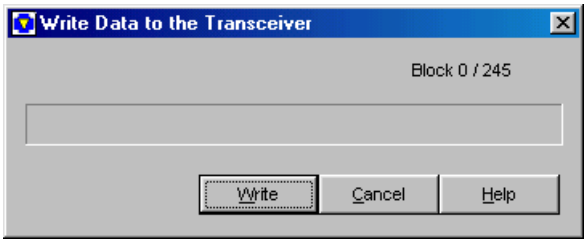



**Figure 2-24 Write Data to the Transceiver Window**

7. Click the "Write" button.

   The configuration data containing the ANI Board information is written to the transceiver.

**Note:**

- Scrambler On/Off and Scrambler Code can be configured for each channel.
- Scrambler configuration for each channel can be changed by using the **Scrambler** key when the **Scrambler** key is assigned.

# 2.9 Voice Scrambler Board (KW21)

A plug-in type of Voice Scrambler Board (KW21) is available for the TK-7160/ TK-8160.

For information on the KW21 Voice Scrambler Board, contact Transcrypt International for details.

**Note:** For TK-7160/ TK-8160 with serial numbers lower than 704xxxxx, the 20-pin connector (CN4) is not available. In this case, KW21 cannot be installed. Install the SC20-460 Voice Scrambler Board instead.

## ■ Required Items to Install the KW21 Voice Scrambler Board

- Transceiver
- KW21
- 3M brand 4950 VHB Acrylic Foam Tape
- 3M brand 4959 VHB Acrylic Foam Tape

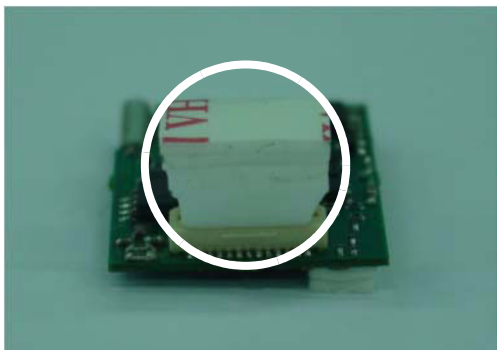
**WARNING**

THE TRANSCEIVER MUST BE TURNED OFF AND THE POWER CABLE MUST BE REMOVED BEFORE INSTALLING THE BOARD IN THE TRANSCEIVER.

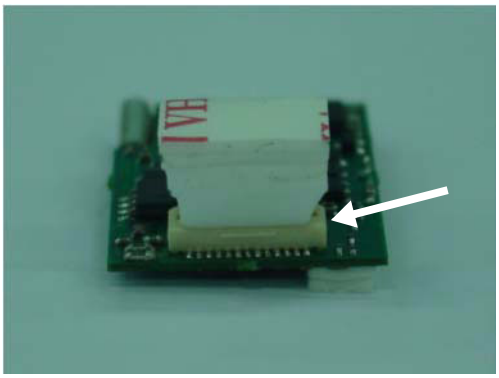
## 2.9.1 Configuring and Modifying the KW21

1. Cut out 2 pieces of 3M brand 4950 VHB Acrylic tape (14 mm x 9 mm x 1.1 mm (0.55” x 0.35” x 0.04”)). Stack and paste these pieces together. Then cut out 2 pieces of 3M brand 4959 Acrylic tape (14 mm x 9 mm x 3 mm (0.55” x 0.35” x 0.12”)) and stack and paste these pieces together. Finally, stack and paste together the two resulting tape stacks to create one tape stack consisting of 4 tapes. The dimensions of the tape stack will be 14 mm x 9 mm x 8.2 mm (0.55” x 0.35” x 0.32”).

**Note:** Do not peel off the coated paper on top of the stacked tapes that is exposed to the top cover.



**2.** Place the stacked tapes on top of the connector on the A-side of KW21.

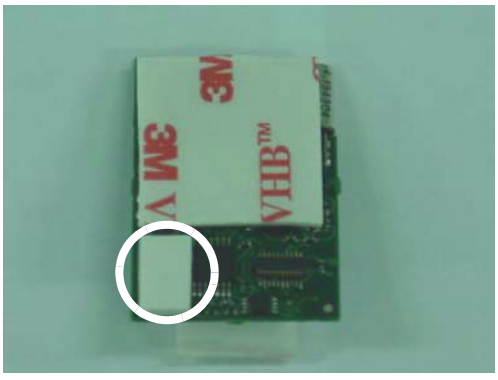


Side view

Top view

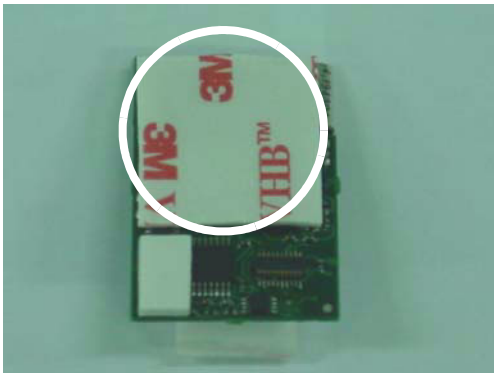
**3.** Cut out 2 pieces of 3M brand 4950 VHB Acrylic tape (14 mm x 9 mm x 1.1 mm (0.55” x 0.35” x 0.04”)) and stack and paste them together. Paste the stack on B-side of KW21 as indicated in the small circle.

**Note:** Peel off the coated paper on top of stacked tapes that is exposed to the TX-RX PCB as shown below.

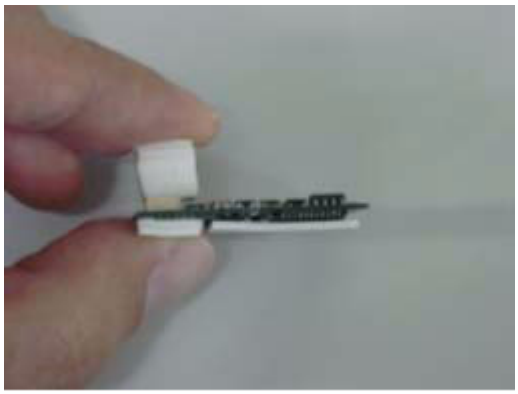



**4.** Cut out 1 piece of 3M brand 4950 VHB Acrylic tape (14 mm x 9 mm x 1.1 mm (0.55” x 0.35” x 0.04”)) and paste it on B-side of KW21 as indicated in the large circle.

**Note:** Do not peel off the coated paper that is exposed to the TX-RX PCB.




Top view

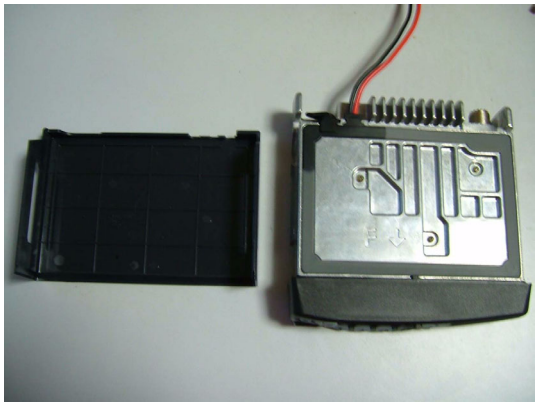


Side view

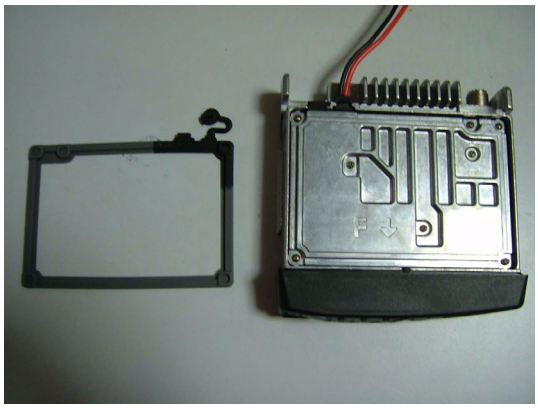
## 2.9.2 Installing the KW21 in the Transceiver

**1.** Remove the top cover of the TK-7160/ TK-8160.

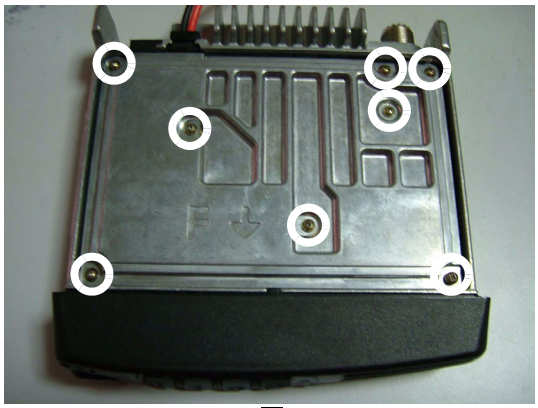
(1) Use a flat-head screwdriver or similar to slightly pry apart the 2 side tabs. Then, pull upward to remove the top cover from the transceiver body.

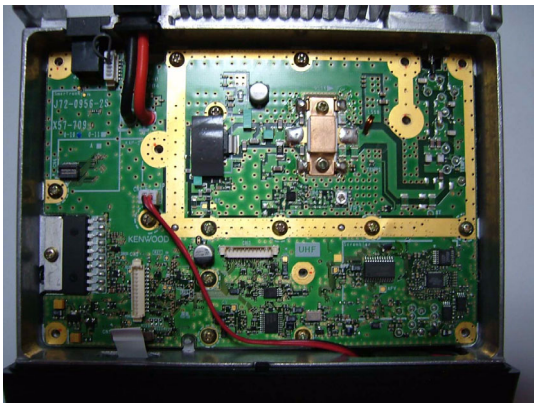


(2) Remove the top rubber packing.



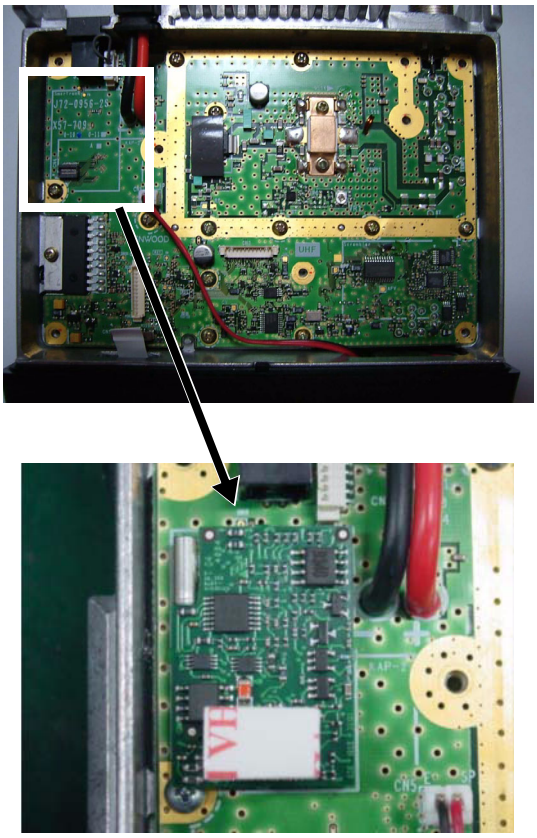
(3) Remove 7 screws and then lift the shielding plate.





**2.** Plug the KW21 into the 20-pin connector (CN4) at the location printed on the TX-RX PCB.

**Note:** For TK-7160/ TK-8160 with serial numbers lower than 704xxxxx, the 20-pin connector (CN4) for KW21 is not available. In this case, KW21 cannot be installed. Install the SC20-460 Voice Scrambler Board instead.



**3.** Reassemble the shielding cover and re-install the screws and packing.

## 2.9.3 Configuration using KPG-99D

Refer to 2.8.2 Configuration using KPG-99D on page 30 for instructions on configuring the KW21.

# 2.10 ANI Board

The ANI Board can be installed in the TK-7160/ TK-8160. This section describes how to install the Cimarron Technologies QE-2 in the transceiver.

## ■ Required Items to Install the ANI Board

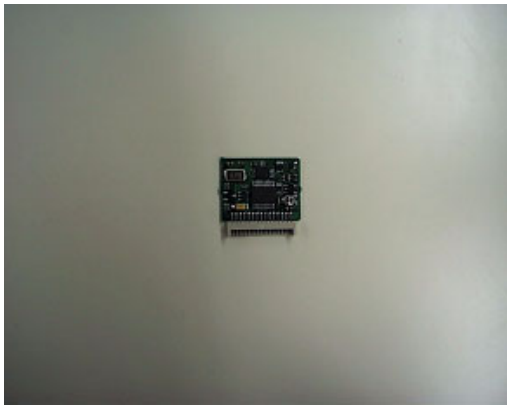
- Transceiver
- QE-2
- Double-sided adhesive tape supplied with the QE-2
- Cushion tape

**WARNING**

THE TRANSCEIVER MUST BE TURNED OFF AND THE POWER CABLE MUST BE REMOVED BEFORE INSTALLING THE ANI BOARD IN THE TRANSCEIVER.

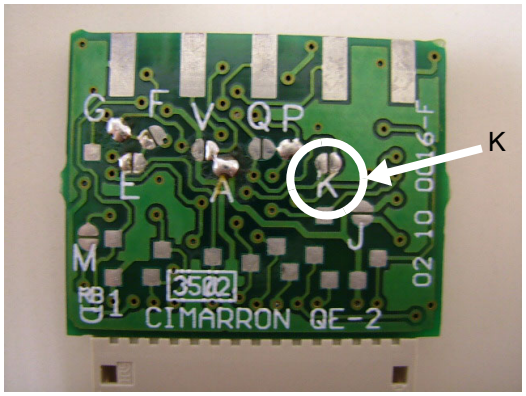
## 2.10.1 Configuring and Modifying the QE-2 Board

**1.** Remove the QE-2 board from the transceiver.

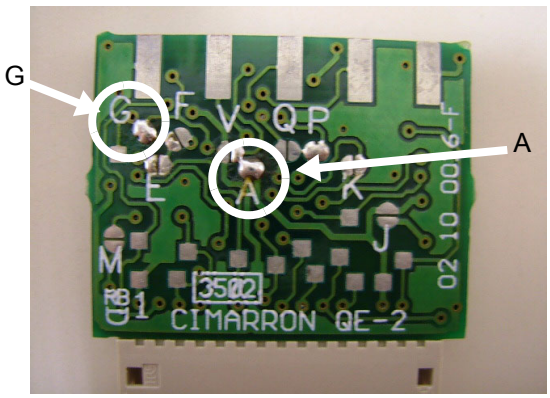


**2.** Modify and configure the QE-2 board.

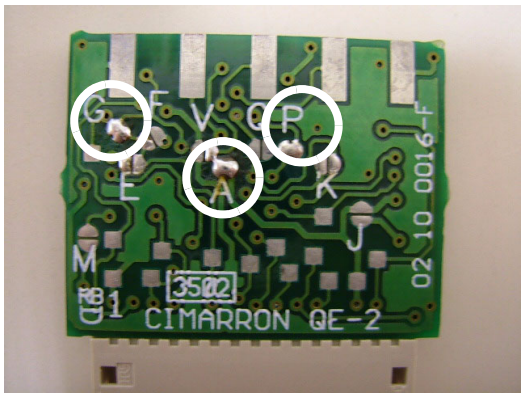
(1) Heat and use suction to remove the solder from K.



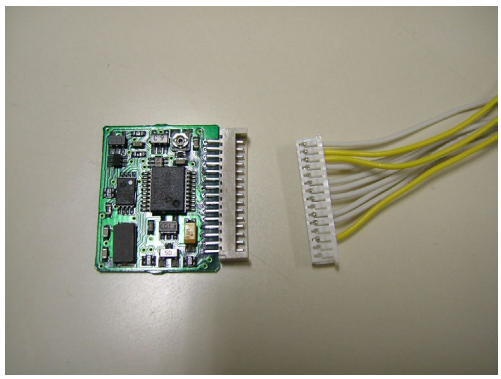

(2) Solder the position between G and A.

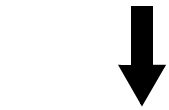


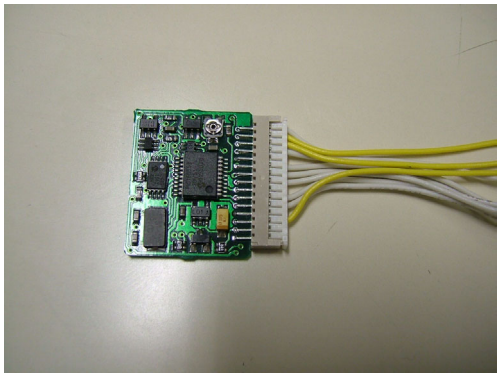

(3) Confirm that G, A and P are soldered (bridged).




**3.** Connect the cable (E37-1164-05) having the connector used for installing the ANI Board to the QE-2 board.







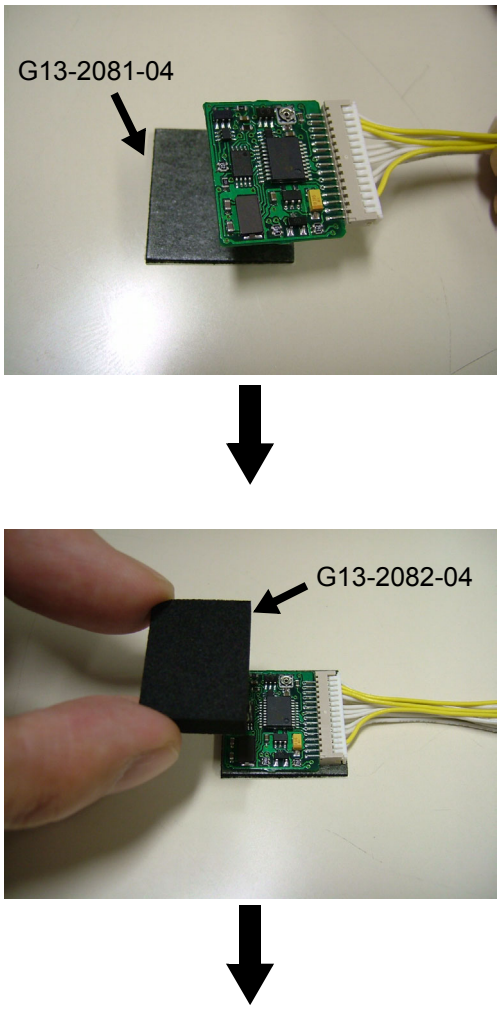
**4.** Prepare the cushion tape.

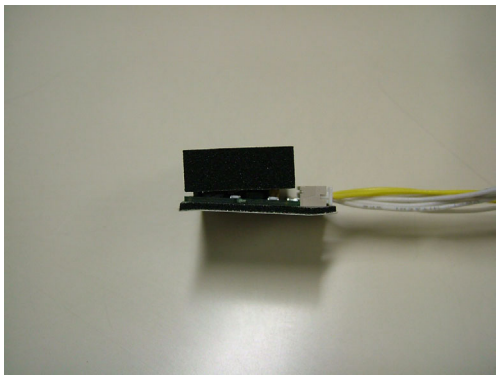
The following cushion tapes must be prepared:

- G13-2082-04
- G13-2081-04

**Note:** Modification of the pieces of cushion tape may be required depending on the size of ANI Board.

**5.** Attach the cushion tape to the QE-2 board as shown in the following figure.

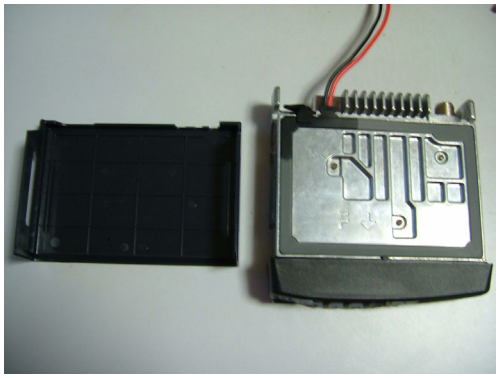


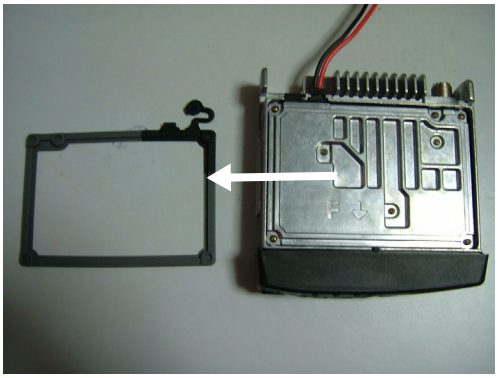
## 2.10.2 Installing the QE-2 Board

**1.** Remove the top cover of the TK-7160/ TK-8160.

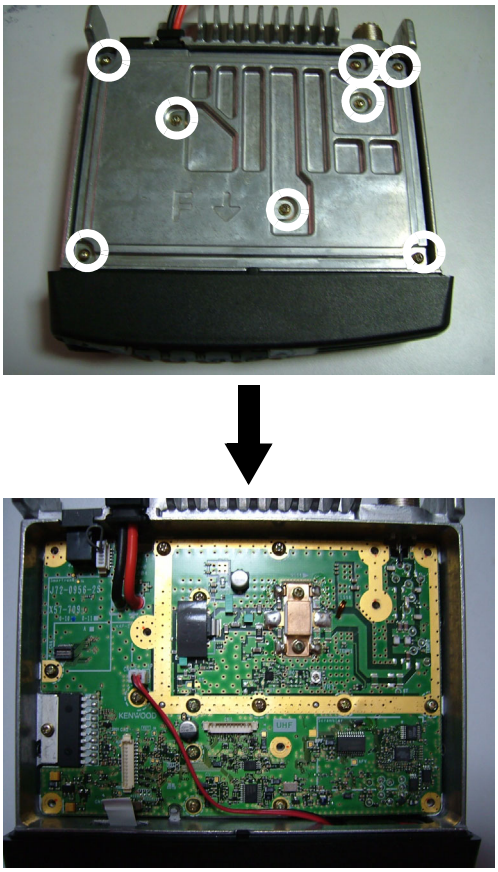
(1) Use a flat-head screwdriver or similar to slightly pry apart the 2 side tabs. Then, pull upward to remove the top cover from the transceiver body.

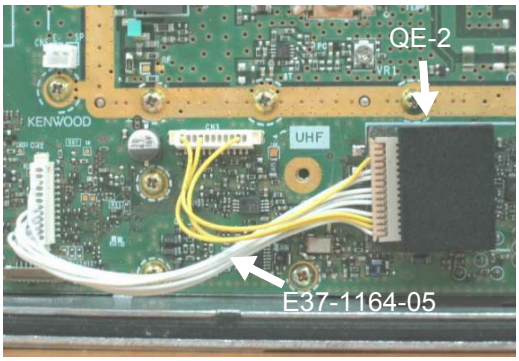
(2) Remove the top rubber packing.



(3) Remove 7 screws and then lift the shielding plate.



2. Connect the cable with connectors (E37-1164-05) that is used for installing the ANI Board to the CN2/ CN3 connector of the TX-RX PCB.




3. Reassemble the shielding cover, and re-install the screws and packing.

## 2.10.3 Configuration using KPG-99D

ANI Board information can be written to the transceiver by using KPG-99D after installing the ANI Board. Follow the procedure below to write ANI Board information to the transceiver.

1. Run KPG-99D.
2. Select the **Program** pulldown menu > "Read Data from the Transceiver". The "" icon in the tool bar can be clicked to read data from the transceiver.

   The **Read Data from the Transceiver** window appears on the display.

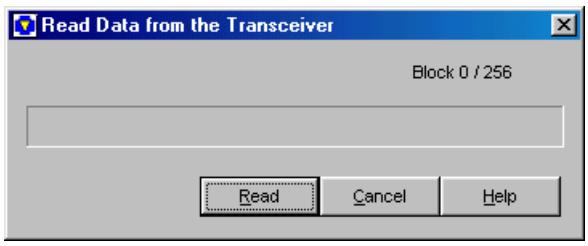



**Figure 2-25 Read Data from the Transceiver Window 1**

3. Click the "Read" button.

   KPG-99D starts reading configuration data from the transceiver.

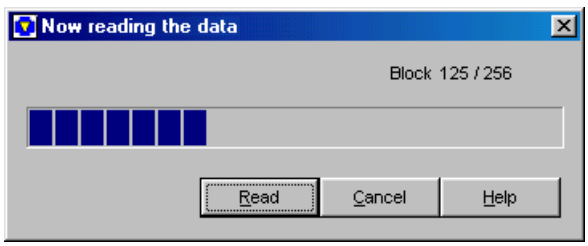



**Figure 2-26 Read Data from the Transceiver Window 2**

4. Select the **Edit** pulldown menu > "Function Port".

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

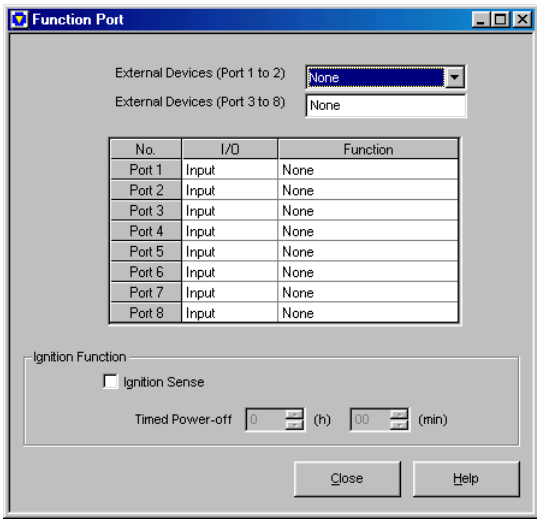



**Figure 2-27 Function Port Window 1**

5. Select the **External Devices (Port 3 to 8)** dropdown list > "ANI Board".

   Refer to the instruction manual supplied with the ANI Board for instructions on how to configure the ANI Board.

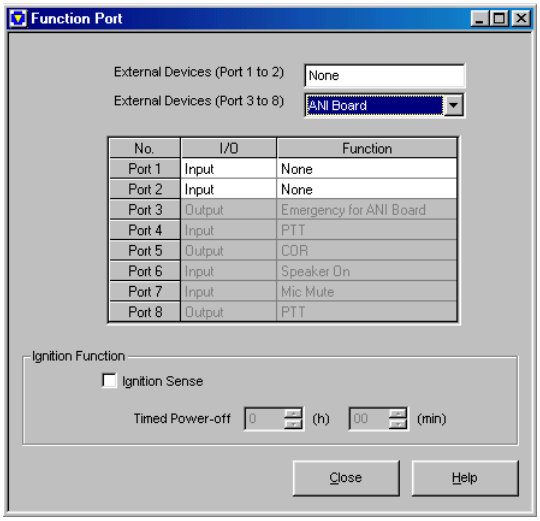



**Figure 2-28 Function Port Window 2**

6. Select the **Program** pulldown menu > "Write Data to the Transceiver". The "" icon in the toolbar can be clicked to write data to the transceiver.

   The **Write Data to the Transceiver** window appears on the display.

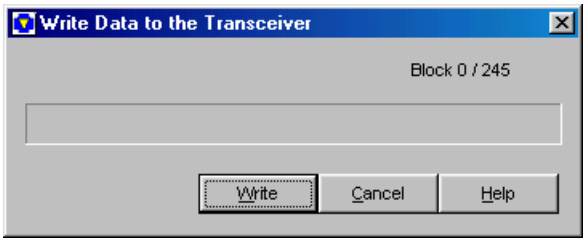



**Figure 2-29 Write Data to the Transceiver Window**

7. Click the "Write" button.

   The configuration data containing the ANI Board information is written to the transceiver.

# 2.11 KAP-2

The cable with the unit (KAP-2) can be connected to the TK-7160/ TK-8160. This cable allows you to add the Public Address, Horn Alert and External Speaker functions. This section describes how to connect KAP-2 to the TK-7160/ TK-8160.

KAP-2 has the following 2 cables. The second cable kit (Kit A) is used.

(1) Cable kit for the TK-7180 and TK-8180

(2) Cable kit for the TK-7160 and TK-8160 (Kit A)

## 2.11.1 Description

This cable and the KAP-2 unit allow you to add the Public Address, Horn Alert, and External Speaker functions to the TK-7160/ TK-8160.

## 2.11.2 Features

HOR1, HOR2, INT SP and EXT SP can be switched by using the jumper connector. (Refer to the circuit diagram for details.)

## 2.11.3 Mechanical Specifications

### ■ Product Dimensions and Weight

**Table 2-20 Product Dimensions and Weight**

| Item | Board Size | Cable Length |
|---|---|---|
| Length | 30.0 mm (1.18”) | 260 mm (10.24”) |
| Width | 27.5 mm (1.08”) | |
| Thickness | 7.8 mm (0.31”) | |
| Weight | 30 g (1.06 oz.) | |

### ■ Cable Specifications

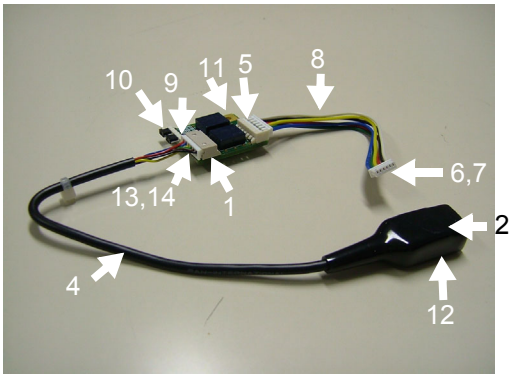



**Figure 2-30 Mechanical Parts**

**Table 2-21 Mechanical Parts**

| No. | Part Name | Qty. | Remarks |
|---|---|---|---|
| 1 | Housing | 1 | 53015-0610 |
| 2 | Housing | 1 | 03-06-1062 |
| 3 | Terminal | 6 | 02-06-1132 |
| 4 | Cable | 1 | 6 Pin<br>Cable Length: 200 mm (7.87”) |
| 5 | Housing | 1 | 53254-0610 |
| 6 | Housing | 1 | 51065-0600 |
| 7 | Terminal | 6 | 50212-8100 |
| 8 | Cable | 6 | Length: 35 mm (1.38”) |
| 9 | Pin Assy | 1 | E40-6375-x5 |
| 10 | Socket | 2 | E18-0254-x5 |
| 11 | Brazier Head Taptite Screw | 1 | N87-2606-48 |
| 12 | CAP | 1 | 513083 |
| 13 | Housing | 1 | 51004-0600 |
| 14 | Terminal | 6 | 50011-8100 |
| 15 | Housing | 1 | 51065-0600 |
| 16 | Terminal | 6 | 50212-8100 |

## 2.11.4 Electrical Specifications

### ■ Port Specifications

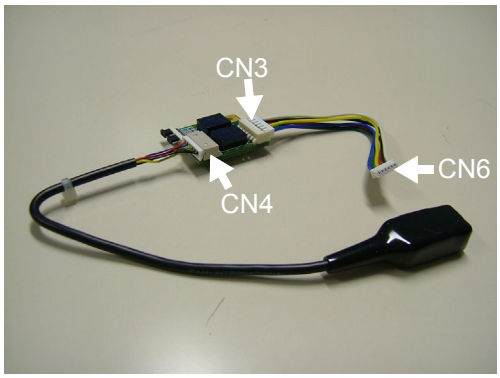



**Figure 2-31 Connector Number**

**Table 2-22 Mechanical Parts**

| Pin Number | Transceiver Side | External Side | External Connector |
|---|---|---|---|
| | CN3 (E40-6393-x5) | CN2 (E40-6394-x5) | CN4 |
| 1 | GND | HR2 (2 A MAX) | HR2 (2 A MAX) |
| 2 | HOR | GND | GND |
| 3 | PA | OSP (2 A MAX) | OSP (2 A MAX) |
| 4 | SPO | ESP (2 A MAX) | ESP (2 A MAX) |
| 5 | SPI | GND | GND |
| 6 | SB | HR1 (2 A MAX) | HR1 (2 A MAX) |

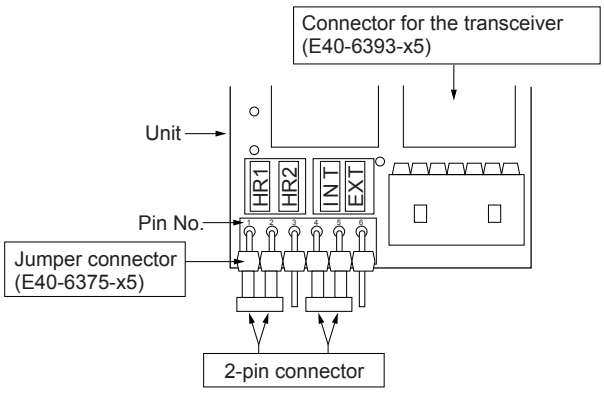



**Figure 2-32 Jumper Pin Specifications (Top View)**

**Table 2-23 Jumper Pin Specifications (CN 5)**

| Connection Pattern | HOR | Ext. Switch (HR1) | Connection Pattern | PA | AF OUTPUT |
|---|---|---|---|---|---|
| When Pin 1 and Pin 2 are connected | Low | OFF (HR1-Open) | When Pin 4 and Pin 5 are connected | Low | Transceiver SP (SPI-SPO) |
| | High | ON (HR1-GND) | | High | Micro-phone Amplifier (SPI-OSP) |
| When Pin 2 and Pin 3 are connected | Low | OFF (HR1-Open) | When Pin 5 and Pin 6 are connected | Low | External SP (SPI-ESP) |
| | High | ON (HR1-HR2) | | High | Micro-phone Amplifier (SPI-OSP) |

* Pin 1 and Pin 2 (HR1) connection and Pin 4 and Pin 5 connection (INT) are default settings.

## 2.11.5 Standard Specifications

(1) Display

No remarks.

## 2.11.6 Supplied Accessories

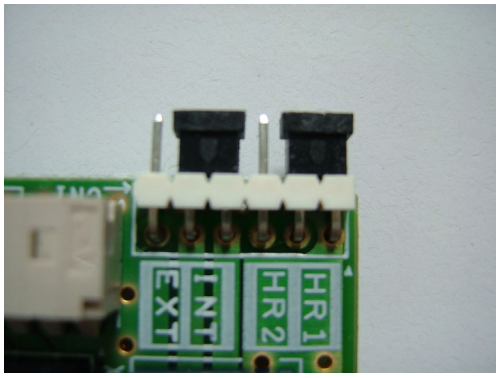
**Table 2-24 Supplied Accessories**

| No. | Name | Part Number | Number | Re-marks |
|---|---|---|---|---|
| 1 | Brazier Head Taptite Screw | N87-2606-48 | 1 | |
| 2 | Square Plug | E59-0419-x5 | 1 | |
| 3 | Insulating Cover | F29-0481-x5 | 1 | |
| 4 | Crimp Terminal | E23-1257-x5 | 8 | Chain Terminal |
| 5 | Pad | G13-2083-04 | 1 | |
| 6 | Pad | G13-2084-04 | 1 | |
| 7 | Pad | G13-2065-04 | 1 | |
| 8 | Sheet | G11-4353-04 | 1 | |
| 9 | Pad | G13-2063-04 | 1 | |

## 2.11.7 Jumper Pin Configurations

HOR1, HOR2, INT SP and EXT SP can be switched by configuring the jumper connector on the KAP-2 cable.

The jumper connector is connected between Pin 1 and Pin 2 or Pin 4 and Pin 5 as a default.




The jumper pin specifications are as follows.

**Table 2-25 Jumper Pin Specifications**

| Pin Number | Transceiver Side | External Side | External Connector |
|---|---|---|---|
| 1 | GND | HR2 (2 A MAX) | HR2 (2 A MAX) |
| 2 | HOR | GND | GND |
| 3 | PA | OSP (2 A MAX) | OSP (2 A MAX) |
| 4 | SPO | ESP (2 A MAX) | ESP (2 A MAX) |
| 5 | SPI | GND | GND |
| 6 | SB | HR1 (2 A MAX) | HR1 (2 A MAX) |

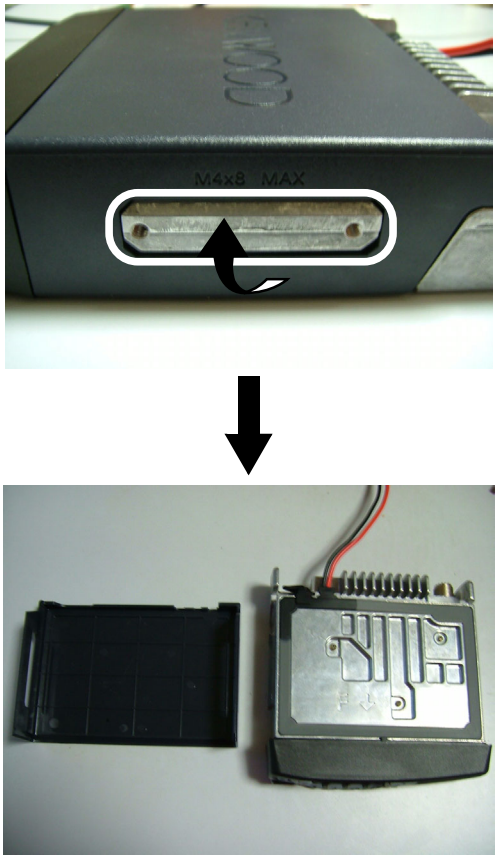
Refer to Table 2-23 Jumper Pin Specifications (CN 5) for relevant operation for selected jumper pin configuration.

## 2.11.8 Connecting the KAP-2 Cable

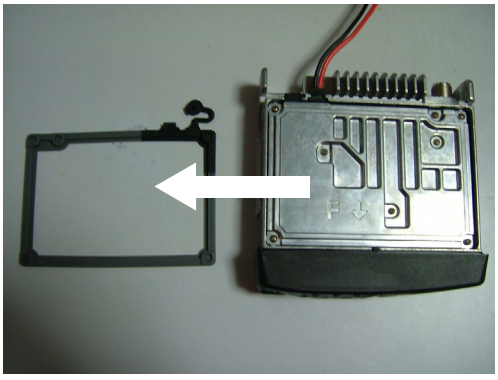
**Note:** KIT A is used for connecting the cable. In this case, the supplied screw (N87-2606-48) is not required.

**1.** Remove the top cover of the TK-7160/ TK-8160 transceiver.

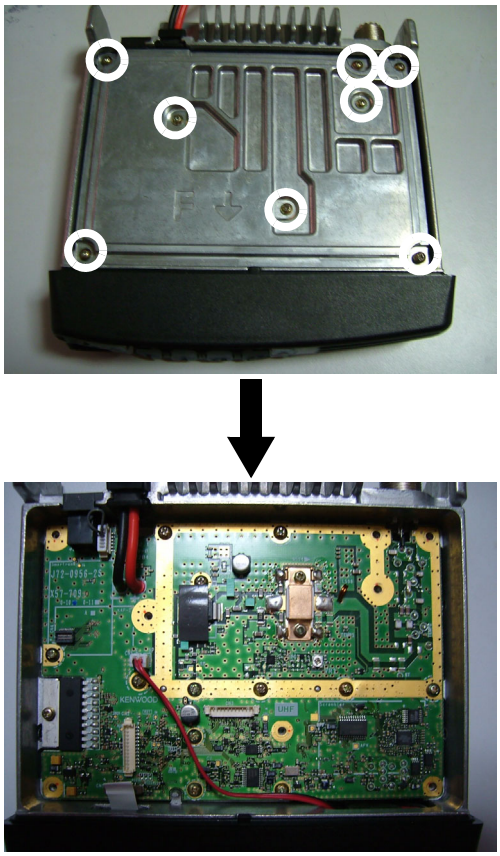
(1) Lift the top cover by widening 2 side tabs, using a flat-head screw driver or similar. Then, pull upward to remove the top cover from the transceiver body.



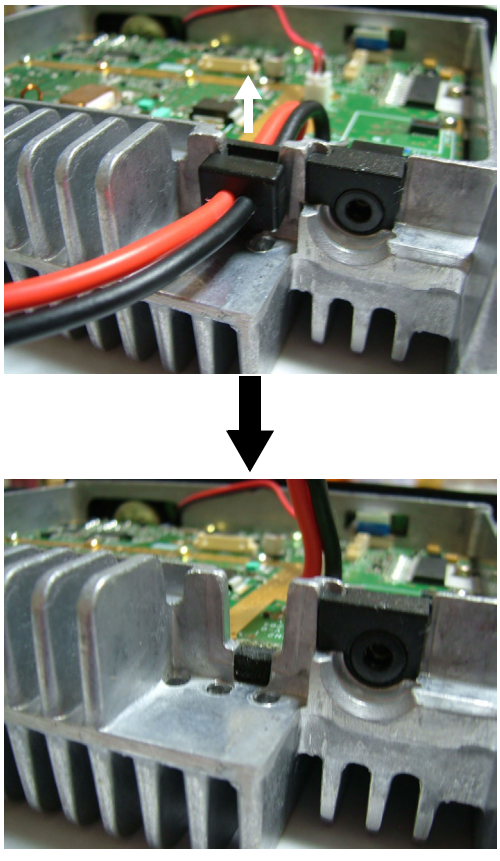

(2) Remove the top rubber packing.



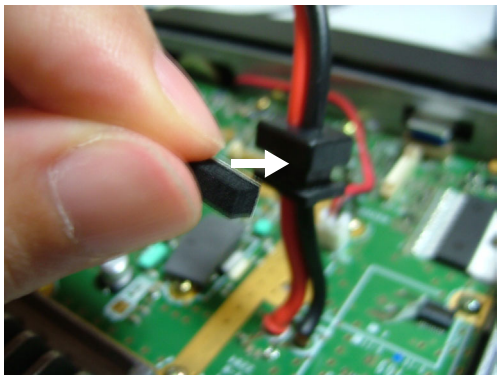
(3) Remove 7 screws and then lift the shielding plate.



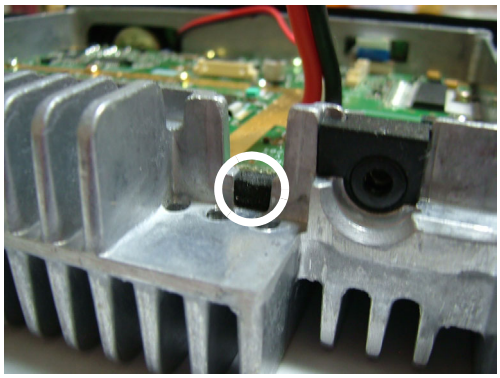
**2.** Disconnect the DC cable in the direction of the arrow.



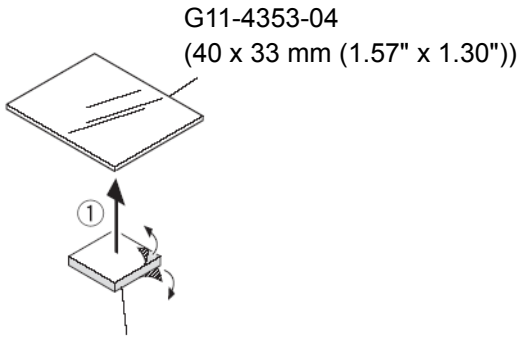
**3.** Attach G13-2083-04 to the DC cable as shown in the figure.



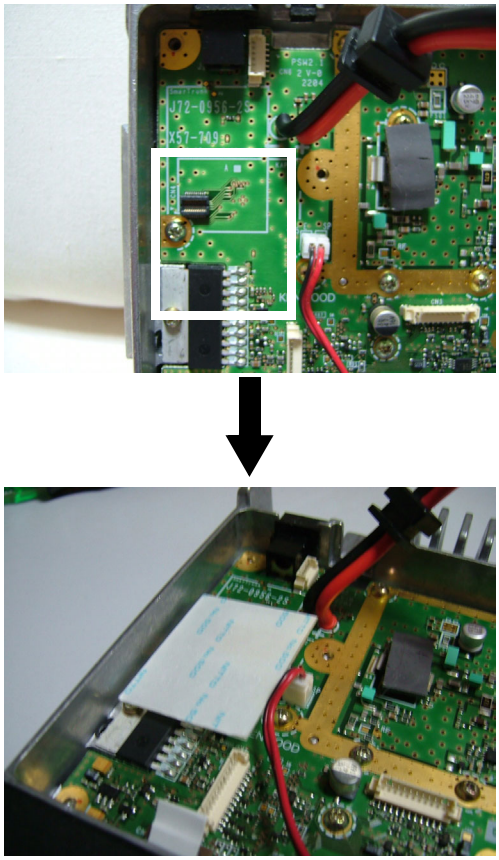
**4.** Cut the cushion part in the figure using diagonal cutters or similar, and then attach G13-2084-04.



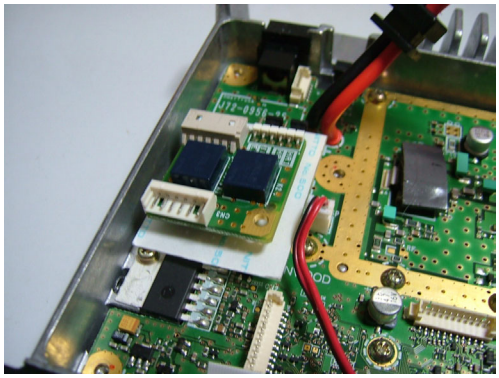
**5.** Attach G11-4353-04 and G13-2065-04 to the cable as shown in the figure.



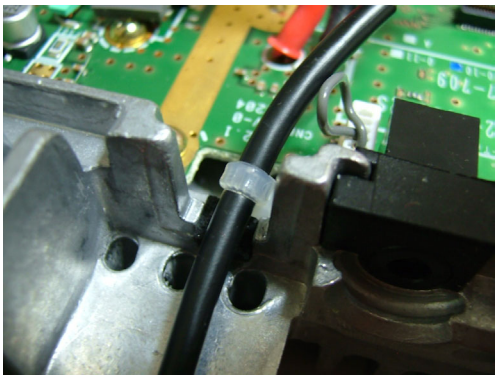

**6.** Connect the cable to the connector of the TX-RX PCB located at the position shown in the following figure.



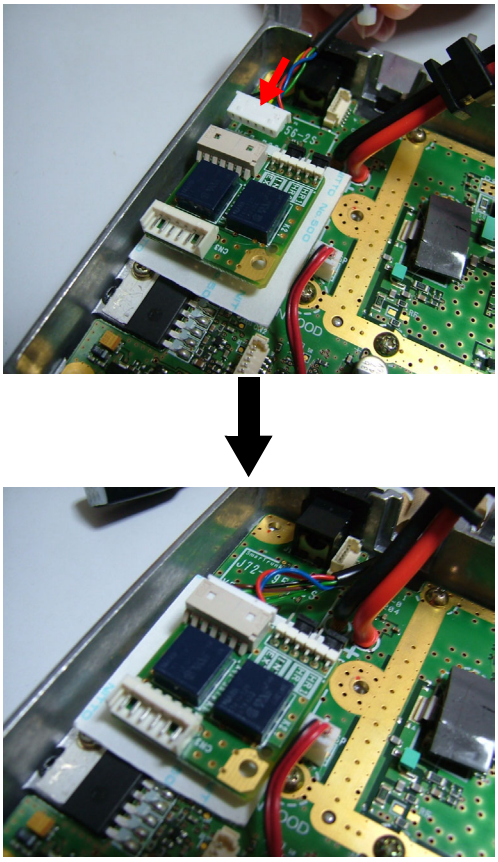
**7.** Peal off the coated paper of G11-4353-04 and install the KAP-2 PCB in the position shown in the figure.



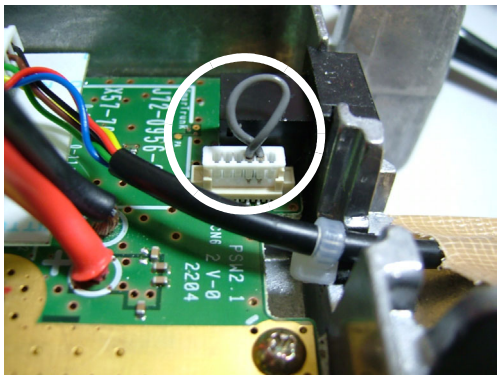
**8.** Dress the KAP-2 cable (E37-1160-05) into the transceiver as shown in the figure.



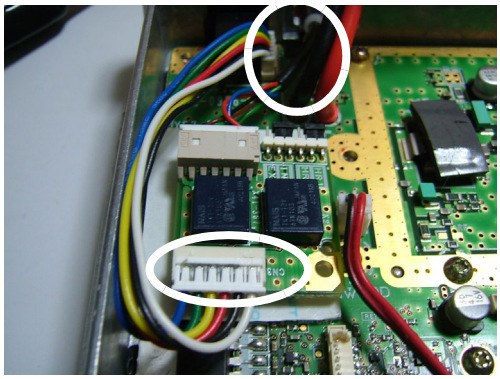
**9.** Insert the 6-pin connector of the connection cable into the Relay PCB connector (CN2).



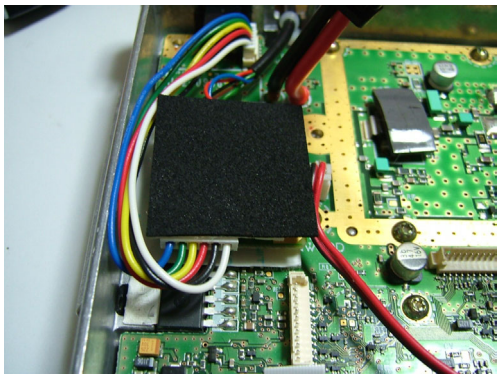
**10.** Remove the cable with the connector that is inserted into the connector (CN6) of the TX-RX PCB



**11.** Plug the cable with the connector (E37-1159-05) into the connector (CN3) on the Relay PCB, then plug the other end into the connector (CN6) on the TX-RX PCB.



**12.** Peal off the coated paper of G13-2063-04 and attach the cable to the KAP-2 PCB.



**13.** Put the DC cable back into place and install the shielding board, top packing, and the top case on the transceiver.

14. Configure the **Function Port** window.

    Select "None" from the **External Devices (Port 1 to 2)** and **External Devices (Port 3 to 8)** dropdown lists, and check the **Ignition Sense** checkbox.

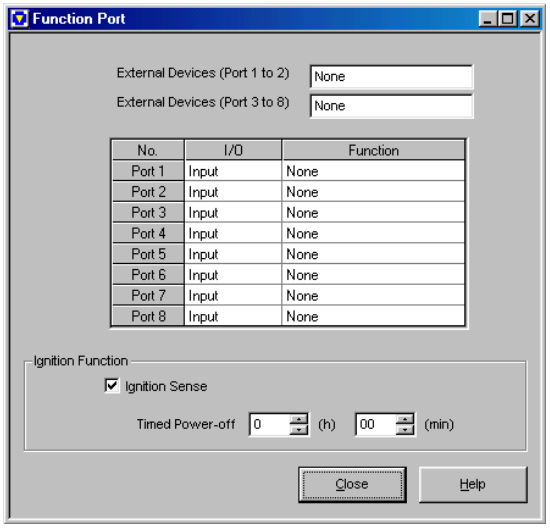
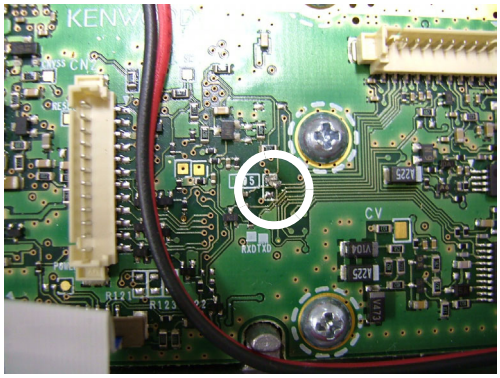



**Figure 2-33 Function Port Window**

# 2.12 Using the Ignition Sense and Other Options

## 2.12.1 Using the Ignition Sense

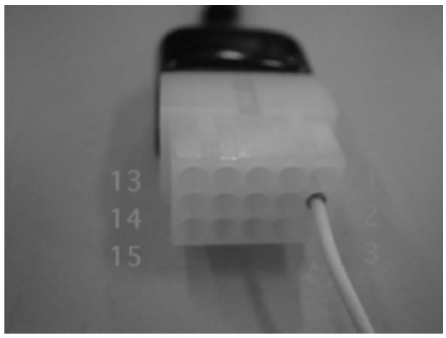
1. Check the **Function Port** window > **Ignition Sense** checkbox in KPG-99D.
2. Remove R95 on the A side of the TX-RX PCB.



3. Connect the KCT-39 cable to the transceiver.

   Refer to 2.3 Ignition Sense Cable for instructions on how to connect the cable.

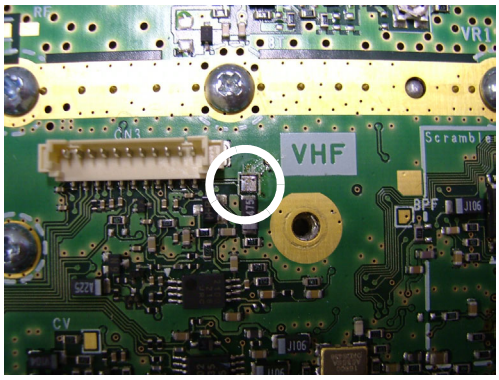
4. Connect the KCT-39 cable to the Ignition Line of the car.
5. Connect the 2nd pin (Pink) of the KCT-39 cable to the Ignition line of the vehicle.




## 2.12.2 Using Ignition Sense with the Scrambler Board

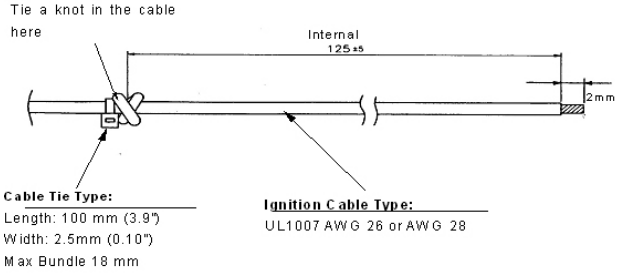
The Scrambler board occupies CN3 having the Ignition Sense port when the Scrambler Board is installed. Therefore, the KCT-39 cable cannot be used.

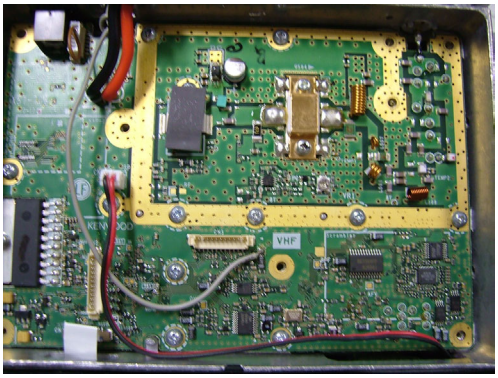
The pad for the Ignition Sense is prepared on the PCB so that the Ignition Sense and Scrambler Board can be used at the same time by soldering a normal cable to the Ignition Sense pad.

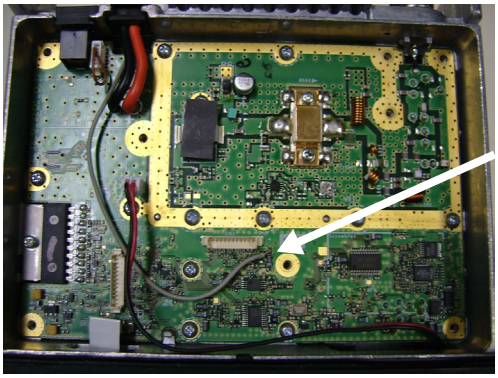



Wires should not be stuck between the top panel and PCB.

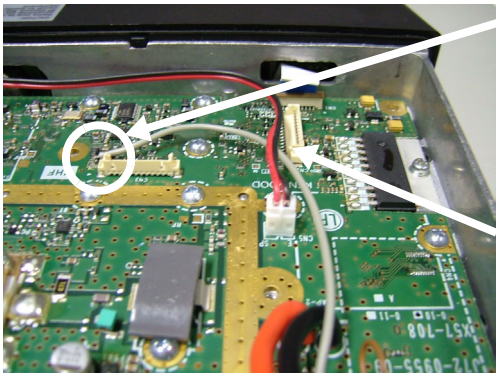
The following figures show the wiring example.





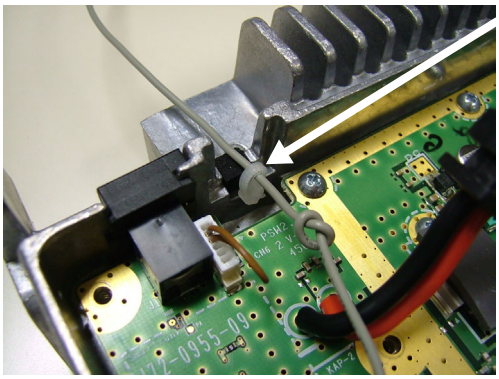


Solder the ignition line of vehicle to this pad.

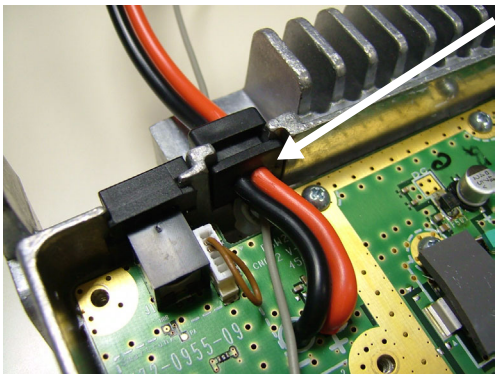


Avoid excessive stress on this soldering point.

Layout of the internal wiring.



Lift up DC, then insert cable tie into the PCB internal slot just above the cushion as shown.



After DC bushing is inserted into chassis, cable tie on the ignition acts as a stopper to limit stress on cable and soldering.

**Note:**

- Similar dustproof properties can be obtained regardless of availability of the KCT-39 cable. However, sufficient dustproof properties cannot be obtained when a normal cable is used for the Ignition Sense.
- Remove the resistor (R95) on the A side of the TX-RX PCB in the same way to use the KCT-39 cable.

## 2.12.3 Using the Transceiver with the KDS-100 or KGP-2A/ KGP-2B

When KDS-100 or KGP-2A/ KGP-2B is selected from the **Function Port** window > **External Devices** dropdown list, the **Ignition Sense** checkbox is automatically unchecked.

The transceiver cannot be turned ON when the Ignition Line of the KCT-31 is connected to the KDS-100 or KGP-2A/ KGP-2B since the Ignition logic level switches to Low.

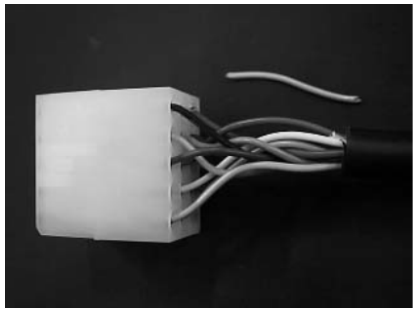
There are 3 ways to use the Ignition Sense with the KDS-100 or KGP-2A/ KGP-2B.

1. Solder the cable to the Ignition Sense pad.

   Solder a normal cable to the pad in the same way as when using the Ignition Sense with the Scrambler Board.

2. Cut the 2nd pin (pink) of the KCT-39 cable.

   Therefore, the KDS-100 cannot be connected to the vehicle Ignition Line.



3. Configure the **Function Port** window.

   Select "None" from the **External Devices (Port 1 to 2)** and **External Devices (Port 3 to 8)** dropdown lists, then configure Port 1 to Port 8 the same as the KDS-100 or KGP-2A/ KGP-2B configurations.

   Check the **Ignition Sense** checkbox.

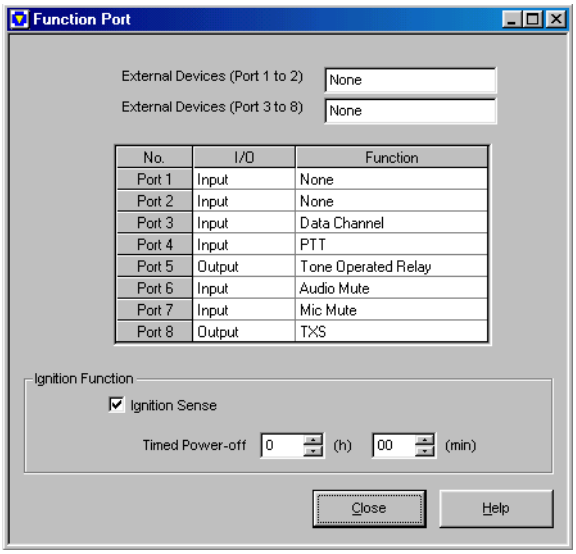



**Figure 2-34 Function Port Window**

**Note:** Remove the resistor (R95) on the A side of the TX-RX PCB in the same way as when using the KCT-39 cable.

# 2.13 Emergency Mic

## 2.13.1 Description

Emergency Mic is the microphone used in Emergency Mode.

Only voice input via the microphone (KMC-30/ KMC-32/ KMC-36) is automatically transmitted when the transceiver is in Emergency Mode and the Emergency Mic is configured for Normal.

The dispatcher cannot receive audio from a vehicle when the handheld microphone is removed from the transceiver or broken.

The transceiver has a port (EMGMIC) for connecting a condenser microphone.

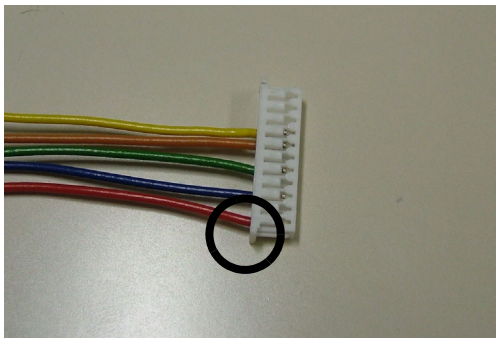
Voice input to the microphone connected to the EMGMIC port and the handheld microphone is automatically transmitted when the transceiver is in Emergency Mode and the Emergency Mic is configured for Internal Mic.

If the microphone connected to the EMGMIC port is installed in a safe and hidden location in the vehicle, the dispatcher can listen to audio from the vehicle.

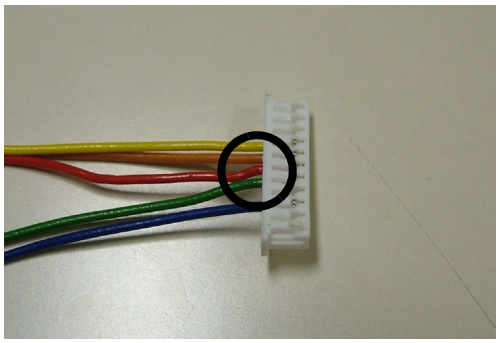
**Note:** The microphone connected to the EMGIC port can be provided by the user.

## 2.13.2 Installing an Emergency Mic

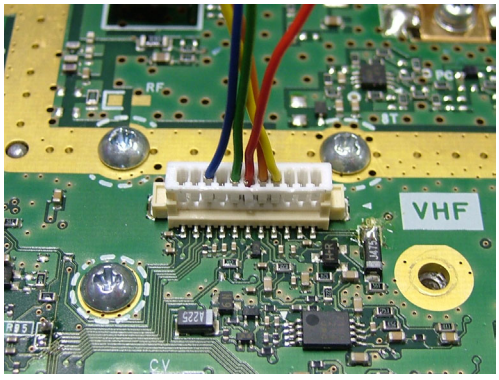
1. Remove the red wire from the cable (E37-1080-05) having the connector used for installing a Scrambler Board.



2. Insert the removed red wire into the 6th pin.

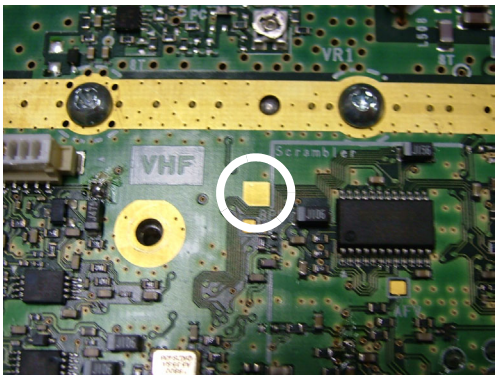


3. Install the connector connected to the 6th pin, then attach the connector to the CN3 connector.




4. Connect the red wire to the hot side of the Emergency Microphone.

**5.** Connect the Emergency Mic ground to the same ground to which the TX-RX PCB is connected.




**6.** Configure the **Function Port** window.

Select "Internal Mic" from the **Emergency Mic** dropdown list.

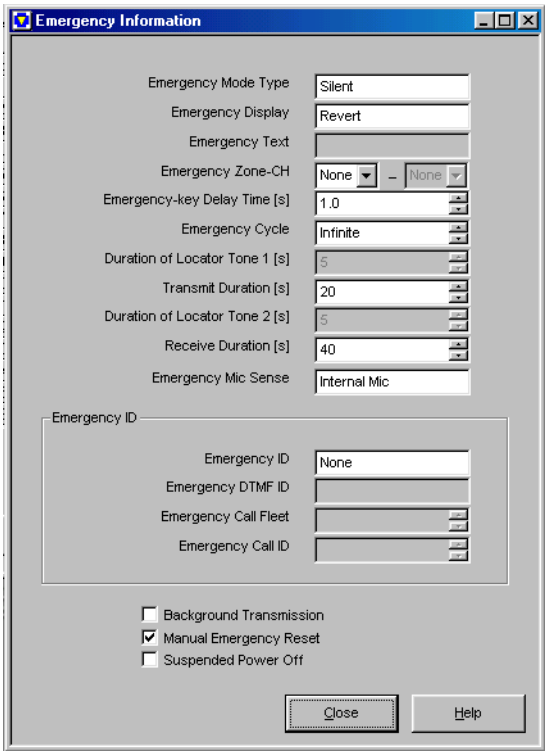



**Figure 2-35 Emergency Information Window**

## 3.1 Import

FPU data of transceivers supporting the import and export functions can be read by using KPG-99D.

The following import and export data are supported by KPG-99D.

**Table 3-1 Import/ Export Configuration Data**

| Item | Data |
|---|---|
| Conventional Group Data | Receive Frequency<br>Transmit Frequency<br>QT/DQT Decode<br>QT/DQT Encode<br>Channel Name |
| FleetSync ID List | Fleet<br>ID<br>ID Name<br>Transmit Inhibit |
| FleetSync Status List | Status<br>Status Name<br>Transmit Inhibit |

Follow the procedure below to import FPU data.

1. Select the **File** menu > "Import".

   The **Open** dialog box appears on the display.

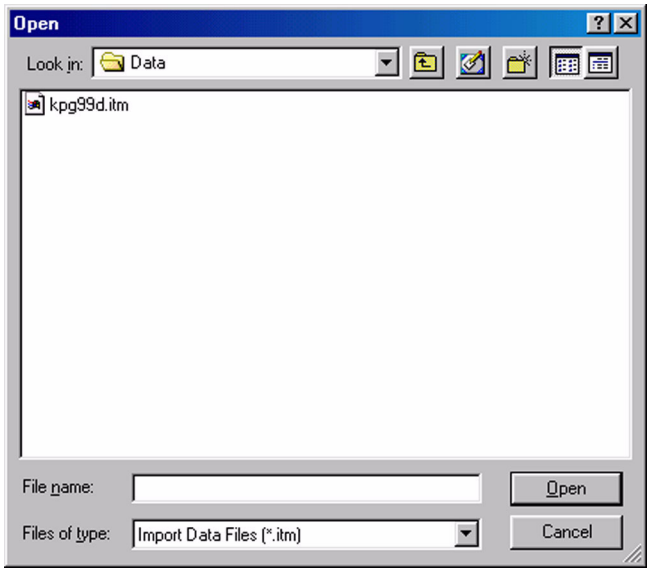



**Figure 3-1 Open Dialog Box**

2. Select a file to import.
3. Click the "Open" button.

**Note:**

- Following are FPUs supporting import and export functions as of January 1, 2005.
  - KPG-92D
  - KPG-99D
  - KPG-100D
- The extension for files supporting import and export functions is ".itm".
- An error message appears on the display when trying to read a file that cannot be imported or exported.
- A warning message appears when trying to import data with a different Radio Band configuration. The frequency is adjusted with the frequency correction function when continuing to import data.
- A warning message appears when trying to import data with a different Language configuration. Therefore, data relevant to language may not be read correctly when continuing to import data with a different Language configuration.

## 3.2 Export

Data configured using KPG-99D can be output in importable format.

Refer to Table 3-1 for import and export data supported by KPG-99D.

Follow the procedure below to export FPU data.

1. Select the **File** menu > "Export".

   The **Save As** dialog box appears on the display.

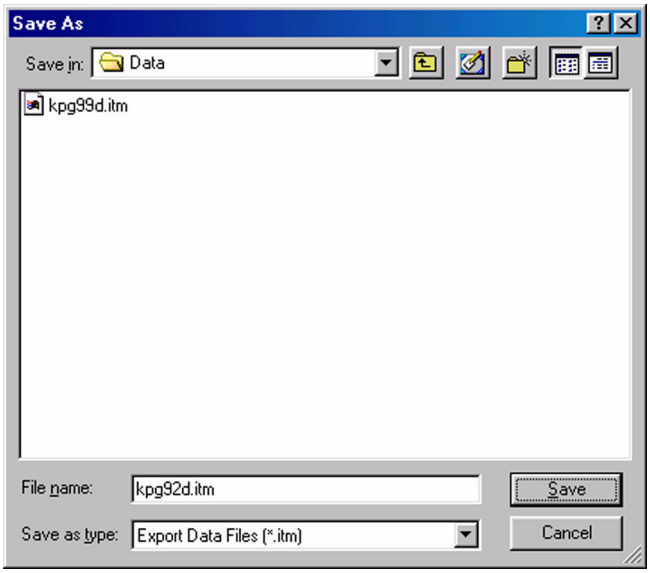



**Figure 3-2 Save As Dialog Box**

2. Select a folder to store the file.
3. Enter a file name.
4. Click the "Save" button.

**Note:**

- Following are FPUs supporting import and export functions as of January 1, 2005.
  - KPG-92D
  - KPG-99D
  - KPG-100D
- The extension for files supporting import and export functions is ".itm".

# 3.3 Export Utility

## 3.3.1 Description

Export Utility is the software that outputs data from a data file in KPG-49D/ KPG-56D/ KPG-60D/ KPG-74D/ KPG-76D to the "*itm" file (Export File format) in Export File format.

KPG-99D can import the file output from Export Utility. Refer to 3.3 Import for instructions on how to import a file output from Export Utility.

**Table 3-2 Conversion Table**

| | | Exportable Data | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Name | QT/ DQT | LTR Repeater | FleetSync ID | | FleetSync Status | | 5-tone ID | | 5-tone Status | |
| | | | | | | List | Name | List No | Name | List | Name | List No | Name |
| KPG-49D | 80 Series | Yes | Yes 10 alphanumeric digits | Yes | Yes | Yes | Yes 10 alphanumeric digits | Yes | Yes 16 alphanumeric digits | - | - | - | - |
| KPG-56D | G Series | Yes | Yes 8 alphanumeric digits | Yes | - | - | - | - | - | - | - | - | - |
| KPG-60D | 80E Series | Yes | Yes 10alphanumeric digits | Yes | - | Yes | Yes 10 alphanumeric digits | Yes | Yes 16 alphanumeric digits | Yes | Yes 16 alphanumeric digits | Yes | Yes 16 alphanumeric digits |
| KPG-74D | TK-2140/ TK-3140 | Yes | Yes 10 alphanumeric digits | Yes | Yes | Yes | Yes 10 alphanumeric digits | Yes | Yes 16 alphanumeric digits | - | - | - | - |

## 3.3.2 System Requirements

The following devices and software are required to install Export Utility.

| PC | IBM PC or Compatible AT |
|---|---|
| Monitor | Resolution of 800 x 600 pixels and 256 or more colors. |
| OS | Microsoft Windows XP<br>Microsoft Windows 2000<br>Microsoft Windows Me<br>Microsoft Windows 98 |

## 3.3.3 Installing the Export Utility

Follow the procedure below to install Export Utility on a PC.

**Note:** Administrative privileges are required to install Export Utility on a PC running Windows 2000/XP.

1. Stop running all programs on the PC (including the virus-checking program).
2. Insert the Export Utility CD into the CD drive.
3. Select one of the options to install Export Utility.
   - Double-click the "CD-ROM drive" icon > "Setup.exe".
   - Select "Start" > "RUN" > "Setup.exe" in the CD-ROM drive. (Example: When the CD-ROM drive is D, "D:\ Setup.exe" must be selected.)
   - Click "Control Panel" > "Application addition/ removal" ("Add/ Remove Programs" in Windows® 2000/XP) > "Install" ("Program" in Windows® 2000/XP).

## 3.3.4 Generating Files in Export File Format

**1.** Run Export Utility.

Select "Start" > "All programs" > "Kenwood FPU" > "Export Utility".

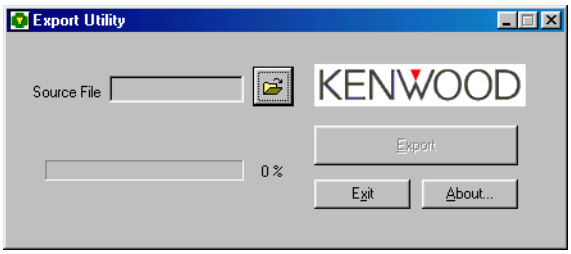



**Figure 3-3 Export Utility Window 1**

**Note:** Export Utility runs when "ExportUtility.exe" is double-clicked in the folder where you installed Export Utility.

**2.** Click the "  " button.

The **Open** dialog box appears on the display.

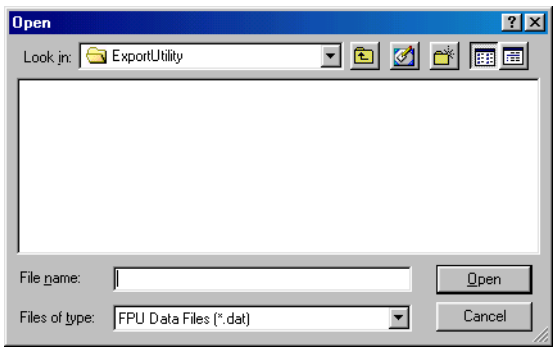



**Figure 3-4 Open Dialog Box 1**

**3.** Select the FPU data file to export, then click the "Open" button.

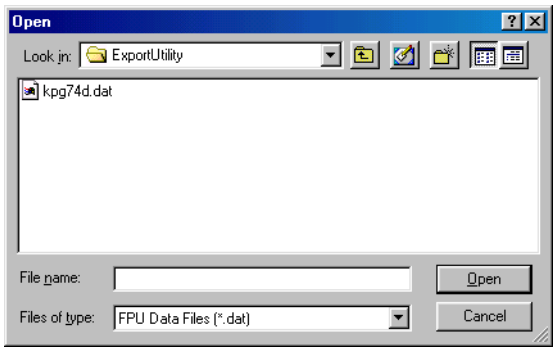



**Figure 3-5 Open Dialog Box 2**

**Note:**

- Only KPG-49D/ KPG-56D/ KPG-60D/ KPG-74D/ KPG-76D data files having "dat" as the file extension can be selected.
- The following error message appears when the selected file is not an FPU data file.


**Figure 3-6 Error Message 1**

- The following error message appears when the selected file is not supported.


**Figure 3-7 Error Message 2**

**4.** Click the "Exportcbutton.

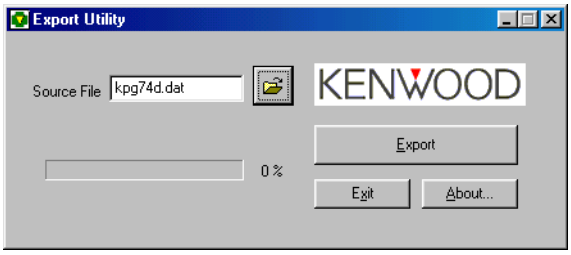



**Figure 3-8 Export Utility Window 2**