

VHF FM TRANSCEIVER

TK-2140

SERVICE MANUAL

E version

KENWOOD

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B51-8630-00 (S) 582

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TK-2140

GENERAL / SYSTEM SET-UP

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication date. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts : components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

PERSONNEL SAFETY

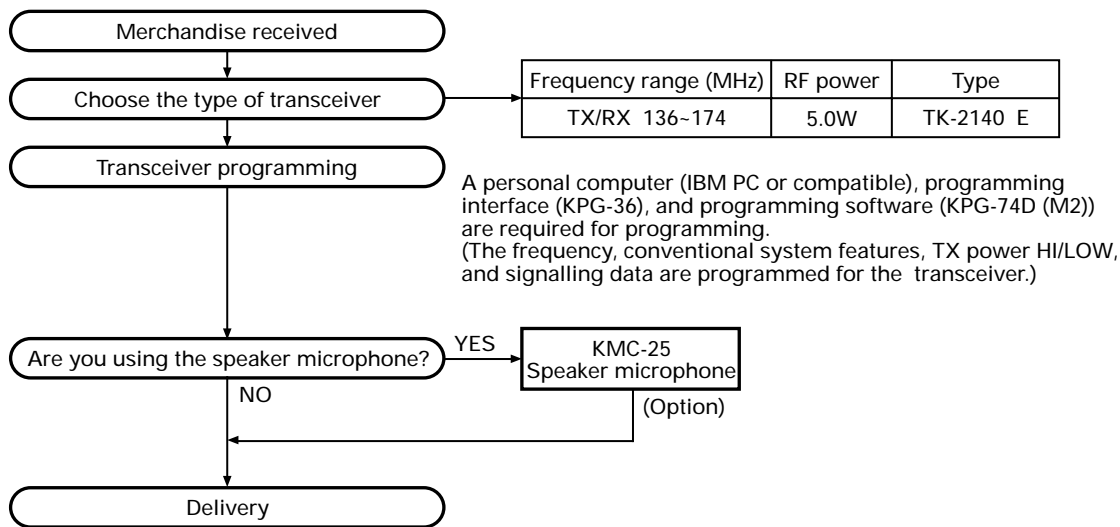
The following precautions are recommended for personnel safety:

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

SERVICE

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

SYSTEM SET-UP

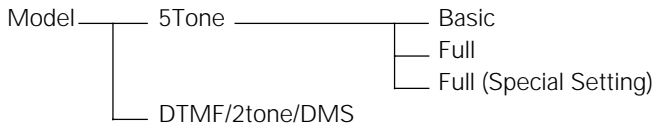


OPERATING FEATURES

1. Operation Features

The TK-2140 is a VHF FM Radio designed in both 5tone Model and DTMF/2tone/DMS Model. The programmable features are summarized.

This transceiver can handle up to 250 groups with 250 channels in each group.



1-1. 5tone Model

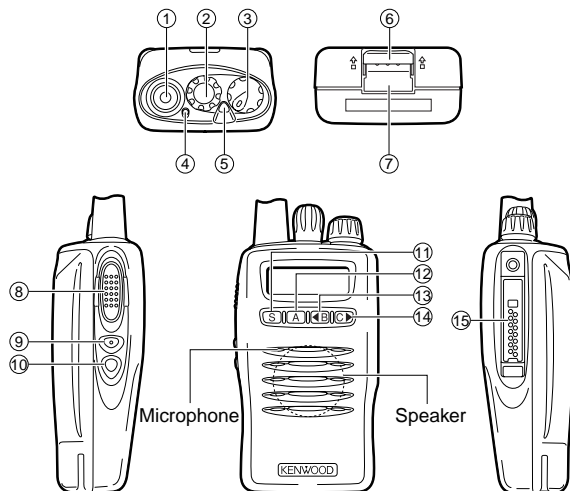
In this model, you can program Basic or Full level features. When you select Basic level, only 1frame 5tone can be programmed, and various functions are limited. When you select "Special setting" in the Full Level, you can use Encode/Decode format. Using Encode/Decode format, you can further program the transceiver to run the script.

1-2. DTMF/2tone/DMS Model

You can use Option signalling which is DTMF or 2tone(only for Decode) or DMS(Digital Message System -FFSK signalling) for every channel.

2. Transceiver Controls and Indicators

2-1. Physical Layout



2-2. Panel controls

The key on the top and front panel is momentary-type push buttons. The functions of these keys and knob are explained below.

① Antenna connector

Connect the antenna here.

② Rotary encoder

Rotate this encoder to activate its programmable function: Channel Up/ Down (default) or Group Up/ Down. For further details, contact your dealer.

③ POWER switch/ VOLUME control

Turn clockwise to switch ON the transceiver. Rotate to adjust the volume. Turn counterclockwise fully to switch OFF the transceiver.

④ LED indicator

This LED lights red during transmission and green while receiving a signal. During Selective Call Alert, the LED flashes orange. If programmed by your dealer, when the battery pack power is low, the LED flashes red during transmission. Replace or recharge the battery pack at this time.

⑤ Auxiliary (orange) key

Press to activate its auxiliary function. This key has no default setting.

⑥ Battery pack safety catch

Flip this catch to prevent accidentally pressing the battery pack release latch.

⑦ Battery pack release latch

Press this latch to release the battery pack.

⑧ PTT (Push-To-Talk) switch

Press this switch, then speak into the microphone to call a station.

⑨ Side 1 key

Press to activate its auxiliary function. The default setting of this key is Monitor.

⑩ Side 2 key

Press to activate its auxiliary function. The default setting of this key is Call 1 for the 5-Tone model. The DTMF/2-Tone/DMS model has no default setting.

⑪ S key

Press to activate its auxiliary function. The default setting of this key is Selcall Entry for the 5-Tone model. The DTMF/2-Tone/DMS model has no default setting.

⑫ A key

Press to activate its auxiliary function. The default setting of this key is Receive Entry for the 5-Tone model. The DTMF/2-Tone/DMS model has no default setting.

OPERATING FEATURES

13 ◀ B keys

Press to activate its auxiliary function. This key has no default setting.

14 C ▶ keys

Press to activate its auxiliary function. This key has no default setting.

15 Universal connector

Connect the (optional KMC-25) speaker/ microphone here. Otherwise, keep the supplied cover in place.

2-3. Programmable keys

Keys ②, ⑤, and ⑨ to ⑭ (pages 3 to 4) can be programmed with the auxiliary functions listed in the following table. The keys can only be programmed with functions, depending on the model purchased. Please contact your dealer for further details on these functions.

Function	DTMF/2-Tone/ DMS Model	5-Tone Model
Auto Dial	Yes	Yes
Call 1	No	Yes
Call 2	No	Yes
Call 3	No	Yes
Call 4	No	Yes
Call 5	No	Yes
Call 6	No	Yes
Channel Down	Yes	Yes
Channel Down Continuous ¹	Yes	Yes
Channel Name	Yes	Yes
Channel Up	Yes	Yes
Channel Up Continuous ¹	Yes	Yes
Channel Up/Down ²	Yes	Yes
Emergency Call ³	Yes	Yes
Fixed Volume	Yes	Yes
Group Down	Yes	Yes
Group Down Continuous ¹	Yes	Yes
Group Up	Yes	Yes
Group Up Continuous ¹	Yes	Yes
Group Up/Down ²	Yes	Yes
Home Channel	Yes	Yes
Key Lock	Yes	Yes
Lamp	Yes	Yes
Low Power	Yes	Yes
Monitor	Yes	Yes
Monitor Momentary	Yes	Yes
None	Yes	Yes
Operator Selectable Tone	Yes	Yes
Queue	Yes	Yes
Radio Password	Yes	Yes
Receive Entry	No	Yes
Scan	Yes	Yes
Scan Delete/Add	Yes	Yes
Selcall Entry	No	Yes
Selcall List	Yes	Yes
Selcall + Status Entry	No	Yes

Function	DTMF/2-Tone/ DMS Model	5-Tone Model
Selcall + Status List	Yes	Yes
Shift	Yes	Yes
Single Tone (1750 Hz)	Yes	Yes
Single Tone (2135 Hz)	Yes	Yes
Squelch Level	Yes	Yes
Squelch Momentary	Yes	Yes
Squelch Off	Yes	Yes
Status Entry	No	Yes
Status List	No	Yes
Talk Around	Yes	Yes

¹ To access these functions, press and hold the appropriate key for more than 1 second.

² These functions can be programmed only on key ②, the encoder.

³ This function can be programmed only on key ⑤, the Auxiliary (orange) key, and on the programmable function key of the optional KMC-25 speaker/ microphone.

■ Auto Dial

To transmit the stored DTMF code automatically.

Press the [Auto Dial] key to enter the "Auto Dial Mode".

Select the desired number to send. It is used the selector knob to select.

Press the [Auto Dial] key to transmit the numbers.

■ Channel Name

Press this key to switch between the "Channel Name" and "Grp#/Ch#" for the display. If no channel name is programmed, the transceiver automatically displays the grp#/channel#.

■ Channel Up/Down

When this key is pressed each time, the channel number to be selected is increased/decreased. If the "Hold" option (Continuous Up/ Down operation) in the Key Assignment window of the FPU is selected, press and hold the channel Up or Down key for more than 1 second to repeat the operation continuously. If you select the "Hold Delay" options in the Key Assignment window of the FPU, the hold delay time can be programmed. Although the default hold time is 3000 ms, you can adjust the time between 100 and 5000 ms.

■ Call 1 to 6 (5tone)

Press the [CALL #] key to transmit the 5tone code that is programmed to "Call #" in the System Parameters.

■ Emergency Call

Pressing this key causes the transceiver to enter the emergency mode. The transceiver jumps to the programmed "Emergency group/channel" and transmits for programmed "Duration of Transmission time".

The transceiver disables mic mute while transmitting. After finishing transmission, the transceiver receivers for programmed "Duration of Receiving". The transceiver mutes

OPERATING FEATURES

the speaker while receiving. Following the above sequence, the transceiver continues to transmit and receive.

You can select whether or not the emergency ID is transmitted in the emergency mode.

■ Fixed Volume

This function is used for changing the volume level, it is Power on Tone, Control Tone, Warning Tone, Alert Tone, AF Volume Type.

If these Tone is set up in "Fixed", the Tone level can be changed when [Fixed Volume] key is pressed.

When [Fixed Volume] key is pressed, Tone level changes in turn to Low (Tone Volume Low), High (Tone Volume High) and Off.

■ Group Up/Down

When this key is pressed each time, the group number to be selected is increased/decreased. If the "Hold" option (Continuous Up/ Down operation) in the Key Assignment window of the FPU is selected, press and hold the Group Up or Down key for more than 1 second to repeat the operation continuously. If you select the "Hold Delay" options in the Key Assignment window of the FPU, the hold delay time can be programmed. Although the default hold time is 3000 ms, you can adjust the time between 100 and 5000 ms.

■ Home Channel

Press this key once, the channel switches to the pre-programmed home channel.

■ Key Lock

Key Lock prevents accidental operation of the transceiver. When Key Lock is activated, all keys other than PTT, Emergency, Monitor, Monitor Momentary, Shift, Squelch, Squelch Momentary, Lamp, Volume are locked.

"LOCKED" appears momentarily when the Key Lock key is pressed.

■ Lamp

Press the [Lamp] key to toggle the display backlight ON or OFF. The backlight automatically turns OFF approximately 5 seconds after it is switched ON.

Press any key other than [Lamp] while the backlight is ON to reset the 5-second timer. The timer will reset and the backlight will remain on for 5 seconds.

■ Low Power

When you press this key, "LO" appears and the transceiver switches to RF Low Power.

If you press this key while "LO" is displayed, the Power status reverts to the preset default setting. If "TX Power" is set to 'Low Power', no change occurs.

■ Monitor

• Model = DTMF/2tone/DMS:

When this key pressed once, "MON" icon lights and squelch unmutes if a carrier is present, regardless of the specified Signalling (including Option Signalling).

If pressed again, "MON" icon goes off and squelch mutes.

• Model = 5tone:

Depend on Monitor Function and Monitor Key Action in the System Parameters.

You can select either QT/DQT or 5tone decoding to be canceled when Monitor key is pressed.

When Monitor function is activated, "MON" icon appears.

■ Monitor Momentary

• Model = DTMF/2tone/DMS:

While pressing this key, "MON" appears and the squelch unmutes if a carrier is present, regardless of the specified Signalling (including Option Signalling).

If released, "MON" disappears, and the squelch mutes.

• Model = 5tone:

Depend on Monitor Function in the System Parameters.

You can select either QT/DQT or 5tone decoding to be canceled while pressing Monitor key.

When Monitor function is activated, "MON" icon appears.

■ Operator Selectable Tone

When this key is pressed, the "OST" appears and Encode/Decode QT/DQT is switched to the OST Tone pair. If pressed again, the "OST" display goes off and Encode/Decode QT/DQT returns to transceivers pre-set.

When this key is held down for 1 sec, the transceiver enters "OST Select Mode". In this mode, the display shows OST No. or OST Name which is set to the channel and operator can select one of OST Tone pair using, the selector knob.

If pressed this key again, the displayed OST code is memorized to the channel, the transceiver exits from the OST Select Mode, returns to normal channel display and "OST" display.

38 kinds of OST Tone pairs can be programmed in the Operator Selectable Tone window.

While in the OST Select mode, the transceiver does not look back at the priority channel in the scan resume mode.

■ Queue

Press [Queue] key to toggle Queue mode ON or OFF.

When it is ON, you will see the contents of the Queue buffer. You can scroll the Queue buffer using the selector knob.

When you are in Queue mode, [C] key to toggle the Selcall and Status displays.

When you are in Queue mode, press the [B] key to toggle the Code and Selcall/Status displays.

Hold down the [C] key to delete the top stack of the Queue buffer.

Hold down the [B] key to cancel Queue mode and return to normal operation.

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■ Radio Password

Back up is done even if the power supply is cut off.

A lock isn't canceled unless a proper password is inputted. The character which can be inputted is to 6 digits with the number of 0 - 9. A lock is canceled if it is the same as Code set up at "Optional Feature - Radio Password".

If the entered Radio Password is incorrect, the "Key Input Error Tone" sounds and the transceiver remains in "LOCK 1" screen.

■ Receive Entry (5tone)

Press [Receive Entry] key to enter the desired Selcall code you want to receive.

This function can be activated only when "RX Address" is set to the channel and "Selectable Receive Digit" has been entered.

When you enter Receive Entry mode, the "RX Address" number appears on the LCD.

You use the channel selector to select the number. Then press [B] key to enter the selected number. The selected digit will shift left to enter the next digit.

Press [C] key to move the cursor 1 position right.

Hold down [C] key to clear the entered number.

■ Scan

Press the [Scan] key to toggle scanning the channels ON and OFF. When the transceiver is scanning, "Revert CH Display" is temporary disabled and the SCN icon and "-SCAN-" appear.

■ Scan Delete/Add

Press the [Scan Del/Add] key to temporarily delete or add each channel from/to the SCAN list.

When a channel is added to the SCAN list, (▼) appears on LCD.

When the transceiver exits SCAN mode, the added or deleted channels are erased from the SCAN list.

The original SCAN list is restored.

■ Selcall Entry (5tone)

Press [Selcall Entry] key to enter the desired Selcall code you want to call.

This function can be activated only when "TX Address" is set to the channel and "Selectable Selcall Digit" has been entered. When you enter Selcall Entry mode, the "TX Address" number appears on the LCD.

■ Selcall List

Press [Selcall List] key to enter Selcall List mode.

● Model = 5tone:

Select the check box of "Selectable Selcall Digit". The number of digit you selected in "Selcall List" will be displayed on LCD. If "Selcall List" has not been programmed, same digits of Selcall List code that you checked as "Selectable Selcall" digits will appear on LCD.

● Model = DTMF/2tone/DMS:

The ID List code of DMS will appear on LCD.

To select the Selcall List, use the selector knob.

■ Selcall+Status Entry

Select the selcall number you wish to call.

Press [Selcall + Status Entry] key to enter "Selcall Entry Mode".

If you press [Selcall + Status Entry] key again, it works as "Status Entry Mode".

■ Selcall+Status List

Select the selcall number you wish to call.

Press [Selcall + Status List] key to enter "Selcall List Select Mode".

If you press [Selcall + Status List] key again, it works as "Status List Select Mode".

■ Single Tone (1750Hz)/Single Tone (2135Hz)

While [Single Tone (1750Hz)] key is pressed and held, the 1750Hz tone is transmitted.

While [Single Tone (2135Hz)] key is pressed and held, the 2135Hz tone is transmitted.

■ Shift

It allows you to enable [Shift + Function] key access. When [Shift] key is pressed, SFT appears on LCD.

■ Squelch Level

Press [Squelch Level] key to enter "Squelch Level Adjustment Mode".

The squelch level can be adjusted by the selector knob.

Press [Squelch Level] key again to store the adjusted squelch level.

■ Squelch Momentary

Press [Squelch Momentary] key to force the squelch unmute. "MON" icon appears on LCD and BUSY LED (Green) lights.

If released, the squelch unmutes and "MON" disappears. Also, BUSY LED (Green) goes off.

■ Squelch Off

Press [Squelch Off] key to force the squelch unmute. "MON" icon appears on LCD and BUSY LED (Green) lights. If the key is pressed again, the squelch unmutes and "MON" disappears. Also, BUSY LED (Green) goes off.

■ Status Entry (5tone)

It allows the operator to input the status and transmit it to the base station.

Both TX Address and "Selectable Status Digit" must be programmed to perform the operation.

Press [Status Entry] key to access Status Entry mode.

"TX Address" of the channel appears on LCD.

OPERATING FEATURES

Selector knob to select the desired number and press [B] key to enter. The cursor moves to next position.

■ Status List (5tone)

Press [Status List] key to enter Status List mode.

Select the check box of "5tone - System Parameters - Selectable Status Digit". The number of digit you selected in "5tone - Status List" will be displayed on LCD. If "Status List" has not been programmed, same digits of Status List code that you checked as "Selectable Status" digits will appear on LCD.

To select the Status List, use the selector knob.

■ Talk Around

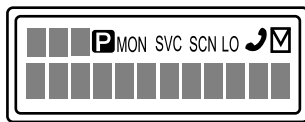
When Talk Around function is activated, "TA" appears and the transceiver transmits on the receive frequency, using receiver's QT/DQT code.

The operator can call the other party directly (without repeater).

■ None

When you press this key, the transceiver emits the "Key Input Error Tone" (no function is performed).

2-4. Display



Indicator	Description
	Displays the group and channel number as well as various dealer programmable settings.
	Appears when the Priority Channel is selected.
MON	Appears when the key programmed as Monitor is pressed.
SVC	This icon is not used on this transceiver.
SCN	Appears when performing Scan.
LO	Appears when the key programmed as RF Power Low is pressed.
	This icon is not used on this transceiver.
	Appears when a message is stored in the queue memory. Flashes when you receive a new message.
	Displays the group and channel number (or name) and received messages when using DMS or 5tone. The left most segment is used as an add indicator (▼). The add indicator shows channels that are not locked out of the scanning sequence. The right most segment is used for Selective Call (⚡) or to display the approximate level of battery power remaining. The battery indicator ranges from full (■) to empty (□) in 4 steps. Note: When using alkaline batteries in place of a battery pack, the battery indicator may not properly indicate the battery power remaining.

3. Scan Operating

1) Scan types

• Single Group Scan

You can scan all valid (ADD) channels in the displayed group that can be selected with the group selector.

• Multiple Group Scan

You can scan all valid (ADD) channels in the all valid (ADD) group.

2) Scan Start Condition

One or more non-priority channels must be added to all channels that can be scanned. The transceiver must be in normal receive mode (PTT off).

When you activate the key programmed to the scan function, the scan starts. The scan icon "SCN" lights and "-SCAN-" or revert channel (programmable) is indicated on alphanumeric display.

3) Scan Stop Condition

The scan stops temporarily if the following conditions are satisfied.

- ① A carrier is detected, then signalling matches on channels for which receive the signalling is set by the programming software.
- ② A carrier is detected on the channel for which receiving signalling is not set by the programming software or when the monitor (signalling cancel) function is activated.

4) Scan Channel Types

- ① Priority channel is the most important channel for the scan, and always detects a signal during scan and when the scan stops temporarily.
- ② Non-priority channels detects a signal during scan. For the channels that can be selected with the group or channel selector when the scan does not occur, adds an indicator (▼) lights.

5) Priority Channel Setting

A priority channel can be set as follows with the programming software (KPG-74D (M2)).

- ① Specify a priority channel as a fixed priority channel.
- ② Make a selected channel a priority channel.

6) Scan Type According to the Priority Channel

- ① When no priority channel is set : Only the non-priority channels are scanned.
If a non-priority channel stops temporarily, it stops until there is no signal on the channel.
- ② When priority channel is set : Either priority channel is scanned.
If a non-priority channel stops temporarily, a priority channel signal is detected at certain intervals.
If a priority channel stops temporarily, it stops until there is no signal on the priority channel.

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7) Revert Channel

The revert channel is used to transmit during scanning and set by the programming software (KPG-74D (M2)).

① Priority

The transceiver reverts to the priority channel.

② Priority with talkback

The transceiver reverts to the priority channel.

If you press PTT during a resume timer (dropout delay time, TX dwell time) or calling, you can transmit on current channel to answer to the call however revert channel is set to priority channel.

After resume time, scan re-starts and transmission channel is return to priority channel.

③ Selected channel

The transceiver reverts to the channel before scanning or the channel that you changed during scan.

④ Last called channel

The transceiver reverts to the last called channel during the scan.

⑤ Last used channel

The transceiver reverts to the last used (transmitted) channel during scan. "Last used" revert channel includes talkback function.

⑥ Selected with talkback

The transceiver reverts to the channel before scanning or the channel that you changed during scan.

8) Scan End

When you reactivate the key programmed to the scan function during scan mode, the scan ends.

The scan icon "SCN" and "-SCAN-" or revert channel (programmable) display goes off.

9) Temporarily Delete/Add

It is possible to delete or add channel temporarily during scan. When scan stops on unnecessary channel for example by interference of the other party, activate the delete/add function (for example press the key), then that channel is deleted temporarily and scan re-start immediately.

When you would like to add the deleted channel temporarily to scan sequence, select the desired (deleted) channel during scan, activate the delete/add function (for example press the key) before scan re-start.

That channel is added temporarily to scan sequence. The temporary deleted or added channels are returns to pre-set delete/add, when the transceiver exits from scan mode.

4. Details of Features

1) Time-out timer

The time-out timer can be programmed off or in 1 second increments from 30 seconds to five minutes. If the transmitter is keyed continuously for longer than the programmed time, the transmitter is disabled and a warning tone sounds while the PTT button is held down. The alert tone stops when the PTT button is released.

2) Sub LCD display

You can use 3-digit the display to display the channel number or group number. It is useful when the main (12-digit) display indicates, group or channel name or other functions.

3) Selective Call Alert LED

You can select whether or not the LED on the transceiver flashes in an orange color when selective call was occurred.

4) PTT ID

PTT ID provides a DTMF or FFSK (DMS : Fleet-ID) ANI to be sent with every time PTT (beginning of transmission, end of transmission, or both).

You can program PTT ID "on" or "off" for each channel. The contents of ID are programmed for each transceiver.

The timing that the transceiver sends ID is programmable.
BOT : DTMF ID (BOT)/FFSK ID is sent on beginning of transmission.

EOT : DTMF ID (EOT)/FFSK ID is sent on end of transmission.

Both : DTMF ID (BOT)/FFSK ID is sent on beginning of transmission and DTMF ID (EOT)/FFSK ID is sent on end of transmission.

5) Radio password

When the password is set in the transceiver, user can not use the transceiver unless enter the correct password.

This code can be up to 6 digits from 0 to 9 and input with the selector knob, and [Side 2] key.

6) Minimum Volume

The minimum volume is programmable (off (0) to 31). The transceiver remains the minimum volume level however the mechanical volume position is set to zero.

7) "TOT" Pre-Alert

The transceiver has "TOT" pre-alert timer. This parameter selects the time at which the transceiver generates "TOT" pre-alert tone before "TOT" is expired.

"TOT" will be expired when the selected time passes from a TOT pre-alert tone.

8) "TOT" Re-Key Time

The transceiver has "TOT" re-key timer. This timer is the time you can not transmit after "TOT" exceeded. After "TOT" re-key time expired you can transmit again.

9) "TOT" Reset Time

The transceiver has "TOT" reset timer. This timer is the minimum wait time allowed during a transmission that will reset the "TOT" count.

"TOT" reset time causes the "TOT" to continue even after PTT is released unless the "TOT" reset timer has expired.

OPERATING FEATURES

10) OST (Operator Selectable Tone)

The transceiver is capable to have "OST" function and 38 tone pair (QT/DQT) with max 10-digit name for each tone pair.

- **"OST" Back Up**

The transceiver is programmable the selected "OST" code is memorized or not. If you set to Disable (no memorized), the "OST" function always starts at "off".

- **Selectable No Tone**

"TONE OFF" can be selected in the OST Select mode when you select the "Selectable No Tone" option in the Operator Selectable Tone window. When it is unchecked, the TONE OFF setting is ignored.

11) Clear to Transpond

The transceiver waits the transpond of 5tone/2tone/DTMF if channel is busy until channel open. This feature prevents the interference to other party.

12) Battery Warning/Status

The battery warning function checks the battery voltage level automatically. If the battery voltage drops to a predetermined value, the operator will be notified.

The Battery Status function shows the current remaining battery capacity in 4 different levels (High, Sufficient, Low and Very low).

Unless the Battery Warning/Status function is set to OFF, the low battery warning function is activated when the transceiver detects the low battery voltage. The transceiver either beeps, the "Lo" icon blinks, the red LED blinks or the Very Low indicator (Battery) blinks, depending on the transceiver's settings.

Then more low voltage is detected during transmission, the transceiver does not transmit and the warning tone beeps while the PTT key is pressed.

Measurements given by this function should be used just as a reference.

13) Battery Save

Battery Saver becomes active when the squelch is closed. The receiver circuit power is toggled ON and OFF to prolong battery life, except in Scan mode.

The "ON" time is automatically selected by the signal conditions.

The "OFF" time is selectable as [OFF], [Short](200ms), [Med](400ms) and [Long](800ms).

14) Auto Light on

You can use the transceiver to turn on the backlight automatically when a key is pressed.

You can turn off the back light by pressing the [Lamp] key while the backlight is ON. You can manually turn on the light at any time by pressing the [Lamp] key.

15) Com Port

This function selects the external serial port function at the universal connector (TXD/RXD). PC programming is accepted, regardless of this setting.

5. Option Signalling (DTMF/2tone)

Built-in DTMF decoder is available for option signalling.

Built-in 2-Tone decoder is available for option signalling.

It is possible to use individual call, group call, stun, kill. Stun and kill are used with DTMF only.

Preset operation is triggered when matches with Option Signaling

When Option Signaling matches on a Group Channel where set to Yes, the Option Signaling display flashes and Option Signaling is canceled. Settings after this will cause "Transpond" or "Alert" to sound.

Setting the Selective Call Alert LED will make an orange LED start flashing.

Mute or Unmute is triggered by the ID/QT/DQT/Carrier when option signaling is a match (when Option Signal is deactivated by a transmission).

AND/OR

Option Signaling match conditions can be selected with AND/OR logic.

	Alert/Transpond	AF Mute Open
AND	Triggers at match with QT/DQT/ID+DTMF (2tone):Both	Triggers at match with QT/DQT/ID+DTMF (2tone):Both
OR	Triggers only for match with DTMF (2tone) : Opt	Triggers only for match with QT/DQT/ID;Signaling

Even if set for OR, AF mute cannot be canceled just by a match with DTMF.

In channels not set with QT/DQT, signaling is a match just by receiving the carrier.

Auto Reset

When Option Signaling matches on a Group channel where set to Yes, Option Signaling is canceled when it matches a group channel set to Yes.

After Option Signaling is a match, Option Signaling can automatically set to Reset after a specified time.

Stun/Kill

If the Stun code matches, a predetermined action will occur. Whether option signalling is activated or not, when stun code matches on any channel, the transceiver will become stun or kill.

While stun is active ("LOCK 2" appears), if the stun code + "#" code is received, stun will disactive.

While kill is active ("ERROR" appears), the transceiver will be disable all functions. The transceiver must be reprogrammed by the FPU (KPG-74D (M2)) to operation again.

OPERATING FEATURES

6. Alphanumeric Two-way Paging Function (Digital Message System)

■ General

The Alphanumeric Two-way Paging Function (DMS) is a Kenwood proprietary protocol. It enables a variety of paging functions.

■ ID Construction

A radio unit ID is defined by a combination of 3-digit Fleet and 4-digit ID numbers. Each radio unit must be assigned its own Fleet and ID numbers.

■ Digital Message System [DMS]

• Inter-fleet Call

Configure the transceiver to respond calls from stations that have a different fleet number.

■ PTT ID

A pre-programmed unique ID can be sent at the beginning of transmission and/or the end of transmission to identify which radio unit is on air.

■ Selective Call (SELCALL)

This is a voice call to a particular individual or group of stations.

• Example of call types;

[100][ALL] : <Group Call>

All the units whose fleet number is "100" are called.

[100][1000] : <Individual Call>

The unit, whose the fleet number is "100" and ID number is "1000", is called.

[ALL][ALL] : <Broadcast Call>

All the units are called.

[ALL][1000] : <Supervisor Call>

All ID "1000" are called regardless of their fleet number.

• Unit ID Encode Block

This function limits the usable IDs using the Block function. If Inter-fleet Call is enabled, block ID setting affects each fleet group.

■ Status Message

Using a 2-digit number, you can send and receive a Status message which may be decided in your talk group. Each Status may be displayed with 16 alphanumeric characters if programmed in the radio. A maximum of 15 received messages can be stored in the stack memory, and it can be reviewed after reception. If the message memory becomes full, the oldest one will be erased. The stack memory will be cleared by turning radio power off.

• Automatic Status Response

If you pre-select a status number and leave the radio in the Status Mode, it can automatically respond with the selected status number upon request from the base station. (The request function is initiated by serial control on the base station (Optional).)

■ Short Message (Optional)

A maximum of 48 characters can be sent (External equipment is required). Received Short Messages will be displayed in the same manner as a Status Message. A maximum of 15 received messages can be stored in the stack memory. In the Stack Mode, 3-digit LCD indicates the received Short Message as "Q1" ~ "Q15".

■ Long Message

A maximum of 4096 characters can be sent (External equipment is required). Received Long Message will not be displayed or stacked in the radio memory but is output through the COM (Data) port.

■ Emergency Function

Emergency status 99 will be sent at the beginning of each emergency transmission.

• Emergency Status response

"Alert" can be selected for the called radio unit's response to reception of status 99 which is used as an emergency status.

■ Other Functions

• Data TX with QT/DQT

Whether programmed QT/DQT is modulated or not with a data transmission except for Selcall. A radio unit can receive a data message regardless of QT/DQT if the receiving unit is not scanning.

• DMS Baud Rate

FFSK data baud rate setting. The same rate must be set as a communication partner.

1200bps :

Data communication is made in 1200bps. The communication area is much wider than 2400bps. Recommended for repeater operation.

2400bps :

Data communication is made in 2400bps. The communication area is narrower than 1200bps, but it will decrease the data traffic. Data rate 2400bps may not work properly depending on the repeater's characteristic.

• Inter-fleet call

• Status/Short/Long Message on Data Group/Channel

Status/Short/Long Message transmission is made whether on the Data Group/Channel.

OPERATING FEATURES

- **Status/Short/Unit ID Message Serial Output**

Whether a received Status/Short message or PTT ID is outputted or not to serial port.

- **Parameters**

- **GTC Count**

Number of "Go To data Channel" messages to be sent before transmitting a data message if it is being made on Data Group/Channel. If a radio unit receives a GTC message, it will move to the Data Group/Channel of the current Group. Increase this item to make sure the called radio unit moves to the Data Group/Channel.

- **Random Access (Contention)**

When a channel is busy, radio unit will not transmit (depending on its Busy Channel Lockout setting). As soon as a channel is cleared, some transmissions may crash. Random access is used to avoid this by employing a random transmission sequence.

- **Number of Retries**

Number of Retries is the maximum number of retry transmission when no acknowledgement is received in the Maximum ACK Wait Time. Increase this item to improve data communication reliability.

- **TX Busy Wait Time**

TX Busy Wait Time is the maximum amount of time before giving up the data transmission when the channel is busy. Also, this timer affects if it expires during Random Access period.

- **Maximum ACK Wait Time**

Maximum ACK Wait Time is the maximum amount of time to wait for an acknowledgement from the called radio unit. It is used as an interval time of retries. It must be set greater than the ACK Delay Time of the called radio unit.

- **ACK Delay Time**

ACK Delay Time is the amount of time from the end of receiving a data to the beginning of sending an acknowledgement. It should be adjusted as the repeater's hang-up delay time. Also, it must be set less than the Maximum ACK Wait Time of the calling radio unit.

- **TX Delay Time (RX Capture)**

TX Delay Time is the amount of unmodulated transmission to let the called unit stop scanning or exit its battery save mode. It is used only when starting a data communication sequence.

- **Data TX Modulation Delay Time**

Data TX Modulation Delay Time is the amount of time from the beginning of transmission to the beginning of a data modulation. It is used every time data is transmitted.

7. 5tone

When you select 5tone Model, you can set the following options.

When you select Basic level features, only 1 frame 5tone format can be programmed.

When you select Full level features, up to 3 frame 5tone format can be programmed.

Enabling "Setting Level" on each menu, you can also use "Encode/decode format".

Using "Encode/decode format", you can further program the transceiver to run the script.

- **5tone Standard**

The selected 5tone Standard is used for 5tone encoding and decoding.

Range:

ZVEI, CCIR, EEA, PZVEI, DZVEI, PCCIR, PDZVEI, ZVEI-2, EIA, Natel, AP-369, Kenwood

- **Monitor Function**

You can select either QT/DQT or 5tone decoding to be canceled when [Monitor] or [Monitor Momentary] key is pressed.

When Monitor function is activated, "MON" icon appears.

When the transceiver is set up in "QT/DQT", cancels the decoding in QT/DQT Decode.

The squelch is controlled by the signal carrier only.

When the transceiver is set up in "5tone", cancels the decoding in 5tone Decode.

The squelch is controlled by QT/DQT Decode only.

If QT/DQT code is programmed in QT/DQT Decode, incoming signal must match the QT/DQT code to open the squelch.

- **Busy Channel Lockout**

You can inhibit the transmission while the channel is busy. You can program the following different conditions.

When the transceiver is set up in "Lockout 1":

Do not transmit when the transceiver is receiving the carrier. Transmit when the transceiver is not receiving the carrier.

When the transceiver is set up in "Lockout 2":

Do not transmit when the transceiver is receiving the carrier and QT/DQT code does not match.

Transmit when the transceiver is not receiving the carrier or receiving the QT/DQT code matches.

- **Selectable Receive Digit**

Select the check box to change Receive Code (maximum 8 digits) manually when receiving Decode Code. You cannot select Selectable Receive Digit, Store Selcall Digit and Store Status Digit at the same time.

For example, the transceiver receives 5tone code, #59401 when you have 4th and 5th digit checked in Selectable Receive Digit menu. In this case, #01 is stored as Receive Code.

Press [Receive Entry] key to enter Receive Entry mode.

OPERATING FEATURES

When you enter Receive Entry Mode, you can change the Receive Code, #01.

You can receive the Receive Code after the modification.

■ Selectable Selcall Digit

Select the check box to change Selcall Code (maximum 8 digits) manually when transmitting Encode Code. You cannot select Selectable Selcall Digit and Selectable Status Digit at the same time.

For example, the transceiver receives 5tone code, #59401 when you have 4th and 5th digit checked in Selectable Selcall Digit menu. In this case, #01 is stored as Selcall.

Press [Selcall Entry] key to enter Selcall Entry mode.

When you enter Selcall Entry Mode, you can change the Selcall Code, #01.

You can transmit the Selcall after the modification.

■ Selectable Status Digit

Select the check box to change Status Code (maximum 8 digits) manually when transmitting Encode Code. You cannot select Selectable Selcall Digit and Selectable Status Digit at the same time.

For example, the transceiver receives 5tone code, #5940167 when you have 6th and 7th digit checked in Selectable Status Digit menu.

Press [Selcall Entry] key to enter Status Entry mode.

When you enter Status Entry Mode, you can change the Status Code, #67.

You can transmit the Status code after the modification.

■ Automatic Close

It compares the selected digits of RX Address code in Channel menu when the transceiver receives 5tone signalling. If the selected digits matches to the received 5tone code, the transceiver closes Monitor. You can select maximum 8 digits of RX Address.

■ Copy from TX/RX Address

You can select to copy the digit to the memory when you change the channel, using the selector knob.

Receive Digit in "RX Address" is copied when the channel is changed. Selcall/Status Digit in "TX Address" is copied when the channel is changed.

■ Encode Code

When "Special Setting" is disabled, you can select the Encode Code to transmit when [Call 1-6] key is pressed.

You can select up to 3 codes to transmit 3-frame 5tone code. The Encode Code is transmitted from left to right digit. 24 different Encode Codes are available.

When "Special Setting" is enabled, you can select the Encode Format setting from #1 to #32.

You can select the Encode Format name, configured in Encode Format menu.

■ Decode Code

When "Special Setting" is disabled, you can select the Decode Code setting from #1 to #8.

The transceiver tries to decode the selected Decode Code setting (maximum 8 different settings) at the same time. When the code matches in "5tone Code" menu, the transceiver operates as programmed in "Decode Code" menu.

When "Special Setting" is enabled, you can select the Decode Format setting from #1 to #32.

You can select the Decode Format name, configured in Decode Format menu.

You can program the 5-tone code you want to receive for each channel. At the same time, you can be on stand-by for a Single tone.

If the 5-tone code set in your transceiver matches a received code, Monitor is activated and a beep sounds. You can display the received 5-tone code on the LCD screen and transmit an acknowledgement to the Base station. Furthermore, you can activate the stun and kill features.

■ Selcall/Status List

You can program Selcall or Status Message when you select the party from the List to make a 5tone selective call. Or you want to display Selcall(Status) Code or Message when you receive the call.

Maximum 8-digit can be programmed for the Code and 100 different Selcalls or Status are available for Selcall/Status List.

You can assign 16 alphanumeric characters to each message.

■ Programmable Alert Tone

You can program the alert type from type 1 to type 8, when the expected 5-tone is received.

You can program the number of times to repeat outputting and frequency and duration for the Alert Tone.

When you select "Special Setting", you can further configure the beep tone type from No. 1 to No. 47, using the Encode/Decode format.

■ Encode/Decode Format

You can use Encode/Decode Format script function when you select "Feature Level" =FULL and "Special Setting" =Enabled.

In order to write the Encode/Decode Format script, you need the technical knowledge of 5tone signalling functions. Of course, you can write the script to perform all the functions that you can do with "Feature Level" =BASIC and FULL and "Special Setting" =Disabled. (Menu driven method)

In addition, you can write the original script to control various functions and signalling timing.

Refer to each function of Encode/Decode Format Code for details. Sample scripts are also available in the KPG-74D (M2).

You can create 32 different types of Encode/Decode Formats. You can assign a name up to 12 characters for each Encode/Decode Format.

OPERATING FEATURES / REALIGNMENT

8. Audible User Feedback Tones

The transceiver outputs various combinations of tones to notify the user of the transceiver operating state. The main tones are listed below.

■ Power on tone

This tone is output when the transceiver is turned on. (The high tone is output for 500ms.)

■ Alert tone

This tone is output when the transceiver is TX inhibition for TOT, battery warning and PLL unlocked. It is output until the PTT button is released.

■ Group call tone

Sounds when a group call with the correct DTMF/2-tone option signalling is received.

■ DMS signalling alert tone

Sounds when an individual call with the correct DMS signalling is received.

■ Individual call tone

Sounds when an individual call with the correct DTMF/2-tone option signalling is received.

■ Key press tone [A]

Sounds when a key is pressed. For toggle keys, sounds when toggle function is turned on (key press tone [B] sounds when it is turned off).

■ Key press tone [B]

Sounds when a key is pressed. For toggle keys, sounds when the toggle function is turned off (key press tone [A] sounds when it is turned on).

■ Key press tone [C]

Sounds when a key is pressed. Also sounds when storing data, adding a DTMF code to memory, and when changing test mode settings.

■ Key input error tone

Sounds when a key is pressed but that key cannot be used.

■ Roll over tone

Sounds at the smallest group/channel.

■ Transpond tone

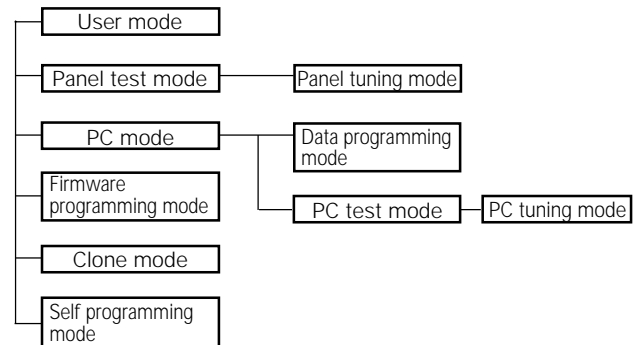
Sounds when an individual call with the correct DTMF/2-tone option signalling is received. For group calls, only the group tone will sound, not the transpond tone.

■ Pre alert tone

Sounds prior to the TOT TX inhibit activation. If TOT pre alert is set, the tone sounds at the amount of time programmed, before the TOT expires (TOT time–TOT pre alert time = Pre alert tone sounding time).

REALIGNMENT

1. Modes



Mode	Function
User mode	For normal use.
Panel test mode	Used by the dealer to check the fundamental characteristics.
Panel tuning mode	Used by the dealer to tune the radio.
PC mode	Used for communication between the radio and PC (IBM compatible).
Data programming mode	Used to read and write frequency data and other features to and from the radio.
PC test mode	Used to check the radio using the PC. This feature is included in the FPU. See panel test.
PC tuning mode	Used to tune the radio using the PC. This feature is included in the FPU. See panel tuning.
Firmware programming mode	Used when changing the main program of the flash memory.
Clone mode	Used to transfer programming data from one radio to another.
Self programming mode	Frequency, signalling and features write to the radio.

2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
Panel test mode	[A]+Power ON
PC mode	Received commands from PC
Panel tuning mode	[Panel test mode]+[S]
Firmware programming mode	[S]+Power ON
Clone mode	[C]+Power ON
Self programming mode	[Side 2]+Power ON

3. Panel Test Mode

Setting method refer to ADJUSTMENT.

4. Panel Tuning Mode

Setting method refer to ADJUSTMENT.

REALIGNMENT

5. PC Mode

5-1. Preface

The TK-2140 transceiver is programmed by using a personal computer, programming interface (KPG-36) and programming software (KPG-74D (M2)).

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

5-2. Connection procedure

1. Connect the TK-2140 to the personal computer with the interface cable.
2. When the POWER switch on, user mode can be entered immediately. When PC sends command the radio enter PC mode, and "PROGRAM" is displayed on the LCD. When data transmitting from transceiver, the red LED is blinking. When data receiving to transceiver, the green LED is blinking.

Notes:

- The data stored in the personal computer must match model type, when it is written into the flash memory.
- Change the TK-2140 to PC mode, then attach the interface cable.

5-3. KPG-36 description

(PC programming interface cable: Option)

The KPG-36 is required to interface the TK-2140 to the computer. It has a circuit in its D-subconnector (25-pin) case that converts the RS-232C logic level to the TTL level.

The KPG-36 connects the universal connector of the TK-2140 to the computers RS-232C serial port.

5-4. Programming software KPG-74D (M2) Description

The KPG-74D (M2) is the programming software for the transceiver supplied on three 3.5" floppy disks. This software runs under MS-Windows 95/98/Me/2000 on an IBM-PC or compatible machine.

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

We recommend that install the KPG-74D (M2) for example to hard disk first then use it.

5-5. Programming with IBM PC

If data is transferred to the transceiver from an IBM PC with the KPG-74D (M2), the destination data (basic radio information) for each set can be modified. Normally, it is not necessary to modify the destination data because their values are determined automatically when the frequency range (frequency type) is set.

The values should be modified only if necessary. Data can be programmed into the flash memory in RS-232C format via the universal connector.

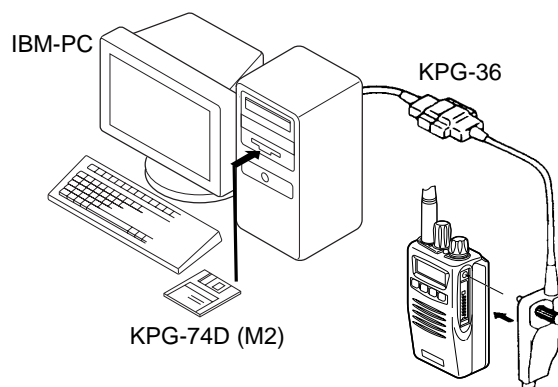


Fig. 1

6. Firmware Programming Mode

6-1. Preface

Flash memory is mounted on the TK-2140. This allows the TK-2140 to be upgraded when new features are released in the future. (For details on how to obtain the firmware, contact Customer Service.)

6-2. Connection procedure

Connect the TK-2140 to the personal computer (IBM PC or compatible) with the interface cable (KPG-36). (Connection is the same as in the PC Mode.)

6-3. Programming

1. Start up the firmware programming software (Fpro.exe).
2. Set the communications speed (normally, 57600 bps) and communications port in the configuration item.
3. Set the firmware to be updated by File name item.
4. Turn the TK-2140 power ON with the [S] switch held down. Hold the switch down until the display changes to "PROG 57600". When "PROG 57600" appears, release your finger from the switch.
5. Check the connection between the TK-2140 and the personal computer, and make sure that the TK-2140 is in the Program mode.
6. Press write button in the window. A window opens on the display to indicate progress of writing. When the TK-2140 starts to receive data, the [P] icon is blinking.
7. If writing ends successfully, the LED on the TK-2140 lights and the checksum is displayed.
8. If you want to continue programming other TK-2140s, repeat steps 4 to 7.

Notes:

- This mode cannot be entered if the Firmware Programming mode is set to Disable in the Programming software (KPG-74D (M2)).
- When programming the firmware, it is recommend to copy the data from the floppy disk to your hard disk before update the radio firmware. Directly copying from the floppy disk to the radio may not work because the access speed is too slow.

REALIGNMENT

6-4. Function

1. If you press the [Side 1] switch (top of left side) while "PROG 57600" is displayed, the version is displayed. If you press the [Side 1] switch again while the version is displayed, "PROG 57600" is redisplayed.
2. If you press the [Side 2] switch (bottom of left side) while "PROG 57600" is displayed, the display changes to "PROG 19200" to indicate that the write speed is low speed (19200 bps). If you press the [Side 2] switch again while "PROG 19200" is displayed, the display changes to "PROG 38400", and the write speed becomes the middle-speed mode (38400 bps). If you press the [Side 2] switch again while "PROG 38400" is displayed, the display returns to "PROG 57600".
3. If you press the [Side 2] switch while the version is displayed, the checksum is displayed. If you press the [Side 2] switch again while the checksum is displayed, the version is redisplayed.

Note:

Normally, write in the high-speed mode.

7. Clone Mode

Programming data can be transferred from one radio to another by connecting them via their external universal connectors. The operation is as follows (the transmit radio is the master and the receive radio is a slave).

1. Turn the master TK-2140 power ON with the [C] key held down. If the Data password is set to the TK-2140, the TK-2140 displays "CLONE LOCK". If the password is not set, the TK-2140 displays "CLONE MODE".
2. When you enter the correct password, and "CLONE MODE" is displayed, the TK-2140 can be used as the cloning master. The following describes how to enter the password.
3. How to enter the password with the encoder;
If the encoder is rotated while "CLONE LOCK" is displayed, numbers (0 to 9) are displayed flashing. When you press the [C] key, the currently selected number is determined. If you press the [Side 2] key after entering the password in this procedure, "CLONE MODE" is displayed if the entered password is correct. If the password is incorrect, "CLONE LOCK" is redisplayed.
4. Power on the slave TK-2140.
5. Connect the cloning cable (No. E30-3325-05) to the universal connectors on the master and slave.
6. Press the [C] key on the master while the master displays "CLONE MODE". The data of the master is sent to the slave. While the slave is receiving the data, "PROGRAM" is displayed. When cloning of data is completed, the master displays "END", and the slave automatically operates in the User mode. The slave can then be operated by the same program as the master.

7. The other slave can be continuously cloned. When the [C] key on the master is pressed while the master displays "END", the master displays "CLONE MODE". Carry out the operation in step 4 to 6.

Note:

Only the same models can be cloned together.

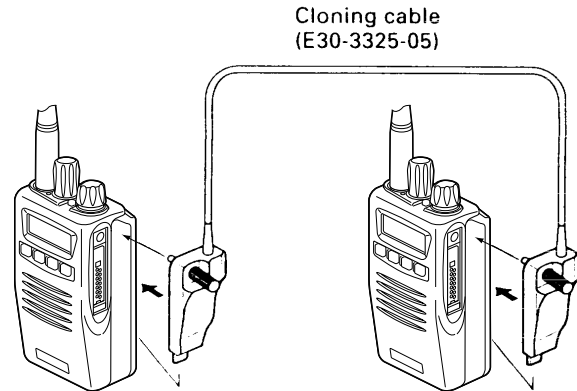


Fig. 2

8. Self Programming Mode

Write mode for frequency data and signalling etc. Mainly used by the person maintaining the user equipment.

8-1. Enter to the self programming mode

Delete R351 (Figure 3) in the TX-RX unit and turn the power switch on while pressing the [Side 2] key. When enter the self programming mode, "SELF PROG" is displayed.

Note :

This mode (self programming mode) cannot be set when it has been disabled with the FPU.

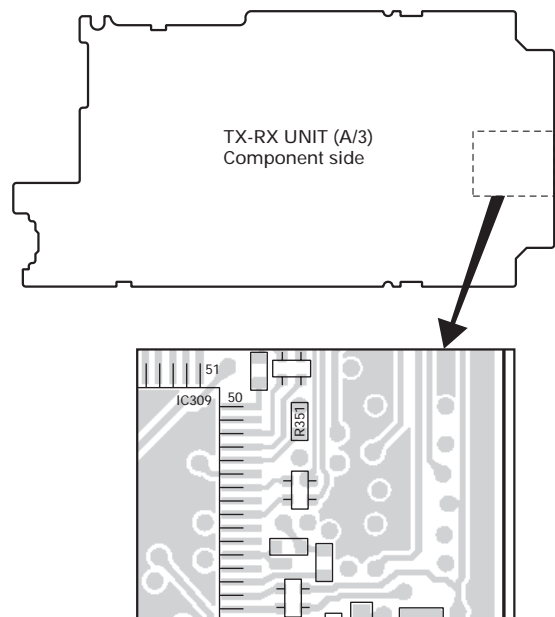


Fig. 3

REALIGNMENT

8-2. Channel Setting Mode

This is a mode for making channel settings with the panel keys without using the FPU.

Pressing [Side 1] when [SELF PROG] is displayed, sets Channel Setting Mode.

Select an item set with [C] and change the selection with the encoder.

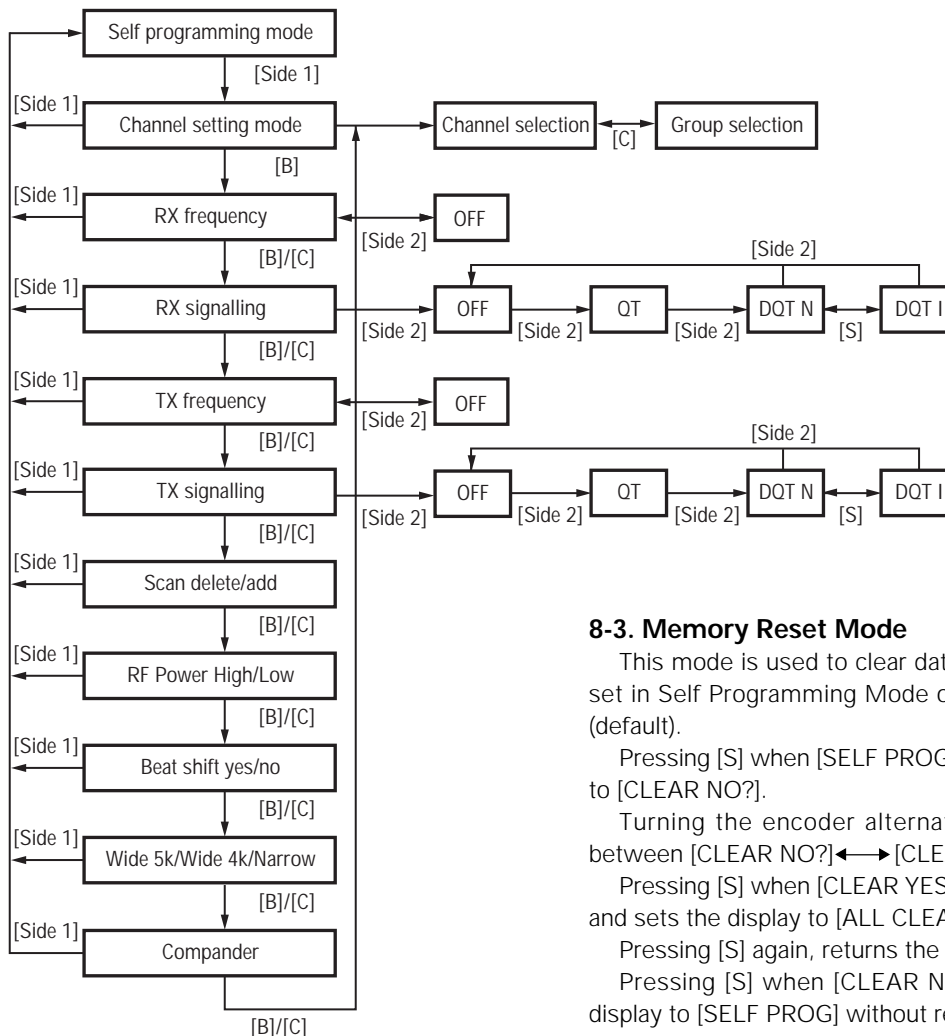
The data displayed with [B] is stored in the memory and then proceeds to the next item. Pressing [C] proceeds to the next item without storing it in the memory.

Press [Side 1] to set the display to [SELF PROG] and return to reset (default) status.

Items set in Channel Setting Mode are as follows.

Function settings	Display	Remarks
Channel select	Channnel or Group	
RX Frequency	RXF	[Side 2] : Freq. On/Off switching [A] : 5kHz/6.25kHz/1MHz step switching
RX Signalling	RXS	[Side 2] : OFF/QT/DQT switching [A] : 1 step/Standard switching [S] : DQT Normal/Invert switching
TX Frequency	TXF	Key operation same as RX Frequencies
TX Signalling	TXS	Key operation same as RX Signalling
Scan Delete/Add	SCN	DEL/ADD
RF Power	PWR	HIGH/LOW
Beat Shift	SFT	YES/NO
Wide 5k/Wide 4k /Narrow	w/s/n	Wide 5k/Wide 4k/Narrow
Compander	CMP	ON/OFF

• Flow Chart



8-3. Memory Reset Mode

This mode is used to clear data for functions that can be set in Self Programming Mode or to return to reset values (default).

Pressing [S] when [SELF PROG] is shown, sets the display to [CLEAR NO?].

Turning the encoder alternately switches the display between [CLEAR NO?] ↔ [CLEAR YES?].

Pressing [S] when [CLEAR YES?] is shown, clears the data and sets the display to [ALL CLEAR].

Pressing [S] again, returns the display to [SELF PROG].

Pressing [S] when [CLEAR NO?] is shown, returns the display to [SELF PROG] without resetting the data.

CIRCUIT DESCRIPTION

1. Overview

This transceiver is VHF/FM portable transceiver designed to operate in the frequency range of 136 to 174MHz.

2. Circuit Configuration by Frequency

The receiver is a double-conversion superheterodyne with a first intermediate frequency (IF) of 44.85MHz and a second IF of 455kHz. Incoming signals from the antenna are mixed with the local signal from the PLL to produce the first IF of 44.85MHz.

This is then mixed with the 44.395MHz second local oscillator output to produce the 455kHz second IF. This is detected to give the demodulated signal.

The transmit signal frequency is generated by the PLL VCO, and modulated by the signal from the microphone. It is then amplified and sent to the antenna.

adjusted by a variable capacitor. The input voltage to the variable capacitor is regulated by the voltage output from the D/A converter (IC307). The signal is amplified by RF amplifier (Q207), and passed through the bandpass filter (L210,213). The resulting signal is applied to the first mixer (Q206), where it is mixed with the first local oscillator signal output from the frequency synthesizer to produce the first IF (44.85MHz).

3-2. IF unit

The first IF signal is passed through a four-pole monolithic crystal filter (XF202) to remove a adjacent channel signal. The filtered first IF signal is amplified by the first IF amplifier (Q205) and then applied to the IF system IC (IC200). The IF system IC provides a second mixer, second local oscillator, limiting amplifier, quadrature detector and RSSI (Received Signal Strength Indicator). The second mixer mixes the first IF signal with the 44.395MHz of second local oscillator output (crystal unit X200) and produces the second IF signal of 455kHz.

The second IF signal is passed through the ceramic filter (CF200 : Wide, CF201 : Narrow) to more remove the adjacent channel signal. The filtered second IF signal is amplified by the limiting amplifier and demodulated by the quadrature detector with ceramic discriminator (CD200). The demodulated signal is routed to the audio circuit.

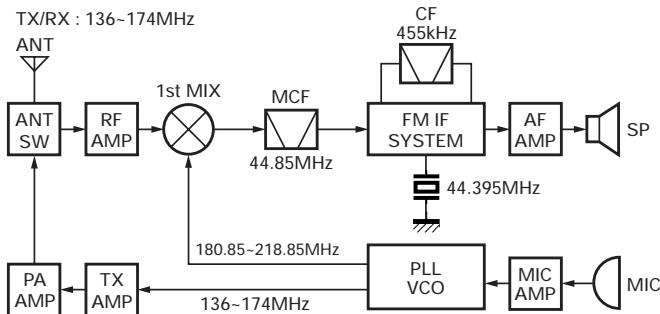


Fig. 1 Frequency configuration

3. Receiver System

3-1. RF unit

An incoming RF signal from the antenna terminal is passed through the antenna switch (D102,103,104 and D105 are off) and then the bandpass filter (L215,217). The bandpass filter is

Center Frequency		Nominal 455kHz
Band Width	3dB	Min. ± 6.5 kHz
	50dB	Max. ± 15.5 kHz
Stop Band Attenuation	$\pm 18 \sim \pm 33$ kHz	Min. 55.0dB
	± 100 kHz	Min. 50.0dB
Spurious Response	0.1~1.0MHz	Min. 20.0dB
Ripple	Within 455 ± 6.5 kHz	Max. 2.0dB
Insertion Loss	at 455 kHz	Max. 4.0dB
Group Delay Time	Within 455 ± 3.0 kHz	Max. 25.0 μ sec
	Within 455 ± 5.0 kHz	Max. 50.0 μ sec

Table 1 Ceramic filter (L72-0995-05): CF200

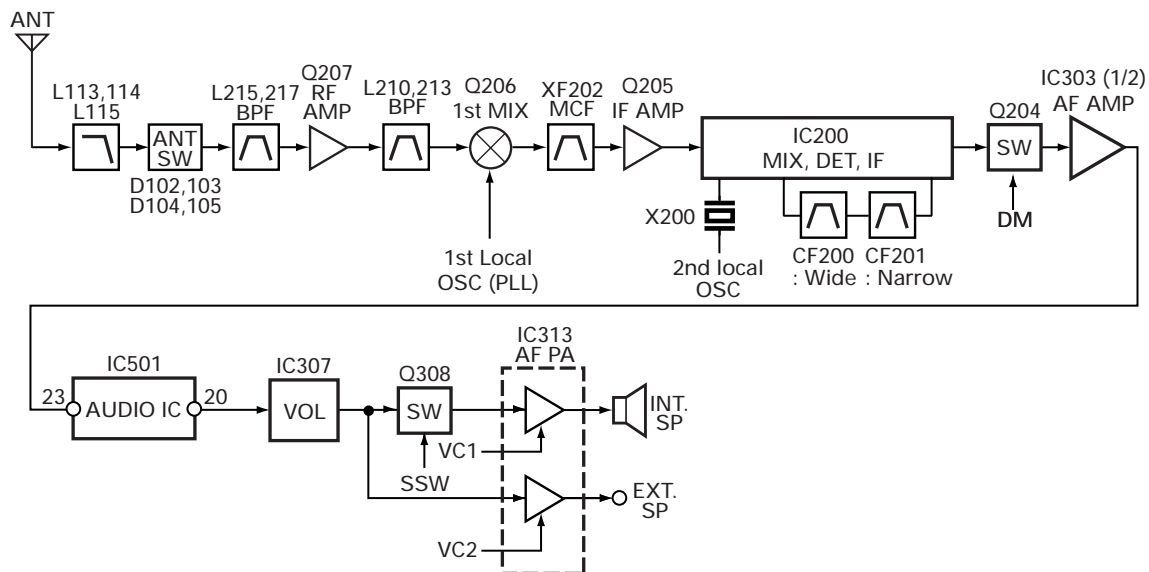


Fig. 2 Receiver section

CIRCUIT DESCRIPTION

Center Frequency		Nominal 455kHz
Band Width	6dB	Min. ± 4.5 kHz
	40dB	Max. ± 10.0 kHz
Stop Band Attenuation	± 100 kHz	Min. 25.0dB
Ripple	Within 455 ± 3.0 kHz	Max. 1.5dB
Insertion Loss	at 455 kHz	Max. 6.0dB

Table 2 Ceramic filter (L72-0996-05): CF201

3-3. Wide/Narrow switching circuit

Wide and Narrow settings can be made for each channel by switching the ceramic filters CF200 (Wide), CF201 (Narrow).

The WIDE (high level) and NARROW (low level) data is output from IC311.

Regardless of NARROW or WIDE band selection, signals always pass through the filter, CF200.

When the WIDE band is selected, Q201 is turned ON, then D202 and D203 are turned OFF.

So, the signal does not pass through the filter CF201. When the NARROW band is selected, Q201 is turned OFF, then D202 and D203 are turned ON. So, the signal passes through the filters, CF200 and CF201.

Q503 turns on/off with the Wide/Narrow data and the IC200 detector output level is changed to maintain a constant output level during wide or narrow signals.

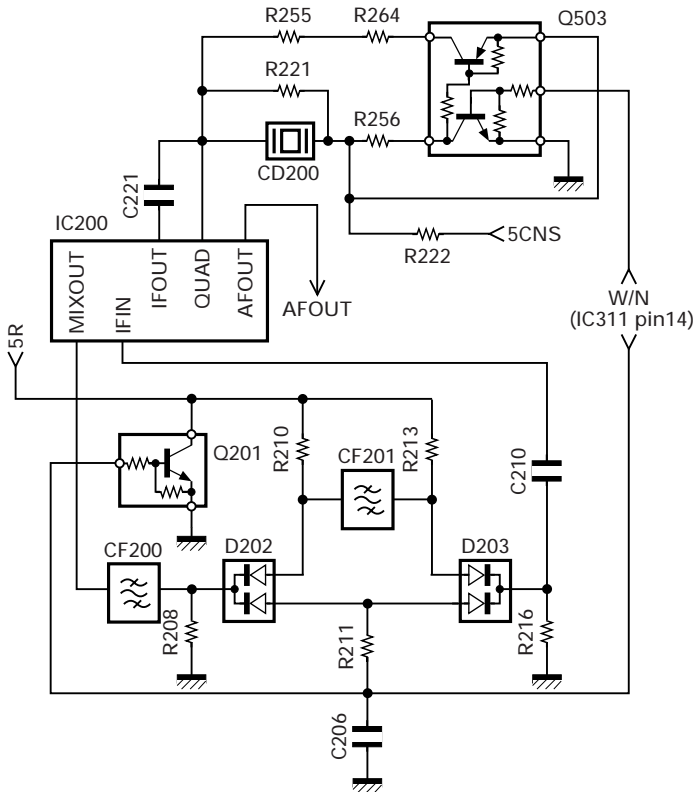


Fig. 3 Wide/Narrow switching circuit

3-4. Audio amplifier circuit

The demodulated signal from IC200 goes through the mute switch (Q204) and is amplified by IC303 (1/2), high-pass filtered, low-pass filtered, high-pass filtered, and de-emphasized by IC501.

The signal then goes through an electronic volume control (IC307), and an AF switch (Q308 is on), and is routed to audio power amplifier (IC313), where it is amplified and output to the internal speaker.

The audio mute signal (AM1) from the shift register becomes Low in the standby and Q302, Q303 which are power supply circuit for IC313 turn off. Also, IC501 is set to the power down mode according to data from microprocessor, and the AF signal is muted. When the audio is output, AM1 becomes High to turn Q302, Q303 ON, and voltage is supplied to power terminal VP of IC313. Also, IC501 is canceled out of the power down mode.

The speaker is switched by the logic of speaker switching terminal SSW on the universal connector. When SP-MIC is not attached, the logic of SSW becomes High and SW (Q308) is turned ON, and the AF signal is input to both amplifiers of IC313.

When SP-MIC is attached, SSW is connected to GND at inside of SP-MIC. For this reason, Q308 is turned OFF, and the AF signal is input only to amplifier for EXT SP of IC313.

Change of INT/EXT SP refer to Fig. 4.

AM1	SSW	VC1	VC2	SP
H	H	H	L	INT
H	L	L	H	EXT
L	H	L	L	MUTE
L	L	L	L	MUTE

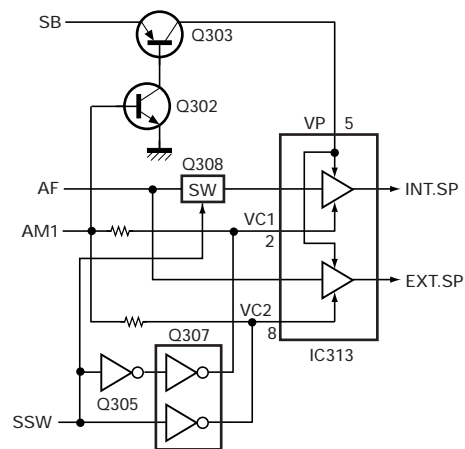


Fig. 4 Audio amplifier circuit

CIRCUIT DESCRIPTION

3-5. Squelch circuit

The output from IC200 goes to Wide/Narrow noise level selector (Block A in Fig. 5) and enters to FM IC again. The noise level selector is able to change amount of Wide and Narrow noise component by Q903. When the Wide band is selected, Q903 is turned ON, the noise pass through R916, R917, TH902. When the Narrow band is selected, Q903 is turned OFF, the noise pass through R914, R915, TH901. The noise component passed through 2 band-pass filter one in IC200 and IC201 (2/2). The output from IC201 (2/2) is amplified by Q208 and rectified by D201 to produce a DC voltage corresponding to the noise level. The DC voltage is sent to the analog port of the CPU (IC309). And IC200 outputs a DC voltage (RSSI) corresponding to the input of the IF amplifier. The CPU reads the RSSI signal via pin 93.

IC309 determines whether to output sounds from the speaker by comparing the input voltage of pin 91 and pin 93 with the preset value.

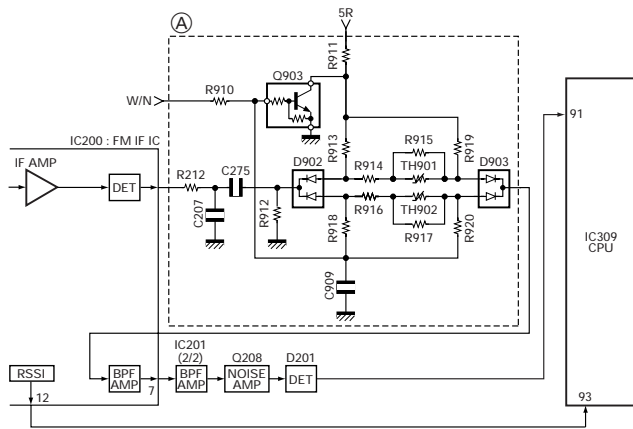


Fig. 5 Squelch circuit

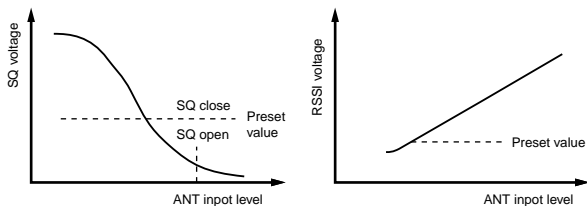


Fig. 6 Squelch and RSSI voltage vs ANT input level

4. Transmitter System

4-1. Microphone amplifier

The signal from the internal microphone goes through the mute switch (Q301).

When the SP-MIC is not attached, the microphone switching terminal (MSW) on the universal connector becomes High, and mute switch (Q301) is turned ON. When the SP-MIC is attached, MSW is connected to GND at inside of SP-MIC. For this reason, Q301 is turned OFF, the internal microphone is muted, and only the input of the external microphone is supplied to the microphone amplifier.

The signal from microphone is amplified by IC502 and limited by AGC circuit composed of D500, D501, Q502 and Q504. IC501 on the small board is composed of high-pass filter, low-pass filter and pre-emphasis/IDC circuit.

The signal passes through the D/A converter (IC307) for the maximum deviation adjustment, and enters the summing amplifier consisting of IC305 (1/2), and is mixed with the low speed data from the CPU (IC309).

The output signal from the summing amplifier passes through the D/A converter (IC307) again and goes to the VCO modulation input.

The other output signal from the summing amplifier passes through the D/A converter (IC307) again for the BAL adjustment, and the buffer amplifier (IC302 2/2), and goes to the TCXO modulation input.

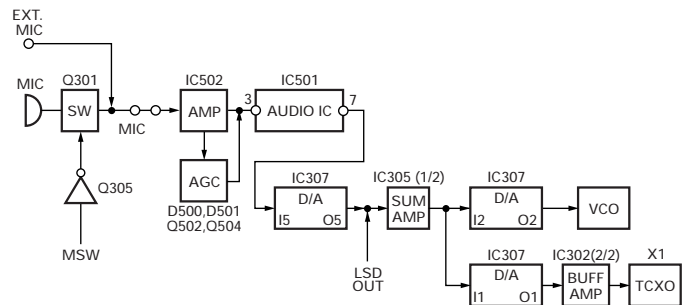


Fig. 7 Microphone amplifier

4-2. Drive and Final amplifier

The signal from the T/R switch (D101 is on) is amplified by drive amplifier (Q100 and Q101) to +15~17dBm.

The output of the drive amplifier is amplified by the RF power amplifier (Q106) to 5.0W (1W when the power is low). The RF power amplifier is MOS FET transistor. The output of the RF power amplifier is then passed through the harmonic filter (LPF) and antenna switch (D102, 103 are on) and applied to the antenna terminal.

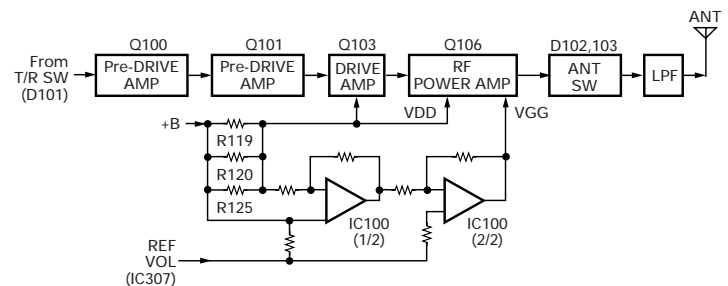


Fig. 8 Drive and final amplifier and APC circuit

4-3. APC circuit

The APC circuit always monitors the current flowing through the drive amplifier (Q103) and the RF power amplifier (Q106) and keeps a constant current. The voltage drop at R119, R120 and R125 is caused by the current flowing through the RF power amplifier and this voltage is applied to the differential amplifier (IC100 1/2).

CIRCUIT DESCRIPTION

IC100(2/2) compares the output voltage of IC100(1/2) with the reference voltage from IC307, and the output of IC100(2/2) controls the VGG of the RF power amplifier to make the both voltages to same voltage.

The change of power high/low is carried out by the change of the reference voltage. Q105,107 and 108 are turned on in transmit and the APC circuit is active.

5. Frequency Synthesizer Unit

5-1. Frequency synthesizer

The frequency synthesizer consists of the TCXO (X1), VCO, PLL IC(IC801) and buffer amplifiers.

The TCXO generates 16.8MHz. The frequency stability is 2.5ppm within the temperature range of -30 to +60°C. The frequency tuning and modulation of the TCXO are done to apply a voltage to pin 1 of the TCXO. The output of the TCXO is applied to pin 1 of the PLL IC.

The TK-2140's VCO consists of 2VCO and covers a dual range of the 180.85~218.85MHz and the 136~174MHz. The VCO generates 180.85~218.85MHz for providing to the first local signal in receive. The operating frequency is generated by Q3 in transmit mode and Q2 in receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator (IC801) to the variable capacitor diodes (D1, D3, D7, and D8 in transmit mode and D2, D4, D9 and D10 in receive mode).

The T/R pin of IC312 goes "high" in receive mode causing Q4, Q6 and Q3 to turn off, and Q2 turn on. The T/R pin goes "low" in transmit mode.

The outputs from Q2 and Q3 are amplified by buffer amplifier (Q5) come to the amplifiers.

The PLL IC consists of a prescaler, reference divider, phase comparator, charge pump (The frequency step of the PLL circuit is 5 or 6.25kHz). The input signal from the pins 1 and 10 of the PLL IC is divided down to the 5 or 6.25kHz and compared at phase comparator. The pulsed output signal of the phase comparator is applied to the charge pump and transformed into DC signal in the loop filter (LPF). The DC signal is applied to the CV of the VCO and locked to keep the VCO frequency constant.

PLL data is output from DP (pin 73), CP (pin 74) and EP (pin 72) of the microprocessor (IC309). The data are input to the PLL IC when the channel is changed or when transmission is changed to reception and vice versa. A PLL lock condition is always monitored by the pin 30 (UL) of the microprocessor. When the PLL is unlocked, the UL goes low.

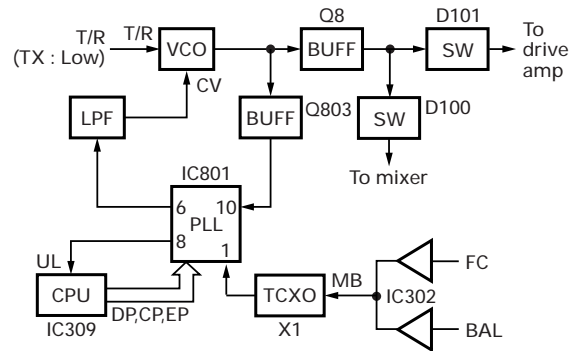


Fig. 9 PLL block diagram

6. Control Circuit

The control circuit consists of microprocessor (IC309) and its peripheral circuits. It controls the TX-RX unit and transfers data to and from the LCD ASSY. IC309 mainly performs the following;

- 1) Switching between transmission and reception by PTT signal input.
- 2) Reading system, group, frequency, and program data from the memory circuit.
- 3) Sending frequency program data to the PLL.
- 4) Controlling squelch on/off by the DC voltage from the squelch circuit.
- 5) Controlling the audio mute circuit by decode data input.
- 6) Transmitting tone and encode data.

6-1. Memory circuit

Memory circuit consists of the CPU (IC309) and a flash memory (IC308). A flash memory has a capacity of 2M bits and contains the transceiver control program for the CPU. It also stores the data for transceiver channels and operating parameter that are written by the FPU. This program can be easily written from an external devices.

The EEPROM (IC310) stores the last channel data, the scan on status, and other parameters.

• Flash Memory

Note : The flash memory stores the data that is written by the FPU (KPG-74D (M2)), and firmware program (User mode, Test mode, Tuning mode, etc.). This data must be rewritten when replacing the flash memory.

• EEPROM

Note : The EEPROM stores tuning data (Deviation, Squelch, etc.).

Realign the transceiver after replacing the EEPROM.

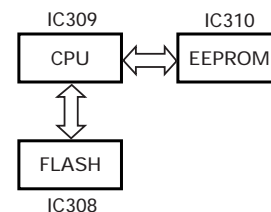


Fig. 10 Memory circuit

CIRCUIT DESCRIPTION

6-2. Low battery warning

The battery voltage is monitored by the microprocessor (IC309 pin90 : BATT1). When the battery voltage falls below the voltage set by the Low Battery Warning adjustment during the transmission, the red LED blinks to notify the operator that it is time to replace the battery (When the "On TX" option (default setting) under the Battery Warning / status function in the FPU is selected.). If the battery voltage falls even more (NiCd, NiMH, Alkaline : approx. 5.8V, Li-ion: approx. 6.1V), the transceiver does not transmit and the warning tone beeps while the PTT switch is pressed.

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

6-3. Battery type detection

The transceiver automatically detects the battery type, measuring the resistance between the S-terminal and + terminal on the battery pack and changes the supplied voltage to the S-terminal as below. The microprocessor then detects the battery type.

Resistor value	Battery type	Input voltage of S-terminal
1.8MΩ	Li-ion	0.3~1.3V
560kΩ	Ni-Cd	1.3~2.6V
220kΩ	Ni-MH	2.6~5.0V
OPEN	Battery case	0~0.3V

7. Signalling Circuit

7-1. Encode

- **Low-speed data (QT,DQT)**

Low-speed data is output from pin 1 of the CPU. The signal passes through a low-pass CR filter, and goes to the summing amplifier (IC305 1/2). The signal is mixed with the audio signal and goes to the VCO and TCXO (X1) modulation input after passing through the D/A converter (IC307) for BAL adjustment.

- **High-speed data (5 tone, DTMF)**

High-speed data (HSD) is output from pin 2 of the CPU. The signal passes through a low-pass filter consisting of IC304, and provides a TX HSD tone and a RX HSD tone. TX HSD deviation making an adjustment by microprocessor is passed through the D/A converter (IC307) and then applied to the audio processor (IC501).

The signal is mixed with the audio signal and goes to the VCO and TCXO. The RX HSD tone is passed a summing amplifier (IC305 1/2). The D/A converter (IC307) for audio control, audio power amplifier and then to the speaker.

- **FFSK**

FFSK signal is output from pin 7 of IC501. The signal passes through the D/A converter (IC307) for the FFSK deviation adjustment, and is routed to the VCO. When encoding FFSK, the microphone input signal is muted.

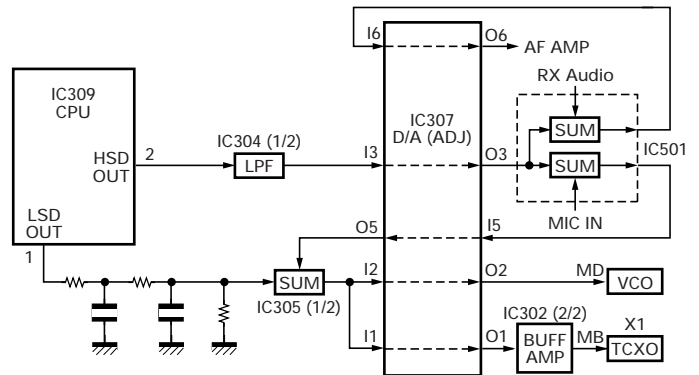


Fig. 13 Encode

CIRCUIT DESCRIPTION

7-2. Decode

• Low-speed data (QT,DQT)

The demodulated signal from the IF IC (IC200) is amplified by IC303 (1/2) and passes through a low-pass filter (IC306) to remove audio components. The signal is input to pin 95 of the CPU.

The CPU digitizes this signal, performs processing such as DC restoration, and decodes the signal.

• High-speed data (DTMF)

The DTMF input signal from the IF IC (IC200) is amplified by IC303 (1/2) and goes to IC500, the DTMF decoder. The decoded information is then processed by the CPU. During transmission and standby, the DTMF IC is set to the power down mode when the PD terminal is High. When the line is busy, the PD terminal becomes Low, the power down mode is canceled and decoding is carried out.

• High-speed data (2 tone, 5 tone)

The demodulated signal from the IF IC (IC200) is amplified by IC303 (1/2) and passes through an audio processor (IC501) and amplifier IC201 (1/2) and comparator IC305 (2/2) to remove a low-speed data. The CPU digitizes this signal, performs processing such as DC restoration, and decodes the signal.

• FFSK

The FFSK input signal from the IF IC is amplified by IC303 (1/2) and goes to pin 23 of IC501. The signal is demodulated by FFSK demodulator in IC501. The demodulated data goes to the CPU for processing.

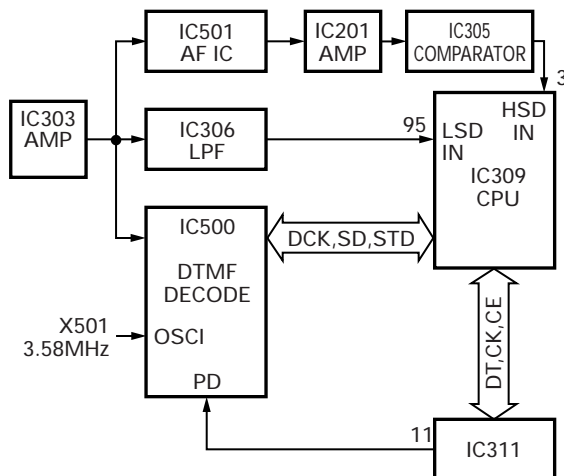


Fig. 14 Decode

8. Power Supply Circuit

Battery +B is supplied via a 3A fuse from the battery terminal connected to the TX-RX unit. After passing through the power switch, power supply (SB) is applied to the three AVRs. IC401 supplies 5V (5M) to the control circuit, and IC403 supplies 5V (5C) to common circuits. IC402 supplies to the TX circuit, the RX circuit and common circuits of needless save mode. During transmission, 5TC becomes Low and Q405 is turned ON to supply 5V (5T) to the TX circuit. During reception, 5RC becomes Low and Q404 is turned ON to supply 5V (5R) to the RX Circuit.

The power supply voltage monitor IC (IC404) monitors power supply voltage (SB). If the voltage falls (less than 5V), the VOUT port goes "LOW" level, the CPU INT port also goes "LOW" level, and the CPU stops.

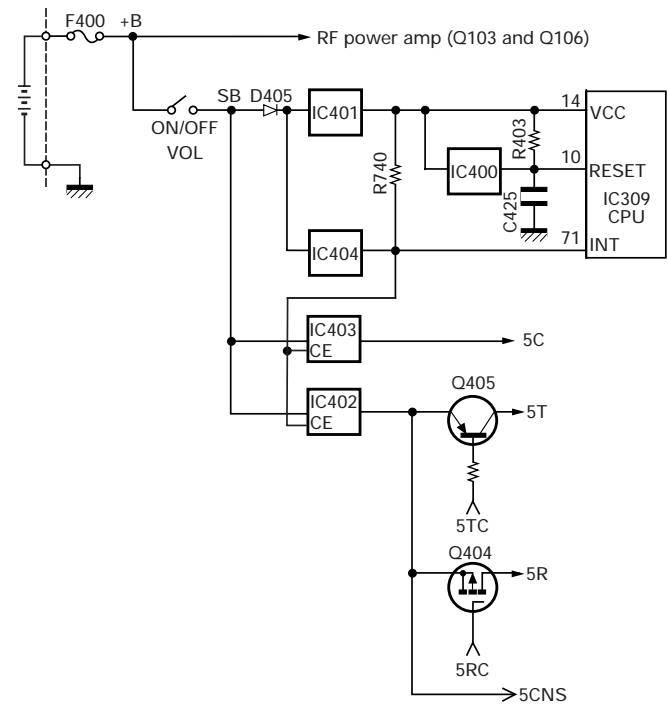


Fig. 15 Power supply circuit

SEMICONDUCTOR DATA

Microprocessor : 30620M8A-2W6GP (TX-RX UNIT : IC309)

■ Pin function

Pin No.	Port Name	I/O	Function
1	LSDO	O	Low speed data output.
2	HSDO	O	High speed data output.
3	HSDI	I	High speed data input.
4	DSTB	O	D/A converter data strobe output.
5	NC	-	NC
6	BYTE	-	+5V.
7	CNV _{ss}	-	GND.
8	AFRDT	I/O	MODEM FFSK decode data input. MODEM serial input/output.
9	AFDAT	O	MODEM FFSK encode data output.
10	RESET	-	CPU reset.
11	XOUT	-	CPU clock.
12	VSS	-	GND.
13	XIN	-	CPU clock.
14	V _{cc}	-	+5V
15	NC	-	NC
16	DTSTD	I	DTMF decoder data detect input.
17	AFTRD	I	MODEM FFSK encode data output timing pulse input.
18	AFRTM	I	MODEM FFSK decode data Input timing pulse input.
19	EEPDAT	I/O	EEPROM data input/output.
20	BEEP	O	Beep output.
21	SKEY	I	[S] Key input.
22	AKEY	I	[A] Key input.
23	BKEY	I	[B] Key input.
24	CKEY	I	[C] Key input.
25	AUX	I	[AUX] Key input.
26	PTT	I	[PTT] Key input.
27	SIDE2	I	[Side 2] Key input.
28	SIDE1	I	[Side 1] Key input.
29	SSW	I	Speaker Mic detect input.
30	UL	I	PLL unlock detect input.
31	DTMDAT	I	DTMF decoder data input.
32	DTCLK	O	DTMF decoder clock output.
33	TXD	O	Serial interface (COM0) TXD0 (to MIC connector).
34	RXD	I	Serial interface (COM0) RXD0 (to MIC connector).
35	DAT	O	Common data output.
36	CLK	O	Common clock output.
37	RDY	-	Can not used.
38	ALE	-	Can not used.
39	HOLD	-	Can not used.
40	HLDA	-	Can not used.
41	BLCK	-	Can not used.
42	RD	O	Flash memory RD bus.
43	BHE	-	Can not used.
44	WR	O	Flash memory WR bus.
45	SAVE	O	Battery save output.
46	SELF	I	Self programming mode enable input.
47	CS/MODE	O	LCD driver chip select output.
48	CSO	O	Flash memory chip enable.
49	A19	-	Can not used.

Pin No.	Port Name	I/O	Function
50-59	A18~A9	O	Flash memory address bus.
60	V _{cc}	-	+5V
61	A8	O	Flash memory address bus.
62	VSS	-	GND.
63-70	A7~A0	O	Flash memory address bus.
71	INT	I	Low voltage detection.
72	EP	O	PLL IC Data Strobe output.
73	DP	O	PLL IC Data output.
74	CP	O	PLL IC Clock output.
75-78	EN4~1	I	Rotary SW input 4~1.
79-86	D7~D0	I	Flash memory data bus.
87	PF	I	SP-Mic PF switch input.
88	VOL	I	Volume level input.
89	BATT2	I	Battery distinction input.
90	BATT1	I	Battery voltage
91	ASQL	I	Squelch level input.
92	TEMP	I	Thermistor input.
93	RSSI	I	Received signal strength indicator input (RSSI).
94	AVSS	-	GND.
95	LSDI	I	Low speed data input.
96	VREF	-	+5V
97	AVCC	-	+5V
98	SFTSTB	O	Shift register data strobe output.
99	OE	O	Shift register output enable output.
100	AFDIR	O	MODEM DIR.

COMPONENTS DESCRIPTION

TX-RX UNIT (X57-6402-71)

Ref. No.	Use/Function	Operation/Condition
IC100	MOS IC	APC AMP
IC200	MOS IC	IF IC
IC201	MOS IC	AF AMP, Filter
IC302	MOS IC	AF AMP, Filter
IC303	MOS IC	AF AMP, Filter
IC304	MOS IC	AF AMP, Filter
IC305	MOS IC	AF AMP, Filter
IC306	MOS IC	AF AMP, Filter
IC307	MOS IC	Potential Meter
IC308	ROM IC	Flash ROM
IC309	MPU	MPU
IC310	ROM IC	EEPROM
IC311,312	MOS IC	Shift Register
IC313	BI-POLAR IC	AF Power AMP
IC400	MOS IC	Detector
IC401	MOS IC	5M AVR
IC402	MOS IC	5CNS AVR
IC403	MOS IC	5C AVR
IC404	MOS IC	Detector
IC500	MOS IC	DTMF Decoder
IC501	MOS IC	Base Band IC
IC502	MOS IC	AF AMP, AGC
IC801	MOS IC	PLL IC
IC901	MOS IC	5TC Buffer
Q2	FET	RX VCO oscillation
Q3	FET	TX VCO oscillation
Q4	FET	VCO Switch
Q5	TRANSISTOR	Buffer AMP
Q6	TRANSISTOR	VCO Switch
Q7	TRANSISTOR	Ripple filter
Q8	TRANSISTOR	TX/RX common RF AMP
Q100	TRANSISTOR	Pre-drive AMP
Q101	TRANSISTOR	Pre-drive AMP
Q103	FET	TX Drive AMP
Q104,105	TRANSISTOR	APC Switch
Q106	FET	TX Final AMP
Q107	FET	APC Switch
Q108	TRANSISTOR	APC Switch
Q201	TRANSISTOR	W/N Switch
Q203	FET	AF detect Switch
Q204	FET	DM Switch
Q205	TRANSISTOR	IF AMP
Q206	FET	Front-end 1st mixer
Q207	FET	Front-end RF AMP
Q208	TRANSISTOR	Noise AMP
Q300	TRANSISTOR	Beat shift Switch
Q301	FET	Mic mute
Q302	TRANSISTOR	AF AMP AVR switch
Q303	TRANSISTOR	AF AMP AVR
Q304	TRANSISTOR	LCD AVR
Q305	FET	Int/Ext Switch
Q306	TRANSISTOR	TX LED switch
Q307	FET	Int/Ext Switch
Q308	FET	Int/Ext Switch

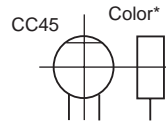
Ref. No.	Use/Function	Operation/Condition
Q309	TRANSISTOR	BUSY LED switch
Q310	TRANSISTOR	LCD LED AVR switch
Q311	TRANSISTOR	LCD LED AVR
Q400	FET	5MS Switch
Q401	FET	5MS Switch
Q403	TRANSISTOR	5R Switch
Q404	FET	5R Switch
Q405	TRANSISTOR	5T Switch
Q406	FET	SAVE Switch
Q500,506	FET	MSK Switch
Q501	FET	TX AF mute
Q502,504	TRANSISTOR	AGC
Q503	TRANSISTOR	W/N Switch
Q505	TRANSISTOR	Limiter Switch
Q507	FET	AF filter Switch
Q803	TRANSISTOR	f in RF AMP
Q903	TRANSISTOR	W/N Switch
D1	Variable capacitance diode	TX VCO
D2	Variable capacitance diode	RX VCO
D3	Variable capacitance diode	TX VCO
D4	Variable capacitance diode	RX VCO
D5	Variable capacitance diode	TX VCO modulation
D6	DIODE	Ripple filter switch
D7,8	Variable capacitance diode	TX VCO
D9,10	Variable capacitance diode	RX VCO
D100,101	DIODE	TX/RX RF switch
D102-105	DIODE	ANT switch
D106	ZENER DIODE	APC protect
D200	DIODE	SQL voltage charge
D201	DIODE	SQL rectification
D202,203	DIODE	W/N Switch
D205-208	Variable capacitance diode	BPF Tuning
D209	DIODE	DM charge/discharge switch
D300	DIODE	AF AMP bias
D301	DIODE	AF AMP protect
D302	DIODE	Surge absorption
D303,304	ZENER DIODE	Protect
D305	ZENER DIODE	AF AMP AVR
D306	DIODE	Surge absorption
D307	ZENER DIODE	Protect
D308	ZENER DIODE	Mic input protect
D309	LED	TX red LED
D310	LED	RX green LED
D402	DIODE	Surge absorption
D403	DIODE	5MS protect switch
D405	DIODE	5M protect
D500	DIODE	AGC protect
D501	DIODE	AGC protect
D801	DIODE	LD protect
D804	Variable capacitance diode	TX VCO
D805	Variable capacitance diode	RX VCO
D901	DIODE	5TC Switch
D902,903	DIODE	W/N Switch

PARTS LIST

CAPACITORS

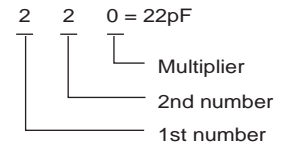
CC 45 TH 1H 220 J
 1 2 3 4 5 6

- 1 = Type ... ceramic, electrolytic, etc.
- 2 = Shape ... round, square, ect.
- 3 = Temp. coefficient
- 4 = Voltage rating
- 5 = Value
- 6 = Tolerance



Capacitor value

- 010 = 1pF
- 100 = 10pF
- 101 = 100pF
- 102 = 1000pF = 0.001μF
- 103 = 0.01μF



Temperature coefficient

1st Word	C	L	P	R	S	T	U
Color*	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/°C	0	-80	-150	-220	-330	-470	-750

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

Example : CC45TH = -470 ± 60ppm/°C

Tolerance (More than 10pF)

Code	C	D	G	J	K	M	X	Z	P	No code
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 -40	+80 -20	+100 -0	More than 10μF -10 ~ +50 Less than 4.7μF -10 ~ +75

(Less than 10pF)

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

Voltage rating

2nd word \ 1st word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	-
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	-
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	-

Chip capacitors

(EX) C C 7 3 F S L 1 H 0 0 0 J
 1 2 3 4 5 6 7

(Chip)(CH,RH<UJ,SL)

(EX) C K 7 3 F F 1 H 0 0 0 Z
 1 2 3 4 5 6 7

(Chip)(B,F)

Refer to the table above.

- 1 = Type
- 2 = Shape
- 3 = Dimension
- 4 = Temp. coefficient
- 5 = Voltage rating
- 6 = Value
- 7 = Tolerance

Dimension (Chip capacitors)

Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
A	4.5 ± 0.5	3.2 ± 0.4	Less than 2.0
B	4.5 ± 0.5	2.0 ± 0.3	Less than 2.0
C	4.5 ± 0.5	1.25 ± 0.2	Less than 1.25
D	3.2 ± 0.4	2.5 ± 0.3	Less than 1.5
E	3.0 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25
G	1.6 ± 0.2	0.8 ± 0.2	Less than 1.0
H	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05

RESISTORS

Chip resistor (Carbon)

(EX) R K 7 3 E B 2 B 0 0 0 J
 1 2 3 4 5 6 7

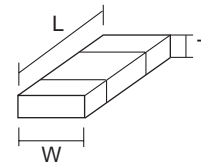
(Chip)(B,F)

Carbon resistor (Nomal type)

(EX) R D 1 4 B B 2 C 0 0 0 J
 1 2 3 4 5 6 7

- 1 = Type
- 2 = Shape
- 3 = Dimension
- 4 = Temp. coefficient
- 5 = Rating wattage
- 6 = Value
- 7 = Tolerance

Dimension



Dimension (Chip resistor)

Dimension code	L	W	T
E	3.2 ± 0.2	1.6 ± 0.2	1.0
F	2.0 ± 0.3	1.25 ± 0.2	1.0
G	1.6 ± 0.2	0.8 ± 0.2	0.5 ± 0.1
H	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05

Rating wattage

Code	Wattage	Code	Wattage	Code	Wattage
1J	1/16W	2C	1/6W	3A	1W
2A	1/10W	2E	1/4W	3D	2W
2B	1/8W	2H	1/2W		

TK-2140

PARTS LIST

* New Parts. Δ indicates safety critical components.
 Parts without **Parts No.** are not supplied.
 Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
 Teile ohne **Parts No.** werden nicht geliefert.

TK-2140 (Y50-5632-71) TX-RX UNIT (X57-6402-71)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
TK-2140						TX-RX UNIT (X57-6402-71)					
1	1B	*	A02-3653-14	CABINET ASSY(4 KEYS)		F	3B		N79-2035-46	PAN HEAD TAPTITE SCREW(TERMINAL)	
3	3A	*	A10-4063-01	CHASSIS		G	1A		N83-2005-46	PAN HEAD TAPTITE SCREW(UNIT)	
6	3B	*	B01-0694-03	ESCUTCHEON(BELT HOOK)		70	2B		R31-0617-05	VARIABLE RESISTOR(POWER SW/VOL)	
7	2C		B09-0625-03	CAP ACCESSORY		71	2B		S60-0415-05	ROTARY SWITCH(ENCODER)	
8	2B		B10-2700-02	FRONT GLASS		72	2B		T07-0732-05	SPEAKER	
9	1A		B38-0859-05	LCD ASSY		73	2B	*	T90-0795-05	HELICAL ANTENNA	
10	1C	*	B62-1479-00	INSTRUCTION MANUAL		74	2B		T91-0630-05	MIC ELEMENT	
11	3A	*	B72-1961-04	MODEL NAME PLATE		TX-RX UNIT (X57-6402-71)					
15	3B		E04-0436-05	RF COAXIAL RECEPTACLE(SMA)		D309			B30-2156-05	LED(RED)	
16	3B		E23-1188-04	TERMINAL(ANT)		D310			B30-2157-05	LED(YELLOW)	
17	3B		E23-1189-04	TERMINAL(BATT-)		C1,2			CK73HB1H102K	CHIP C 1000PF K	
18	3A		E37-0978-05	LEAD WIRE WITH CONNECTOR(SW2,SP)		C4			CC73HCH1H100D	CHIP C 10PF D	
19	3A	*	E37-1007-05	LEAD WIRE WITH CONNECTOR(SW1,PTT)		C5			CK73HB1H102K	CHIP C 1000PF K	
20	3B		E58-0440-05	SQUARE SOCKET(SP/MIC)		C9			CK73HB1H102K	CHIP C 1000PF K	
21	3B		E72-0413-03	TERMINAL BLOCK(BATT)		C10			CC73HCH1H100D	CHIP C 10PF D	
25	2A	*	F10-2415-04	SHIELDING PLATE(CPU)		C29			CK73HB1C103K	CHIP C 0.010UF K	
26	1A		F10-2416-03	SHIELDING PLATE(LCD)		C30			CK73HB1H102K	CHIP C 1000PF K	
27	2A	*	F10-2444-04	SHIELDING PLATE(SP)		C31			CC73HCH1H100D	CHIP C 10PF D	
28	3A	*	F15-1006-04	SHIELDING PLATE(CHASSIS)		C32			CC73HCH1H680J	CHIP C 68PF J	
29	1A		F20-1192-04	INSULATING SHEET(LCD)		C33			CC73HCH1H220J	CHIP C 22PF J	
30	1B	*	G10-1304-04	FIBROUS SHEET(CABINET)		C34			CC73HCH1H330J	CHIP C 33PF J	
31	3A		G11-4046-14	SHEET(PTT)		C35		*	CC73HCH1H150J	CHIP C 15PF J	
32	2A		G11-4050-04	SHEET(TCXO)		C37			CC73GCH1H110G	CHIP C 11PF G	
33	1A		G11-4089-04	SHEET(LCD)		C38			CC73GCH1H160G	CHIP C 16PF G	
34	3A		G11-4090-04	SHEET(FINAL FET)		C39			CC73GCH1H3R5B	CHIP C 3.5PF B	
35	1A	*	G11-4174-04	SHEET(LCD)		C40			CC73GCH1H080B	CHIP C 8.0PF B	
38	1A,2A	*	G11-4188-04	SHEET(A/3PCB,SHIELDING PLATE(LCD))		C41			CC73GCH1H0R5B	CHIP C 0.5PF B	
39	1B	*	G11-4189-04	SHEET(UPPER SIDE OF CABINET)		C42,43			CK73GB1H103J	CHIP C 0.010UF J	
40	1A	*	G11-4190-04	SHEET(LOWER SIDE OF CABINET)		C44			CC73GCH1H0R5B	CHIP C 0.5PF B	
41	3A		G13-1885-04	CUSHION(CHASSIS)		C45,46			CK73HB1H102K	CHIP C 1000PF K	
42	2B	*	G53-1540-12	PACKING(4 KEYS)		C47			C92-0712-05	CHIP-TAN 22UF 6.3WV	
43	3A	*	G53-1547-04	PACKING(TERMINAL BLOCK)		C48			CC73HCH1H330J	CHIP C 33PF J	
44	3B	*	G53-1560-02	PACKING(TOP)		C49			CC73HCH1H150J	CHIP C 15PF J	
45	1D		H52-1811-02	ITEM CARTON CASE		C50-52			CK73HB1H102K	CHIP C 1000PF K	
50	2A		J19-5430-03	HOLDER(VOL/ENC)		C53			CC73HCH1H100D	CHIP C 10PF D	
52	2A		J21-8424-04	HARDWARE FIXTURE(CHASSIS)		C54			CK73HB1H102K	CHIP C 1000PF K	
53	2C	*	J29-0701-05	BELT HOOK ACCESSORY		C56			C92-0714-05	CHIP-TAN 4.7UF 6.3WV	
54	1B		J30-1269-04	SPACER(VOL)		C57			CC73GCH1H0R5B	CHIP C 0.5PF B	
55	2B		J82-0078-05	FPC(VOL/ENC)		C62			C92-0714-05	CHIP-TAN 4.7UF 6.3WV	
56	3B		J82-0079-05	FPC(UNIVERSAL)		C100-102			CK73HB1H102K	CHIP C 1000PF K	
60	1B		K29-9131-03	KNOB(PTT)		C103			CC73HCH1H390J	CHIP C 39PF J	
61	1A		K29-9132-03	KEY TOP(SW1,SW2)		C104,105			CK73HB1H102K	CHIP C 1000PF K	
62	1B		K29-9133-03	KNOB(VOL)		C106			CC73HCH1H390J	CHIP C 39PF J	
63	1B		K29-9134-03	KNOB(ENC)		C108			CK73HB1A104K	CHIP C 0.10UF K	
A	2C		N08-0548-04	DRESSED SCREW ACCESSORY		C109			CK73HB1H102K	CHIP C 1000PF K	
B	3B		N14-0569-04	CIRCULAR NUT(VOL,ENC)		C111			CK73HB1H102K	CHIP C 1000PF K	
C	3B		N30-2604-46	PAN HEAD MACHINE SCREW(ANT)		C115			CK73HB1H102K	CHIP C 1000PF K	
D	3A		N30-2608-46	PAN HEAD MACHINE SCREW(CABINET)		C116			CC73HCH1H101J	CHIP C 100PF J	
E	3B		N30-3006-45	PAN HEAD MACHINE SCREW(ESCUTCHEON)		C117			CC73GCH1H270J	CHIP C 27PF J	
						C118			CK73HB1A104K	CHIP C 0.10UF K	
						C119			CK73GB1H102K	CHIP C 1000PF K	
						C123			C92-0565-05	CHIP-TAN 6.8UF 10WV	

PARTS LIST

TX-RX UNIT (X57-6402-71)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C124			CK73GB0J105K	CHIP C 1.0UF K		C235			CC73HCH1H150J	CHIP C 15PF J	
C125-127			CK73HB1H102K	CHIP C 1000PF K		C236			CC73HCH1H020C	CHIP C 2.0PF C	
C128			CC73HCH1H101J	CHIP C 100PF J		C238			CC73HCH1H180J	CHIP C 18PF J	
C129			CK73HB1H102K	CHIP C 1000PF K		C239			CK73HB1H102K	CHIP C 1000PF K	
C130			CK73HB1C103K	CHIP C 0.010UF K		C240			CC73HCH1H1R5C	CHIP C 1.5PF C	
C131			CK73HB1H102K	CHIP C 1000PF K		C241			CC73HCH1H090D	CHIP C 9.0PF D	
C132			CC73GCH1H100D	CHIP C 10PF D		C242			CK73HB1A104K	CHIP C 0.10UF K	
C134			CK73HB1A104K	CHIP C 0.10UF K		C243			CK73HB1H561K	CHIP C 560PF K	
C135			CK73GB1A105K	CHIP C 1.0UF K		C244			CC73GCH1H050B	CHIP C 5.0PF B	
C136			CK73HB1H102K	CHIP C 1000PF K		C245			CK73HB1H102K	CHIP C 1000PF K	
C137			CK73HB1C103K	CHIP C 0.010UF K		C250			CK73HB1H102K	CHIP C 1000PF K	
C138			CC73GCH1H820J	CHIP C 82PF J		C251			CC73GCH1H060B	CHIP C 6.0PF B	
C139			CK73HB1H102K	CHIP C 1000PF K		C252			CC73HCH1H470J	CHIP C 47PF J	
C140			CC73HCH1H100D	CHIP C 10PF D		C253			CK73HB1A104K	CHIP C 0.10UF K	
C141			CC73GCH1H820J	CHIP C 82PF J		C255			CK73HB1A104K	CHIP C 0.10UF K	
C144			CK73HB1H102K	CHIP C 1000PF K		C256			CC73HCH1H470J	CHIP C 47PF J	
C145			CC73HCH1H270J	CHIP C 27PF J		C257-260			CK73HB1H102K	CHIP C 1000PF K	
C146			CK73HB1H102K	CHIP C 1000PF K		C261			CC73GCH1H4R5B	CHIP C 4.5PF B	
C147			CC73HCH1H060D	CHIP C 6.0PF D		C263			CC73HCH1H470J	CHIP C 47PF J	
C148			CC73HCH1H100D	CHIP C 10PF D		C264			CK73HB1H102K	CHIP C 1000PF K	
C149			CC73HCH1H240G	CHIP C 24PF G		C266			CK73HB1H102K	CHIP C 1000PF K	
C150			CC73HCH1H120J	CHIP C 12PF J		C267			CC73GCH1H020B	CHIP C 2.0PF B	
C151			CC73HCH1H330J	CHIP C 33PF J		C268			CC73HCH1H330J	CHIP C 33PF J	
C152			CC73HCH1H120J	CHIP C 12PF J		C269			CC73GCH1H090B	CHIP C 9.0PF B	
C153			CC73HCH1H070D	CHIP C 7.0PF D		C270			CC73HCH1H050C	CHIP C 5.0PF C	
C154			CC73HCH1H270G	CHIP C 27PF G		C271			CK73HB1A104K	CHIP C 0.10UF K	
C155			CC73GCH1H220J	CHIP C 22PF J		C272			CK73HB1C103K	CHIP C 0.010UF K	
C156			CK73HB1H102K	CHIP C 1000PF K		C275			CK73HB1E472K	CHIP C 4700PF K	
C161			CC73HCH1H220J	CHIP C 22PF J		C276			CK73HB1H102K	CHIP C 1000PF K	
C162			CC73HCH1H100D	CHIP C 10PF D		C279,280			CK73HB1A104K	CHIP C 0.10UF K	
C200			CK73GB1A224K	CHIP C 0.22UF K		C281,282			CK73HB1H102K	CHIP C 1000PF K	
C201			CK73HB1A104K	CHIP C 0.10UF K		C283,284			CK73HB1A104K	CHIP C 0.10UF K	
C202			CK73HB1H221K	CHIP C 220PF K		C286			CC73GCH1H010B	CHIP C 1.0PF B	
C203-205			CK73HB1A104K	CHIP C 0.10UF K		C287,288			CK73HB1H102K	CHIP C 1000PF K	
C206			CK73HB1C103K	CHIP C 0.010UF K		C289,290			CC73GCH1H1R5B	CHIP C 1.5PF B	
C207			CK73HB1H471K	CHIP C 470PF K		C291			CK73HB1H102K	CHIP C 1000PF K	
C208,209			CK73HB1H221K	CHIP C 220PF K		C294			CK73GB1H102K	CHIP C 1000PF K	
C210			CK73HB1A104K	CHIP C 0.10UF K		C295			CC73HCH1H150J	CHIP C 15PF J	
C211			CK73HB1H102K	CHIP C 1000PF K		C298			CK73HB1H102K	CHIP C 1000PF K	
C212			CC73HCH1H220J	CHIP C 22PF J		C300			C92-0713-05	CHIP-TAN 10UF 6.3WV	
C213			CC73HCH1H100D	CHIP C 10PF D		C301			CK73HB1H102K	CHIP C 1000PF K	
C214			CK73HB1A104K	CHIP C 0.10UF K		C304			CC73HCH1H220J	CHIP C 22PF J	
C215			C92-0773-05	CHIP-TAN 15UF 6.3WV		C310			CK73HB1C103K	CHIP C 0.010UF K	
C216			CK73HB1A104K	CHIP C 0.10UF K		C311			CC73HCH1H101J	CHIP C 100PF J	
C217			CK73HB1H221K	CHIP C 220PF K		C312			C92-0713-05	CHIP-TAN 10UF 6.3WV	
C218			CK73HB1A104K	CHIP C 0.10UF K		C313			CK73HB1A104K	CHIP C 0.10UF K	
C219			CK73HB1A333K	CHIP C 0.033UF K		C314			CK73HB1H102K	CHIP C 1000PF K	
C220			CK73HB1A104K	CHIP C 0.10UF K		C315			C92-0713-05	CHIP-TAN 10UF 6.3WV	
C221			CC73HCH1H680J	CHIP C 68PF J		C316			CK73HB1A333K	CHIP C 0.033UF K	
C222			CK73HB1A104K	CHIP C 0.10UF K		C318			CK73HB1H331K	CHIP C 330PF K	
C223			CK73HB1C103K	CHIP C 0.010UF K		C319			CC73HCH1H101J	CHIP C 100PF J	
C224			C92-0713-05	CHIP-TAN 10UF 6.3WV		C320			CK73HB1A104K	CHIP C 0.10UF K	
C225			CK73HB1C103K	CHIP C 0.010UF K		C321			CK73HB1H271K	CHIP C 270PF K	
C227			CK73HB1A104K	CHIP C 0.10UF K		C322			CK73HB1H152K	CHIP C 1500PF K	
C228,229			CK73HB1C103K	CHIP C 0.010UF K		C323			CK73HB1H222K	CHIP C 2200PF K	
C230			CC73HCH1H100C	CHIP C 10PF C		C325			CK73HB1C123K	CHIP C 0.012UF K	
C231			CK73HB1C103K	CHIP C 0.010UF K		C327			CK73HB1H681K	CHIP C 680PF K	
C232			CK73HB1H102K	CHIP C 1000PF K		C328			CK73GB1C683K	CHIP C 0.068UF K	
C233			CK73HB1C103K	CHIP C 0.010UF K		C329			CK73GB0J105K	CHIP C 1.0UF K	
C234			CK73HB1H102K	CHIP C 1000PF K		C330			CK73HB1A104K	CHIP C 0.10UF K	

PARTS LIST

TX-RX UNIT (X57-6402-71)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C331			CK73HB1E682K	CHIP C 680PF K		C511			CC73HCH1H680J	CHIP C 68PF J	
C332			CK73HB1C103K	CHIP C 0.010UF K		C512			CK73HB1A473K	CHIP C 0.047UF K	
C333			CK73HB1H332K	CHIP C 3300PF K		C513,514			CK73HB1A104K	CHIP C 0.10UF K	
C334,335			CK73HB1C103K	CHIP C 0.010UF K		C515			CK73GB1H122K	CHIP C 1200PF K	
C336,337			CC73HCH1H330J	CHIP C 33PF J		C516			C92-0714-05	CHIP-TAN 4.7UF 6.3WV	
C338			CC73HCH1H150J	CHIP C 15PF J		C517			CK73HB1A104K	CHIP C 0.10UF K	
C339-342			CK73HB1C103K	CHIP C 0.010UF K		C518,519			C92-0714-05	CHIP-TAN 4.7UF 6.3WV	
C344			C92-0713-05	CHIP-TAN 10UF 6.3WV		C520			CC73HCH1H120J	CHIP C 12PF J	
C345			CK73GB1A474K	CHIP C 0.47UF K		C522			CK73HB1A104K	CHIP C 0.10UF K	
C346,347			CC73HCH1H470J	CHIP C 47PF J		C523			CK73HB1H271K	CHIP C 270PF K	
C348			CK73GB1A474K	CHIP C 0.47UF K		C524			CC73HCH1E181J	CHIP C 180PF J	
C349			CK73HB1C153K	CHIP C 0.015UF K		C525			CK73HB1H102K	CHIP C 1000PF K	
C350			C92-0647-05	CHIP-TAN 3.3UF 4WV		C526			CK73HB1C103K	CHIP C 0.010UF K	
C351			CC73HCH1H470J	CHIP C 47PF J		C527			CK73HB1A104K	CHIP C 0.10UF K	
C352-354			CK73HB1A104K	CHIP C 0.10UF K		C531			CC73HCH1H120J	CHIP C 12PF J	
C355			C92-0628-05	CHIP-TAN 10UF 10WV		C537			CK73HB1A104K	CHIP C 0.10UF K	
C356			CC73HCH1H470J	CHIP C 47PF J		C539,540	*		C92-0804-05	CHIP-TAN 1.5UF 16WV	
C357,358			C92-0712-05	CHIP-TAN 22UF 6.3WV		C541			CK73HB1A104K	CHIP C 0.10UF K	
C359			CC73HCH1H470J	CHIP C 47PF J		C542,543			CK73HB1H102K	CHIP C 1000PF K	
C362			CC73HCH1H470J	CHIP C 47PF J		C544,545			CK73HB1A104K	CHIP C 0.10UF K	
C364			CC73HCH1H470J	CHIP C 47PF J		C546			CC73HCH1H101J	CHIP C 100PF J	
C369			CC73HCH1H101J	CHIP C 100PF J		C720			C92-0714-05	CHIP-TAN 4.7UF 6.3WV	
C371			CC73HCH1H470J	CHIP C 47PF J		C730			CS77SJOJ2R2M	CHIP-TAN 2.2UF 6.3WV	
C375			CC73HCH1H470J	CHIP C 47PF J		C730	*		C92-0800-05	CHIP-TAN 2.2UF 6.3WV	
C382			CK73HB1A104K	CHIP C 0.10UF K		C801-803			CC73HCH1H101J	CHIP C 100PF J	
C383,384			CC73HCH1H470J	CHIP C 47PF J		C805			CK73GB1C104K	CHIP C 0.10UF K	
C386			CC73HCH1H470J	CHIP C 47PF J		C806			CK73HB1A104K	CHIP C 0.10UF K	
C388			CK73HB1H102K	CHIP C 1000PF K		C807			C92-0773-05	CHIP-TAN 15UF 6.3WV	
C389			CC73HCH1H470J	CHIP C 47PF J		C809			CK73HB1H102K	CHIP C 1000PF K	
C390			CK73HB1A104K	CHIP C 0.10UF K		C811			C92-0002-05	CHIP-TAN 0.22UF 35WV	
C391,392			CK73HB1C103K	CHIP C 0.010UF K		C812			C92-0713-05	CHIP-TAN 10UF 6.3WV	
C394,395			CK73HB1A104K	CHIP C 0.10UF K		C813	*		C92-0805-05	CHIP-TAN 0.68UF 16WV	
C396			CK73HB1C103K	CHIP C 0.010UF K		C815			CC73HCH1H101J	CHIP C 100PF J	
C397,398			CK73HB1A104K	CHIP C 0.10UF K		C818			CC73HCH1H220J	CHIP C 22PF J	
C399			CK73HB1E562K	CHIP C 5600PF K		C819			CC73HCH1H100D	CHIP C 10PF D	
C400			CK73HB1H102K	CHIP C 1000PF K		C823			CC73HCH1H100D	CHIP C 10PF D	
C402-405			CK73HB1H102K	CHIP C 1000PF K		C824			CC73HCH1H220J	CHIP C 22PF J	
C408			CK73HB1H102K	CHIP C 1000PF K		C825			CC73HCH1H100D	CHIP C 10PF D	
C410			CK73FB1A475K	CHIP C 4.7UF K		C826			CC73HCH1H220J	CHIP C 22PF J	
C411			CK73GB1A105K	CHIP C 1.0UF K		C827			CC73HCH1H100D	CHIP C 10PF D	
C413			C92-0713-05	CHIP-TAN 10UF 6.3WV		C831			CC73HCH1H150J	CHIP C 15PF J	
C415			CC73HCH1H101J	CHIP C 100PF J		C832			CC73HCH1H240J	CHIP C 24PF J	
C416			C92-0713-05	CHIP-TAN 10UF 6.3WV		C833	*		CC73HCH1H300J	CHIP C 30PF J	
C417			CK73GB0J105K	CHIP C 1.0UF K		C834			CC73HCH1H220J	CHIP C 22PF J	
C419			CK73HB1H102K	CHIP C 1000PF K		C838			CK73HB1H102K	CHIP C 1000PF K	
C420			CC73HCH1H101J	CHIP C 100PF J		C839			CC73HCH1H120J	CHIP C 12PF J	
C421			CK73GB1A105K	CHIP C 1.0UF K		C840			CC73HCH1H100D	CHIP C 10PF D	
C422			CK73GB0J105K	CHIP C 1.0UF K		C841			CK73GB1C104K	CHIP C 0.10UF K	
C423			C92-0773-05	CHIP-TAN 15UF 6.3WV		C842			CC73GCH1H471J	CHIP C 470PF J	
C424			CC73HCH1H101J	CHIP C 100PF J		C843-846			CK73HB1H471K	CHIP C 470PF K	
C425			CK73HB1A104K	CHIP C 0.10UF K		C849			CC73HCH1H101J	CHIP C 100PF J	
C426			CC73HCH1H101J	CHIP C 100PF J		C901			CK73HB1A104K	CHIP C 0.10UF K	
C431			CC73HCH1H101J	CHIP C 100PF J		C902			CK73GB1A474K	CHIP C 0.47UF K	
C500-503			CK73HB1A104K	CHIP C 0.10UF K		C903	*		C92-0805-05	CHIP-TAN 0.68UF 16WV	
C504			CK73GB1C104K	CHIP C 0.10UF K		C908,909			CK73HB1H102K	CHIP C 1000PF K	
C506			CC73HCH1H220J	CHIP C 22PF J		TC1,2			C05-0384-05	CERAMIC TRIMMER CAP(10PF)	
C507			CK73HB1A104K	CHIP C 0.10UF K		CN300	*		E40-6256-05	PIN ASSY SOCKET	
C508			CK73HB1H821K	CHIP C 820PF K		CN301,302			E40-5856-05	FLAT CABLE CONNECTOR	
C509			CC73HCH1H220J	CHIP C 22PF J		CN303-306			E40-6092-05	PIN ASSY	
C510			CC73HCH1H820J	CHIP C 82PF J							

PARTS LIST

TX-RX UNIT (X57-6402-71)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
CN400			E40-5856-05	FLAT CABLE CONNECTOR		X501			L78-0479-05	RESONATOR(3.58MHZ)	
CN500		*	E40-6257-05	PIN ASSY		XF202			L71-0530-05	MCF(44.85MHZ)	
F400			F53-0190-05	FUSE(2.5A/32V)		CP2			RK75HA1J102J	CHIP-COM 1.0K J 1/16W	
CD200			L79-1779-05	TUNING COIL		CP300-313			RK75HA1J102J	CHIP-COM 1.0K J 1/16W	
CF200			L72-0995-05	CERAMIC FILTER		CP314			RK75HA1J473J	CHIP-COM 47K J 1/16W	
CF201			L72-0996-05	CERAMIC FILTER		CP315			RK75HA1J102J	CHIP-COM 1.0K J 1/16W	
L1			L40-4795-85	SMALL FIXED INDUCTOR(4.7UH)		CP316			RK75HA1J473J	CHIP-COM 47K J 1/16W	
L8,9			L40-1001-86	SMALL FIXED INDUCTOR(10UH)		CP317-320			RK75HA1J102J	CHIP-COM 1.0K J 1/16W	
L13,14			L40-1001-86	SMALL FIXED INDUCTOR(10UH)		CP322			RK75HA1J102J	CHIP-COM 1.0K J 1/16W	
L15,16			L40-2778-67	SMALL FIXED INDUCTOR(27NH)		CP323,324			RK75HA1J473J	CHIP-COM 47K J 1/16W	
L17,18			L40-1001-86	SMALL FIXED INDUCTOR(10UH)		CP326,327			RK75HA1J473J	CHIP-COM 47K J 1/16W	
L21			L40-1085-92	SMALL FIXED INDUCTOR(100NH)		CP400,401			RK75HA1J473J	CHIP-COM 47K J 1/16W	
L22			L92-0163-05	BEADS CORE		R2			RK73HB1J101J	CHIP R 100 J 1/16W	
L23			L40-1085-92	SMALL FIXED INDUCTOR(100NH)		R16,17			RK73HB1J271J	CHIP R 270 J 1/16W	
L100			L40-8275-92	SMALL FIXED INDUCTOR(82NH)		R18,19			RK73HB1J220J	CHIP R 22 J 1/16W	
L101			L40-1085-92	SMALL FIXED INDUCTOR(100NH)		R20			RK73HB1J104J	CHIP R 100K J 1/16W	
L102			L92-0140-05	FERRITE CHIP		R21			RK73HB1J154J	CHIP R 150K J 1/16W	
L103			L40-1585-54	SMALL FIXED INDUCTOR(150NH)		R22			RK73HB1J472J	CHIP R 4.7K J 1/16W	
L104			L92-0149-05	FERRITE CHIP		R23			RK73HB1J101J	CHIP R 100 J 1/16W	
L105			L40-2775-57	SMALL FIXED INDUCTOR(27.ONH 5%)		R24			RK73HB1J102J	CHIP R 1.0K J 1/16W	
L106			L40-2775-54	SMALL FIXED INDUCTOR(27NH)		R25			RK73HB1J332J	CHIP R 3.3K J 1/16W	
L107			L92-0149-05	FERRITE CHIP		R26			RK73HB1J103J	CHIP R 10K J 1/16W	
L108			L34-4577-05	AIR-CORE COIL		R27			RK73HB1J331J	CHIP R 330 J 1/16W	
L109			L34-4563-05	AIR-CORE COIL		R28			RK73HB1J333D	CHIP R 33K D 1/16W	
L110			L34-4573-05	AIR-CORE COIL		R29			RK73HB1J104D	CHIP R 100K D 1/16W	
L111			L40-2295-85	SMALL FIXED INDUCTOR(2.2UH)		R31			RK73HB1J470J	CHIP R 47 J 1/16W	
L112			L34-4576-05	AIR-CORE COIL		R33			RK73HB1J473J	CHIP R 47K J 1/16W	
L113			L34-4575-05	AIR-CORE COIL		R34			RK73HB1J274J	CHIP R 270K J 1/16W	
L114			L34-4567-05	AIR-CORE COIL		R36			R92-1368-05	CHIP R 0 OHM	
L115			L34-4566-05	AIR-CORE COIL		R37			RK73HB1J223J	CHIP R 22K J 1/16W	
L116			L40-1092-81	SMALL FIXED INDUCTOR		R100,101			RK73HB1J472J	CHIP R 4.7K J 1/16W	
L120			L40-5675-92	SMALL FIXED INDUCTOR(56NH)		R102			RK73HB1J563J	CHIP R 56K J 1/16W	
L201,202			L40-1091-86	SMALL FIXED INDUCTOR(1.0UH)		R103			RK73HB1J331J	CHIP R 330 J 1/16W	
L203			L92-0163-05	BEADS CORE		R104			RK73HB1J220J	CHIP R 22 J 1/16W	
L204			L40-5685-85	SMALL FIXED INDUCTOR(0.56UH)		R105			RK73HB1J561J	CHIP R 560 J 1/16W	
L205,206			L40-3975-57	SMALL FIXED INDUCTOR(39.ONH 5%)		R106			RK73HB1J152J	CHIP R 1.5K J 1/16W	
L207			L40-1285-92	SMALL FIXED INDUCTOR(120NH)		R107			RK73HB1J150J	CHIP R 15 J 1/16W	
L210			L41-6878-14	SMALL FIXED INDUCTOR		R108,109			RK73HB1J331J	CHIP R 330 J 1/16W	
L212			L92-0163-05	BEADS CORE		R111			RK73HB1J180J	CHIP R 18 J 1/16W	
L213			L41-6878-14	SMALL FIXED INDUCTOR		R112			RK73HB1J331J	CHIP R 330 J 1/16W	
L215			L41-6878-14	SMALL FIXED INDUCTOR		R113			R92-1252-05	CHIP R 0 OHM J 1/16W	
L217			L41-5678-14	SMALL FIXED INDUCTOR		R114			RK73HB1J683J	CHIP R 68K J 1/16W	
L220			L40-1885-92	SMALL FIXED INDUCTOR(180NH)		R115			RK73HB1J473J	CHIP R 47K J 1/16W	
L223			L40-2785-92	SMALL FIXED INDUCTOR(270NH)		R116			RK73HB1J150J	CHIP R 15 J 1/16W	
L300-313			L92-0163-05	BEADS CORE		R118			RK73HB1J331J	CHIP R 330 J 1/16W	
L314-317			L92-0408-05	FERRITE CHIP		R119,120			RK73EB2ER39K	CHIP R 0.39 K 1/4W	
L320			L92-0163-05	BEADS CORE		R122			RK73HB1J123J	CHIP R 12K J 1/16W	
L400			L92-0149-05	FERRITE CHIP		R123			RK73GB1J820J	CHIP R 82 J 1/16W	
L710			L34-4563-05	AIR-CORE COIL		R124			RK73HB1J473J	CHIP R 47K J 1/16W	
L801			L92-0163-05	BEADS CORE		R125			RK73EB2ER39K	CHIP R 0.39 K 1/4W	
L802			L92-0141-05	FERRITE CHIP		R126			R92-1368-05	CHIP R 0 OHM	
L805			L40-6875-92	SMALL FIXED INDUCTOR(68NH)		R127-129			RK73HH1J154D	CHIP R 150K D 1/16W	
L807,808			L40-2775-57	SMALL FIXED INDUCTOR(27.ONH 5%)		R131-133			RK73HH1J154D	CHIP R 150K D 1/16W	
L810,811			L40-1001-86	SMALL FIXED INDUCTOR(10UH)		R134			RK73HB1J103J	CHIP R 10K J 1/16W	
X1			L77-1869-05	TCXO(16.8MHZ)		R135			RK73HB1J473J	CHIP R 47K J 1/16W	
X200			L77-1760-15	CRYSTAL RESONATOR(44.395MHZ)		R137			RK73HH1J105D	CHIP R 1M D 1/16W	
X300			L77-1810-05	CRYSTAL RESONATOR(9.8304MHZ)		R138			RK73HB1J561J	CHIP R 560 J 1/16W	
X500			L77-1517-05	CRYSTAL RESONATOR(3.6864MHZ)		R139			RK73HB1J222J	CHIP R 2.2K J 1/16W	
						R141,142			RK73HB1J104J	CHIP R 100K J 1/16W	

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Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R143,144			RK73HB1J271J	CHIP R 270 J 1/16W		R303			RK73HB1J684J	CHIP R 680K J 1/16W	
R145			R92-1252-05	CHIP R 0 OHM J 1/16W		R304			RK73HB1J394J	CHIP R 390K J 1/16W	
R147			RK73HB1J100J	CHIP R 10 J 1/16W		R308			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R148			R92-1368-05	CHIP R 0 OHM		R309			R92-1368-05	CHIP R 0 OHM	
R200			RK73HB1J224J	CHIP R 220K J 1/16W		R310			RK73HB1J473J	CHIP R 47K J 1/16W	
R201			RK73HB1J104J	CHIP R 100K J 1/16W		R311			RK73HB1J104J	CHIP R 100K J 1/16W	
R202			RK73HB1J123J	CHIP R 12K J 1/16W		R312			RK73HB1J224J	CHIP R 220K J 1/16W	
R203			RK73HB1J683D	CHIP R 68K D 1/16W		R313			R92-1368-05	CHIP R 0 OHM	
R204			RK73HB1J824D	CHIP R 820K D 1/16W		R314			RK73HB1J101J	CHIP R 100 J 1/16W	
R205			RK73HB1J334J	CHIP R 330K J 1/16W		R315			RK73HB1J105D	CHIP R 1M D 1/16W	
R206			RK73HB1J333J	CHIP R 33K J 1/16W		R316			RK73HB1J104J	CHIP R 100K J 1/16W	
R207			RK73HB1J154J	CHIP R 150K J 1/16W		R317			RK73HB1J184J	CHIP R 180K J 1/16W	
R208			RK73HB1J472J	CHIP R 4.7K J 1/16W		R318,319			RK73HB1J683J	CHIP R 68K J 1/16W	
R209			RK73HB1J103J	CHIP R 10K J 1/16W		R320			RK73HB1J123J	CHIP R 12K J 1/16W	
R210			RK73HB1J183J	CHIP R 18K J 1/16W		R321			RK73HB1J104J	CHIP R 100K J 1/16W	
R211			RK73HB1J223J	CHIP R 22K J 1/16W		R322			RK73HB1J154J	CHIP R 150K J 1/16W	
R212			RK73HB1J472J	CHIP R 4.7K J 1/16W		R323			RK73HB1J823J	CHIP R 82K J 1/16W	
R213			RK73HB1J183J	CHIP R 18K J 1/16W		R324			RK73HB1J474J	CHIP R 470K J 1/16W	
R215			RK73HB1J332J	CHIP R 3.3K J 1/16W		R325		*	RK73HB1J364J	CHIP R 360K J 1/16W	
R216			RK73HB1J472J	CHIP R 4.7K J 1/16W		R326			RK73HB1J223J	CHIP R 22K J 1/16W	
R217			RK73HB1J334J	CHIP R 330K J 1/16W		R327			RK73HB1J473J	CHIP R 47K J 1/16W	
R218			RK73HB1J123J	CHIP R 12K J 1/16W		R330			RK73HB1J184J	CHIP R 180K J 1/16W	
R219			RK73HB1J224J	CHIP R 220K J 1/16W		R333			RK73HB1J473J	CHIP R 47K J 1/16W	
R220			RK73HB1J332J	CHIP R 3.3K J 1/16W		R334			RK73HB1J184J	CHIP R 180K J 1/16W	
R221			RK73HB1J332D	CHIP R 3.3K D 1/16W		R336			RK73HB1J223J	CHIP R 22K J 1/16W	
R222			RK73HB1J220J	CHIP R 22 J 1/16W		R337,338			RK73HB1J473J	CHIP R 47K J 1/16W	
R223			RK73HB1J184J	CHIP R 180K J 1/16W		R339-341			RK73HB1J103J	CHIP R 10K J 1/16W	
R226			RK73HB1J272J	CHIP R 2.7K J 1/16W		R342			RK73HB1J223J	CHIP R 22K J 1/16W	
R227,228			RK73HB1J331J	CHIP R 330 J 1/16W		R343			RK73HB1J103J	CHIP R 10K J 1/16W	
R229			RK73HB1J472J	CHIP R 4.7K J 1/16W		R344,345			R92-1368-05	CHIP R 0 OHM	
R230			R92-1368-05	CHIP R 0 OHM		R346			RK73HB1J473J	CHIP R 47K J 1/16W	
R232			RK73HB1J561J	CHIP R 560 J 1/16W		R347			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R233			RK73HB1J221J	CHIP R 220 J 1/16W		R348			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R234-237			RK73HB1J823J	CHIP R 82K J 1/16W		R349,350			RK73HB1J473J	CHIP R 47K J 1/16W	
R238			R92-1368-05	CHIP R 0 OHM		R351			R92-1368-05	CHIP R 0 OHM	
R240,241			RK73HB1J105J	CHIP R 1.0M J 1/16W		R352,353			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R242			RK73HB1J471J	CHIP R 470 J 1/16W		R354,355			R92-1368-05	CHIP R 0 OHM	
R243			RK73HB1J221J	CHIP R 220 J 1/16W		R356			RK73HB1J473J	CHIP R 47K J 1/16W	
R244			RK73HB1J102J	CHIP R 1.0K J 1/16W		R357			RK73HB1J471J	CHIP R 470 J 1/16W	
R245			RK73HB1J104J	CHIP R 100K J 1/16W		R358			R92-1368-05	CHIP R 0 OHM	
R246			RK73HB1J184J	CHIP R 180K J 1/16W		R359			RK73HB1J153J	CHIP R 15K J 1/16W	
R247			RK73HB1J104J	CHIP R 100K J 1/16W		R360			RK73HB1J182J	CHIP R 1.8K J 1/16W	
R248,249			RK73HB1J105J	CHIP R 1.0M J 1/16W		R361			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R250			RK73HB1J102J	CHIP R 1.0K J 1/16W		R362			RK73HB1J473J	CHIP R 47K J 1/16W	
R252			RK73HB1J470J	CHIP R 47 J 1/16W		R363			RK73HB1J124J	CHIP R 120K J 1/16W	
R253			R92-1252-05	CHIP R 0 OHM J 1/16W		R364			RK73HB1J104J	CHIP R 100K J 1/16W	
R254			R92-1368-05	CHIP R 0 OHM		R365			RK73HB1J473J	CHIP R 47K J 1/16W	
R255			RK73HB1J272D	CHIP R 2.7K D 1/16W		R366			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R256			RK73HB1J473J	CHIP R 47K J 1/16W		R367			RK73HB1J103J	CHIP R 10K J 1/16W	
R259			RK73HB1J684J	CHIP R 680K J 1/16W		R368			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R260			RK73HB1J184J	CHIP R 180K J 1/16W		R369			RK73HB1J563J	CHIP R 56K J 1/16W	
R264			RK73HB1J181J	CHIP R 180 J 1/16W		R370			RK73HB1J104J	CHIP R 100K J 1/16W	
R265			RK73HB1J684J	CHIP R 680K J 1/16W		R371			RK73HB1J272J	CHIP R 2.7K J 1/16W	
R266			RK73HB1J272J	CHIP R 2.7K J 1/16W		R372			R92-1368-05	CHIP R 0 OHM	
R267			RK73HB1J334J	CHIP R 330K J 1/16W		R373			RK73HB1J124J	CHIP R 120K J 1/16W	
R268			RK73HB1J221J	CHIP R 220 J 1/16W		R374			RK73HB1J104J	CHIP R 100K J 1/16W	
R269,270			R92-0670-05	CHIP R 0 OHM		R376			RK73HB1J103J	CHIP R 10K J 1/16W	
R272-276			R92-1368-05	CHIP R 0 OHM		R377			RK73HB1J104J	CHIP R 100K J 1/16W	
R300,301			RK73HB1J104J	CHIP R 100K J 1/16W		R378			RK73HB1J101J	CHIP R 100 J 1/16W	
R302			RK73HB1J393J	CHIP R 39K J 1/16W		R379			RK73HB1J821J	CHIP R 820 J 1/16W	

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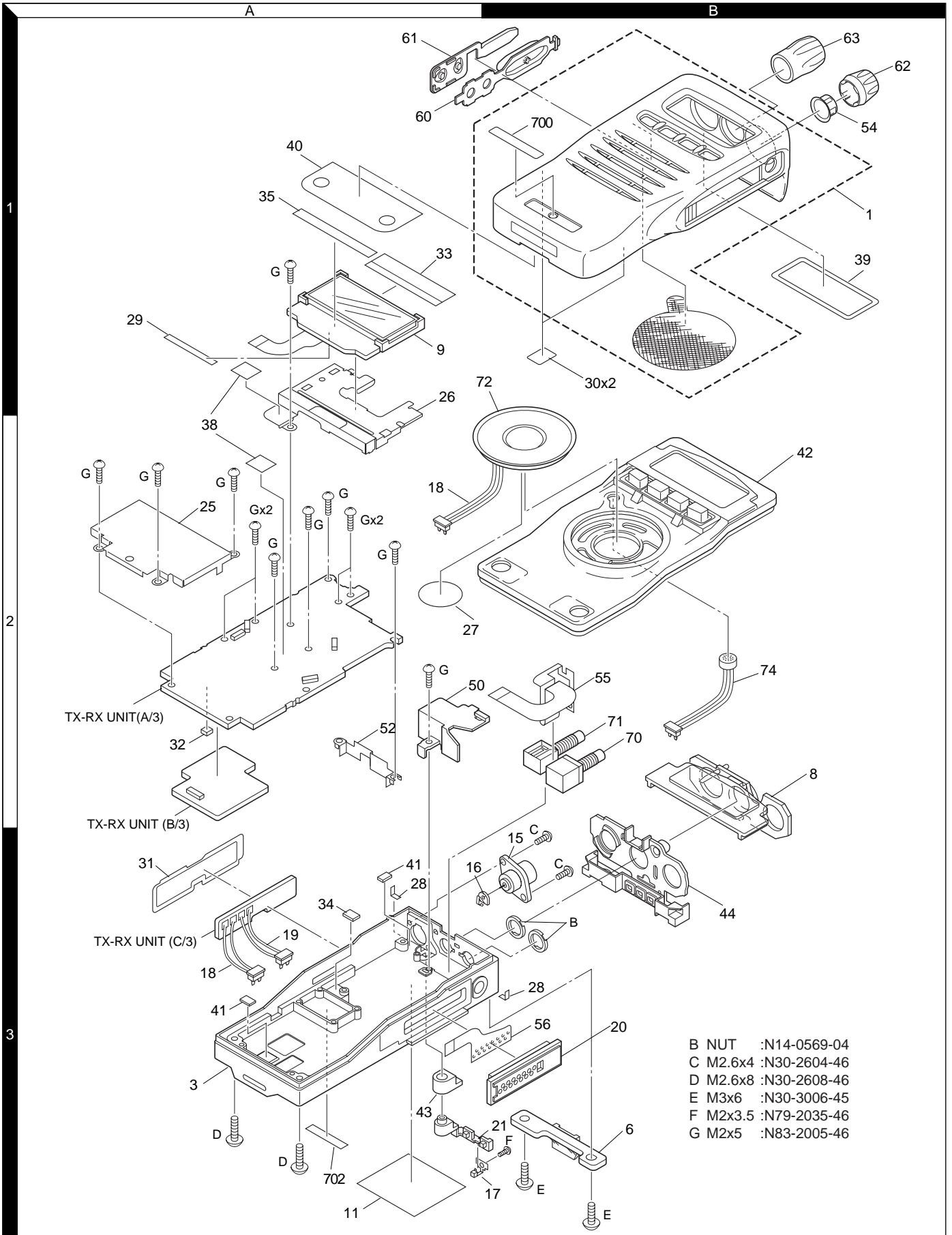
Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R380,381			RK73HB1J101J	CHIP R 100 J 1/16W		R603-611			RK73HB1J471J	CHIP R 470 J 1/16W	
R382			RK73HB1J103J	CHIP R 10K J 1/16W		R612,613			R92-1368-05	CHIP R 0 OHM	
R383			RK73HB1J101J	CHIP R 100 J 1/16W		R614,615			RK73HB1J473J	CHIP R 47K J 1/16W	
R384			RK73HB1J331J	CHIP R 330 J 1/16W		R617,618			RK73HB1J473J	CHIP R 47K J 1/16W	
R385			RK73HB1J470J	CHIP R 47 J 1/16W		R619			R92-1368-05	CHIP R 0 OHM	
R386			RK73HB1J331J	CHIP R 330 J 1/16W		R620			RK73HB1J473J	CHIP R 47K J 1/16W	
R388			RK73HB1J474J	CHIP R 470K J 1/16W		R621			R92-1368-05	CHIP R 0 OHM	
R389			RK73HB1J472J	CHIP R 4.7K J 1/16W		R623			R92-1368-05	CHIP R 0 OHM	
R390			RK73HB1J821J	CHIP R 820 J 1/16W		R720			RK73HB1J470J	CHIP R 47 J 1/16W	
R391,392			RK73HB1J331J	CHIP R 330 J 1/16W		R740			RK73HB1J473J	CHIP R 47K J 1/16W	
R397,398			R92-1368-05	CHIP R 0 OHM		R801			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R400			RK73HB1J103J	CHIP R 10K J 1/16W		R806			RK73HB1J124J	CHIP R 120K J 1/16W	
R401,402			RK73HB1J474D	CHIP R 470K D 1/16W		R807			RK73HB1J100J	CHIP R 10 J 1/16W	
R403			RK73HB1J334J	CHIP R 330K J 1/16W		R809			R92-1368-05	CHIP R 0 OHM	
R404			RK73HB1J105J	CHIP R 1.0M J 1/16W		R811			R92-1368-05	CHIP R 0 OHM	
R405			R92-1252-05	CHIP R 0 OHM J 1/16W		R812			RK73HB1J391J	CHIP R 390 J 1/16W	
R406			RK73HB1J103J	CHIP R 10K J 1/16W		R813,814			RK73HB1J151J	CHIP R 150 J 1/16W	
R407			RK73HB1J224J	CHIP R 220K J 1/16W		R815			RK73HB1J103J	CHIP R 10K J 1/16W	
R408			RK73HB1J102J	CHIP R 1.0K J 1/16W		R817			RK73HB1J101J	CHIP R 100 J 1/16W	
R410,411			R92-1368-05	CHIP R 0 OHM		R818			RK73HB1J683J	CHIP R 68K J 1/16W	
R413			RK73HB1J105J	CHIP R 1.0M J 1/16W		R819			RK73HB1J473J	CHIP R 47K J 1/16W	
R414			RK73HB1J103J	CHIP R 10K J 1/16W		R820			R92-1368-05	CHIP R 0 OHM	
R500			RK73HB1J105D	CHIP R 1M D 1/16W		R824,825			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R501			RK73HB1J333J	CHIP R 33K J 1/16W		R826,827			R92-1368-05	CHIP R 0 OHM	
R502			RK73HB1J334J	CHIP R 330K J 1/16W		R901			RK73HB1J103J	CHIP R 10K J 1/16W	
R503			RK73HB1J154J	CHIP R 150K J 1/16W		R902,903			RK73HB1J473J	CHIP R 47K J 1/16W	
R504			RK73HB1J184J	CHIP R 180K J 1/16W		R906-908			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R505			R92-1368-05	CHIP R 0 OHM		R909			R92-1368-05	CHIP R 0 OHM	
R506			RK73HB1J105D	CHIP R 1M D 1/16W		R910,911			RK73HB1J103J	CHIP R 10K J 1/16W	
R507			RK73HB1J124J	CHIP R 120K J 1/16W		R912			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R508			RK73HB1J224J	CHIP R 220K J 1/16W		R913			RK73HB1J103J	CHIP R 10K J 1/16W	
R509			R92-1368-05	CHIP R 0 OHM		R914			RK73HB1J393J	CHIP R 39K J 1/16W	
R510			RK73HB1J105D	CHIP R 1M D 1/16W		R915			R92-1368-05	CHIP R 0 OHM	
R511			RK73HB1J153J	CHIP R 15K J 1/16W		R916			RK73HB1J184J	CHIP R 180K J 1/16W	
R512			RK73HB1J124J	CHIP R 120K J 1/16W		R917			R92-1368-05	CHIP R 0 OHM	
R513			RK73HB1J153J	CHIP R 15K J 1/16W		R918-920			RK73HB1J103J	CHIP R 10K J 1/16W	
R514			R92-1368-05	CHIP R 0 OHM		R921			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R515,516			RK73HB1J124J	CHIP R 120K J 1/16W		S600-602			S70-0457-05	TACT SWITCH(PTT,SW1,SW2)	
R517			RK73HB1J273J	CHIP R 27K J 1/16W		D1			HVC376B	VARIABLE CAPACITANCE DIODE	
R518		*	RK73HB1J114J	CHIP R 110K J 1/16W		D2			HVC375B	VARIABLE CAPACITANCE DIODE	
R519			RK73HB1J472J	CHIP R 4.7K J 1/16W		D3			HVC376B	VARIABLE CAPACITANCE DIODE	
R520,521			RK73HB1J394J	CHIP R 39K J 1/16W		D4			HVC375B	VARIABLE CAPACITANCE DIODE	
R522			RK73HB1J473J	CHIP R 47K J 1/16W		D5			1SV278	VARIABLE CAPACITANCE DIODE	
R523			RK73HB1J684J	CHIP R 680K J 1/16W		D6			MA2S111	DIODE	
R524			RK73HB1J154J	CHIP R 150K J 1/16W		D7,8			HVC376B	VARIABLE CAPACITANCE DIODE	
R527			RK73HB1J474J	CHIP R 470K J 1/16W		D9,10			HVC375B	VARIABLE CAPACITANCE DIODE	
R528-534			RK73HB1J472J	CHIP R 4.7K J 1/16W		D100,101			HSC277	DIODE	
R535			RK73HB1J105D	CHIP R 1M D 1/16W		D102-105			HVC131	DIODE	
R536			RK73HB1J104J	CHIP R 100K J 1/16W		D106			HZU5CLL	ZENER DIODE	
R537			RK73HB1J103J	CHIP R 10K J 1/16W		D200			HVC131	DIODE	
R538			RK73HB1J272J	CHIP R 2.7K J 1/16W		D201			RB706F-40	DIODE	
R539			RK73HB1J102J	CHIP R 1.0K J 1/16W		D202,203			DAN235E	DIODE	
R540			R92-1368-05	CHIP R 0 OHM		D205-208			1SV305	VARIABLE CAPACITANCE DIODE	
R541		*	RK73HB1J114J	CHIP R 110K J 1/16W		D209			MA2S111	DIODE	
R542			RK73HB1J123J	CHIP R 12K J 1/16W		D300			RB706F-40	DIODE	
R543,544			RK73HB1J472J	CHIP R 4.7K J 1/16W		D301			1SS373	DIODE	
R545-547			R92-1368-05	CHIP R 0 OHM		D302			DA221	DIODE	
R548			RK73HB1J184J	CHIP R 180K J 1/16W		D303,304			015A26.8	ZENER DIODE	
R549			RK73HB1J472J	CHIP R 4.7K J 1/16W							
R550			RK73HB1J153J	CHIP R 15K J 1/16W							

PARTS LIST

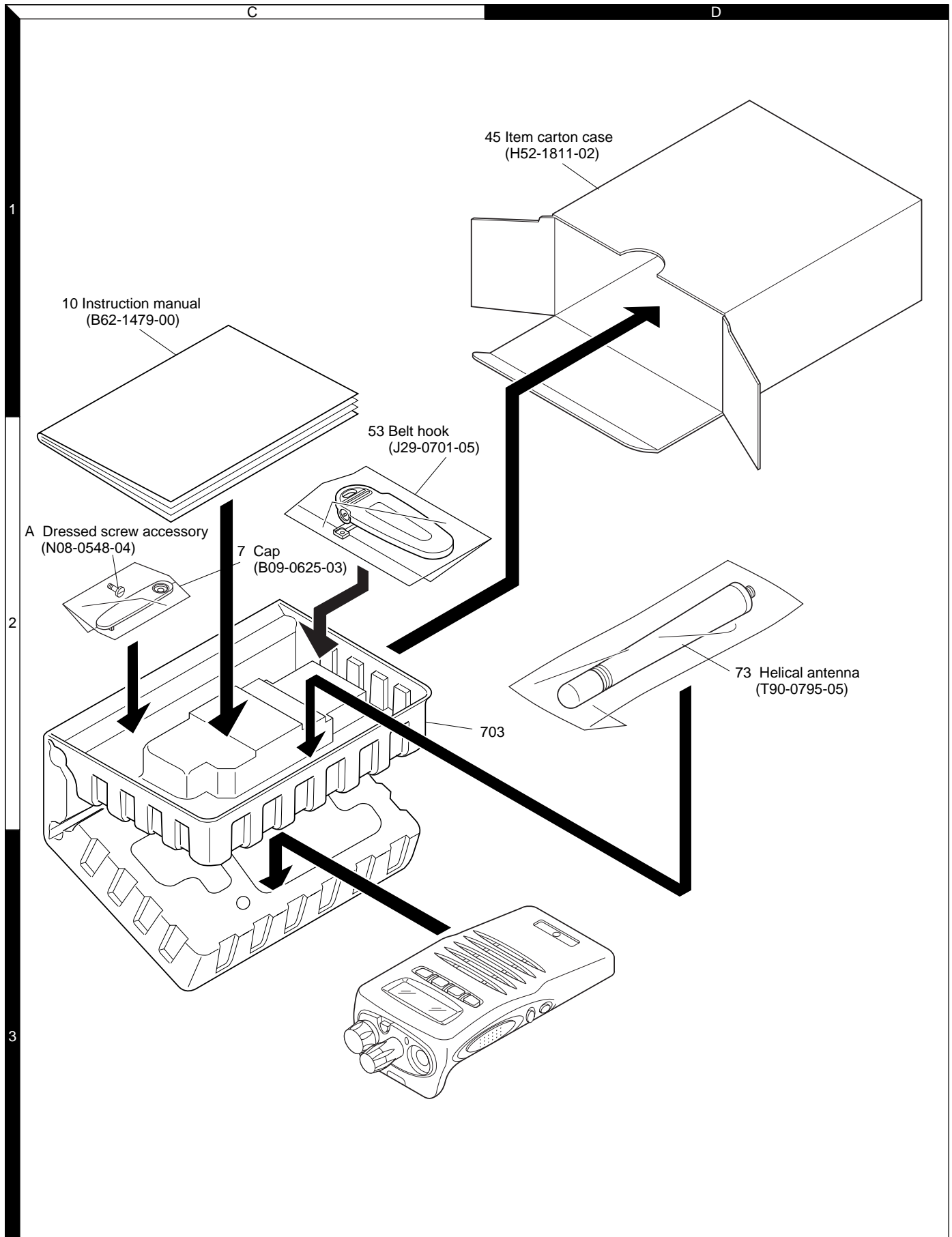
TX-RX UNIT (X57-6402-71)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
D305			015AZ2.4-X	ZENER DIODE		Q305			UPA672T	FET	
D306			DA221	DIODE		Q306			2SC4617(S)	TRANSISTOR	
D307			015AZ6.8	ZENER DIODE		Q307			UPA672T	FET	
D308			NNCD6.8G	ZENER DIODE		Q308			2SK1824	FET	
D402			1SR154-400	DIODE		Q309,310			2SC4617(S)	TRANSISTOR	
D403			MA2S111	DIODE		Q311			2SA1362(Y)	TRANSISTOR	
D405			RB521S-30	DIODE		Q400			2SJ347	FET	
D500,501			HSM88AS	DIODE		Q401			2SK1830	FET	
D801			MA2S111	DIODE		Q403			DTC144EE	DIGITAL TRANSISTOR	
D804			HVC376B	VARIABLE CAPACITANCE DIODE		Q404			2SJ347	FET	
D805			HVC375B	VARIABLE CAPACITANCE DIODE		Q405			KTA2015(Y)	TRANSISTOR	
D901			MA2S111	DIODE		Q406			2SJ347	FET	
D902,903			DAN235E	DIODE		Q500,501			2SJ243	FET	
IC100			TA75W01FU	MOS IC		Q502			2SC4116(Y)	TRANSISTOR	
IC200			TA31136FN	MOS IC		Q503			RN47A4	TRANSISTOR	
IC201			TC75W51FU	MOS IC		Q504			2SA1586(Y,GR)	TRANSISTOR	
IC302-304			TC75W51FU	MOS IC		Q505			DTA114EE	DIGITAL TRANSISTOR	
IC305		*	TC75W51FK	MOS IC		Q506			2SK1824	FET	
IC306			TC75W51FU	MOS IC		Q507			2SJ243	FET	
IC307			M62364FP	MOS IC		Q803			2SC5010-T1	TRANSISTOR	
IC308			AT29C020-90TI	ROM IC		Q903			DTC144EE	DIGITAL TRANSISTOR	
IC308			W29C020C90	SRAM IC		TH1			ERTJ0EV104H	THERMISTOR	
IC309		*	30620M8A-2W6GP	MPU		TH200			ERTJ0EV104H	THERMISTOR	
IC310			AT2416N10SI2.5	ROM IC		TH300			TN10-3S154JT	THERMISTOR	
IC311,312			BU4094BCFV	MOS IC							
IC313			TDA7053AT	BI-POLAR IC							
IC400			XC61CN4202NR	MOS IC							
IC401		*	XC6204B502MR	MOS IC							
IC402			XC62GR5012PR	MOS IC							
IC403		*	XC6204B502MR	MOS IC							
IC404			XC61CN5002NR	MOS IC							
IC500			LC73872M	MOS IC							
IC501		*	AK2346	MOS IC							
IC502			TC75S51F	MOS IC							
IC801			LMX1511TMX	MOS IC							
IC901		*	TC75S51FE	MOS IC							
Q2,3			2SK508NV(K52)	FET							
Q4			2SJ347	FET							
Q5			2SC5108(Y)	TRANSISTOR							
Q6			RN47A4	TRANSISTOR							
Q7			2SC4617(S)	TRANSISTOR							
Q8			2SC5108(Y)	TRANSISTOR							
Q100			2SC5108(Y)	TRANSISTOR							
Q101			2SC5192	TRANSISTOR							
Q103			2SK2596	FET							
Q104,105			DTC114EE	DIGITAL TRANSISTOR							
Q106			2SK2595	FET							
Q107			2SK1824	FET							
Q108			DTA144EE	DIGITAL TRANSISTOR							
Q201			DTC144EE	DIGITAL TRANSISTOR							
Q203			2SK1824	FET							
Q204			2SK1830	FET							
Q205			2SC5108(Y)	TRANSISTOR							
Q206,207			3SK318	FET							
Q208			2SC4617(S)	TRANSISTOR							
Q300			2SC4649(N,P)	TRANSISTOR							
Q301			2SJ347	FET							
Q302			2SC4617(S)	TRANSISTOR							
Q303			2SB1132(Q,R)	TRANSISTOR							
Q304			2SC4617(S)	TRANSISTOR							

EXPLODED VIEW



PACKING



ADJUSTMENT

Test Equipment Required for Alignment

Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range Modulation Output	136 to 174MHz Frequency modulation and external modulation. -127dBm/0.1μV to greater than -47dBm/1mV
2. Power Meter	Input Impedance Operation Frequency Measurement Range	50Ω. 136 to 174MHz or more. Vicinity of 10W
3. Deviation Meter	Frequency Range	136 to 174MHz.
4. Digital Volt Meter (DVM)	Measuring Range Input Impedance	10mV to 10V DC High input impedance for minimum circuit loading.
5. Oscilloscope		DC through 30MHz.
6. High Sensitivity Frequency Counter	Frequency Range Frequency Stability	10Hz to 1000MHz. 0.2ppm or less.
7. Ammeter		5A.
8. AF Volt Meter (AF VTVM)	Frequency Range Voltage Range	50Hz to 10kHz. 1mV to 10V.
9. Audio Generator (AG)	Frequency Range Output	50Hz to 5kHz or more. 0 to 1V.
10. Distortion Meter	Capability Input Level	3% or less at 1kHz. 50mV to 10Vrms.
11. 16Ω Dummy Load		Approx. 16Ω, 3W.
12. Regulated Power Supply		5V to 10V, approx. 5A Useful if ammeter equipped.

■ The following parts are required for adjustment

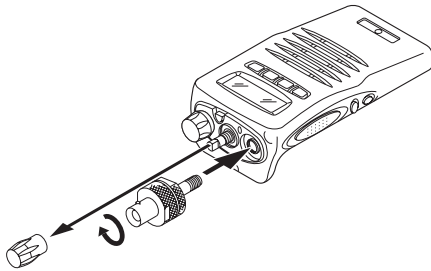
1. Antenna connector adapter

The antenna connector of this radio uses an SMA terminal.

Use an antenna connector adapter [SMA(f) – BNC(f)] for adjustment. (The adapter is not provided as an option, so buy a commercially-available one.)

Note

When the antenna connector adapter touches the knob, draw out the knob to mount the connector.



2. Universal connector

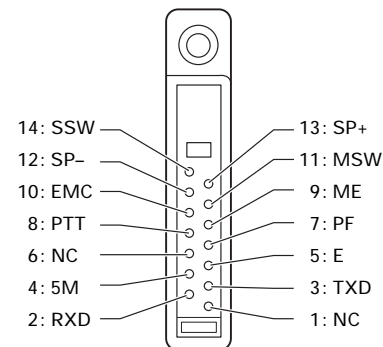
Use the interface cable (KPG-36) for PC tuning or the lead wire with plug (E30-3287-18) and screw (N08-0535-08) for panel tuning. Connect the plug to the universal connector of the radio and tighten the screw.

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

Caution

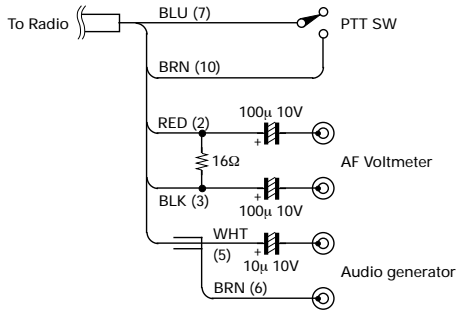
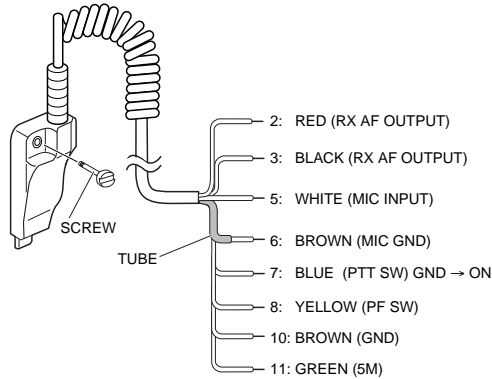
1. When connecting the plug to the universal connector of the radio, a short circuit may occur. To prevent this, be sure to turn the radio POWER switch off.
2. Since the RX AF output is a BTL output, there is a DC component. Isolate this with a capacitor or transformer as shown in the figure.
3. Do not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

• Universal connector



ADJUSTMENT

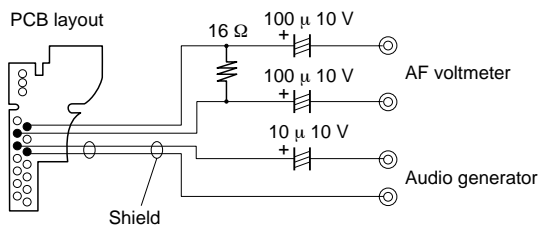
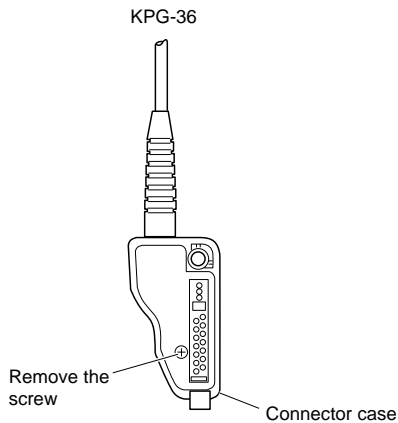
• Panel tuning



• PC tuning

Connect the wires to the PCB in the connector case of interface cable.

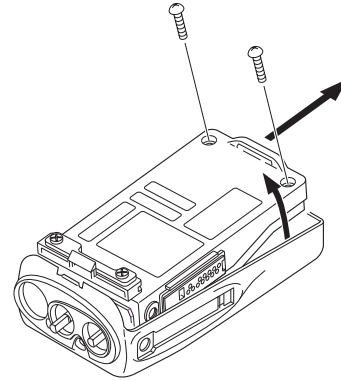
For output the wires out of the connector case, need to process the connector case.



■ Removing the front panel

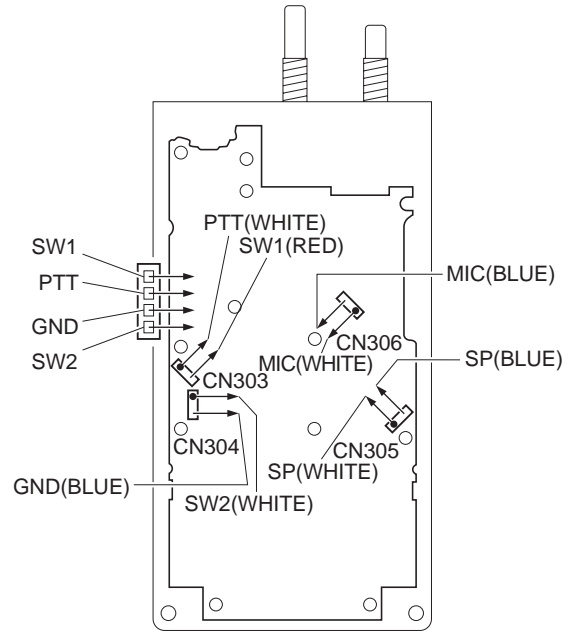
After removing the battery pack, knobs, and antenna, remove the 2 screws from the back of the transceiver.

Lift the chassis away from the bottom part gently, then pull out the chassis as shown below.



■ Connecting the PTT, MIC, SP, and SW2 cables

When connecting the PTT, MIC, SP and SW2 2-wire cables, ensure that the color of each cable mates as shown in the following diagram.



■ How to assemble the antenna connector and its terminal.

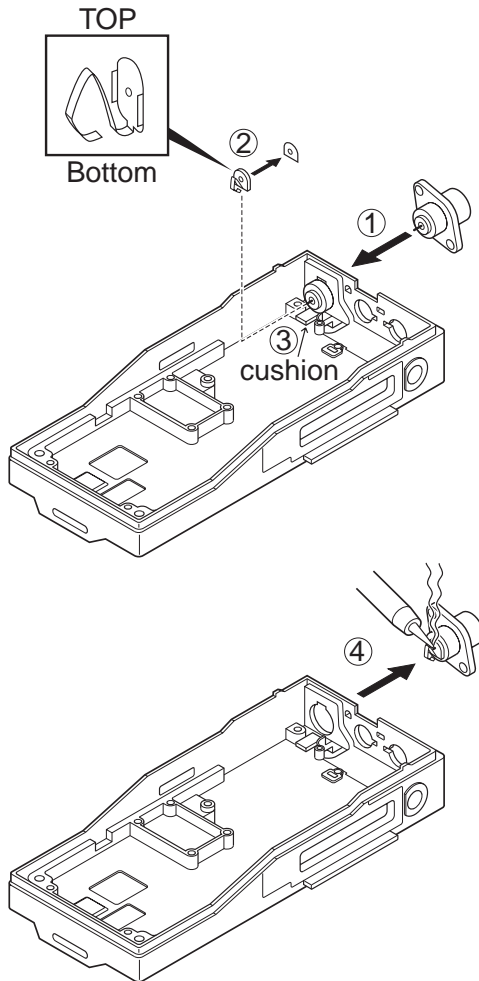
The antenna connector and its terminal are supplied as separate parts.

When replacing the antenna connector and/or terminal, assemble the parts prior to the replacement.

1. Mount the antenna connector onto the chassis ①.
- Double-sided adhesive tape is attached to the terminal; peel off the tape cover ②.

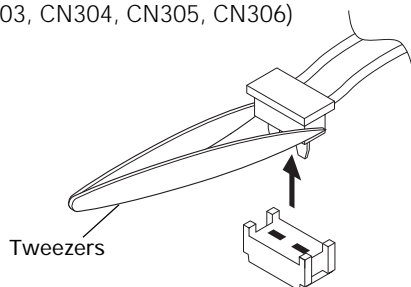
ADJUSTMENT

- Attach the terminal to the antenna connector as shown below.
 - Slide the antenna terminal along the adhesive cushion on the chassis so that the adhesive part on the terminal is firmly attached to the antenna connector ③.
2. Remove the antenna connector from the chassis with its terminal attached, then solder the center part of antenna connector to its terminal ④.
Do not use excessive solder on terminal.

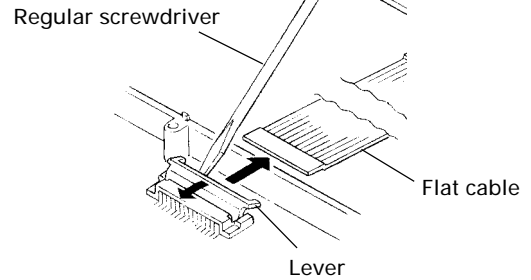


How to Remove the Cable

1. Gently draw out both sides of the connector lever uniformly in the direction of the arrow with tweezers.
(CN303, CN304, CN305, CN306)



2. Gently rise up the connector lever in the direction of the arrow with a fine regular screwdriver or tweezers.
(CN301, CN302, CN400)

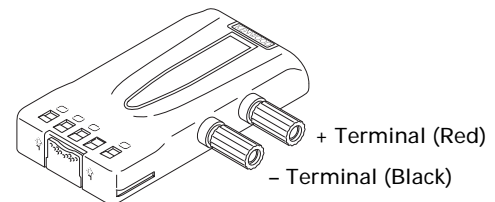


Repair Jig (Chassis)

Use jig (part No.: A10-4060-14) for repairing the TK-2140. Place to TX-RX unit on the jig and fit it with screws.

The jig facilitates the voltage check and protects the final amplifier FET when the voltage on the flow side of the TX-RX unit is checked during repairs.

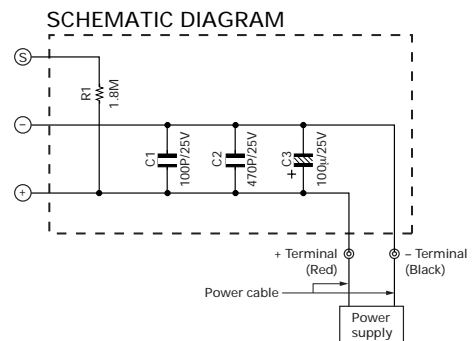
Battery Jig (W05-0909-00)



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

When using the battery jig in user mode, the transceiver assumes that a lithium-ion battery pack is attached to the transceiver. In adjustment mode, battery type detection is not performed. Refer to page 21 for details.

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



ADJUSTMENT

Test Mode

■ Test mode operating features



This transceiver has a test mode. **To enter test mode, press [A] key and turn power on. Hold [A] key until test channel No. and test signalling No. appears on LCD.** Test mode can be inhibited by programming. To exit test mode, switch the power on again. The following functions are available in test mode.

• Controls

Controls	"SFT" appears	"SFT" not appears
[PTT]	Used when making a transmission.	Used when making a transmission.
[AUX]	Unused	Unused
[Side 1]	Shift OFF.	Monitor ON and OFF.
[Side 2]	Lights the lamp for five seconds. Lighting is extended for a further five seconds by pressing any key while the lamp is lit.	Changes wide, semi-wide and narrow.
[S]	FFSK 1200bps and 2400bps.	Sets to the Tuning mode.
[A]	Shift OFF	Shift ON.
[B]	Compander function ON and OFF.	RF power HIGH and LOW.
[C]	Beat shift ON and OFF.	Changes signalling.
[ENCODER]	Changes channel.	Changes channel.

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

• LCD indicator

"SCN"	Unused
" 	Lights at Compander ON.
"LO"	Lights at RF Power Low. Blink at the low battery voltage warning.
"P"	Unused
"MON"	Lights at monitor ON.
"SVC"	Lights at beat shift ON.
" 	Lights at FFSK 2400bps.

• LED indicator

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

• Sub LCD indicator

"SFT"	Appears at Shift ON.
-------	----------------------

■ Frequency and signalling

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

Frequency (MHz)

Channel No.	E type	
	RX (MHz)	TX (MHz)
1	155.05000	155.10000
2	136.05000	136.10000
3	173.95000	173.90000
4	155.00000	155.00000
5	155.20000	155.20000
6	155.40000	155.40000
7	177.95000	177.90000
8 ~ 16	—	—

Note

You must adjust the frequencies in all channels as shown above, even though the channel frequencies in the 7 row are below the specifications of the TK-2140.

Signalling

Signalling No.	RX	TX
1	None	None
2	None	100Hz Square
3	QT 67.0Hz	QT 67.0Hz
4	QT 151.4Hz	QT 151.4Hz
5	QT 210.7Hz	QT 210.7Hz
6	QT 250.3Hz	QT 250.3Hz
7	DQT 023N	DQT 023N
8	DQT 754I	DQT 754I
9	DTMF DEC.(159D)	DTMF ENC.(159D)
10	None	DTMF tone #
11	2Tone (321.7/928.1Hz)	None
12	Single Tone 1200Hz	Single Tone 1200Hz
13	5Tone DEC.(EIA #12345)	5Tone ENC.(EIA #12345)
14	—	FFSK(1:1 Pattern)
15	FFSK Code	FFSK Code
16	FFSK Error Bit Check	—

Note

Signalling No.16 (FFSK Error Bit Check) appears only in Panel Test mode.

• Preparations for tuning the transceiver

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

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

The speaker output connector must be terminated with a 16Ω dummy load and connected to an AC voltmeter and an audio distortion meter or a SINAD measurement meter at all times during tuning.

• Transceiver tuning

(To place transceiver in tuning mode)

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

ADJUSTMENT

LCD display (Test mode)

n _ _ _ 1 _ - _ _ _ 1

n: Narrow
s: Wide 4k
w: Wide 5k

channel No. Signalling No.

Press [S], now in tuning mode. Use [◀ B] button to write tuning data through tuning modes, and channel selector knob to adjust tuning requirements (1 to 256 appears on LCD).

Use [C ▶] button to select the adjustment item through tuning modes. Use [A] button to adjust 3 or 5 point tuning, and use [Side 2] button to switch between Wide 5k/Wide 4k/Narrow.

LCD display (Tuning mode)

FREQ _ _ _ _ 1

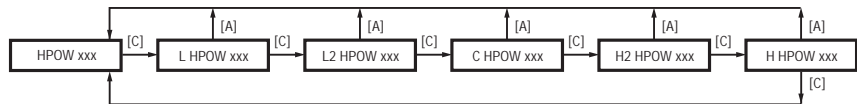
Adjustment item Adjustment (1~256)

Panel Tuning Mode

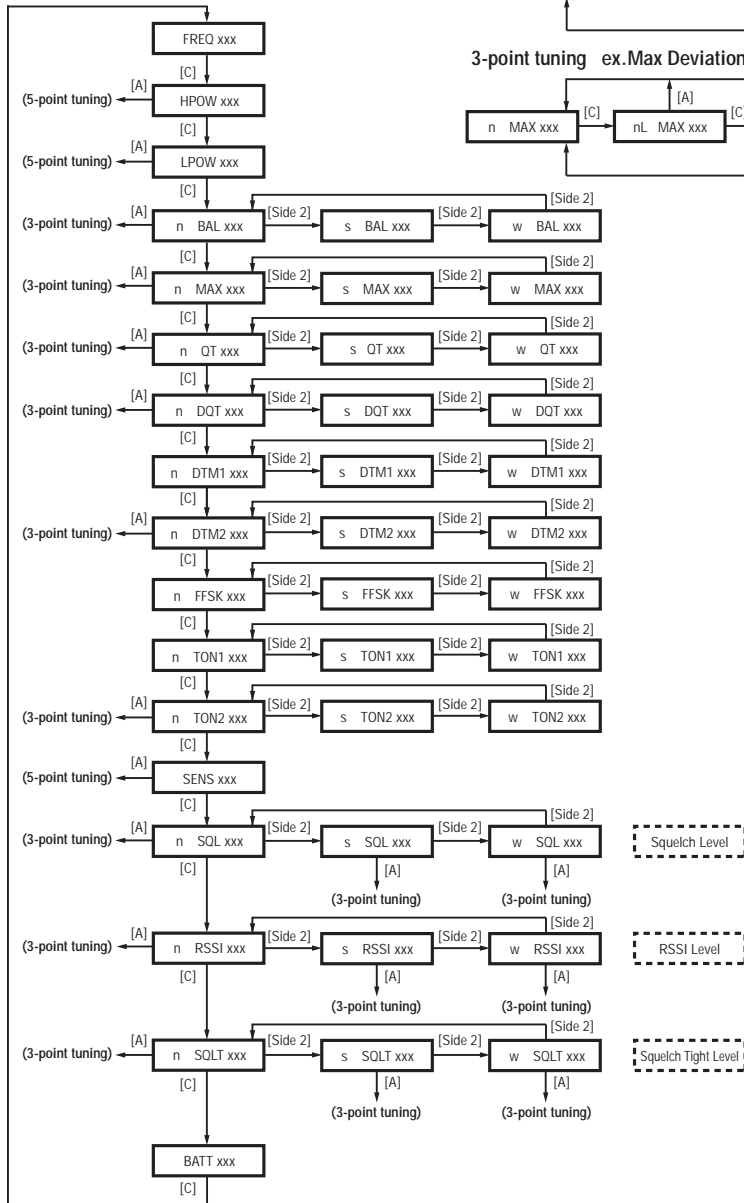
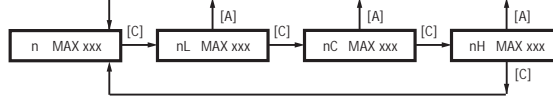
TEST Ch	E type	
	RX frequency (MHz)	TX frequency (MHz)
L	136.05000	136.10000
L2	145.55000	145.60000
C	155.05000	155.10000
H2	164.55000	164.60000
H	173.95000	173.90000

■ Tuning mode

5-point tuning ex. RF Power High



3-point tuning ex. Max Deviation (Narrow)



ADJUSTMENT

Common Section


Item	Condition	Measurement			Adjustment			Specifications/ Remark
		Test equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) BATT terminal voltage:7.5V 2) SSG Standard modulation [Wide 5k] MOD:1kHz, DEV:3kHz [Wide 4k] MOD:1kHz, DEV:2.4kHz [Narrow] MOD:1kHz, DEV:1.5kHz							
2. VCO lock voltage RX TX	[Panel Test Mode] 1) CH-Sig:7-1	Power meter DVM	Panel TX-RX	ANT CV	TX-RX	TC2	4.15V	±0.1V
	2) CH-Sig:2-1						Check	0.6V or more
	3) CH-Sig:7-1 PTT:ON	TC1	4.15V	±0.1V				
	4) CH-Sig:2-1 PTT:ON		Check	0.6V or more				

Transmitter Section [Panel Tuning Mode except when Panel TEST Mode is specified.]

Item	Condition	Measurement			Adjustment			Specifications/ Remark
		Test equipment	Unit	Terminal	Unit	Parts	Method	
1. Frequency Adjust	1) Adj item [FREQ] Adjust [***] PTT:ON	Power meter Am meter	Panel	ANT	Panel	Encoder knob	Center frequency ±100Hz	
							(Note:.) After replacing the TCXO (X1), align using KPG-74D (M2).	
2. Hight Power Adjust	1) Adj item [HPOW] Adjust [***] 2) Adj item [L HPOW] → [L2 HPOW] → [C HPOW] → [H2 HPOW] → [H HPOW] Adjust [***] PTT:ON					Encoder knob	4.8W	±0.1W 2.2A or less
3. Hight Power Check	[Panel Test Mode] 1) CH-Sig:1-1 PTT:ON						Check	4.6~5.0W 2.3A or less
	2) CH-Sig:2-1 PTT:ON							
	3) CH-Sig:3-1 PTT:ON							
4. Low Power Adjust	1) Adj item [LPOW] Adjust [***] 2) Adj item [L LPOW] → [L2 LPOW] → [C LPOW] → [H2 LPOW] → [H LPOW] Adjust [***] PTT:ON					Encoder knob	1.0W	±0.1W 1.0A or less
5. Low Power Check	[Panel Test Mode] 1) CH-Sig:1-1 Set low power (Push [B]) PTT:ON						Check	0.5~1.5W 1.2A or less
	2) CH-Sig:2-1 PTT:ON							
	3) CH-Sig:3-1 PTT:ON							

ADJUSTMENT

Transmitter Section [Panel Tuning Mode except when Panel TEST Mode is specified.]

Item	Condition	Measurement			Adjustment			Specifications/ Remark
		Test equipment	Unit	Terminal	Unit	Parts	Method	
6. DQT Balance Adjust [Narrow]	1) Adj item [n BAL] Adjust [***] LPF:3kHz HPF:OFF	Power meter Dev meter Oscilloscope AG AF VTVM	Panel	ANT universal connector	Panel	Encoder knob	Make the demodulation waves into square waves.	
	2) Adj item [nL BAL] → [nC BAL] → [nH BAL] Adjust [***] PTT:ON							
	[Wide 4k] 3) Adj item [s BAL] Adjust [***] PTT:ON							
[Wide 5k]	4) Adj item [w BAL] Adjust [***] PTT:ON							
7. Max DEV Adjust [Narrow]	1) Adj item [n MAX] Adjust [***] AG:1kHz / 100mV Dev meter filter LPF:15kHz HPF:OFF						2.10kHz (According to the larger +,-)	±50Hz
	2) Adj item [nL MAX] → [nC MAX] → [nH MAX] Adjust [***] PTT:ON							
	[Wide 4k] 3) Adj item [s MAX] Adjust [***] PTT:ON							
[Wide 5k]	4) Adj item [w MAX] Adjust [***] PTT:ON						3.45kHz (According to the larger +,-)	±50Hz
							4.30kHz (According to the larger +,-)	±50Hz
8. MIC Sensitivity Check	[Panel Test Mode] 1) CH-Sig:1-1 AG:1kHz / 8mV LPF:15kHz PTT:ON						Check	1.0-2.2kHz (Narrow) 1.8-3.0kHz (Wide 4k) 2.4-3.6kHz (Wide 5k)
9. QT Deviation Adjust [Narrow]	1) Adj item [n QT] Adjust [***] LPF:3kHz HPF:OFF		Panel	ANT universal connector	Panel	Encoder knob	0.35kHz	±50Hz
	2) Adj item [nL QT] → [nC QT] → [nH QT] Adjust [***] PTT:ON							
	[Wide 4k] 3) Adj item [s QT] Adjust [***] PTT:ON							
[Wide 5k]	4) Adj item [w QT] Adjust [***] PTT:ON						0.60kHz	±50Hz
							0.75kHz	±50Hz

ADJUSTMENT

Transmitter Section [Panel Tuning Mode except when Panel TEST Mode is specified.]

Item	Condition	Measurement			Adjustment			Specifications/ Remark		
		Test equipment	Unit	Terminal	Unit	Parts	Method			
10.DQT Deviation Adjust [Narrow] [Wide 4k] [Wide 5k]	1) Adj item [n DQT] Adjust [***] LPF:3kHz HPF:OFF	Power meter Dev meter Oscilloscope AG AF VTVM	Panel	ANT universal connector	Panel	Encoder knob	0.35kHz	±50kHz		
	2) Adj item [nL DQT] → [nC DQT] → [nH DQT] Adjust [***] PTT:ON									
	3) Adj item [s DQT] Adjust [***] PTT:ON								0.60kHz	±50kHz
	4) Adj item [w DQT] Adjust [***] PTT:ON								0.75kHz	±50kHz
11.DTMF1 *1 Deviation Adjust [Narrow] (The AF output is automatically set to the minimum volume.) [Wide 4k] [Wide 5k]	1) Adj item [n DTM1] Remove the Panel tuning cable assembly from the universal connector Adjust [***] LPF:15kHz HPF:OFF PTT:ON			ANT			1.25kHz	±0.1kHz		
	2) Adj item [s DTM1] Adjust [***] PTT:ON						2.0kHz	±0.1kHz		
	3) Adj item [w DTM1] Adjust [***] PTT:ON						2.5kHz	±0.1kHz		
12.DTMF2 *1 Deviation Adjust [Narrow] (The AF output is automatically set to the maximum volume.) [Wide 4k] [Wide 5k]	1) Adj item [n DTM2] Adjust [***] LPF:15kHz HPF:OFF						1.25kHz	±0.1kHz		
	2) Adj item [nL DTM2] → [nC DTM2] → [nH DTM2] Adjust [***] PTT:ON									
	3) Adj item [s DTM2] Adjust [***] PTT:ON						2.0kHz	±0.1kHz		
	4) Adj item [w DTM2] Adjust [***] PTT:ON						2.5kHz	±0.1kHz		
13.FFSK Deviation Adjust [Narrow] [Wide 4k] [Wide 5k]	1) Adj item [n FFSK] Adjust [***] LPF:15kHz HPF:OFF PTT:ON						1.5kHz	±0.1kHz		
	2) Adj item [s FFSK] Adjust [***] PTT:ON						2.4kHz	±0.1kHz		
	3) Adj item [w FFSK] Adjust [***] PTT:ON						3.0kHz	±0.1kHz		

ADJUSTMENT

Transmitter Section [Panel Tuning Mode except when Panel TEST Mode is specified.]

Item	Condition	Measurement			Adjustment			Specifications/ Remark	
		Test equipment	Unit	Terminal	Unit	Parts	Method		
14.TONE1 *1 Deviation Adjust [Narrow] (The AF output is automatically set to the minimum volume.)	1) Adj item [n TON1] Adjust [***] LPF:15kHz HPF:OFF PTT:ON	Power meter Dev meter Oscilloscope AG AF VTVM	Panel	ANT universal connector	Panel	Encoder knob	1.25kHz	±0.1kHz	
	[Wide 4k]						2) Adj item [s TON1] Adjust [***] PTT:ON	2.0kHz	±0.1kHz
	[Wide 5k]						3) Adj item [w TON1] Adjust [***] PTT:ON	2.5kHz	±0.1kHz
15.TONE2 *1 Deviation Adjust [Narrow] (The AF output is automatically set to the maximum volume.)	1) Adj item [n TON2] Adjust [***] LPF:15kHz HPF:OFF 2) Adj item [nL TON2] → [nC TON2] → [nH TON2] Adjust [***] PTT:ON						1.25kHz	±0.1kHz	
	[Wide 4k]						3) Adj item [s TON2] Adjust [***] PTT:ON	2.0kHz	±0.1kHz
	[Wide 5k]						4) Adj item [w TON2] Adjust [***] PTT:ON	2.5kHz	±0.1kHz
16.BATT Detection Writing	1) Adj item [BATT] Adjust [***] PTT:ON Use the battery jig. (Refer to page 37)	Power meter DVM	Panel	ANT BATT terminal	Panel	Encoder knob	After pressing the PTT switch, confirm that one predetermined numeric in the range 1 to 256 appears and then press [B] key. That numeric will be stored in memory.	BATT terminal voltage:5.8V	
17.BATT Detection Check	[Panel Test Mode] 1) CH-Sig:1-1 BATT terminal voltage: 7.2V (Li-ion) PTT:ON						Check	The transceiver can transmit without causing the LED to blink.	
	2) BATT terminal voltage: 5.8V (Li-ion) PTT:ON							The transceiver should not transmit.	

*1: In order to compensate the side-tone feedback to the PLL circuit, the transceiver has deviation adjustment values for Minimum Volume and Maximum Volume in DTMF deviation/ Tone deviation adjustment mode.

ADJUSTMENT

Receiver Section [Panel Tuning Mode except when Panel TEST Mode is specified.]

Item	Condition	Measurement			Adjustment			Specifications/ Remark
		Test equipment	Unit	Terminal	Unit	Parts	Method	
1. Sensitivity Adjust	1) Adj item [SENS] Adjust [***] 2) Adj item [L SENS] → [L2 SENS] → [C SENS] → [H2 SENS] → [H SENS] Adjust [***] SSG OUT:-118dBm (0.28μV) (MOD:1kHz / ±1.5kHz)	S S G A F V T V M O s c i l l o s c o p e	Panel	A N T U n i v e r s a l C o n n e c t o r	Panel	Encoder knob	Adjust for 12dB SINAD.	Rotate the encoder knob and decrease the adjustment value starting from "256" to obtain SINAD 12dB.
2. Sensitivity Check	[Panel Test Mode] 1) CH-Sig:1-1 SSG OUT Wide 5k:-118dBm (0.28μV) (MOD:1kHz / ±3kHz) Narrow:-118dBm (0.28μV) (MOD:1kHz / ±1.5kHz)						Check	12dB SINAD or more
3. Squelch (Preset) Adjust [Narrow]	1) Adj item [n SQL] Adjust [***] SSG OUT:-117dBm (0.32μV)[nL SQL] only :-118dBm (0.28μV)[nC SQL],[nH SQL] (MOD: 1kHz / ±1.5kHz)					Encoder knob	Adjust to point of opening squelch.	
	2) Adj item [nL SQL] → [nC SQL] → [nH SQL] Adjust [***]							
[Wide 4k]	3) Adj item [s SQL] Adjust [***] SSG OUT:-117dBm (0.32μV)[sL SQL] only :-118dBm (0.28μV)[sC SQL],[sH SQL] (MOD: 1kHz / ±2.4kHz)							
	4) Adj item [sL SQL] → [sC SQL] → [sH SQL] Adjust [***]							
[Wide 5k]	5) Adj item [w SQL] Adjust [***] SSG OUT:-117dBm (0.32μV)[wL SQL] only :-118dBm (0.28μV)[wC SQL],[wH SQL] (MOD: 1kHz / ±3.0kHz)							
	6) Adj item [wL SQL] → [wC SQL] → [wH SQL] Adjust [***]							
4. RSSI Adjust [Narrow]	1) Adj item [n RSSI] Adjust [***] SSG OUT:-117dBm (0.32μV)[nL RSSI] only :-118dBm (0.28μV)[nC RSSI],[nH RSSI] (MOD:1kHz / ±1.5kHz)						After input signal from SSG,press [B] key. That numeric will be stored in memory.	
	2) Adj item [nL RSSI] → [nC RSSI] → [nH RSSI] Adjust [***]							
[Wide 4k]	3) Adj item [s RSSI] Adjust [***] SSG OUT:-117dBm (0.32μV)[sL RSSI] only :-118dBm (0.28μV)[sC RSSI],[sH RSSI] (MOD:1kHz / ±2.4kHz)							
	4) Adj item [sL RSSI] → [sC RSSI] → [sH RSSI] Adjust [***]							

ADJUSTMENT

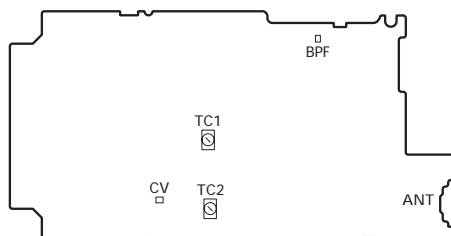
Receiver Section [Panel Tuning Mode except when Panel TEST Mode is specified.]

Item	Condition	Measurement			Adjustment			Specifications/ Remark
		Test equipment	Unit	Terminal	Unit	Parts	Method	
[Wide 5k]	5) Adj item [w RSSI] Adjust [***] SSG OUT:-117dBm (0.32μV) [wL RSSI] only :-118dBm (0.28μV)[wC RSSI],[wH RSSI] (MOD:1kHz / ±3.0kHz)	SSG AF VTVM Oscilloscope	Panel	ANT Universal Connector	Panel		After input signal from SSG,press [B] key. That numeric will be stored in memory.	
	6) Adj item [wL RSSI] → [wC RSSI] → [wH RSSI] Adjust [***]							
5. Squelch (Preset) Check	[Panel Test Mode] 1) CH-Sig:1-1 SSG OUT:-118dBm (0.28μV) (MOD: 1kHz / ±1.5kHz (Narrow) 1kHz / ±2.4kHz (Wide 4k) 1kHz / ±3.0kHz (Wide 5k)) 2) SSG OUT:OFF						Check	Squelch must be opened. Squelch must be closed.
6. Squelch (Tight) Adjust [Narrow]	1) Adj item [n SQLT] Adjust [***] SSG OUT:-113dBm (0.5μV) (MOD:1kHz / ±1.5kHz)					Encoder knob	Adjust to point of opening squelch.	
	2) Adj item [nL SQLT] → [nC SQLT] → [nH SQLT] Adjust [***]							
[Wide 4k]	3) Adj item [s SQLT] Adjust [***] SSG OUT:-113dBm (0.5μV) (MOD:1kHz / ±2.4kHz)							
	4) Adj item [sL SQLT] → [sC SQLT] → [sH SQLT] Adjust [***]							
[Wide 5k]	5) Adj item [w SQLT] Adjust [***] SSG OUT:-113dBm (0.5μV) (MOD:1kHz / ±3.0kHz)							
	6) Adj item [wL SQLT] → [wC SQLT] → [wH SQLT] Adjust [***]							
7. Squelch (Tight) Check	[Panel Test Mode] 1) CH-Sig:1-1 SSG OUT:-113dBm (0.5μV) (MOD: 1kHz / ±1.5kHz (Narrow) 1kHz / ±2.4kHz (Wide 4k) 1kHz / ±3.0kHz (Wide 5k)) 2) SSG OUT:OFF						Check	Squelch must be opened. Squelch must be closed.

Adjustment points

TX-RX unit (X57-6402-71) (A/3)

Foil side view



TERMINAL FUNCTION

CN No.	Pin No.	Name	I/O	Function
TX-RX UNIT (X57-6402-71): TX-RX section				
CN301	1	NC	-	Not used
	2	RXD	I	Serial data input
	3	TXD	O	Serial data output
	4	5M	O	5V output
	5	E	-	GND
	6	NC	-	Not used
	7	PF	I	Programmable function key input
	8	PTT	I	External PTT input
	9	ME	-	External microphone ground
	10	EMC	I	External microphone input
	11	MSW	I	EXT/INT MIC switch input
	12	SP-	O	BTL output + for external speaker
	13	SP+	O	BTL output - for external speaker
	14	SSW	I	EXT/INT speaker switch input
CN302	1	NC	-	Not used
	2	LEDK	I	Backlight LED control
	3	LEDA	O	Backlight LED control
	4	CKEY	I	C key input
	5	BKEY	I	B key input
	6	AKEY	I	A key input
	7	SKEY	I	S key input
	8	VEE	-	GND
	9	SDO	O	Serial data output for LCD
	10	SID	I	Serial data input for LCD
	11	SCLK	O	Clock data output for LCD
	12	CS	O	LCD chip select output
	13	VCC	-	5V
	14	GND	-	GND
CN303		PTT	I	PTT key input
		SW1	I	SIDE1 key input
CN304		SW2	I	SIDE2 key input
		GND	-	GND
CN305		SP+	O	BTL output + for internal speaker
		SP-	O	BTL output - for internal speaker
CN306		EMC+	O	Internal microphone input
		EMC-	-	Internal microphone ground

CN No.	Pin No.	Name	I/O	Function
CN400	1	S_DET	I	Battery detect input
	2	AUXKEY	I	AUX key input
	3	GND	-	GND
	4	5M	-	5V
	5	VOL	I	Volume level input for audio control
	6	EN1	I	Encoder pulse input
	7	EN2	I	Encoder pulse input
	8	GND	-	GND
	9	EN3	I	Encoder pulse input
	10	EN4	I	Encoder pulse input
	11	SB	I	Power input after passing through the fuse
	12	SB	I	Power input after passing through the fuse
	13	+B	O	Power output after power switch
	14	+B	O	Power output after power switch
CN300, 500	1	DTMSD	I	DTMF IC decoder data input
	2	DTMACK	O	DTMF IC decoder clock output
	3	GND	-	GND
	4	TEST	O	Modem IC test register switching output
	5	AFDAT	O	Modem IC MSK encoder data output
	6	AFRTM	I	Modem IC MSK decoder data input timing pulse input
	7	AFTRD	I	Modem IC MSK encoder data output timing pulse input
	8	EMTONE SW	O	EMERGENCY GROUND TONE control switch
	9	CLK	O	Modem IC serial clock output
	10	AFRDT	I/O	Modem IC serial data input/output
	11	NC	-	Not used
	12	MSK SW	-	Not used
	13	AFDIR	O	Modem IC serial data input/output control
	14	5CNS	O	5V (Non save)
	15	LIMIT SW	O	Audio modulation control switch
	16	SSW	O	EXT/INT speaker switch input
	17	BEEP	O	Beep output
	18	GND	-	GND
	19	5C	O	5V
	20	GND	-	GND
	21	MICI	I	MIC input
	22	PTT	O	PTT key input (Not used)
	23	ME	-	MIC ground
	24	ME	-	MIC ground
	25	TXHSD	O	HSD output (TX)
	26	GND	-	GND
	27	TXAF	O	Audio output (TX)
	28	RXAFI	O	Audio output (RX)
	29	5RC	-	5R control
	30	HSDIN	O	HSD output (RX)
	31	RXAFO	I	Audio input (RX)
	32	GND	-	GND
	33	DTMSTD	O	DTMF IC data strobe output
	34	DTMPD	O	DTMF IC power down switch

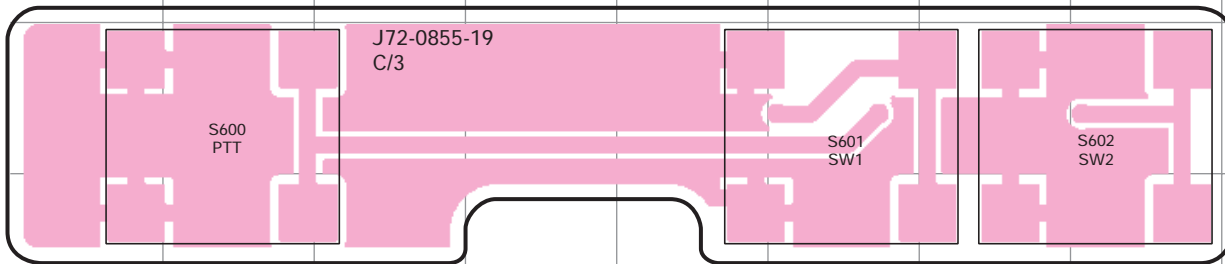
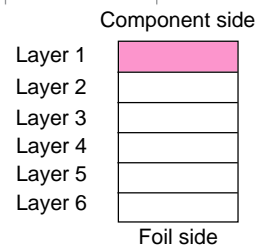
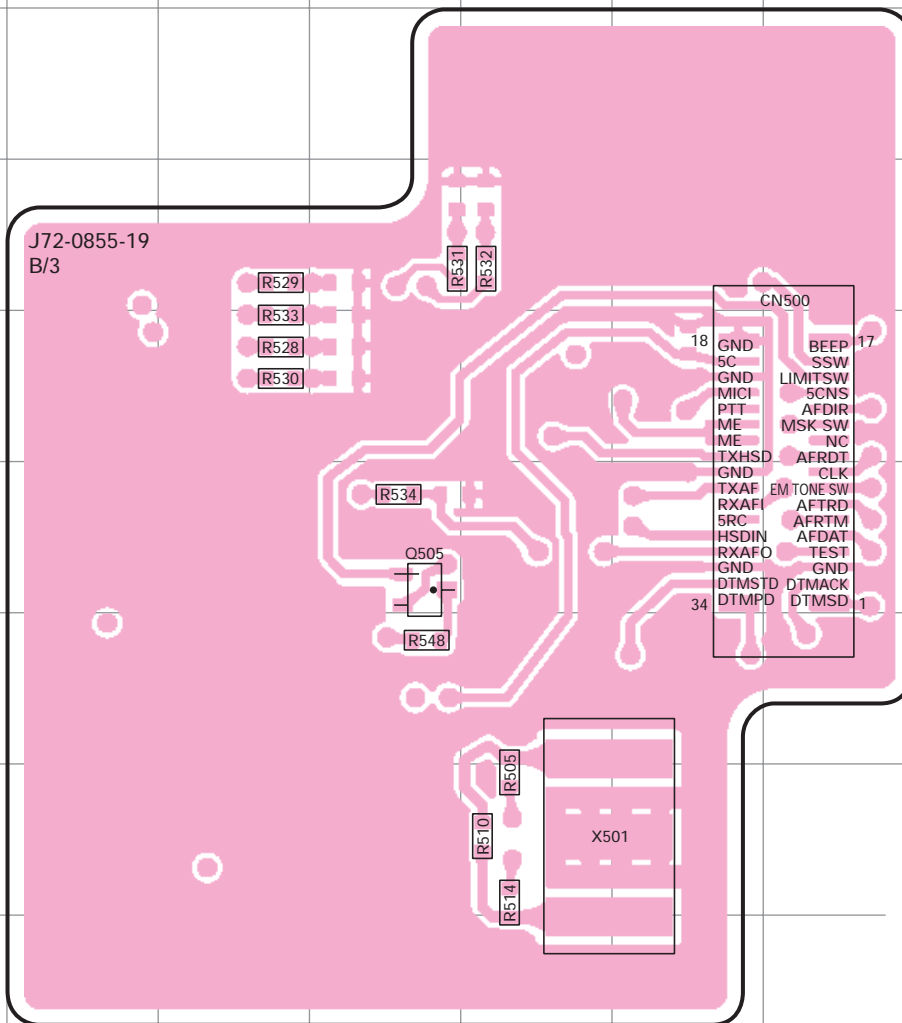
PC BOARD VIEWS

TK-2140

TX-RX UNIT (X57-6402-71) (B/3),(C/3) Component Side View (J72-0855-19)

TX-RX UNIT
(X57-6402-71)

Ref. No.	Address
Q505	6D



DTA114EE



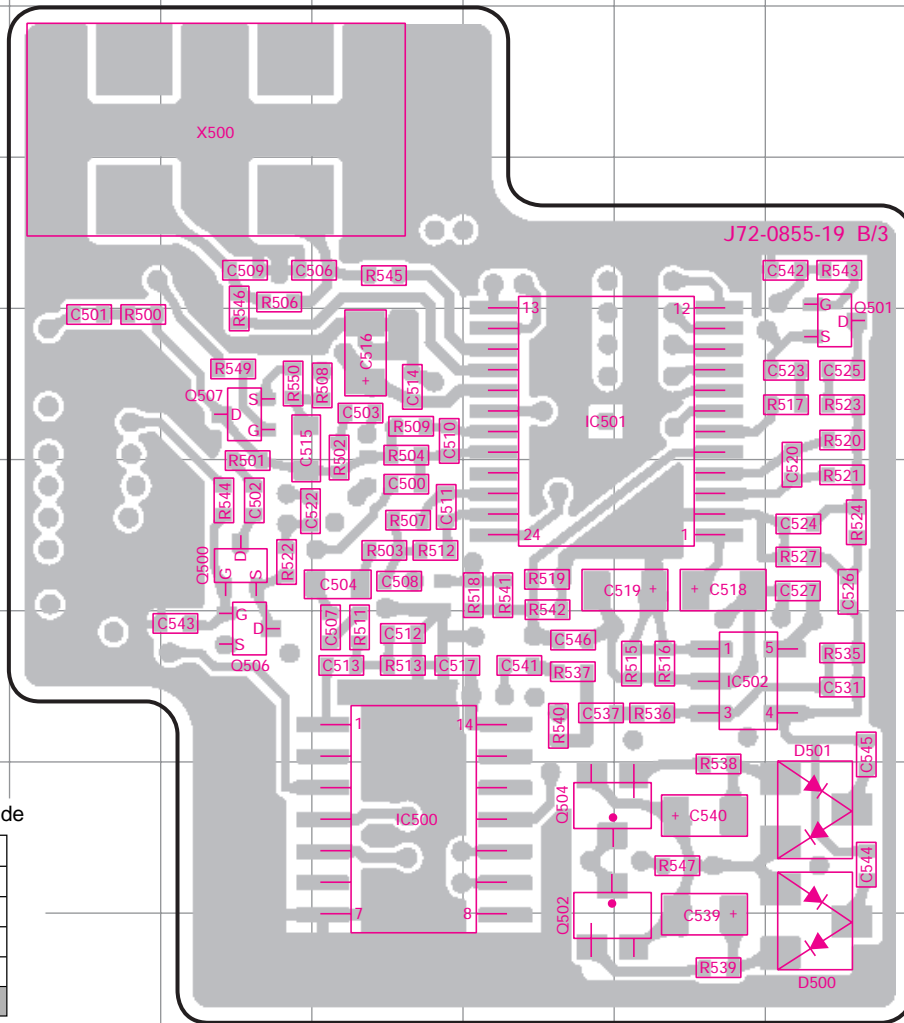
TK-2140

PC BOARD VIEWS

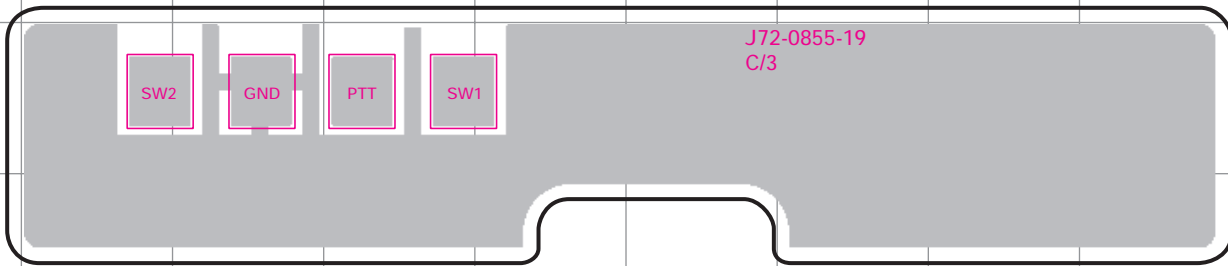
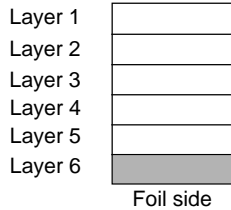
TX-RX UNIT (X57-6402-71) (B/3),(C/3) Foil Side View (J72-0855-19)

TX-RX UNIT
(X57-6402-71)

Ref. No.	Address
IC500	8E
IC501	5F
IC502	7G
Q500	6D
Q501	5H
Q502	9F
Q504	8F
Q506	7D
Q507	5D
D500	9H
D501	7H



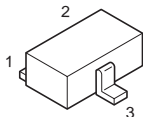
Component side



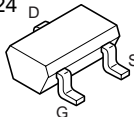
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2SC4116(Y)



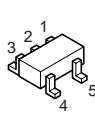
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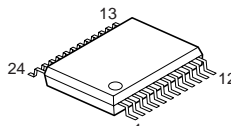
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2SK1824



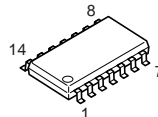
TC75S51F



AK2346



LC73872M



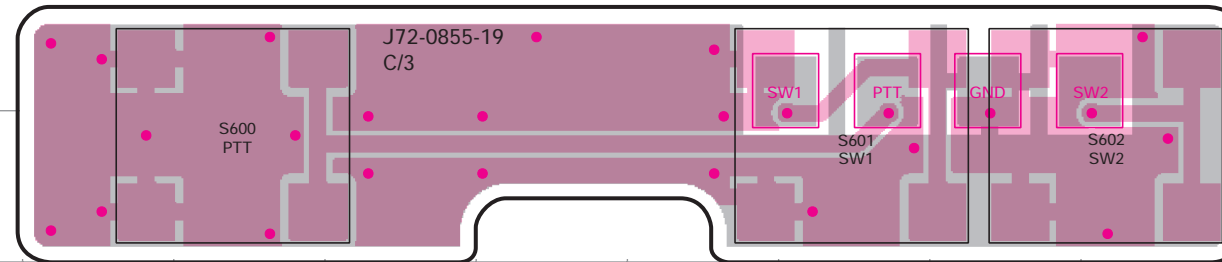
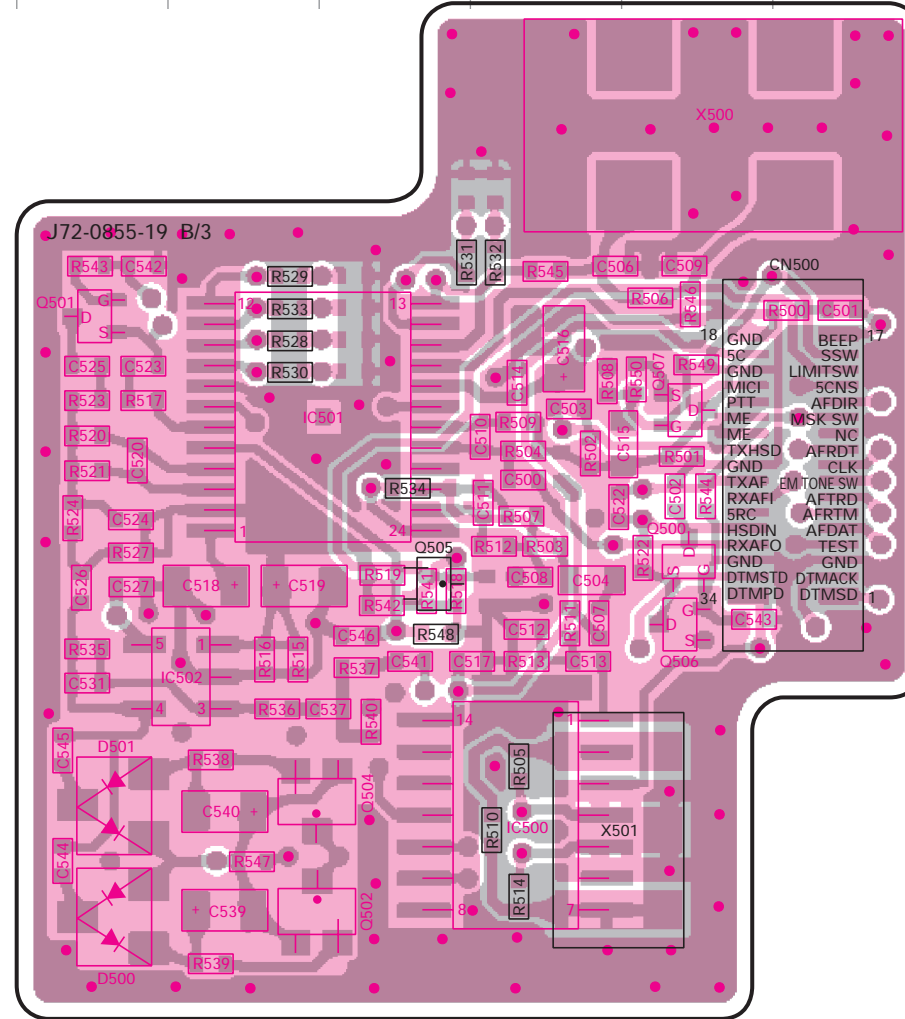
PC BOARD VIEWS

TK-2140

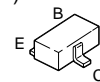
TX-RX UNIT (X57-6402-71) (B/3),(C/3) Component Side View + Foil Side View (J72-0855-19)

TX-RX UNIT
(X57-6402-71)

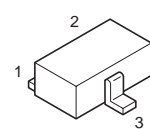
Ref. No.	Address
IC500	7J
IC501	5I
IC502	6H
Q500	6K
Q501	4G
Q502	8I
Q504	7I
Q505	6I
Q506	6K
Q507	5K
D500	8G
D501	7G



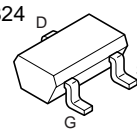
DTA114EE
2SA1586(Y,GR)
2SC4116(Y)



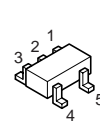
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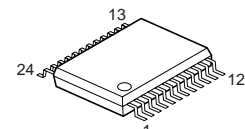
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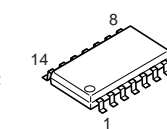
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AK2346

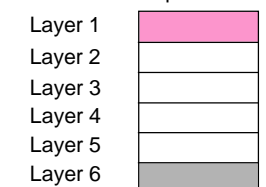


LC73872M



● Connect 1 and 6.

Component side



TK-2140

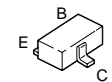
PC BOARD VIEWS

TX-RX UNIT (X57-6402-71) (A/3) Component Side View (J72-0855-19)

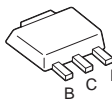
TX-RX UNIT (X57-6402-71)

Ref. No.	Address
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IC303	4M
IC308	5O
IC309	8O
IC310	10P
IC311	3N
IC312	3P
IC313	4F
IC400	5I
IC401	6E
IC402	10F
IC403	6H
IC901	8I
Q104	6I
Q105	8H
Q107	7H
Q108	6H
Q300	10N
Q301	5I
Q302	6G
Q303	6G
Q304	10K
Q305	4I
Q306	10E
Q307	4H
Q308	4E
Q309	9E
Q310	9L
Q311	9L
Q400	6E
Q401	5I
Q403	10F
Q404	10F
Q405	10G
Q406	6H
D106	7I
D300	5M
D301	7F
D302	3J
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D307	5H
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D405	7F
D901	8J

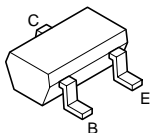
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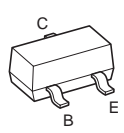
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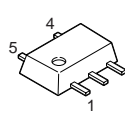
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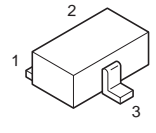
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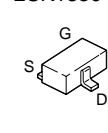
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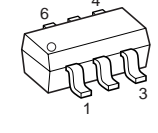
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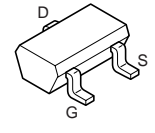
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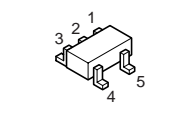
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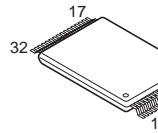
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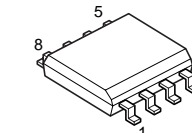
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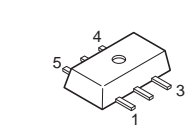
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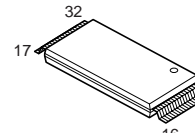
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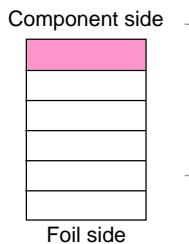
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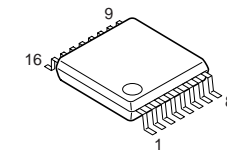
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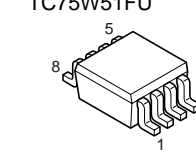
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6



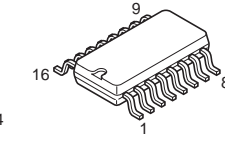
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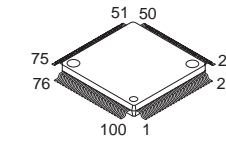
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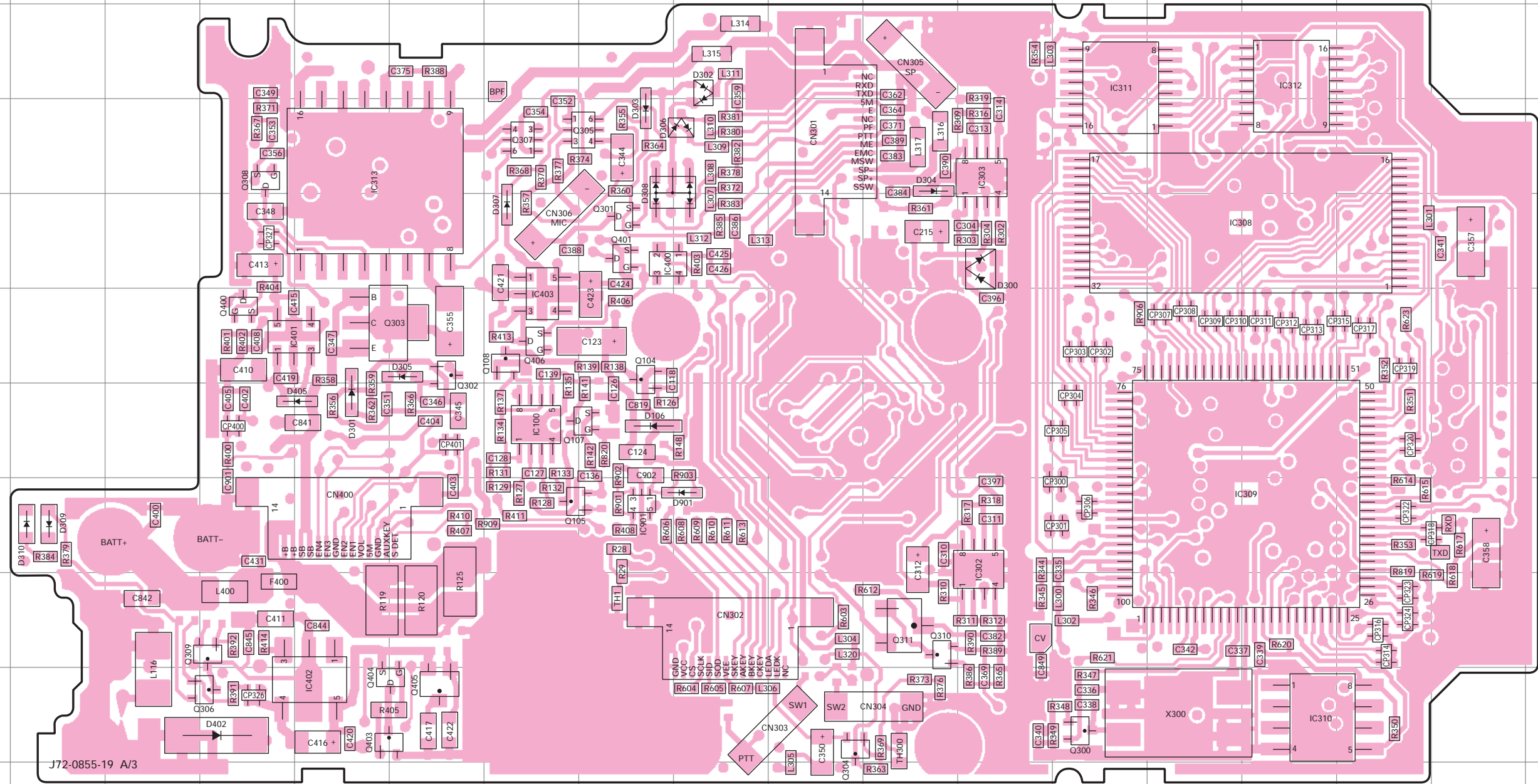
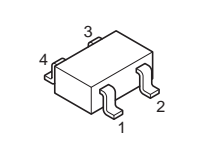
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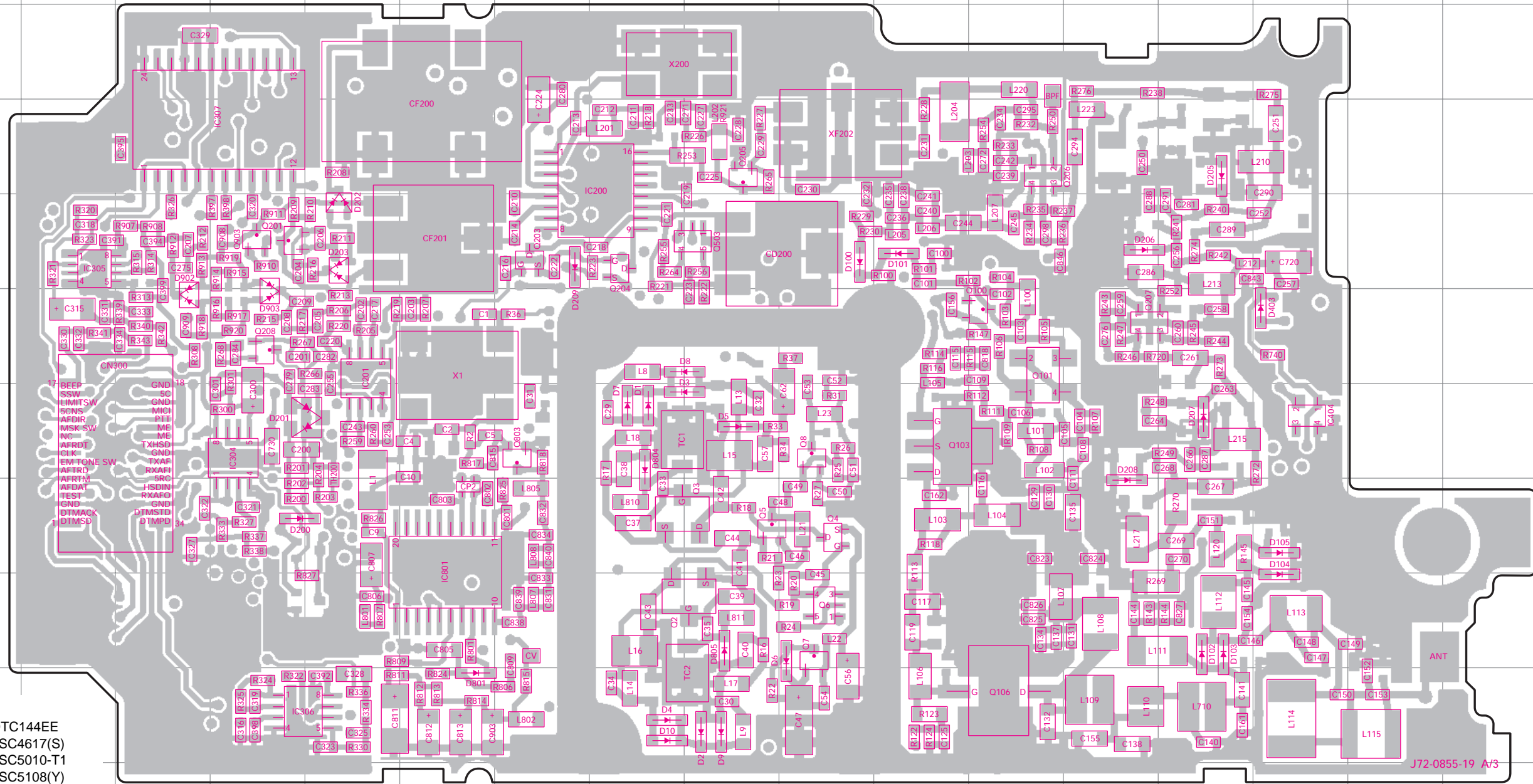
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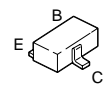
TX-RX UNIT (X57-6402-71) (A/3) Foil Side View (J72-0855-19)

TX-RX UNIT (X57-6402-71)

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IC305	5B
IC306	10D
IC307	4D
IC404	7O
IC801	8F
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Q3	8H
Q4	8J
Q5	8I
Q6	9J
Q7	9J
Q8	7J
Q100	6L
Q101	6L
Q103	7K
Q106	10L
Q201	5D
Q203	5G
Q204	5H
Q205	4I
Q206	4L
Q207	6M
Q208	6D
Q503	5I
Q803	7G
Q903	5D
D1	7H
D2	10I
D3	7H
D4	10H
D5	7I
D6	9J
D7	7H
D8	6H
D9	10I
D10	10H
D100	5J
D101	5K
D102	9N
D103	9N
D104	9O
D105	8O
D200	8D
D201	7D
D202	5E
D203	5E
D205	4N
D206	5M
D207	7N
D208	8M
D209	5G
D403	6O
D801	10F
D804	7H
D805	9I
D902	6C
D903	6D



DTC144EE
2SC4617(S)
2SC5010-T1
2SC5108(Y)



2SC5192

RN47A4

2SK508NV(K52)

2SJ347
2SK1830

3SK318

2SK2596

2SK2595

2SK1824

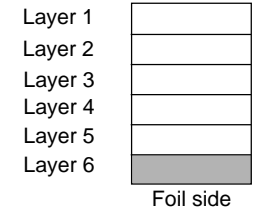
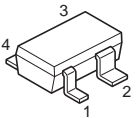
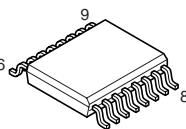
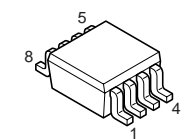
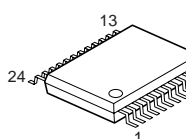
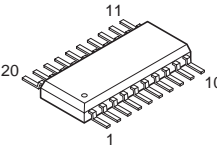
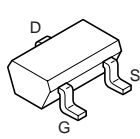
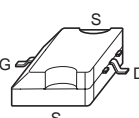
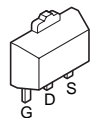
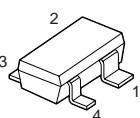
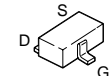
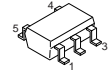
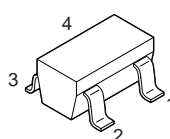
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TK-2140

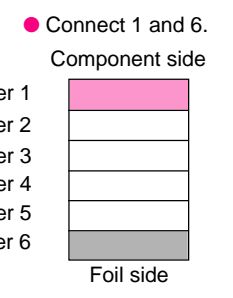
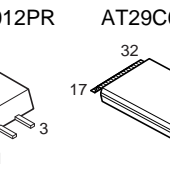
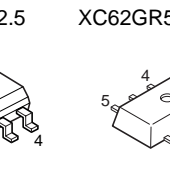
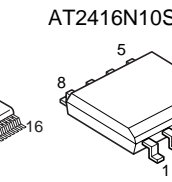
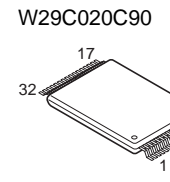
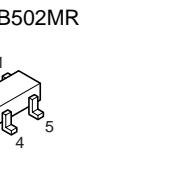
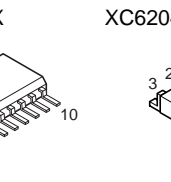
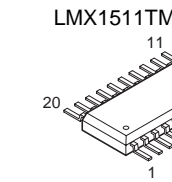
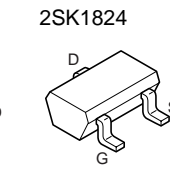
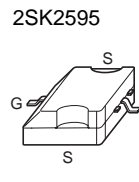
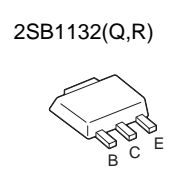
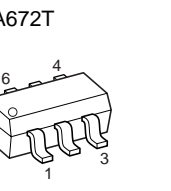
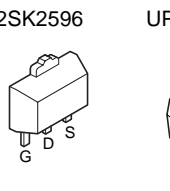
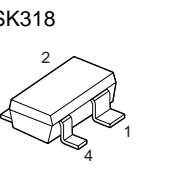
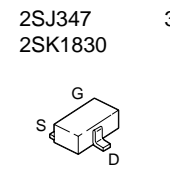
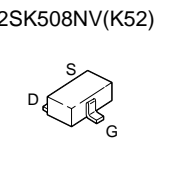
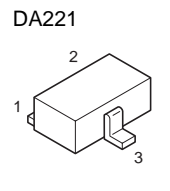
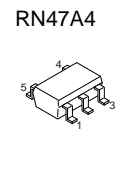
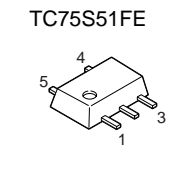
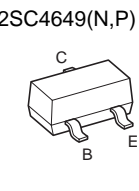
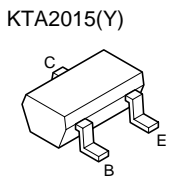
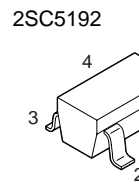
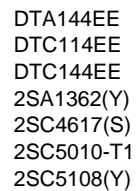
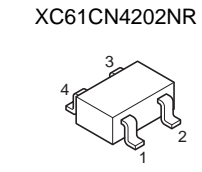
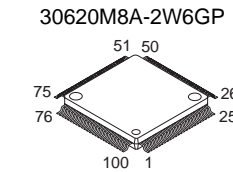
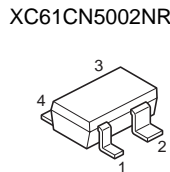
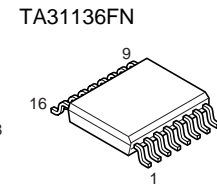
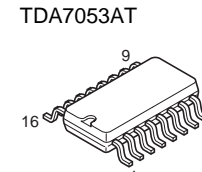
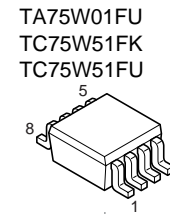
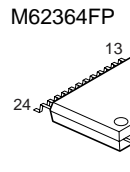
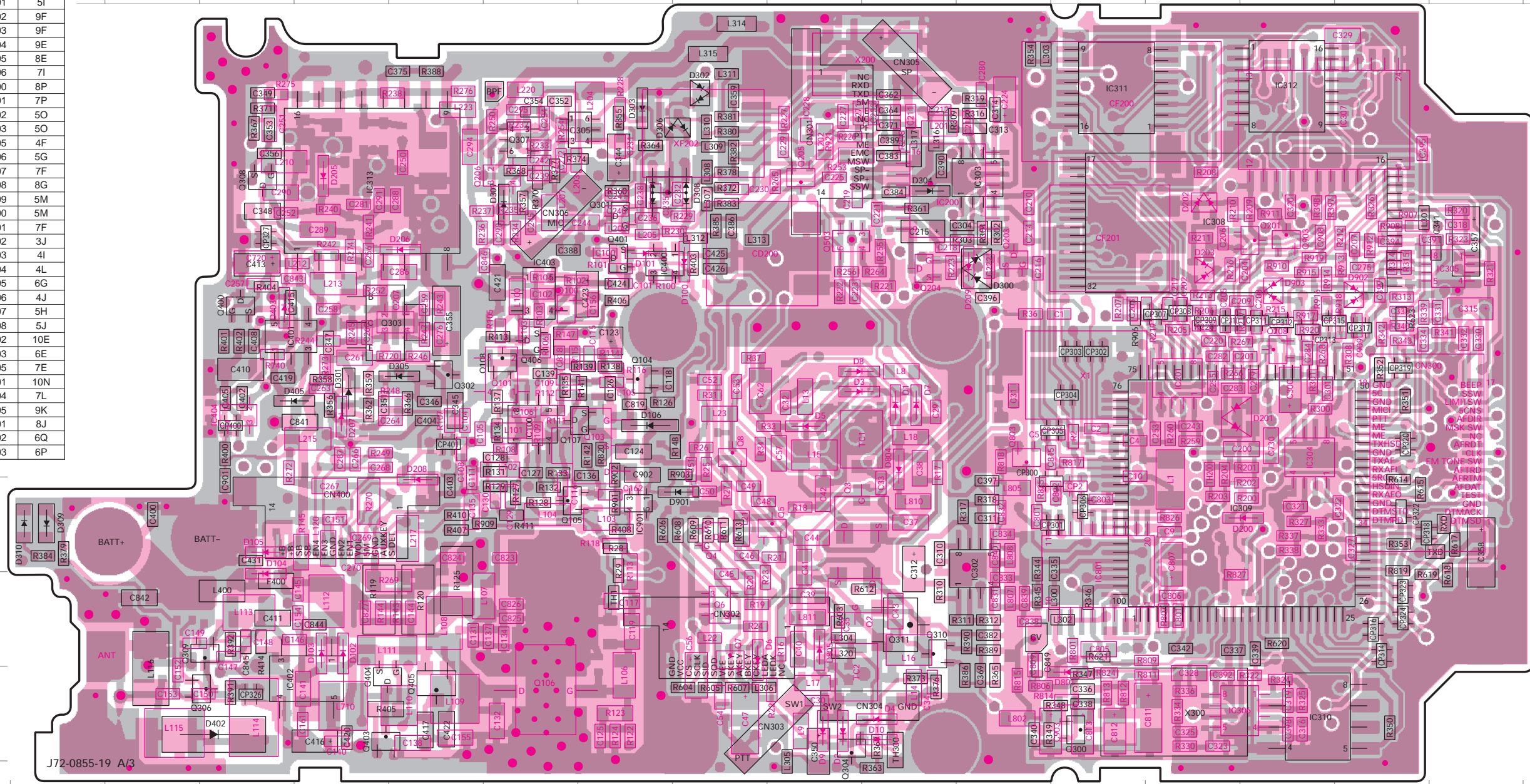
PC BOARD VIEWS

TX-RX UNIT (X57-6402-71) (A/3) Component Side View + Foil Side View (J72-0855-19)

TX-RX UNIT
(X57-6402-71)

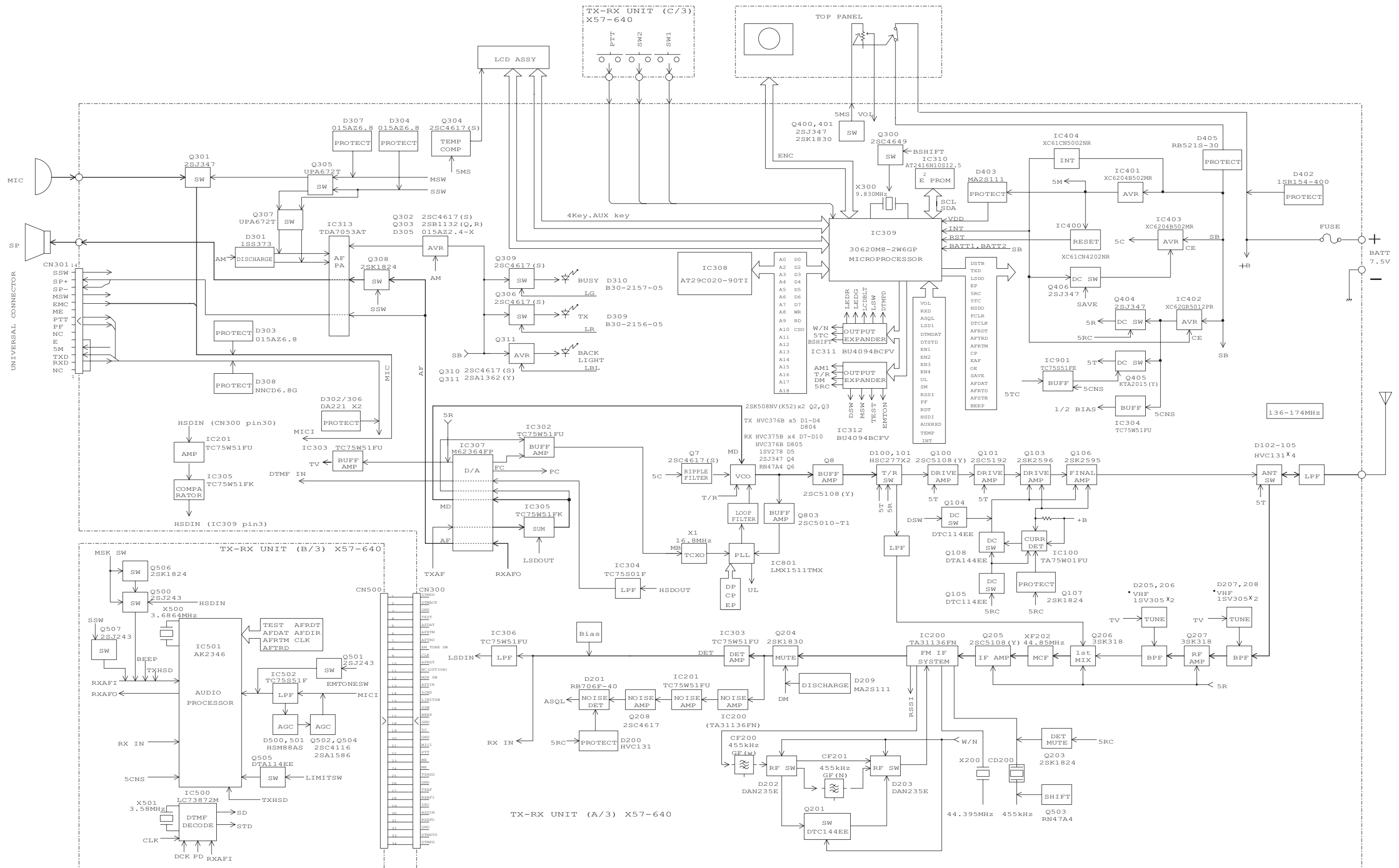
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IC302	8M	D103	9F
IC303	4M	D104	9E
IC304	7P	D105	8E
IC305	5R	D106	7I
IC306	10P	D200	8P
IC307	4P	D201	7P
IC308	5O	D202	5O
IC309	8O	D203	5O
IC310	10P	D205	4F
IC311	3N	D206	5G
IC312	3P	D207	7F
IC313	4F	D208	8G
IC400	5I	D209	5M
IC401	6E	D300	5M
IC402	10F	D301	7F
IC403	6H	D302	3J
IC404	7E	D303	4I
IC801	8N	D304	4L
IC901	8I	D305	6G
Q2	9K	D306	4J
Q3	8K	D307	5H
Q4	8J	D308	5J
Q5	8K	D402	10E
Q6	9J	D403	6E
Q7	9J	D405	7E
Q8	7J	D801	10N
Q100	6H	D804	7L
Q101	6H	D805	9K
Q103	7I	D901	8J
Q104	6I	D902	6Q
Q105	8H	D903	6P
Q106	10H		
Q107	7H		
Q108	6H		
Q201	5P		
Q203	5M		
Q204	5L		
Q205	4K		
Q206	4H		
Q207	6G		
Q208	6P		
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Q310	9L		
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Q404	10F		
Q405	10G		
Q406	6H		
Q503	5K		
Q803	7M		
Q903	5P		
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D5	7K		
D6	9J		
D7	7L		
D8	6K		
D9	10K		
D10	10L		

Ref. No.	Address	Ref. No.	Address
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D102	9F	D103	9F
D104	9E	D105	8E
D106	7I	D200	8P
D201	7P	D202	5O
D203	5O	D205	4F
D206	5G	D207	7F
D208	8G	D209	5M
D300	5M	D301	7F
D302	3J	D303	4I
D304	4L	D305	6G
D306	4J	D307	5H
D308	5J	D402	10E
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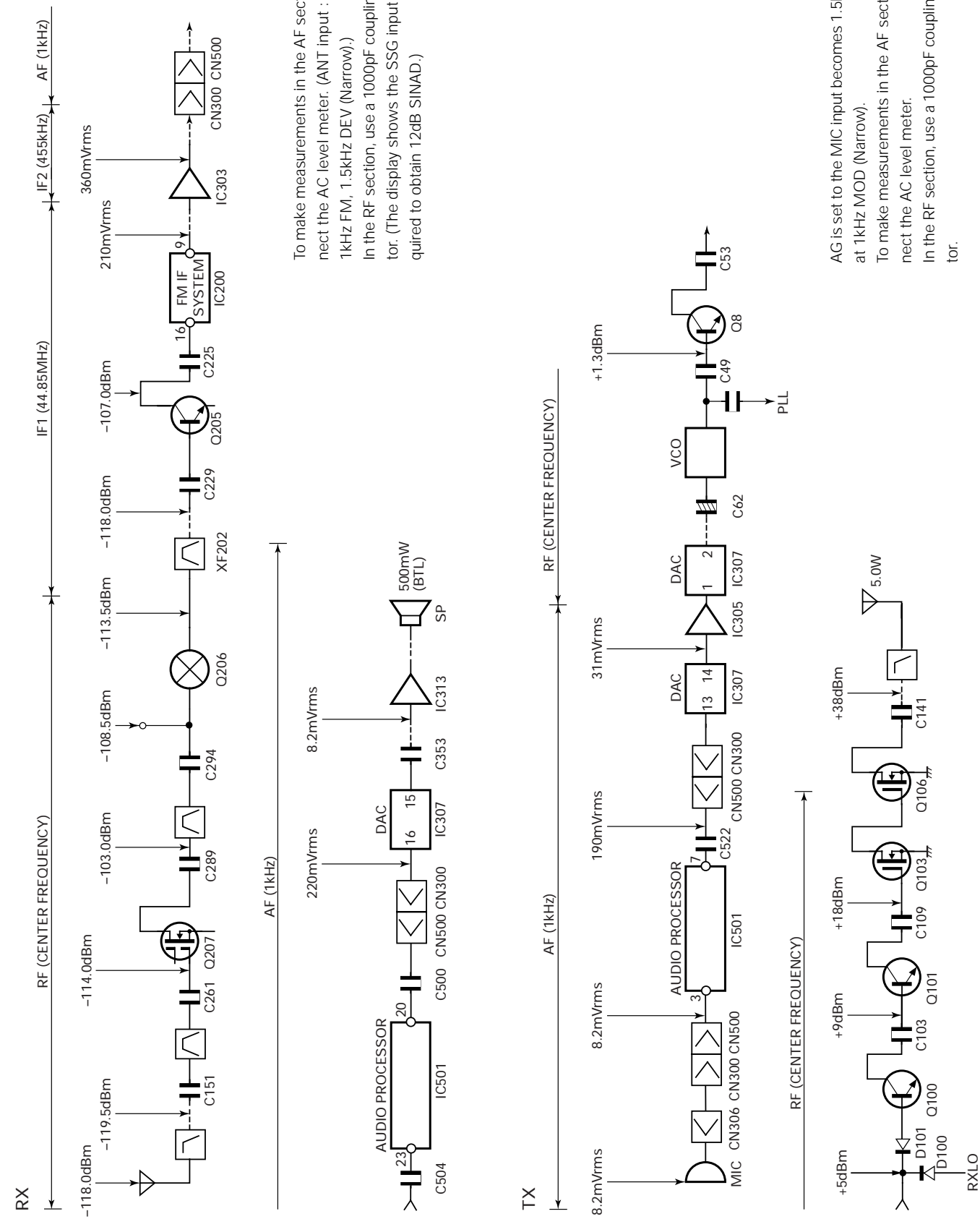


TK-2140 TK-2140

BLOCK DIAGRAM



LEVEL DIAGRAM



To make measurements in the AF section, connect the AC level meter. (ANT input : -53dBm, 1kHz FM, 1.5kHz DEV (Narrow).) In the RF section, use a 1000pF coupling capacitor. (The display shows the SSG input value required to obtain 12dB SINAD.)

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

KSC-25 / KNB-24L / KNB-25A / KNB-26N

KSC-25 (RAPID CHARGER)

External View



Specifications

Charging current 1200mA ±5% (KNB-25A, KNB-26N)
 945mA ±5% (KNB-24L)
 Charging time KNB-24L: Approx. 150minutes
 KNB-25A: Approx. 60minutes
 KNB-26N: Approx. 100minutes
 Dimensions (Charger only) 105W x 55H x 135D (mm)
 Weight (Charger only) Approx. 170g

KNB-24L (Li-ion Battery Pack)

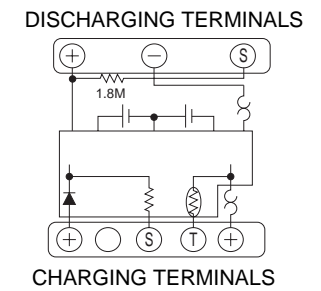
External View



Specifications

Voltage 7.4V (3.7V x 2)
 Battery capacity ... 1400mAh

Schematic Diagram



KNB-25A (Ni-Cd Battery pack)

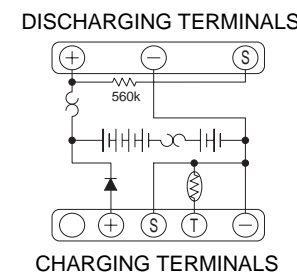
External View



Specifications

Voltage 7.2V (1.2V x 6)
 Battery capacity ... 1200mAh

Schematic Diagram



KNB-26N (Ni-MH Battery pack)

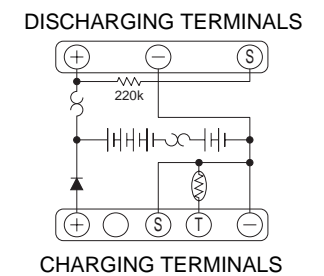
External View



Specifications

Voltage 7.2V (1.2V x 6)
 Battery capacity ... 2000mAh

Schematic Diagram



KBP-5 / KMC-25

KBP-5 BATTERY CASE

■ External View



AA alkaline battery x 6

KMC-25 (Speaker Microphone)

■ External View



■ Specifications

Microphone

Impedance 2k Ω

Sensitivity -65dB \pm 4.0dB at 1kHz

Speaker

Impedance 16 Ω

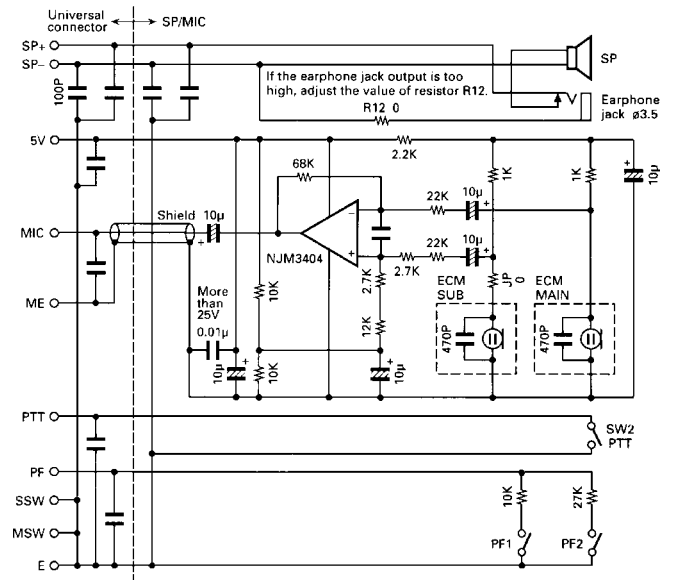
Input 0.5W

Maximum input 1.5W

Dimensions 62W x 81H x 29D (mm)

Weight (With plug cord) Approx. 0.17kg

■ Circuit Diagram



TK-2140

SPECIFICATIONS

General

Frequency Range	
RX, TX	E : 136 to 174MHz
Groups	Maximum 250
Channels	Maximum 250 (Case of 1 Group)
Channel Spacing (Wide 5k/Wide 4k/Narrow)	25kHz/20kHz/12.5kHz
PLL Channel Stepping	5.0, 6.25kHz
Antenna Impedance	50 Ω
Operating Voltage	DC 7.5V \pm 20%
Battery Life (5-5-90 duty cycle with battery saver off)	Approx. 9 hours at 5W with KNB-24L battery Approx. 8 hours at 5W with KNB-25A battery Approx. 12 hours at 5W with KNB-26N battery
Temperature Range	-30°C to +60°C (-22°F to + 140°F) when KNB-25A in use -10°C to +60°C (+14°F to + 140°F) when KNB-24L/KNB-26N in use
Frequency Stability	\pm 0.00025% (-30°C to +60°C)
Dimensions and Weight	
With KNB-24L (1400mAh battery)	4.13" (105mm) H x 2.21" (56mm) W x 1.16" (29.5mm) D 0.66lbs (300g)
With KNB-25A (1200mAh battery)	4.13" (105mm) H x 2.21" (56mm) W x 1.41" (35.7mm) D 0.79lbs (360g)
With KNB-26N (2000mAh battery)	4.13" (105mm) H x 2.21" (56mm) W x 1.41" (35.7mm) D 0.90lbs (410g)
(Dimensions not including protrusions)	

Receiver (Measurements made per TIA/EIA-603, EN-086)

Sensitivity	
EIA 12dB SINAD	0.28 μ V
EN 20dB SINAD	-3dB μ V
Adjacent Channel Selectivity (Wide 5k/Wide 4k/Narrow) ..	75dB/75dB/65dB
Intermodulation	68dB
Spurious Response Rejection	70dB
Audio Power Output	500mW at 16 Ω less than 5% distortion
Channel Frequency Spread	38MHz

Transmitter (Measurements made per TIA/EIA-603, EN-086)

RF Power Output	
Hi	5W
Low	1W
Spurious Emission	-36dBm \leq 1GHz, -30dBm > 1GHz
Modulation Limiting	
Wide 5k	\pm 5.0kHz at 25kHz
Wide 4k	\pm 4.0kHz at 20kHz
Narrow	\pm 2.5kHz at 12.5kHz
FM Noise (EIA)	
Wide 5k/Wide 4k/Narrow	45dB/45dB/40dB
Microphone Impedance	600 Ω
Modulation Distortion (EIA)	Less than 3% at 1kHz
Channel Frequency Spread	38MHz

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